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Intimate partner violence and children's cognitive development

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This study examines how Intimate Partner Violence (IPV) affects the educational outcomes of children living in violent households. We employ data from the Millennium Cohort Study, a longitudinal survey that follows about 19,000 children born in the UK in 2000-01. We use their educational performance measures in English, Science, Mathematics, Physical Education, Creativity, and Information and Technology at ages 7 and 11. We find that children exposed to IPV have worse educational outcomes. Children living with abused mothers have lower scores in English and Maths by age 11. These results remain consistent across different definitions of IPV and remains significant even after controlling for potential sample selection bias. Subjects that require prior knowledge, such as Maths and Science, are more strongly affected.

Keywords: intimate partner violence; cognitive development; sample selection, propensity score matching

JEL Classification: I21,I24

1 Introduction

According to the Crime Survey for England and Wales (CSEW), 5% of individuals aged 16 and over were subjected to domestic abuse in the 12 months leading up to March 2022,¹ and 20% had experienced abuse since the age of 16.² Approximately 20% of adults, aged between 18 and 74 years, experienced one or more instances of abuse (emotional, physical, or sexual) or witnessed domestic violence during their childhood.³ Our paper examines how witnessing domestic violence affects the educational outcomes of children.

Research in the field of paediatrics emphasizes the far-reaching impact of witnessing a violent parental relationship. The presence of intimate partner violence (IPV) has a detrimental effect on the child's socio-emotional development, with long-lasting consequences not only for interpersonal relationships but also for academic knowledge acquisition (Margolin & Gordis 2000). Various psychological studies underscore the negative effects of growing up in troubled families. Children in such environments may internalize violence as a means of asserting control over others. Additionally, these children are more prone to engaging in antisocial behaviours, such as delinquency, struggling with mood regulation, and experiencing low self-esteem (Magdol et al. 1998). Furthermore, children who witness abuse are more likely to exhibit force in their future relationships, and their parenting styles may be influenced by their exposure to IPV.

Children's exposure to violence has a detrimental impact on the accumulation of human capital, resulting in worsened health, cognitive development, and labour outcomes (Duque 2017, Ang 2021). A well-established negative correlation exists between environmental violence and neonatal/early childhood health (Rodríguez 2022, Shemyakina 2021, Wang et al. 2023). Violent shocks during pregnancy and early childhood lead to compromised child health, affecting not only the short- and medium-term but also extending into adulthood (Almond et al. 2018, Currie 2020). Likewise, the presence of violent incidents and conflicts has an adverse effect on educational outcomes (Gartland et al. 2021). Existing literature explores various violent events, including drug-related conflicts, homicides in the school vicinity, school shootings, terrorist attacks, and police killings. The

¹Domestic abuse in CSEW includes/combines partner abuse (non-sexual), family abuse (non-sexual) and sexual assaults or stalking carried out by a current or former partner or other family member

²<https://www.ons.gov.uk/peoplepopulationandcommunity/crimeandjustice/bulletins/domesticabuseinenglandandwalesoverview/november2022>

³<https://www.ons.gov.uk/peoplepopulationandcommunity/crimeandjustice/articles/childabuseextentandnatureenglandandwales/yearendingmarch2019>

evidence consistently demonstrates the negative impact of violence on school completion rates, absenteeism, test scores, school graduation, and even on labor outcomes in young adulthood (Brown & Velásquez 2017, Monteiro & Rocha 2017, Duque 2017, Ang 2021, Koppensteiner & Menezes 2021, Cabral et al. 2021, Levine & McKnight 2021).

Our research builds on the work of Anderberg & Moroni (2020), who explored the influence of IPV on cognitive development using data from the Avon Longitudinal Study of Parents and Children. They used the MacArthur-Bates Communicative Development Inventories to measure educational development from infancy to around age 7, covering vocabulary comprehension, production, gesture, and grammar. Their results suggested that IPV exposure negatively impacts cognitive skills after age 3 and affects the aggregate score on national tests taken around age 7. Our study extends this research by examining children not only at age 7 but also at age 11, specifically investigating how IPV’s impact evolves between these ages within specific subject areas defined by the National Curriculum. This curriculum evaluates students at two Key Stages: KS1 at age 7 and KS2 at age 11, examining differences across subject areas. In line with Anderberg & Moroni (2020), we examine both the ever and contemporaneous effects of IPV exposure, allowing us to determine whether the timing of exposure has different effects.

In our empirical approach, we initially employ an Ordinary Least Squares (OLS) estimator to measure the association of IPV with a child’s educational development. Recognising the potential influence of unobservable family factors that could simultaneously affect both IPV and test scores, we explore the self-selection into a violent relationship by means of a control function approach. We additionally assess the stability of the control function IPV estimates by looking at the bounding sets proposed by Oster (2019). This method partially discerns the impact under scrutiny by setting up reliable bounds on the actual value that would have emerged if we had taken into account all pertinent control variables, whether they were observed or not. As a concluding test of robustness, we employ propensity score matching techniques to compute the Average Treatment Effects on the Treated (ATT). Our findings reveal that the coefficients derived from this method align closely with those obtained from the control function, further validating our results. Our analysis consistently indicates that IPV reduces cognitive development when children are aged 11 only, with no discernible effects at the age of 7. We observe heterogeneity in the ever impact across academic subjects for children’s exposure to IPV: it affects

significantly more academic areas like Maths and Science, where cumulative knowledge plays a more crucial role in progression compared to subjects like Creativity.

The paper is organised as follows. Section 2 introduces the data used, outcome variables, the definition of IPV measures used and controls included, as well as some descriptive statistics. Section 3 presents the econometric strategy. Section 4 presents the results and section 5 concludes.

2 Data

We use the Millennium Cohort Study (MCS), a national survey that tracks the lives of nearly 19,000 children born in the United Kingdom during 2000-2001. The first wave was collected when children were 9 months old, and consecutive interviews were gathered at different intervals. Trained interviewers carried out a set of multipurpose questionnaires, which are intended to capture not only the cognitive and physical attributes but also the socioeconomic and demographic environment of the child. For the purpose of this paper, we use data from waves 4 and 5, when the children are 7 and 11 years old, respectively, and restrict the sample to families where the children’s biological parents are cohabiting.

2.1 Educational Outcomes

We focus on cognitive and psycho-motor development in children during primary education, as these aspects together lay the foundation for the accumulation of human capital in subsequent stages of education. While cognitive development is central to academic performance, psycho-motor activities—such as physical education, creative tasks, and play—are equally important as they foster the coordination of mental and physical processes. These activities help children develop attention, memory, and problem-solving skills, which are crucial to their overall intellectual growth. For instance, physical tasks like writing, dancing, and sports enhance motor skills, which, in turn, support the development of spatial awareness and other cognitive domains, particularly in mathematical reasoning and scientific inquiry.

The integration of physical education and creative activities into early learning is supported by research demonstrating their substantial impact on cognitive development. Participation in sports is associated with higher educational attainment, as it helps chil-

dren develop non-cognitive skills like discipline, perseverance, and self-esteem, which are crucial for academic success (Pfeifer & Cornelißen 2010). This positive effect is especially pronounced in girls, where involvement in competitive sports can significantly enhance academic performance. Physical education not only supports cognitive functions but also contributes to social skill development, reducing behavioural problems (Felfe et al. 2016).⁴ Engaging in psycho-motor and creative activities strengthens brain plasticity by promoting neural connectivity, which underpins both intellectual growth and behavioural development (Marzola et al. 2023).

In assessing educational outcomes, we consider children’s abilities across key areas specified in the UK National School Curriculum, which include a balance of cognitive assessments and teacher evaluations of children’s overall development. The National Curriculum for Primary Education consists of two key stages (KS): KS1 for ages 5 to 7 and KS2 for ages 7 to 11. At the end of KS1, children take standardised national tests in English, reading, and maths (KS1 SATs), and teachers assess them in maths, science, and English reading and writing. Similarly, at the end of KS2, children take national tests in English reading, maths, grammar, punctuation, and spelling, while teachers assess their English writing and science. Children are also assessed on Physical Education (PE), Information and Technology (IT) and creativity. Our analysis focuses on the periods when children are aged 7 and 11, aligning with the end of KS1 and KS2 assessments. The MCS includes the results of these assessments, allowing us to evaluate how cognitive development, supported by physical education and creative activities, influences academic and social outcomes during these critical stages of primary education.

Children’s teachers were contacted contingent on parental consent.⁵ Teachers rated student performance with respect to all other children in the same class or school and also with respect to the national academic threshold requirements for children of the same age. Responses are categorical and coded from 1, “being well above the average”, to 5, “well below the average”. We invert the coding of the teacher’s scores and standardise it, transforming scores into a variable with a zero mean and a standard deviation of one. Table 1 shows summary statistics of subjective teacher’s scores for children at the

⁴These activities also provide long-term benefits with skills acquired through sports positively influencing future labour market outcomes (Lechner 2009).

⁵In waves 4 and 5, consent and appropriate information were obtained to include teachers’ assessments. Consent was obtained for 12,655 out of 14,043 children aged 7 and for 9,610 out of 10,506 children who were 11 years old. This resulted in 8,876 and 7,430 usable surveys for waves 4 and 5, respectively. In the fifth wave, the teacher’s questionnaire was only accessible for England and Wales.

ages of 7 and 11, differentiating those households without IPV (non-IPV sample) and households with IPV (IPV sample). At age 7, English is specifically split into three sub-areas, Reading, Writing and Speaking, and Listening. At age 11, a single score is given for English overall. Table 1 shows the summary statistics for the educational outcomes. Children exposed to IPV score 0.20 to 0.30 standard deviations lower than the mean in English. By age 11, these children score more than 0.30 standard deviations below the mean in Maths and Science. At both ages, there are marked differences in scores between children in non-IPV households and children exposed to IPV. We report the results of testing whether the different subject means are statistically different among both samples.

Table 1 around here

2.2 Intimate Partner Violence

Our variable of IPV in the MCS is based on the following question asked to mothers: “People often use force in a relationship - grabbing, pushing, shaking, hitting, kicking etc. Has your husband/partner ever used force on you for any reason?”.⁶ The respondent has three alternatives: 1 (Yes), 2 (No) and 3 (Don’t want to answer).⁷ Using this information we define two IPV variables: a contemporaneous IPV indicator equal to 1 if the mother answers yes to this question in a given wave, and 0 if the mother answers no. We define a second variable ever-IPV which equals 1 if the mother has answered yes in the current wave or any of the past waves $t-j$, for $j < t$ and 0 if she has consistently answered no in each wave.⁸

Documenting the effect of IPV is complicated by the potential lack of consistent and reliable answers. The most recent CSEW indicates that 6.9% of women reported domestic abuse.⁹ The major drawback of relying on survey-elicited IPV information is the potential

⁶Specifically, the question asked is “People often use force in a relationship - grabbing, pushing, shaking, hitting, kicking etc. Has your [husband/wife/ partner] ever used force on you for any reason?”. We will use the information on force from the husband/partner for the main specification. Later in the results section, we extend the analysis to include the reporting from fathers on whether their wife/partner was violent towards them.

⁷The parental questionnaire was administered by an interviewer, though more personal or sensitive questions were self-completed by one parent at a time in order to lessen the misreporting effect. Further details are available in the User Guides of each sweep: <https://cls.ucl.ac.uk/cls-studies/millennium-cohort-study/>.

⁸The Ever-IPV variable for wave 4 when children are aged 7 uses information on IPV reporting in waves 1 to 4. The variable Ever-IPV for wave 5 when children are 11 years of age includes the reporting of IPV in waves 1 to 5.

⁹<https://www.ons.gov.uk/peoplepopulationandcommunity/crimeandjustice/datasets/domesticabuseprevalenceandvictimcharacteristicsappendixtables>

under-reporting which may lead to downward biasing the estimates. Among the reasons for under-reporting given by respondents in the CSEW are embarrassment in 22.25% of cases and it being a private matter in 12.92% of cases.¹⁰ This is especially problematic given that the timing of IPV reporting by mothers matters with regards to its long-term influence on children (Carrell & Hoekstra 2010). As in the CSEW, our analysis is also akin to measurement error due to under-reporting and our results will be a lower bound of the IPV impact on education.

Our measure of IPV explicitly captures violence experienced directly by the mother. It does not reflect whether children in the household are directly or indirectly subject to domestic abuse. Approximately 62% of children living in violent households, experience direct violence by the parent exerting IPV (Co-ordinated Action Against Domestic Abuse 2014). In the UK, the Domestic Abuse Act 2021¹¹ recognises that “a child who sees or hears, or experiences the effects of domestic abuse and is related to or under parental responsibility of the person being abused or the perpetrator is also to be regarded as a victim of domestic abuse”. Therefore, we consider children exposed to parental violence to be domestic abuse victims.

Table 2 around here

We further extend the definition of violence in two distinct ways. First, we examine whether the father reported experiencing IPV perpetrated by the mother. In addition, we analyse instances where either parent reported IPV. Table 2 shows children and parental summary statistics for households with and without IPV. The table includes the reporting of ever-IPV exposure and reveals that 3% (column (1)) and 4.5% (column (4)) of women not exposed to IPV in waves 4 and 5, respectively, do report having experienced IPV in previous waves who declared having suffered IPV in previous waves do not report it at the time of the interview.¹²

¹⁰<https://www.ons.gov.uk/peoplepopulationandcommunity/crimeandjustice/bulletins/crimeinenglandandwales/2015-04-23>

¹¹<https://www.gov.uk/government/publications/domestic-abuse-bill-2020-factsheets/statutory-definition-of-domestic-abuse-factsheet#how-does-the-act-deal-with-children-affected-by-domestic-abuse>

¹²We also present in Table A1 the reported incidence of IPV per wave, as well as the proportion of mothers who persistently reported experiencing IPV. The variables IPV_{W1} , IPV_{W2} , IPV_{W3} , and IPV_{W4} denote whether a mother reported IPV during each respective wave. The data indicate that within the IPV sample, a significant proportion of mothers reported experiencing IPV across multiple waves. For instance, at age 7, 27.8% of mothers in the IPV group reported IPV in the first wave, compared to only 1.1% in the non-IPV group, a statistically significant difference. This trend persists in subsequent waves, with 37.6% and 51.1% of mothers in the IPV group reporting IPV in the second and third waves, respectively, while reporting in the non-IPV group remains consistently low. A similar pattern is observed at age 11. In the IPV group, 24.0% of mothers reported experiencing IPV in the first wave, increasing to 25.0%, 34.6%,

The variable Father IPV captures whether the father reported experiencing IPV perpetrated by the mother. The data reveal that 32.3% of fathers in IPV households reported experiencing IPV at age 7, compared to 6.7% in non-IPV households—a statistically significant difference. At age 11, the percentages are 26.0% for IPV households and 6.4% for non-IPV households. This indicates that in IPV households, not only mothers but also some fathers report experiencing IPV, suggesting the possibility of bidirectional violence. To explore this issue further, we created the variable Violence, coded as 1 if either parent reported IPV and 0 otherwise. Thus, the variable Violence takes the value 1 for all IPV households and for the 6.7% (at age 7) and 6.4% (at age 11) of non-IPV households where only the father reported IPV.

2.3 Control variables

We include a set of plausible exogenous explanatory variables for child, parental and household characteristics, for instance, the child’s gender, a dummy variable that captures whether the child was born with low birth weight, and their ethnic background.¹³ In England, Wales and Northern Ireland the academic year starts on September 1st and ends on August 31st, whereas Scottish children start on the 15th of August and end on the 14th of August. Pupils born in the first months of the academic year (September–December) tend to perform better than those born in the summer (Thomas 1995, Alton & Massey 1998). For pupils in the same cohort, there is a premium for being born during the first part of the academic year. To control for this, we incorporate a dichotomous variable on whether the child was born between September and December. Finally, to control for the lifestyle and the type of upbringing experienced by the child, we also include indicators on whether the child is overweight or obese. While BMI is a proxy for both lean and fat mass, it does not reveal a child’s body composition. There is a range of physiological indices that can tackle better the definitions of obesity and overweight in children, such as waist and hip circumferences or subcutaneous fat measurements like

and 48.1% in subsequent waves. The non-IPV group continues to show minimal reporting across all waves. These findings suggest that IPV is persistent in affected households over time. Finally, we observe that approximately 16.5% and 13.5% of mothers consistently reported IPV across all waves in waves 4 and 5, respectively.

¹³There is evidence these variables affect cognitive outcomes. For instance, girls lose more than two-tenths of a standard deviation relative to males during the first years of schooling in Mathematics (Fryer & Levitt 2010). An increasing body of literature reports a long-lasting negative effect of low birth weight on later job performance (Alderman & Behrman 2006, Almond et al. 2004) and ethnic background also affects birth weight, which in turn is key for later child development. Dearden et al. (2006) examines the relation between birth weight and race using the first wave of the MCS, suggesting that Asian and Black babies are 5% and 6% respectively more likely to be of low birth weight than white babies.

triceps skinfold (Saxena et al. 2004). In this paper, we use age and gender Body Mass Index (BMI)-specific thresholds as in Saxena et al. (2004). Table 2 provides the summary statistics for children’s and parental characteristics, revealing virtually no statistically significant differences in child-related variables between the two groups.

The set of parental characteristics includes: controls for age and health, capturing whether the mother or father suffers from long-term health conditions, suffer from depression, and smoking status. We also control for the highest educational (vocational or academic) level attained by the parents: GCSE grades (D-G) or equivalent, O-level or equivalent, A-level or equivalent, first degree or equivalent and higher degree or equivalent.¹⁴ Our specification also has an indicator variable that captures the working status. The reason for including this employment control is two-fold. Firstly, it is a proxy of the income stream in the household. Secondly, and importantly, if the mother has no income or earns less than her partner, her bargaining power inside the household might be lower than otherwise. Empirical results emphasise that employed women are less likely to suffer from domestic violence; however, the effect might greatly depend on the relative income difference among both partners (Farmer & Tiefenthaler 1996, Aizer 2010, Anderberg et al. 2016). As a household control, we incorporate an indicator for whether the family lives in a council house or housing association to proxy for neighbourhood deprivation.¹⁵ We also control for household income¹⁶ to account for the effect that the income gradient has on cognitive development.¹⁷

¹⁴Cutler & Lleras-Muney (2010) show that education influences cognitive ability, and in turn, this leads to healthier behaviours, weighing more on how one processes the information rather than how much one knows. Better-educated parents are likely to engage in more stimulating conversations with their children as well as have a better network in case of ill health. More educated parents will have a network of family and friends in case the child needs health treatments (Putnam 2016).

¹⁵Bilger & Carrieri (2013) find there is long-lasting, damaging impact on the health production function (self-assessed health, presence of chronic conditions and limitations to daily activities) of crime, pollution and noise in the neighbourhood. Jacob et al. (2013) also find positive spillover effects of moving into a less distressed neighbourhood on child mortality.

¹⁶In the MCS, income is given in threshold levels and is defined as the combined annual income from all sources after deductions. We took the midpoint of the reported range and adjusted it to real terms using the annual average consumer price index provided by the Office of National Statistics with 2005 as a base. We take the natural logarithm of the income.

¹⁷The literature highlights the relevance of income on a child’s behaviour. For instance, Blau (1999) looks at the income effect on childhood development, which is defined through cognitive, social and emotional dimensions. He finds that permanent income (averaged across all periods) has a small impact on child outcomes and highlights that other factors, like parental education background or home environment, have a more significant effect. Findings in Dooley & Stewart (2007) are also in line with Blau (1999) but they argue that parental style introduces heterogeneity that is difficult to control for and might bias the income effect. Violato et al. (2011) looks at the income gradient on school outcomes using the MCS dataset, and their results are consistent with the above studies. In addition to income levels, household income instability may also affect school behaviour. Gennetian et al. (2015) stress that an abrupt income change is related to a lower likelihood of adolescents engaging at school as well as more likely to be expelled, particularly among low-income household level and racial minority children.

3 Econometric Strategy

We first estimate a linear regression of the association between IPV and educational attainment as specified in the following equation:

$$score_{it} = \alpha + \delta IPV_{it} + X_{it}\beta + \varepsilon_{it} \quad (1)$$

where *score* refers to the performance measure for each learning dimension for a child *i* at sampling wave *t*, α is a constant term, X_{it} is the vector of control variables including covariates for the child, parental and household characteristics and ε is an idiosyncratic error normally distributed. Our variable of interest IPV_{it} indicates whether the mother of the child *i* was exposed to IPV in wave *t*. The latter definition of IPV corresponds to the contemporaneous effect of domestic abuse. However, as discussed above, we also estimate an alternative specification using the IPV variable that captures if the mother has ever experienced IPV, in the current or past waves.

3.1 Do parents self-select into a violent relationship?

Accounting for unobservable characteristics

In addition to the test of coefficient stability discussed above, we further explore the role of unobservables that may challenge the identification of δ in Equation (1). Related literature highlights that women experiencing IPV are more likely to come from an ethnic minority, have a lower socioeconomic background and engage in risky behaviours (Aizer 2011). Table 2 shows that in households in which there exists IPV, both parents are more likely to suffer depression, live in a council house, have lower household income and smoke across both sampling waves. The baseline differences between the sub-samples suggest that there might be unobserved factors that lead to self-selecting into a violent relationship that also affects children’s scores. Failing to control for this may render a downward-biased estimate for the IPV coefficient. We therefore turn our attention to the issue of self-selection into a violent relationship.

IPV against women frequently entails a mixture of abusive behaviours including physical, sexual and psychological aggressions. It is difficult to isolate a unique cause for IPV from the perspective of a perpetrator. There are many confounders like men’s gender role during socialisation, alcohol/drug abuse, economic hardship, experiencing or

witnessing violence in childhood, stress, gender inequality and psychopathology (Coker et al. 2000, DeMaris et al. 2003, Holtzworth-Munroe et al. 2000). The clinical literature establishes some distinctive features of abusers. The perpetrator suffers from cognitive distortion in the form of denial, blame, justification and minimisation to downplay actions (Holtzworth-Munroe et al. 2000, Eckhardt & Dye 2000). Being bullied during childhood might contribute to cognitive distortion, becoming more prone to dominate or seek control (Jennings & Murphy 2000, Lisak 1995). Perpetrators are also more likely to have problems of anger management and have irrational beliefs compared to non-violent partners (Eckhardt et al. 1998). Further, intergenerational models of IPV transmission suggest that in violent families both parents self-select themselves into the relationship and that behavioural strategies might be passed on from one generation to another (Pollak 2004).

We attempt to address the bias caused by the existence of these unobserved factors that influence both IPV and children’s scores by following Aizer (2011). To do so, we employ a control function approach (Heckman 1977, Lee 1982). The empirical strategy relies on the following specifications:

$$score_i = \alpha + \delta IPV_i + X_i\beta + \varepsilon_i \quad (2)$$

$$IPV_i^* = 1[\theta + \varpi Z_i + X_i\eta + \nu_i] \quad (3)$$

Equation (2) remains the main equation of interest and equation (3) relates to the selection into a violent relationship. Equation (3), the selection equation, requires an exclusion restriction variable that influences IPV but not children’s scores. We estimate Equation (3) using a probit model and construct the inverse Mill’s ratio for inclusion in Equation (2) to generate consistent estimates of δ . Our exclusion restriction employs the regional unemployment gap between men and women, based on game-theoretical models by Tauchen et al. (1991) and Farmer & Tiefenthaler (1996). These models suggest that IPV can be a coercive tool within households, and its prevalence is influenced by each partner’s control over resources and available alternatives to cohabitation. Further evidence by Anderberg et al. (2016) highlights the role of gender-specific unemployment in IPV prevalence, with higher female unemployment relative to male unemployment increasing IPV. This underscores the importance of each spouse’s relative position in the

labour market for IPV exposure.

Based on these theoretical and empirical considerations, we construct a variable capturing the difference between male and female regional unemployment rates using data from the Office of National Statistics (ONS).¹⁸ We use the regional unemployment difference that existed during the first wave of the MCS to remove the possibility that contemporaneous differences affect the relative bargaining power of women at the time of recording children’s academic performance because of intra-household resource allocation decision.¹⁹

We present the probit estimates of the selection Equation (3) in Table 3. The estimates shown in each column refer to specifications that we progressively incorporate a richer set of controls - starting with basic demographics and then adding parental education and household characteristics - to capture a set of detailed socioeconomic and behavioural controls. In our analysis, we focus on the third and sixth columns of Table 3 for both contemporaneous and ever-IPV definitions. The consistency of our results across these specifications, with the estimate for the unemployment gap being stable to the addition of controls and statistically significant throughout all specifications, provides suggestive evidence that outside options for women reduce exposure to IPV.

Table 3 around here

There may still exist unobserved factors affecting a child’s cognitive development not captured in our set of control variables, even after adjusting for sample selection. Consequently, our estimates are susceptible to omitted variable bias despite having controlled for a comprehensive set of variables that are unrelated to IPV and adjusted by sample selection. We assess the role of unobserved heterogeneity on our control function regression estimates for IPV following the testing procedure suggested by Oster (2019), which links the stability of the coefficients to changes in the observed R-squared under the as-

¹⁸The rate of UK unemployment is based on data from the ONS-Labour Force Survey (LFS) uses the definition of unemployment specified by the International Labour Organisation. Unemployed people are those without a job who have been actively seeking work in the past 4 weeks and are available to start work in the next 2 weeks. It also includes those who are out of work but have found a job and are waiting to start it in the next 2 weeks. See <https://www.ons.gov.uk/employmentandlabourmarket/peoplenotinwork/unemployment> Figure A1 presents the regional difference in unemployment rates across England, Wales, Scotland and Northern Ireland in 2001.

¹⁹Figure A2 shows the proportion of Ever-IPV cases, collected at the age of 7 and 11 respectively. A suitable instrument should have enough regional variation, as shown graphically in Figure A1. In those areas where the difference is near zero, there is also a proportionally higher record of IPV cases in the MCS, which is in line with the work of Anderberg et al. (2016).

sumption that the relationship between the variable of interest and the unobservables can be recovered from the relationship between the main variable and the observable. Oster (2019) shows that the bias-adjusted coefficient of the main variable of interest (δ) is:

$$\delta^* \approx \tilde{\delta} - \gamma[\mathring{\delta} - \tilde{\delta}] \frac{R_{max} - \tilde{R}}{\tilde{R} - \mathring{R}} \quad (4)$$

where $\tilde{\delta}$ is the estimated coefficient and $\tilde{R}$ is the R-squared of the regression with all controls, and $\mathring{\delta}$ and $\mathring{R}$ are obtained by running the regression with the reduced set of child covariates. We assume that the selection on observables is proportional to the selection on unobservables so that $\gamma = 1$. In our table, we also include $\gamma = 0.5$, for comparison. We follow Oster (2019) to parameterise $R_{max} = \min[1.3\tilde{R}, 1]$. The bounding set for each of the specifications presented is $[\tilde{\delta}, \delta^*]$, which indicates the interval where the true value of the IPV coefficient lies. Where the bounding set does not include zero, confirms that the presence of unobservables would not change the direction of the effect of IPV on the child's cognitive development.

3.2 Propensity score matching

In our final empirical analysis, we explore a comparison of the academic performance of children in families where mothers experienced domestic violence with those in families where mothers were not exposed. We utilize propensity score matching methods for this comparison, matching children in households affected by domestic violence to those in non-affected households based on observable characteristics. In this context, the counterfactual is represented by households sharing the same baseline characteristics as those affected by domestic violence, excluding the variable capturing the mother's exposure to IPV. Any variations in the distribution of school outcomes between these two groups are attributed to witnessing IPV. The standard framework in evaluation analysis adopts the potential outcomes approach. We define a binary treatment indicator D_i as 1 if child i lives in a household where IPV is present, and 0 otherwise. The potential outcomes for academic scores are defined as $Y_i(D_i)$ for each child i , where $i=1, \dots, N$. In our study, we estimate the average treatment effect on the treated (IPV sample) as follows:

$$ATT = E[Y(1)|D = 1] - E[Y(0)|D = 1] \quad (5)$$

Since the counterfactual mean score for those treated ($E[Y(0)|D = 1]$) is not observable, we reconstruct it to compare the IPV sample with the control group (non-IPV sample) based on similarly distributed variables. Matching IPV and non-IPV families using covariates is equivalent to using a balancing score $B(x)$ based on the propensity score $p(x) = Pr[IPV = 1|X = x]$, ensuring that selection into treatment is independent of those observables (Rosenbaum & Rubin 1983). We use a probit model to estimate the propensity score to avoid values outside the $[0,1]$ interval due to the skewness of IPV distribution. To meet balance property requirements, we find a common support of covariates equivalent between both groups. Using the nearest neighbour propensity score algorithm with replacement (Caliendo & Kopeinig 2008, Wooldridge 2010), we match 237 treated observations to 2757 control observations for children aged 7, and 223 treated observations to 1956 control observations for children aged 11.²⁰

4 Results

4.1 Exposure to IPV and Cognitive Development

In this section, we present the point estimates for the IPV variable on academic scores for children aged 7 and 11. Table 4 shows the results using the contemporaneous definition of IPV, while Table 5 presents the results using the ever-IPV definition. Both tables present the outcomes of the base-case OLS estimator and the control function approach. In specifications involving the control function, we incorporate the inverse Mills ratio and bootstrap the standard errors. All estimates provided were obtained while controlling for an extensive set of covariates, including characteristics related to the child, their parents and the household. Tables A4 to A7 in the Appendix present the estimates obtained

²⁰Figure A3 in the Appendix presents histograms of the propensity scores for the treated (in red) and untreated (in blue) groups. These histograms illustrate the distribution of propensity scores for both groups and help determine whether sufficient overlap (common support) exists between them, which is essential for effective propensity score matching. At ages 7 and 11, the propensity score distributions for the treated and untreated groups reveal varying degrees of overlap, highlighting differences in common support across the two age groups. At age 7, the overlap is mainly concentrated within the 0.05 to 0.15 propensity score range, with limited common support beyond this, which may pose challenges in matching treated individuals with those in the control group at higher propensity scores. By age 11, the overlap expands slightly, reaching up to 0.20, suggesting improved common support between the groups. Nonetheless, in both cases, fewer untreated individuals have higher propensity scores, particularly beyond 0.20. This reduced overlap at higher propensity score levels indicates that observations with higher treatment probabilities may lack adequate matches, potentially compromising the comparability and robustness of the results in these regions.

when the specifications progressively introduce child, parental, and household controls for the OLS and control function strategies.

Table 4 around here

The OLS estimates in Table 4 indicate that the contemporaneous effect of IPV is not statistically significant for any of the subjects at the age of 7. However, by age 11, the IPV coefficient becomes statistically significant. At this age, English is represented as a single dimension, in contrast to the breakdown into three components provided at age 7. There is heterogeneity in the impact of contemporaneous IPV on various academic dimensions, with effects that are quantitatively larger for technical-related areas. Exposure to IPV results in a reduction of Science mean scores by 0.31, Maths by 0.24, and Information and Technology by 0.26 standard deviations. The effect is quantitatively smaller for English and Creativity, where children exposed to IPV score 0.17 and 0.15 lower compared to those in non-IPV families. There is no statistically significant effect of IPV on PE.

Table 4 presents estimates derived from the control function approach. These results closely mirror those obtained from the OLS specification. Specifically, the findings at age 7 consistently indicate that the contemporaneous impact of IPV is not statistically significant, except for the Reading component in English, where a negative and significant effect is observed when accounting for unobservables using a control function approach. Once again, at the age of 11, the effect becomes statistically significant, and the estimates are quantitatively similar in magnitude to the OLS estimates.

Table 5 around here

Table 5 presents the estimates when using the ever-IPV definition. In general, the results presented exhibit similarities in terms of both direction and statistical significance when compared to those obtained using the contemporaneous definition of IPV. The most noticeable distinction is that the effects in Table 5 are marginally smaller than those in Table 4. This implies that when IPV occurred in the past, there was a slightly smaller impact on IPV. This could be partly attributed to the fact that the ever-IPV definition may encompass isolated occurrences of IPV in previous waves that might not recur, thereby alleviating the IPV effect. It also highlights differences in the detrimental

effects between interrupted and sustained exposure to IPV on cognitive development.

At age 7, there is no statistically significant effect observed when employing the ever-IPV definition. However, at the age of 11, the effects persist and are statistically significant for English, Science, and Maths, though their magnitude is smaller compared to Table 4. Specifically, children exposed to IPV experience a reduction in their mean scores of 0.20 standard deviations in Science (compared to -0.32 with the contemporaneous definition), 0.21 in Maths (compared to 0.24), and 0.13 in English (compared to 0.17). This suggests that the ever impact of IPV is more pronounced for technical and scientific knowledge than for Creativity, Physical Education and Language, or Information and Technology.

Overall, the findings indicate that when children are exposed to IPV, there is a more pronounced impact on the concentration mechanisms necessary for acquiring technical and scientific knowledge. A plausible explanation is that in households affected by IPV, children encounter challenges in learning during their formative stages, thereby complicating future learning processes and widening the educational disparity between children in IPV and non-IPV households. This has large policy implications. Early detection of IPV could play a crucial role in mitigating the adverse effects on the learning process of children in families experiencing IPV.²¹

In light of the evidence from Srivastava & Trinh (2021) and Fletcher & Schurer (2017), our findings suggest that the impact of Intimate Partner Violence (IPV) on children’s cognitive development is broadly in line with the effects of other adverse childhood events documented in the literature. For instance, Srivastava & Trinh (2021) reported that parental smoking results in a reduction of children’s cognitive skills by 0.09 to 0.17 standard deviations. Fletcher & Schurer (2017) demonstrated that childhood maltreatment significantly affects personality traits, with neuroticism increasing by 0.32 to 0.50 standard deviations due to sexual abuse and conscientiousness decreasing by 0.24 to 0.25 standard deviations following neglect. Similarly, our study shows that the cognitive impacts of IPV on children, particularly in subjects such as Science and Maths, range from 0.22 to 0.32 standard deviations. These effects are comparable to other significant ad-

²¹There exists attrition between waves 4 and 5. Ideally, we would use the Inverse Probability Weighting (IPW) method to control for attrition. In our empirical specification, we compare estimates using OLS with those obtained from the control function approach, for which standard errors are bootstrapped, limiting the possibility of using IPW weights in the control function approach. However, to explore the potential bias in our OLS estimates due to attrition we obtain OLS estimates using IPWs. The results are presented in Table A3 and the results obtained are similar in size and significance to those in Tables 4 and 5, suggesting attrition is not biasing our estimates.

verse events, reinforcing the profound negative impact of IPV on children’s educational outcomes and underscoring the need for interventions to address this issue.

Table 6 around here

In Table 6, we present the identified sets $[\tilde{\delta}, \delta^*]$ as proposed by Oster (2019). The results seem to indicate that the parameters are generally stable, both for the contemporary and ever definitions, with some exceptions. For instance, in the subject of Science at the age of 7, where the impact of IPV is not significant, there is a 0 in the bounding set suggesting the bias would be changing the direction of the effect. The bounding set for the subject of PE at the age of 11 also includes 0. However, it is noteworthy that the impact of IPV on these two educational outcomes, Science and PE, is relatively close to 0 and non-significant in both Tables 4 and 5. All other statistically significant results from Tables 4 and 5 show no change in sign within the bounding sets, and there are no substantial differences with the estimated parameters from the control function. This exercise suggests that the results obtained in Tables 4 and 5 are generally stable, and indicate that unobservable factors play a minimal role and the bias introduced is minimal. It is reasonable to suggest that given the extensive number of covariates included in our OLS specification, the IPV estimates are fairly robust to selection biases. Other studies rely mainly on administrative data, making it difficult to control for a more comprehensive set of individual and household covariates. However, our study benefits from the depth and comprehensiveness of the covariates included in the empirical specification.

4.2 Extensions of basic results

We broaden the scope of the analysis by examining IPV on educational outcomes extending the set of family structures included in our sample, and incorporating in our sample families of single mothers and families where the mother has a partner (different from the biological father). This extension allows us to explore whether the presence of a partner, even if non-biological, is associated with mitigating or intensifying the effects of IPV on children’s cognitive outcomes, and whether single-mother households face distinct challenges in relation to IPV and their children’s educational development. By incorporating these two additional dimensions, we can provide a more comprehensive understanding of

the relationship between family structure, IPV and children’s educational outcomes.

4.2.1 Alternative IPV definitions

Table 7 around here

Table 7 shows the results for the specification that includes father-reported IPV. The point estimates are relatively small and non-significant across all subjects. The finding suggests that father-reported IPV is not associated with children’s cognitive development. Table 8 shows the results of including the variable Violence, an IPV indicator that captures IV regardless of whether the victim is the mother or father. The point estimates shown are small and statistically insignificant. Overall, results in Tables 7 and 8 suggest there exist differential implications for children’s educational outcomes that largely depend on the parent exposed to IPV, with effects that only arise when the mother is the victim.

Table 8 around here

4.2.2 Including different family structures

In this section, we present the results of using different family structures. The estimations use the Ever-IPV variable, as this is the IPV definition that we can consistently report given the inclusion of alternative family structures in our sample. In all regressions, we control only for maternal variables, child-specific variables, and household characteristics. The inclusion of single mothers for instance rules out the possibility of adding the father’s characteristics in our specification, as for this group this remains missing information.

Table 9 shows the estimates of including all family types in our sample. The results are very similar to those in Table 4, with point estimates at the age of 11 being statistically significant across all subjects except IT. In subjects like Science and Maths, there are substantial changes and exposure to IPV reduces the educational outcomes by -0.32 and -0.30, respectively. This suggests that exposure to IPV at a later age has a significant detrimental effect on academic performance in subjects that require cumulative learning. Given that our outcome variables are standardised, a point estimate of -0.30 means that IPV-exposed children score almost a third of a standard deviation lower than their peers, a meaningful reduction in cognitive performance. Interestingly, at age 7 there are

negative and statistically significant effects of IPV on the reading and writing components of English, albeit of smaller magnitude than the effects found for age 11.

Table 9 around here

Table 10 presents the association of the Ever-IPV definition with cognitive outcomes for the sample of mothers living with the biological father or with her partner (non-biological father). The specification explicitly excludes single-mother households. The size of the point estimates in Table 10 continues to show notable effects of IPV. For example, at age 11, the beta for Maths is -0.155, and for Science, it is -0.171. These betas are similar to those in Table 9, confirming that the negative impact of IPV persists across different household structures. The estimated coefficients suggest that IPV-exposed children perform substantially worse than their peers in cognitively demanding subjects. The point estimates indicate a significant performance gap, reinforcing the notion that cumulative knowledge subjects like Maths and Science are particularly affected by IPV exposure. In Table A8 in the Appendix, we show the results of using the definition of contemporaneous definition using the same sample of families as in Table 10, with very similar results.

Table 10 around here

4.3 Matching estimates

Evidence from the previous section indicates stable coefficients across specifications. If the maternal exposure to IPV is not random, the OLS estimator could render biased estimates. We use propensity score matching to pair IPV and non-IPV observations and address such bias. Table 11 provides the average treatment effect (ATT) obtained from the propensity score matching model discussed in Section 3.2 by using the ever-IPV definition.²² The sign and statistical significance of the estimates are in line with those presented in Tables 4 and 5. However, once we match our sample of children from IPV families with the counterfactual sample (i.e. children with the same set of characteristics except for being in a family without IPV), the Creativity dimensions also

²²When using the contemporaneous definition we were not able to match for a comprehensive set of characteristics, making our results unreliable.

become statistically significant at age 11. The only non-significant impact at this age is on PE. Interestingly, the effect with respect to the comparison group in English is -0.20, which is similar to previous results. Children in families with IPV lose around 0.30 in the Science and Maths dimension when compared to their counterfactual group.

Table 11 around here

5 Conclusion

Our paper examines the spillover effect of witnessing IPV on children’s educational outcomes, using data from the MCS to analyze differences at ages 7 and 11. We define IPV in two ways: contemporaneous (current wave) and ever-IPV (current or any previous waves). Our base-case estimate is obtained using OLS methods. To account for potential bias from unobserved factors, we explore the possibility of parents self-selecting into violent relationships. We address this by exploiting the regional difference between male and female unemployment rates as an exclusion restriction in the control function approach. In regions where the gender unemployment gap is smaller, women have greater bargaining power, and vice versa.

Our results show negligible differences across empirical strategies, suggesting minimal bias in the OLS estimates. We further validate these findings using the method proposed by Oster (2019), which links coefficient stability to changes in R-squared, and propensity score matching to compare families with and without IPV based on observable characteristics. Our estimates are consistent across various academic subjects, both in direction and magnitude.

Our findings consistently show a negative association of witnessing IPV on children’s cognitive development, which is robust across all specifications and estimators. The magnitude of this effect varies by academic subject and child age. While no statistically significant effect is observed at age 7, substantial disparities emerge by age 11, particularly in subjects like Science and Mathematics that rely on cumulative knowledge. The concept of dynamic complementarity of skills may explain why children exposed to IPV suffer more pronounced negative effects in these areas (Cunha & Heckman 2007). These results hold across both IPV definitions, though past exposure (ever-IPV) appears to lessen the

observed impact.

Our results align with literature examining the impact of various violent events on children’s cognitive development, which consistently finds that violence reduces school completion rates and lowers test scores (Brown & Velásquez 2017, Duque 2017, Ang 2021, Koppensteiner & Menezes 2021). Moreover, there is evidence that prolonged exposure to violence exacerbates its negative effects on cognitive development (Monteiro & Rocha 2017). This paper adds to the growing body of research on the impact of domestic violence on children’s development. Prior studies have shown that in-utero exposure to IPV negatively affects infant health with long-term consequences for child development (Aizer 2011, Currie et al. 2022), and that children exposed to IPV exhibit worse cognitive outcomes, with spillover effects on their classroom peers (Anderberg & Moroni 2020, Carrell & Hoekstra 2010).

Our paper makes two main contributions. First, we provide a clearer understanding of how witnessing IPV affects children’s educational outcomes, with a particular focus on its detrimental effects on cognitive development. Second, we show that the cumulative impact of IPV varies by subject area, with stronger negative effects in subjects where prior knowledge acquisition is crucial. These findings align with Anderberg & Moroni (2020), who demonstrate that IPV exposure leads to larger, statistically significant declines in cognitive skills at older ages. The use of cognitive measures rooted in the UK National School Curriculum allows us to investigate how IPV impacts different academic subjects, complementing the analysis in Anderberg & Moroni (2020). The policy implications of these results are significant, indicating that early interventions to mitigate the effects of IPV can improve both short- and long-term educational outcomes.

However, there are several limitations to our study. First, while we can identify differences in educational outcomes at ages 7 and 11, we are unable to track changes in outcomes between those ages. Monitoring cognitive development over time could provide valuable insights into when IPV has the most severe effects on children’s learning. Second, the IPV variable is subject to measurement error. Third, the survey lacks information on the frequency and intensity of IPV, making it difficult to differentiate the effects of persistent and severe abuse. Finally, our estimates are based solely on measures of physical abuse, as data on verbal abuse are unavailable. However, evidence from Anderberg & Moroni (2020) suggests that physical and emotional abuse frequently co-occur, which

may alleviate some concerns regarding this limitation.

Tables

Table 1: Child's ability scores by subject

	Age 7			Age 11		
	Non-IPV (1)	IPV (2)	Diff in Means (3)	Non-IPV (4)	IPV (5)	Diff in Means (6)
<i>Child's ability scores by subject</i>						
Speaking and listening (English)	0.008	-0.229	***	X	X	
Reading (English)	0.009	-0.234	***	X	X	
Writing (English)	0.008	-0.224	***	X	X	
English	X	X		0.011	-0.289	***
Science	0.006	-0.153	+	0.015	-0.396	***
Maths and numeracy	0.007	-0.203	**	0.013	-0.321	***
Physical education	0.007	-0.180	**	0.004	-0.111	
ICT	0.007	-0.202	**	0.013	-0.325	**
Expressive and Creative Arts	0.005	-0.128		0.009	-0.236	**
N	3630	133		2662	104	

Note: ICT refers to Information and Communication Technology. The entries are means of pupil-level data for those students in the MCS with non-missing values for gender, race, birth weight, weight, month born, teacher subjective scores, parental long-standing illness, parental smoking habits, parental education, parental age, parental working status, housing income and whether the family lives in a Council house or a housing association. Our sample only includes families where parents are cohabiting. N refers to the number of observations. Significance levels : + $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 2: Parental summary statistics

	Age 7			Age 11		
	Non-IPV (1)	IPV (2)	Diff in Means (3)	Non-IPV (4)	IPV (5)	Diff in Means (6)
<i>Domestic violence</i>						
Ever IPV	0.029	1	***	0.045	1	***
Father IPV	0.067	0.323	***	0.064	0.260	***
Violence	0.067	1	***	0.064	1	***
<i>Child's characteristics</i>						
Female	0.493	0.534		0.502	0.442	
Low birthweight	0.059	0.045		0.054	0.048	
Obese	0.047	0.105	***	0.058	0.029	
Overweight	0.132	0.143		0.190	0.202	
White	0.920	0.932		0.902	0.865	
Bang/Ind/Pak	0.033	0.023		0.042	0.048	
Black	0.011	0.008		0.016	0.010	
Other	0.036	0.038		0.040	0.077	**
Born September-December	0.359	0.353		0.337	0.365	
<i>Mother characteristics</i>						
Depression	0.312	0.534	***	0.322	0.529	***
Long term health problems	0.223	0.361	***	0.169	0.221	
Smoking	0.143	0.316	***	0.112	0.202	***
Age	37.566	37.113		41.843	41.635	
GCSE grades (D-G) or equivalent	0.056	0.075		0.043	0.096	***
O level or equivalent	0.272	0.278		0.249	0.308	
A level or equivalent	0.167	0.226	**	0.173	0.125	
First degree or equivalent	0.437	0.308	***	0.444	0.356	**
Higher degree or equivalent	0.067	0.113	***	0.091	0.115	
In work	0.774	0.759		0.830	0.721	***
<i>Father characteristics</i>						
Depression	0.133	0.278	***	0.172	0.269	***
Long term health problems	0.233	0.278		0.163	0.240	**
Smoker	0.192	0.346	***	0.139	0.288	***
Age	39.772	40.504		44.138	44.385	
GCSE grades (D-G) or equivalent	0.057	0.045		0.057	0.087	
O level or equivalent	0.270	0.331		0.260	0.337	**
A level or equivalent	0.177	0.150		0.171	0.096	**
First degree or equivalent	0.394	0.361		0.391	0.404	
Higher degree or equivalent	0.101	0.113		0.122	0.077	
In work	0.963	0.947		0.950	0.856	***
<i>Household characteristics</i>						
Ln Income	10.400	10.278	**	10.415	10.255	***
Council house	0.061	0.150	***	0.058	0.125	***
N	3630	133		2662	104	

Note: The entries are means of pupil-level data for those students in the MCS who do not have missing values for gender, race, birth weight, weight, month born, teacher subjective scores, parental long-standing illness, parental smoking habits, parental education, parental age, parental working status, housing income and whether the family lives in a council house or a housing association. Our sample only includes families where parents are cohabiting. *N* stands for the number of observations. Significance levels : ⁺ $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3: First stage: Probability of exposure to IPV

	Age 7			Age 11		
	(1)	(2)	(3)	(4)	(5)	(6)
<i>Contemporaneous</i>						
Male-Female Unemployment	-0.0969*** (0.0363)	-0.1083*** (0.0374)	-0.1012*** (0.0372)	-0.1176*** (0.0412)	-0.1192*** (0.0418)	-0.1125*** (0.0425)
<i>Ever</i>						
Male-Female Unemployment	-0.0553+ (0.0311)	-0.0664** (0.0315)	-0.0590+ (0.0316)	-0.0561+ (0.0331)	-0.0635+ (0.0337)	-0.0582+ (0.0341)
<i>Controls</i>						
<i>Child</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>
<i>Household</i>	<i>No</i>	<i>Yes</i>	<i>Yes</i>	<i>No</i>	<i>Yes</i>	<i>Yes</i>
<i>Maternal</i>	<i>No</i>	<i>Yes</i>	<i>Yes</i>	<i>No</i>	<i>Yes</i>	<i>Yes</i>
<i>Father</i>	<i>No</i>	<i>No</i>	<i>Yes</i>	<i>No</i>	<i>No</i>	<i>Yes</i>

Notes: Each row corresponds to the effect of the unemployment difference between males and females on the probability of experiencing IPV across both waves when children are aged 7 and 11. The difference in unemployment used is the one recorded at the first wave of the MCS (2001-2002). We evaluate the effect by using both definitions of IPV, contemporaneous and ever. Standard errors in parentheses. + $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 4: The impact of IPV on educational outcomes – Contemporaneous IPV

	Age 7		Age 11	
	OLS (1)	Control function (2)	OLS (3)	Control function (4)
Speaking and listening (English)	-0.1374 (0.0913)	-0.135 (0.0938)	N.A.	N.A.
Read (English)	-0.1393 (0.0937)	-0.1399 ⁺ (0.0849)	N.A.	N.A.
Writing (English)	-0.1291 (0.0901)	-0.1288 (0.0792)	N.A.	N.A.
English	N.A.	N.A.	-0.1738** (0.0887)	-0.1734 ⁺ (0.0906)
Science	-0.02886 (0.0861)	-0.03153 (0.0718)	-0.3158*** (0.0996)	-0.3153*** (0.1025)
Maths	-0.1001 (0.0910)	-0.1034 (0.0840)	-0.2445** (0.1045)	-0.2463** (0.1011)
Physical education	-0.0723 (0.0890)	-0.0739 (0.0828)	-0.0588 (0.0980)	-0.0577 (0.1042)
Information and Technology	-0.1058 (0.0925)	-0.1087 (0.1021)	-0.2644*** (0.1017)	-0.2628** (0.1024)
Creativity	-0.0553 (0.0898)	-0.0574 (0.0817)	-0.1540 ⁺ (0.0934)	-0.1546 (0.0976)
Controls				
<i>Child</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>
<i>Household</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>
<i>Maternal</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>
<i>Father</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>

Notes: Each row corresponds to a child's ability dimension. Values in the table are the parameter estimates of the IPV effect. See tables A4, A5, A6 and A7 in the Appendix for a detailed breakdown. The estimates from columns (1) and (2) correspond to the econometric estimation at age 7 and columns (4) and (5) correspond to the econometric estimation at age 11. Child variables: race, sex, whether the child is born with low weight, born between September-December, whether obese or overweight. Mother variables: age, whether she has ever been diagnosed with depression, whether she suffers from chronic conditions, whether at work, highest educational level attained (academic or vocational): GCSE grades (D-G) or equivalent, O level or equivalent, A-level or equivalent, First degree or equivalent, Higher degree or equivalent. Father variables: age, whether ever been diagnosed with depression, whether he suffers from chronic conditions, whether at work, highest educational level attained (as defined for the mother). Household variables: whether the family lives in a council house (or in a housing association), the natural logarithm of the household income. Significance levels: ⁺ $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 5: The impact of IPV on educational outcomes - Ever IPV

	Age 7		Age 11	
	OLS (1)	Control function (2)	OLS (3)	Control function (4)
Speaking and listening (English)	-0.03067 (0.0676)	-0.0305 (0.0762)	N.A.	N.A.
Read (English)	-0.0802 (0.0677)	-0.0803 (0.0663)	N.A.	N.A.
Writing (English)	-0.0952 (0.064)	-0.0952 (0.065)	N.A.	N.A.
English	N.A.	N.A.	-0.1333** (0.067)	-0.1331 ⁺ (0.0747)
Science	-0.0352 (0.0655)	-0.0355 (0.0622)	-0.2033*** (0.0697)	-0.2032** (0.0841)
Maths	0.0046 (0.0651)	0.0043 (0.067)	-0.2176** (0.0701)	-0.2178*** (0.076)
Physical education	-0.0664 (0.0665)	-0.0666 (0.0673)	0.0164 (0.0651)	0.0175 (0.0661)
Information and Technology	-0.0636 (0.068)	-0.0639 (0.0814)	-0.0932 (0.0697)	-0.0931 (0.0671)
Creativity	-0.0361 (0.0649)	-0.0364 (0.0643)	-0.0823 (0.0632)	-0.0824 (0.0625)
Controls				
<i>Child</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>
<i>Household</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>
<i>Maternal</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>
<i>Father</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>

Notes: See notes in Table 4. Significance levels: ⁺ $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 6: Oster's test

	Age 7		Age 11	
	$\gamma=1$ (1)	$\gamma=0.5$ (2)	$\gamma=1$ (3)	$\gamma=0.5$ (4)
Contemporaneous-IPV definition				
Speaking and listening (English)	[-0.135,-0.087]	[-0.135,-0.111]	N.A.	N.A.
Read (English)	[-0.140,-0.093]	[-0.140,-0.116]	N.A.	N.A.
Writing (English)	[-0.129,-0.066]	[-0.129,-0.097]	N.A.	N.A.
English	N.A.	N.A.	[-0.173,-0.102]	[-0.173,-0.138]
Science	[-0.0315 ,0.016]	[-0.032,-0.008]	[-0.315,-0.264]	[-0.315,-0.290]
Maths	[-0.103,-0.057]	[-0.103,-0.080]	[-0.246,-0.192]	[-0.246,-0.219]
Physical education	[-0.074,-0.011]	[-0.074,-0.042]	[-0.058,0.026]	[-0.058,-0.016]
Information and Technology	[-0.109,-0.066]	[-0.109,-0.087]	[-0.263,-0.220]	[-0.263,-0.241]
Creativity	[-0.057,0.043]	[-0.057,-0.007]	[-0.155,-0.068]	[-0.155,-0.112]
Ever-IPV definition				
Speaking and listening (English)	[-0.030,0.006]	[-0.030,-0.012]	N.A.	N.A.
Read (English)	[-0.080,-0.043]	[-0.080,-0.062]	N.A.	N.A.
Writing (English)	[-0.095,-0.044]	[-0.095,-0.070]	N.A.	N.A.
English	N.A.	N.A.	[-0.133,-0.086]	[-0.133,-0.110]
Science	[-0.036,0.003]	[-0.036,-0.016]	[-0.203,-0.165]	[-0.203,-0.184]
Maths	[0.004,0.043]	[0.004,0.024]	[-0.218,-0.179]	[-0.218,-0.199]
Physical education	[-0.067,-0.016]	[-0.067,-0.041]	[0.017,0.072]	[0.017, 0.044]
Information and Technology	[-0.064,-0.029]	[-0.064,-0.047]	[-0.093,-0.063]	[-0.093,-0.078]
Creativity	[-0.036, 0.036]	[-0.036,-0.000]	[-0.082,-0.023]	[-0.082,-0.053]

Notes: The table shows the bounding set $[\tilde{\delta}, \delta^*]$, where $\tilde{\delta}$ is the estimated coefficient when we include all controls and δ^* is the bias-adjusted coefficient.

Table 7: The impact of IPV on educational outcomes - Father IPV

	Age 7		Age 11	
	OLS (1)	Control function (2)	OLS (3)	Control function (4)
Speaking and listening (English)	0.0740 (0.063)	0.0765 (0.062)	N.A.	N.A.
Read (English)	0.0172 (0.061)	0.0168 (0.058)	N.A.	N.A.
Writing (English)	-0.00723 (0.064)	-0.00676 (0.064)	N.A.	N.A.
English	N.A.	N.A.	0.0184 (0.067)	0.0189 (0.079)
Science	0.0746 (0.061)	0.0722 (0.057)	0.0198 (0.067)	0.0202 (0.074)
Maths	0.0443 (0.063)	0.0414 (0.059)	0.0660 (0.069)	0.0662 (0.065)
Physical education	-0.0494 (0.066)	-0.0509 (0.063)	-0.0493 (0.067)	-0.0492 (0.065)
Information and Technology	-0.0438 (0.065)	-0.0466 (0.064)	0.0326 (0.075)	0.0329 (0.075)
Creativity	-0.0133 (0.064)	-0.0152 (0.062)	-0.00466 (0.067)	-0.00476 (0.077)
N	3763	3763	2766	2766
Controls				
<i>Child</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>
<i>Household</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>
<i>Maternal</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>
<i>Father</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>

Notes: The dependent variable is equal to 1 if the father reported experiencing IPV, 0 otherwise. See notes in Table 4 .
Significance levels: ⁺ $p < 0.10$, ^{**} $p < 0.05$, ^{***} $p < 0.01$

Table 8: The impact of IPV on educational outcomes - Violent environment

	Age 7		Age 11	
	OLS (1)	Control function (2)	OLS (3)	Control function (4)
Speaking and listening (English)	0.037 (0.056)	0.040 (0.054)	N.A.	N.A.
Read (English)	0.003 (0.054)	0.002 (0.050)	N.A.	N.A.
Writing (English)	0.002 (0.060)	0.003 (0.054)	N.A.	N.A.
English	N.A.	N.A.	-0.005 (0.058)	-0.005 (0.072)
Science	0.069 (0.054)	0.066 (0.050)	-0.059 (0.059)	-0.059 (0.069)
Maths	0.024 (0.055)	0.020 (0.055)	-0.016 (0.062)	-0.016 (0.063)
Physical education	-0.034 (0.057)	-0.036 (0.056)	-0.017 (0.059)	-0.017 (0.057)
Information and Technology	-0.036 (0.057)	-0.039 (0.058)	-0.028 (0.063)	-0.029 (0.070)
Creativity	0.021 (0.056)	0.019 (0.049)	-0.039 (0.058)	-0.039 (0.061)
N	3763	3763	2766	2766
Controls				
<i>Child</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>
<i>Household</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>
<i>Maternal</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>
<i>Father</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>

Notes: The dependent variable is Violence, an indicator variable that captures violence in the household regardless of whether the mother or father were victims. See notes in Table 4. Significance levels: ⁺ $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 9: The impact of IPV on educational outcomes - Ever IPV (All Families)

	Age 7		Age 11	
	OLS (1)	Control function (2)	OLS (3)	Control function (4)
Speaking and listening (English)	-0.0524 (0.0465)	-0.0481 (0.0436)	N.A.	N.A.
Read (English)	-0.0835+ (0.0478)	-0.0834+ (0.0427)	N.A.	N.A.
Writing (English)	-0.0759+ (0.0456)	-0.0747+ (0.0403)	N.A.	N.A.
English	N.A.	N.A.	-0.0857+ (0.0464)	-0.0848+ (0.0491)
Science	-0.0194 (0.0459)	-0.0222 (0.0428)	-0.151*** (0.0474)	-0.150 * ** (0.0469)
Maths	-0.0192 (0.0452)	-0.0218 (0.0445)	-0.141*** (0.0483)	-0.142** (0.0551)
Physical education	-0.0357 (0.0451)	-0.0365 (0.0414)	0.0214 (0.0478)	0.0229 (0.0484)
Information and Technology	-0.0604 (0.0472)	-0.0641 (0.0447)	-0.0724 (0.0470)	-0.0711 (0.0476)
Creativity	-0.0571 (0.0455)	-0.0583 (0.0452)	-0.137*** (0.0433)	-0.137*** (0.0428)
N	5858	5858	4720	4720

Notes: Each row corresponds to a child's ability dimension. Values in the table are the parameter estimates of the IPV effect. The estimates from columns (1) and (2) correspond to the econometric estimation at age 7 and columns (4) and (5) correspond to the econometric estimation at age 11. Child variables: race, sex, whether the child is born with low weight, born between September-December, whether obese or overweight. Mother variables: age, whether she has ever been diagnosed with depression, whether she suffers from chronic conditions, whether at work, highest educational level attained (academic or vocational): GCSE grades (D-G) or equivalent, O level or equivalent, A-level or equivalent, First degree or equivalent, Higher degree or equivalent. Household variables: whether the family lives in a council house (or in a housing association), the natural logarithm of the household income. Significance levels: ⁺ $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 10: The impact of IPV on educational outcomes - Ever IPV (Mother and Father/Partner)

	Age 7		Age 11	
	OLS (1)	Control function (2)	OLS (3)	Control function (4)
Speaking and listening (English)	-0.0407 (0.0547)	-0.0389 (0.0520)	N.A.	N.A.
Read (English)	-0.0754 (0.0548)	-0.0753 (0.0566)	N.A.	N.A.
Writing (English)	-0.0815 (0.0523)	-0.0810 (0.0534)	N.A.	N.A.
English	N.A.	N.A.	-0.102+ (0.0552)	-0.102+ (0.0546)
Science	-0.0324 (0.0537)	-0.0335 (0.0471)	-0.171*** (0.0570)	-0.171 * ** (0.0534)
Maths	-0.00647 (0.0524)	-0.00746 (0.0482)	-0.155*** (0.0573)	-0.155*** (0.0529)
Physical education	-0.0460 (0.0541)	-0.0462 (0.0529)	0.0426 (0.0549)	0.0423 (0.0512)
Information and Technology	-0.0920+ (0.0545)	-0.0932** (0.0452)	-0.0497 (0.0563)	-0.0499 (0.0547)
Creativity	-0.0532 (0.0538)	-0.0538 (0.0474)	-0.144*** (0.0525)	-0.144*** (0.0502)
N	4999	4999	3854	3854

Notes: See notes in Table 9. Significance levels: + $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 11: Matching estimates - ATT

	Age 7	Age 11
Speaking and listening (English)	-0.024 (0.069)	N.A.
Read (English)	-0.067 (0.068)	N.A.
Writing (English)	-0.067 (0.075)	N.A.
English	N.A.	-0.196*** (0.081)
Science	-0.026 (0.087)	-0.295*** (0.084)
Maths	-0.006 (0.083)	-0.281*** (0.083)
Physical education	-0.104 (0.083)	-0.02 (0.07)
Information and Technology	-0.082 (0.078)	-0.157*** (0.064)
Creativity	-0.057 (0.064)	-0.164*** 0.075
Matched Units	237	223

Notes: To define matched variables (control and treatment=IPV) we use the nearest neighbour matching process with replacement. We estimate our parameters by using the Stata[®] build-in ado file developed by Becker et al. (2002). Standard errors in parentheses. Significance levels: ⁺ $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

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Appendix

Table A1: Per wave and persistence of IPV statistics

	Age 7			Age 11		
	Non-IPV (1)	IPV (2)	Diff in Means (3)	Non-IPV (4)	IPV (5)	Diff in Means (6)
IPV_{W1}	0.011	0.278	***	0.013	0.240	***
IPV_{W2}	0.010	0.376	***	0.014	0.250	***
IPV_{W3}	0.012	0.511	***	0.018	0.346	***
IPV_{W4}	N.A.	N.A.		0.015	0.481	***
Persistent IPV	0	0.165	***	0	0.135	***
N	3630	133		2662	104	

Note: The entries are means of pupil-level data for those students in the MCS who do not have missing values for gender, race, birth weight, weight, month born, teacher subjective scores, parental long-standing illness, parental smoking habits, parental education, parental age, parental working status, housing income and whether the family lives in a council house or in a housing association. Our sample only includes families where parents are cohabiting. N stands for the number of observations. Significance levels : ⁺ $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A2: Matched control covariates

Variable	Definition
<i>Child characteristics</i>	
Female	1 if female, 0 otherwise
Low birthweight	1 if the childbirth weight was lower or equal to 2,5 Kg., 0 otherwise
White	1 if the child's race was white, 0 otherwise
born September-December	1 if the child was born between September and December, 0 otherwise
<i>Mother characteristics</i>	
Depression	1 if the parent has ever been diagnosed with depression, 0 otherwise
Education	1 if the parent has a Higher degree or a First Degree, 0 otherwise
In work	1 if the parent is working at the time of the questionnaire, 0 otherwise
<i>Father characteristics</i>	
Education	1 if the parent has a Higher degree or a First Degree, 0 otherwise
In work	1 if the parent is working at the time of the questionnaire, 0 otherwise
<i>Household characteristics</i>	
Council house	1 if the family lives in a council house or in a housing association, 0 otherwise

Table A3: The impact of IPV on educational outcomes - Attrition corrected

	IPV		Ever-IPV	
	Age 7 (1)	Age 11 (2)	Age 7 (3)	Age 11 (4)
Speaking and listening (English)	-0.132 (0.094)		-0.0387 (0.072)	
Read (English)	-0.157+ (0.095)		-0.0971 (0.071)	
Writing (English)	-0.143 (0.093)		-0.112+ (0.068)	
English		-0.170+ (0.092)		-0.126+ (0.071)
Science	-0.0239 (0.088)	-0.308*** (0.100)	-0.0423 (0.069)	-0.179** (0.073)
Maths	-0.102 (0.093)	-0.259** (0.106)	0.00884 (0.069)	-0.200*** (0.073)
Physical education	-0.0646 (0.092)	-0.0421 (0.106)	-0.0571 (0.071)	0.000799 (0.069)
Information and Technology	-0.0983 (0.095)	-0.282*** (0.102)	-0.0694 (0.072)	-0.0878 (0.072)
Creativity	-0.0634 (0.093)	-0.156 (0.100)	-0.0514 (0.069)	-0.0602 (0.067)

Notes: Each row corresponds to a child's ability dimension. Values in the table are the parameter estimates of an OLS specification. All regressions are weighted by the Inverse Probability Weighting (IPW). The estimates from columns (1) and (2) correspond to the econometric estimation using the IPV definition and columns (4) and (5) correspond to the econometric estimation using the Ever-IPV. Columns (1) and (3) correspond to age 7 and columns (2) and (4) correspond to age 11. Child variables: race, sex, whether the child is born with low weight, born between September-December, whether obese or overweight. Mother variables: age, whether she has ever been diagnosed with depression, whether she suffers from chronic conditions, whether at work, highest educational level attained (academic or vocational): GCSE grades (D-G) or equivalent, O level or equivalent, A-level or equivalent, First degree or equivalent, Higher degree or equivalent. Father variables: age, whether ever been diagnosed with depression, whether he suffers from chronic conditions, whether at work, highest educational level attained (as defined for the mother). Household variables: whether the family lives in a council house (or in a housing association), the natural logarithm of the household income. Significance levels: ⁺ $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A4: OLS Estimates of IPV gap on educational outcomes - Contemporaneous IPV

	Age 7			Age 11		
	(1)	(2)	(3)	(4)	(5)	(6)
Speaking and listening (English)	-0.2341** (0.0953)	-0.1458 (0.0917)	-0.1374 (0.0913)	N.A.	N.A.	N.A.
N	3763	3763	3763			
ll	-5264.404	-5161.577	-5143.314			
Read (English)	-0.1908+ (0.0999)	-0.1433 (0.0946)	-0.1393 (0.0937)	N.A.	N.A.	N.A.
N	3763	3763	3763			
ll	-5230.172	-5156.133	-5132.804			
Writing (English)	-0.2297** (0.0943)	-0.09886 (0.1387)	-0.1291 (0.0901)	N.A.	N.A.	N.A.
N	3763	2185	3763			
ll	-5211.363	-2915.418	-5086.084			
English	N.A.	N.A.	N.A.	-0.3035*** (0.0927)	-0.1869** (0.0885)	-0.1738** (0.0887)
N				2766	2766	2766
ll				-3835.566	-3734.397	-3720.663
Science	-0.1471 (0.0911)	-0.04203 (0.0859)	-0.02886 (0.0861)	-0.4382*** (0.1058)	-0.3258*** (0.1007)	-0.3158*** (0.0996)
N	3763	3763	3763	2766	2766	2766
ll	-5293.561	-5174.266	-5154.813	-3875.428	-3762.280	-3745.312
Maths	-0.1912*** (0.0973)	-0.1024 (0.0914)	-0.1001 (0.0910)	-0.3601*** (0.1090)	-0.2530*** (0.1051)	-0.2445** (0.1045)
N	3763	3763	3763	2766	2766	2766
ll	-5275.025	-5188.849	-5176.784	-3871.401	-3788.979	-3771.708
Physical education	-0.1495+ (0.0906)	-0.0868 (0.0891)	-0.0723 (0.0890)	-0.1494 (0.0980)	-0.0720 (0.0987)	-0.0588 (0.0980)
N	3763	3763	3763	2766	2766	2766
ll	-5267.659	-5230.938	-5224.484	-3828.520	-3787.339	-3780.393
Information and Technology	-0.1896** (0.0960)	-0.1045 (0.0929)	-0.1058 (0.0925)	-0.3621*** (0.1056)	-0.2649** (0.1028)	-0.2644*** (0.1017)
N	3763	3763	3763	2766	2766	2766
ll	-5290.172	-5219.596	-5213.559	-3885.977	-3808.550	-3798.467
Creativity	-0.1398 (0.0918)	-0.0688 (0.0908)	-0.0553 (0.0898)	-0.2379** (0.0940)	-0.1637+ (0.0935)	-0.1540+ (0.0934)
N	3763	3763	3763	2766	2766	2766
ll	-5165.736	-5110.642	-5104.498	-3781.844	-3725.234	-3717.711
Controls						
Child	Yes	Yes	Yes	Yes	Yes	Yes
Mother	No	Yes	Yes	No	Yes	Yes
Father	No	No	Yes	No	No	Yes
Household	No	Yes	Yes	No	Yes	Yes

Notes: Robust standard errors in parentheses and clustered at child level. Child variables: race, sex, whether the child is born with low weight, born between September-December, whether obese or overweight. Mother variables: age, whether she has ever been diagnosed with depression, whether she suffers from chronic conditions, whether at work, highest educational level attained (academic or vocational): GCSE grades (D-G) or equivalent, O level or equivalent, A-level or equivalent, First degree or equivalent, Higher degree or equivalent. Father variables: age, whether ever been diagnosed with depression, whether suffers from chronic conditions, whether at work, and highest educational level attained (as defined for the mother). Household variables: whether the family lives in a council house (or in a housing association), the natural logarithm of the household income. Significance levels: + $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A5: OLS Estimates of IPV gap on educational outcomes - Ever IPV definition

	Age 7			Age 11		
	(1)	(2)	(3)	(4)	(5)	(6)
Speaking and listening (English)	-0.1056 (0.0703)	-0.05714 (0.0696)	-0.03067 (0.0676)	N.A.	N.A.	N.A.
N	3763	3512	3763			
ll	-5266.770	-4803.358	-5144.504			
Read (English)	-0.1320 ⁺ (0.0706)	-0.0830 (0.0684)	-0.0802 (0.0677)	N.A.	N.A.	N.A.
N	3763	3763	3763			
ll	-5230.598	-5156.730	-5133.377			
Writing (English)	-0.1763** (0.0664)	-0.0396 (0.0946)	-0.0952 (0.0640)	N.A.	N.A.	N.A.
N	3763	2185	3763			
ll	-5211.306	-2915.711	-5086.154			
English	N.A.	N.A.	N.A.	-0.2198*** (0.0700)	-0.1416** (0.0671)	-0.1333** (0.0670)
N				2766	2766	2766
ll				-3835.229	-3734.075	-3720.327
Science	-0.1297 ⁺ (0.0679)	-0.0464 (0.0653)	-0.0352 (0.0655)	-0.2950*** (0.0737)	-0.2117*** (0.0700)	-0.2033*** (0.0697)
N	3763	3763	3763	2766	2766	2766
ll	-5293.079	-5174.131	-5154.722	-3876.190	-3763.122	-3746.180
Maths	-0.0721 (0.0685)	-0.0007 (0.0651)	0.0046 (0.0651)	-0.2976*** (0.0726)	-0.2256*** (0.0704)	-0.2176** (0.0701)
N	3763	3763	3763	2766	2766	2766
ll	-5276.849	-5189.561	-5177.461	-3868.766	-3786.857	-3769.716
Physical education	-0.1283 ⁺ (0.0673)	-0.0794 (0.0667)	-0.0664 (0.0665)	-0.0442 (0.0649)	0.0057 (0.0654)	0.0164 (0.0651)
N	3763	3763	3763	2766	2766	2766
ll	-5267.259	-5230.714	-5224.325	-3829.500	-3787.617	-3780.550
Information and Technology	-0.1322 ⁺ (0.0701)	-0.0667 (0.0680)	-0.0636 (0.0680)	-0.1649** (0.0712)	-0.0967 (0.0700)	-0.0932 (0.0697)
N	3763	3763	3763	2766	2766	2766
ll	-5290.553	-5219.812	-5213.838	-3889.858	-3811.286	-3801.250
Creativity	-0.0972 (0.0661)	-0.0454 (0.0654)	-0.0361 (0.0649)	-0.1406** (0.0645)	-0.0892 (0.0634)	-0.0823 (0.0632)
N	3763	3763	3763	2766	2766	2766
ll	-5165.964	-5110.725	-5104.555	-3782.745	-3725.838	-3718.272
Controls						
Child	Yes	Yes	Yes	Yes	Yes	Yes
Mother	No	Yes	Yes	No	Yes	Yes
Father	No	No	Yes	No	No	Yes
Household	No	Yes	Yes	No	Yes	Yes

Notes: See notes in Table A4. Robust standard errors in parentheses and clustered at child level. Significance levels: ⁺ $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A6: Control function-Contemporaneous IPV definition

	Age 7			Age 11		
	(1)	(2)	(3)	(4)	(5)	(6)
Speaking (English)	-0.2307** (0.0944)	-0.1421 (0.0922)	-0.1350 (0.0938)	N.A.	N.A.	N.A.
N	3763	3763	3763			
ll	-5262.246	-5159.466	-5141.674			
Reading (English)	-0.2366*** (0.0914)	-0.1438+ (0.0860)	-0.1399+ (0.0849)	N.A.	N.A.	N.A.
N	3763	3763	3763			
ll	-5262.307	-5156.102	-5132.690			
Writing (English)	-0.2288*** (0.0851)	-0.1267 (0.0802)	-0.1288 (0.0792)	N.A.	N.A.	N.A.
N	3763	3763	3763			
ll	-5211.214	-5107.073	-5086.060			
English	N.A.	N.A.	N.A.	-0.3034*** (0.0988)	-0.1865** (0.0919)	-0.1734+ (0.0906)
N				2766	2766	2766
ll				-3835.565	-3734.367	-3720.627
Science	-0.1496** (0.0748)	-0.04509 (0.0706)	-0.03153 (0.0718)	-0.4381*** (0.1108)	-0.3251*** (0.1036)	-0.3153*** (0.1025)
N	3763	3763	3763	2766	2766	2766
ll	-5292.426	-5172.820	-5152.822	-3875.427	-3762.224	-3745.261
Math	-0.1947** (0.0915)	-0.1064 (0.0852)	-0.1034 (0.0840)	-0.3622*** (0.1093)	-0.2549** (0.1036)	-0.2463** (0.1011)
N	3763	3763	3763	2766	2766	2766
ll	-5272.845	-5186.388	-5173.800	-3870.829	-3788.496	-3771.162
Physical education	-0.1512+ (0.0831)	-0.07652 (0.0853)	-0.07393 (0.0828)	-0.1482 (0.1069)	-0.07051 (0.1039)	-0.05768 (0.1042)
N	3763	3512	3763	2766	2766	2766
ll	-5267.132	-4887.741	-5223.747	-3828.320	-3787.032	-3780.177
Inf tech	-0.1928+ (0.1013)	-0.1082 (0.1013)	-0.1087 (0.1021)	-0.3608*** (0.1063)	-0.2632** (0.1028)	-0.2628** (0.1024)
N	3763	3763	3763	2766	2766	2766
ll	-5288.288	-5217.604	-5211.158	-3885.747	-3808.122	-3798.027
Creativity	-0.1414+ (0.0816)	-0.1591 (0.1379)	-0.05740 (0.0817)	-0.2390** (0.0957)	-0.1645+ (0.0971)	-0.1546 (0.0976)
N	3763	2185	3763	2766	2766	2766
ll	-5165.245	-2957.665	-5103.342	-3781.677	-3725.141	-3717.639
Controls						
Child	Yes	Yes	Yes	Yes	Yes	Yes
Mother	No	Yes	Yes	No	Yes	Yes
Father	No	No	Yes	No	No	Yes
Household	No	Yes	Yes	No	Yes	Yes

Notes: Each row corresponds to a child's ability dimension. Values in the table are the parameter estimates of the IPV effect from a Control function. Robust standard errors are in parentheses. The estimates from columns (1), (2) and (3) correspond to the econometric estimation at age 7 and columns (4), (5) and (6) correspond to the econometric estimation at age 11. Child variables: race, sex, whether the child is born with low weight, born between September-December, whether obese or overweight. Mother variables: age, whether she has ever been diagnosed with depression, whether suffers from chronic conditions, whether at work, highest educational level attained (academic or vocational): GCSE grades (D-G) or equivalent, O level or equivalent, A-level or equivalent, First degree or equivalent, Higher degree or equivalent. Father variables: age, whether ever been diagnosed with depression, whether suffers from chronic conditions, whether at work and the highest educational level attained (as defined for the mother). Household variables: whether the family lives in a council house (or in a housing association), the natural logarithm of the household income. Significance levels: + $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A7: Control function-Ever IPV definition

	Age 7			Age 11		
	(1)	(2)	(3)	(4)	(5)	(6)
Speaking (English)	-0.1050 (0.0787)	-0.03467 (0.0752)	-0.03046 (0.0762)	N.A.	N.A.	N.A.
N	3763	3763	3763			
ll	-5264.472	-5160.768	-5142.984			
Reading (English)	-0.1577** (0.0715)	-0.08313 (0.0675)	-0.08030 (0.0663)	N.A.	N.A.	N.A.
N	3763	3763	3763			
ll	-5263.184	-5156.702	-5133.234			
Writing (English)	-0.1761** (0.0708)	-0.09675 (0.0646)	-0.09519 (0.0650)	N.A.	N.A.	N.A.
N	3763	3763	3763			
ll	-5211.124	-5107.092	-5086.147			
English	N.A.	N.A.	N.A.	-0.2197*** (0.0785)	-0.1416+ (0.0770)	-0.1333+ (0.0747)
N				2766	2766	2766
ll				-3835.221	-3734.039	-3720.313
Science	-0.1301** (0.0646)	-0.04719 (0.0615)	-0.03554 (0.0622)	-0.2949*** (0.0851)	-0.2117** (0.0854)	-0.2032** (0.0841)
N	3763	3763	3763	2766	2766	2766
ll	-5292.037	5172.674	-5152.628	-3876.177	-3763.072	-3746.153
Math	-0.07272 (0.0742)	-0.001644 (0.0675)	0.004292 (0.0670)	-0.2978*** (0.0784)	-0.2258*** (0.0779)	-0.2178*** (0.0760)
N	3763	3763	3763	2766	2766	2766
ll	-5274.813	-5187.161	-5174.430	-3868.279	-3786.332	-3769.045
Physical education	-0.1286+ (0.0684)	-0.07341 (0.0610)	-0.06660 (0.0673)	-0.04416 (0.0641)	0.005955 (0.0662)	0.01655 (0.0661)
N	3763	3512	3763	2766	2766	2766
ll	-5266.775	-4887.575	-5223.589	-3829.268	-3787.212	-3780.257
Inf tech	-0.1327 (0.0829)	-0.06759 (0.0812)	-0.06386 (0.0814)	-0.1648** (0.0657)	-0.09653 (0.0674)	-0.09313 (0.0671)
N	3763	3763	3763	2766	2766	2766
ll	-5288.786	-5217.848	-5211.366	-3889.567	-3810.950	-3800.969
Creativity	-0.09747 (0.0642)	-0.04603 (0.0637)	-0.03637 (0.0643)	-0.1407** (0.0602)	-0.08939 (0.0620)	-0.08240 (0.0625)
N	3763	3763	3763	2766	2766	2766
ll	-5165.506	-5109.755	-5103.103	-3782.610	-3725.753	-3718.175
Controls						
Child	Yes	Yes	Yes	Yes	Yes	Yes
Mather	No	Yes	Yes	No	Yes	Yes
Father	No	No	Yes	No	No	Yes
Household	No	Yes	Yes	No	Yes	Yes

Notes: See notes in Table A6.

Table A8: The impact of IPV on educational outcomes - Contemporaneous IPV (Mother and Father/Partner)

	Age 7		Age 11	
	OLS (1)	Control function (2)	OLS (3)	Control function (4)
Speaking and listening (English)	-0.110 (0.0732)	-0.105 (0.0775)	N.A.	N.A.
Read (English)	-0.136+ (0.0753)	-0.136+ (0.0791)	N.A.	N.A.
Writing (English)	-0.118 (0.0732)	-0.117 (0.0760)	N.A.	N.A.
English	N.A.	N.A.	-0.204*** (0.0787)	-0.203** (0.0883)
Science	-0.0241 (0.0703)	-0.0274 (0.0787)	-0.322*** (0.0864)	-0.322 * ** (0.0932)
Maths	-0.0771 (0.0742)	-0.0804 (0.0771)	-0.269*** (0.0856)	-0.269*** (0.0868)
Physical education	-0.0368 (0.0756)	-0.0374 (0.0760)	-0.0657 (0.0890)	-0.0648 (0.0853)
Information and Technology	-0.100 (0.0750)	-0.104 (0.0777)	-0.231*** (0.0894)	-0.230 * ** (0.102)
Creativity	-0.0457 (0.0773)	-0.0475 (0.0741)	-0.258*** (0.0830)	-0.259*** (0.0949)
N	4999	4999	3854	3854

Notes: See notes in Table 9. Significance levels: $^+p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$

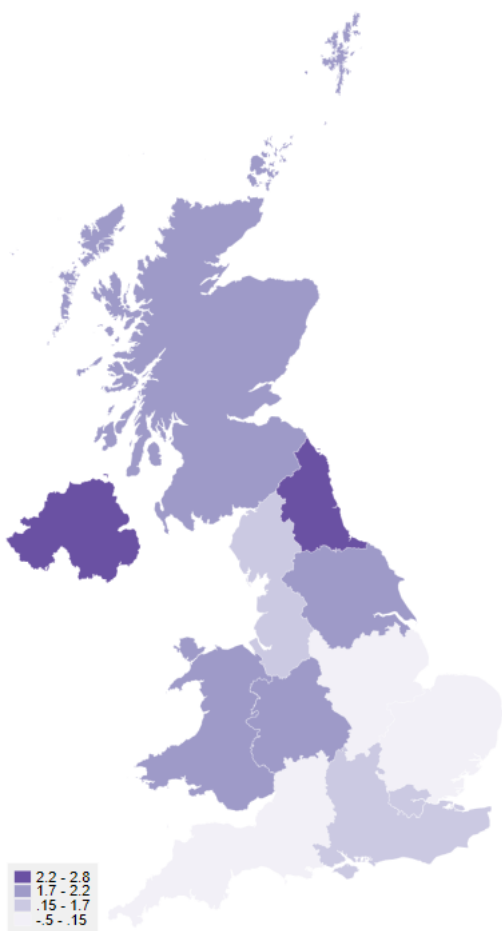
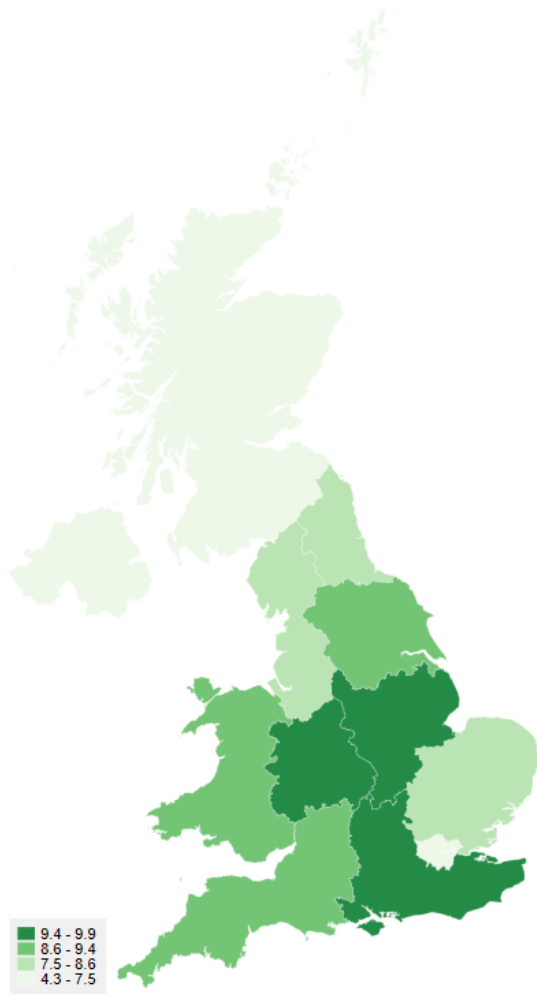
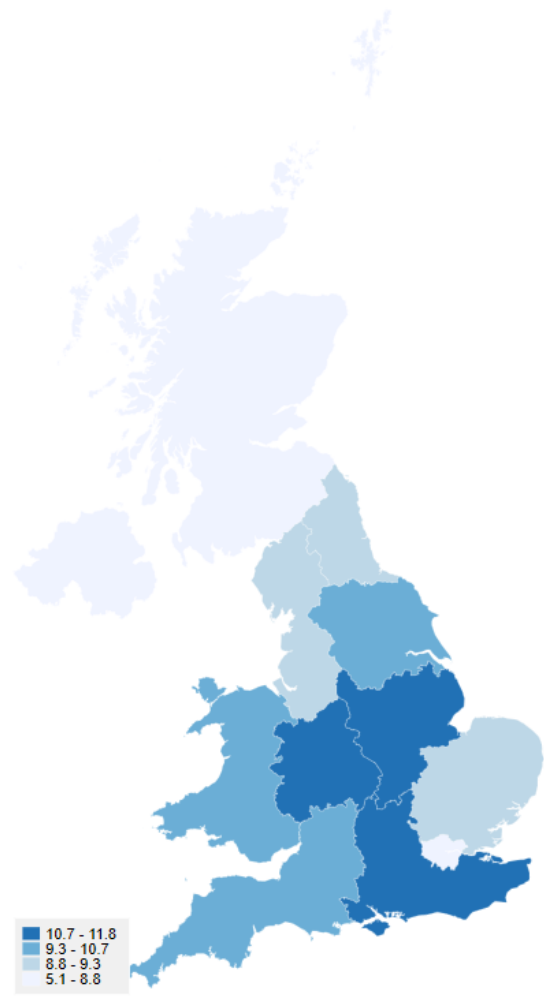


Figure A1: Male-Female Regional Unemployment Rate Difference in 2001

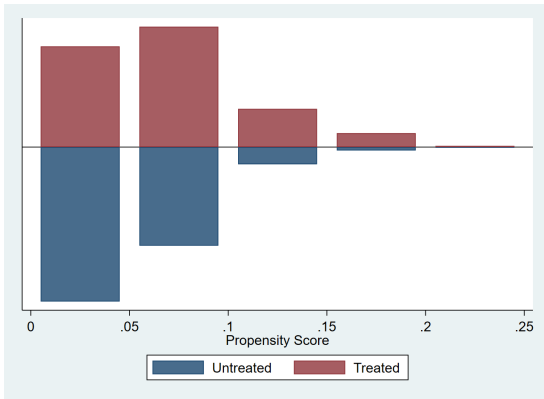


(a) Age 7

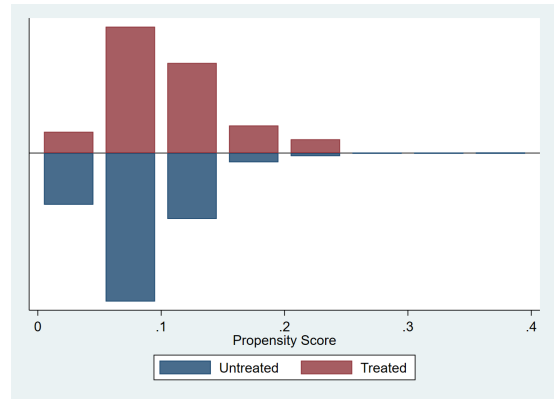


(b) Age 11

Figure A2: Proportion of Ever-IPV cases recorded in the MCS



(a) Age 7



(b) Age 11

Figure A3: Propensity Score