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**Bullying, Education and Labour Market Outcomes:
Evidence from the National Child Development Study.**

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Abstract

We explore the effect of bullying at school on the educational attainment of a sample of individuals drawn from the British *National Child Development Study* (*NCDS*). Our empirical findings suggest that school bullying has an adverse effect on human capital accumulation both at and beyond school. Moreover, the impact of bullying on educational attainment at age 16 is found to be similar in magnitude to class size effects. Furthermore, in contrast to class size effects, the adverse influence of bullying on educational attainment remains during adulthood. In addition, being bullied at school influences wages received during adulthood as well as indirectly influencing wages via educational attainment.

Key Words: Bullying; Education; Human Capital; Wages.

JEL Classification: J24, Z12

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I. Introduction and Background

Since education is a major determinant of quality of life, it is not surprising that there has been considerable interest in the economics literature in the determinants of the educational attainment of individuals. Educational qualifications influence employment and career opportunities, which in turn affect well-being (see, for example, Layard, 2003, Clark and Oswald, 2002). In this paper, we analyse one particular influence on educational attainment – bullying at school – which has attracted scant attention in the economics literature despite keen interest amongst policy makers. In the UK, for example, there have been a number of reports published recently suggesting that a relatively high proportion of children experience bullying:

> '31% of children experienced bullying during childhood, a further 7% were discriminated against and 14% were made to feel different/an outsider. 43% experienced at least one of these things during childhood.'[Cawson *et al*. 2000, p.26].

Similarly, the State of London's Children Report (2004), which reviews the health and well-being of children in London, identified bullying as having a range of adverse effects on children's well-being. Moreover, just under one fifth of the children surveyed in the Greater London Authority stated that they had been bullied. Furthermore, Smith *et al.* (2004a) argue that bullying in schools has become an international focus of concern with some anti-bullying programs such as the Olweus Bullying Prevention Program being the subject of research in the UK, the US, Germany and Canada since the 1970s.

The detrimental effects of bullying on educational attainment have been remarked upon by policy-makers. In the foreword to Oliver and Candappa (2003), for example, it is stated that: 'bullying not only scars the life of too many children, it also reflects a serious weakness in our education system.' Hence, there is a degree of concern about the adverse effects of bullying on educational attainment amongst policy-makers. In addition to impinging on a child's happiness and well-being at school, it is apparent that bullying may also have longer-term consequences, which may be felt during adulthood. If being bullied at school adversely affects educational achievement, then the individual's employment prospects may be indirectly influenced by bullying, Elliot and Kilpatrick (1994). For instance, lower levels of educational

achievement may influence the labour market status of individuals or earnings received in adulthood.

Given the current Government policy focus in many countries on introducing programs to alleviate bullying at school,[1] it is surprising that the implications of this much publicised adverse effect on children's happiness and well-being has not been explored by economists. One exception in the economics literature is a study based on Australian twins born between 1961 and 1974 by Le *et al*. (2005) who explore how childhood disorder problems influence schooling and labour market outcomes. They identify two behavioural problems that have the largest negative impacts on the school leaving decisions of males and females; bullying activity and a propensity for starting physical fights. As argued by Waddell (2006), the impact of noncognititive skills on labour market outcomes has been attracting increasing interest in the economics literature. Waddell (2006) finds that in the U.S. youths who have low self-esteem and poor attitude are likely to have relatively low educational attainment, more likely to be unemployed and, if employed, are likely to receive low wages. Being bullied at school may be associated with negative attitudes and low self-esteem.[2]

In stark contrast to the paucity of research on the effects of school bullying in the economics literature, the psychology literature has been active in researching the implications of school bullying. For example, Smith *et al.* (2004b) compare profiles of non victims, escaped victims and new victims of school bullying. They find that, irrespective of gender, continuing victims of bullying have fewer friends, are more likely to be absent from school, like other pupils less and dislike break-times. Woods and Wolke (2004), who argue there has been a dearth of research focusing on the association between bullying and academic achievement, explore the relationship between bullying behaviour at primary school and

[1] For example, the British Government's Department of Education and Skills' *'Don't Suffer in Silence'* campaign (see http://www.dfes.gov.uk/bullying/).

[2] Although there is a lack of research on bullying at school, there has been a considerable amount of research in the economics literature exploring the issue of work place harassment and bullying focusing on, for example, issues related to gender (see, for example, Kaushik, 2003) and ethnicity (see, for example, Shields and Wheatley Price, 2002).

academic outcomes in the form of the UK's National Curriculum Standard Assessment Tasks and Tests (SATs).[3] Surprisingly, the results suggest little evidence of a direct link between being a bully and erosion of academic achievement. In contrast, Varhama and Björkqvist (2005) study the relationship between being bullied at school in adolescence and long term unemployment in adulthood in Finland. Amongst those individuals with long term unemployment problems, 29% responded to having been exposed to bullying at least once per week during adolescence.

In this paper, we add to the existing literature on school bullying by conducting econometric analysis of the effects of bullying on human capital accumulation over an individual's lifecycle. To be specific, our principal aim is to explore the impact of school bullying on individuals' human capital accumulation at and also beyond age 16. We exploit the rich data available from the British *National Child Development Study* (*NCDS*), which enables us to relate a child's experience of bullying at school to their subsequent educational attainment and wages received during various stages of adulthood. In contrast to the existing literature on school bullying, the *NCDS* allows us to ascertain whether or not there are long term economic consequences of school bullying relating to an individual's labour market prospects over his/her life cycle. In addition, we are able to distinguish between those who are bullied and those who bully. Such a distinction is potentially importance since policies to alleviate school bullying should arguably focus on both the victim and the perpetrator.

II. Data

The *NCDS* is a British cohort study with a target sample of all children born in Great Britain during a given week – March 3rd to March 9th – in 1958. The *NCDS* contains information about the respondents' experiences of bullying at school as well as a wealth of information relating to family background in addition to having the advantage of tracing individuals over a relatively

[3] SATs are currently employed in UK schools to assess children's academic performance at ages 7, 11 and 14. They are national assessments designed to provide information about a pupil's progress which can be compared to national results.

long time horizon being conducted by interview at ages 7, 11, 16, 23, 33 and 42. The *NCDS* asks the mother of each respondent whether their child is bullied by other children when the child is aged 7 and when the child is aged 11.[4] The response rates to these questions are detailed below:

Bullied	*Aged 7 (%)*	*Aged 11 (%)*
0=never	*65.47*	*76.24*
1=sometimes	*29.33*	*20.18*
2=frequently	*5.20*	*3.57*

In accordance with the existing literature, the response rates suggest that bullying is more prevalent at primary school age.[5] From the response rates shown above, we construct two three-point indices to measure the extent of bullying at ages 7 and 11. It is important to re-iterate that the information pertaining to bullying is elicited from the mother rather than the child. However, given that children are often reluctant to reveal that they have been subjected to bullying such information may be more accurate than if elicited from the child. Furthermore, Oliver and Candappa (2003) report that the majority of pupils surveyed about bullying stated that they could talk to their mothers, suggesting that mothers are well informed about their child's experiences at school.[6]

In Table 1, we explore how educational attainment at age 16, as well as at three ages in adulthood, 23, 33 and 42, varies with the extent of bullying at ages 7 and 11. Educational attainment is measured by the number of Ordinary (O) levels accumulated at age 16 as well as

[4] There is a lack of information on bullying at school in individual level data sets. To our knowledge, the *NCDS* is the only large scale British data set which meets our data requirements. The absence of such information within more recent studies precludes analysis of the effects of school bullying on the current generation. The *British Cohort Survey* (*BCS*), for example, which follows individuals born in April 1970, does not contain information on whether children are bullied at school. The *British Household Panel Survey* (*BHPS*) *Youth Survey*, which targets respondents aged between 11 and 16, does ask whether respondents worry about being bullied at school, 36% of respondents state that they worry about being bullied a lot or a little at school. Unfortunately, the *BHPS Youth Survey* does not contain information on the respondents' actual experiences of bullying.

[5] See, for example, Sharp *et al.* (2002) and the National Children's Bureau (2004).

[6] The mothers of male respondents indicate that at age 7 (11) 31.1% (23.2%) of the sample were sometimes bullied and 5.6% (4.1%) were frequently bullied. In contrast, the mothers of female respondents indicate that at age 7 (11) 27.6% (17.4%) of the sample were sometimes bullied and 4.9% (3.1%) were frequently bullied. As stated by a referee, there is a possibility that the level of bullying reported by the mother is biased by gender. However, the lack of data relating to fathers' reports of bullying means that we are unable to ascertain the existence of such bias in the reporting of bullying across parents. It is, however, an important point to bear in mind when considering our empirical results.

the highest level of educational attainment at ages 23, 33 and 42. O levels were normally taken at age 16 and approximate to the US honours high school curriculum.[7] We distinguish between 5 levels of educational attainment: no educational qualifications; O level education; Advanced (A) levels (the school qualification taken at age 18);[8] diploma (i.e. intermediate qualifications between high school and university degree including teaching or nursing qualifications); and a degree (including higher degrees) taken at age 21 or after. The summary statistics indicate that the higher is the incidence of being bullied, the greater is the percentage of individuals with no qualifications across the life cycle. In general, higher incidences of being bullied at school are associated with a lower percentage of qualifications across the various educational categories at each age. In terms of the number of O levels, it is apparent that the proportion of individuals reporting six or more O levels is significantly lower for those who were frequently bullied at school. We also analyse information pertaining to whether the parent thinks that their child bullies others at age 16. Table 1 reveals that being a bully is also associated with relatively low levels of educational attainment. In sum, such descriptive statistics suggest that bullying does adversely influence educational attainment.

In what follows, Section III explores the determinants of school bullying; Section IV explores the influence of school bullying on educational attainment and Section V explores the implications of school bullying for earnings. Table 2 presents summary statistics of the variables used in our empirical analysis.[9]

[7] Certificates of Secondary Education (CSEs) and O levels were replaced by General Certificates of Secondary Education (GCSEs) in the 1980s. CSEs were the equivalent of GCSEs grades below C and O levels were the equivalent of GCSEs grades A to C. In the following analysis, the term O level refers to O level equivalent education and includes CSEs grade 1.

[8] A levels are public examinations taken at age 18, usually studying a set syllabus in one to four subjects over a two-year period. This qualification is the major determinant of eligibility for entry to higher education in the UK.

[9] The following analysis exploits multiple sweeps of the *NCDS* data and, as such, issues relating to attrition may be of importance. Attrition is inevitable in any cohort study and can lead to a biased sample. Attrition in the *NCDS* due to non-response is, however, relatively low in the non-adult waves (ages 7, 11 and 16) and increases in the adult waves. For waves 1 to 3, the response rates are over 86%, falling to around 73% for the adult sweeps, with observed samples: 15,051 (age 7); 14,757 (age 11); 13,917 (age 16); 12,044 (age 23); 10,986 (age 33); and 10,979 (age 42), see Hawkes and Plewis (2006). Dearden *et al*. (1997, 2002) indicate that attrition in the *NCDS* has tended to be amongst those with lower education and lower ability. Thus, our sample may under-represent such individuals. If bullying is associated with lower educational attainment, then such attrition may serve to moderate our estimates. For the following results, we have analysed the effects of attrition by modelling the probability of remaining in the sample between birth in 1958 and time 1958+*t*, based upon a specification similar to Hawkes and

III. The Determinants of School Bullying

Methodology

It is apparent that being bullied at school may be influenced by certain personal characteristics and circumstances. We model an individual's experiences of school bullying by specifying an ordered probit model as follows:

$$bullied_i^T = \phi + \boldsymbol{G}_i'\lambda + \varepsilon_{i1} \quad (1)$$

where T denotes whether the individual is aged 7 or 11. The vector $\boldsymbol{G}_i$ contains explanatory variables which may influence the level of bullying experienced by the individual and contains individual, school and family characteristics. In the vector of explanatory variables we include a quadratic in maths and reading test scores, birth-weight, body mass index, controls for the number of schools attended, the child's physical characteristics, whether the child's family had financial problems or an unemployed parent, whether the child is in care or attends special classes, personality *BSAG* scores – where a higher numerical score signifies greater behavioural problems,[10] an index of how frequently the child prefers to spend time alone, whether the child fights with other children and whether the child is upset by new situations. The majority of the explanatory variables relate to when the individual was aged 7. Issues relating to causality may arise when estimating equation (1) based on the bulling index at age 7. In order to alleviate such concerns when modeling the age 1l bullying index, the covariates are measured at age 7. In addition, we include a lagged dependent variable.

Results

The results from the estimation of the bullying equation for ages 7 and 11 are presented in the first two columns of Table 3, where the marginal effects associated with the probability of

Plewis (2006). The results presented in Sections III, IV and V are found to be largely unaffected by controlling for attrition.

[10] The *BSAG* personality scores refer to the "Bristol Social-Adjustment Guide" which was designed to describe a child's behaviour and attitudes in particular settings. 'Syndrome' scores were used in the *NCDS* to give a quantitative assessment of the child's behaviour defined from the following syndromes: Unforthcomingness; Withdrawal; Depression; Anxiety for acceptance by adults; Hostility towards adults; 'Writing off' of adults and adult standards; Anxiety for acceptance by children; Hostility towards children; Restlessness; 'Inconsequential' behaviour; Miscellaneous symptoms and Miscellaneous nervous symptoms. We use the combined total score for each of these 'syndromes'.

being frequently bullied are shown. Individual characteristics associated with increasing the probability of the child being bullied at both 7 and 11 are: being male; being unattractive, personality traits and being upset by new environments. School characteristics and family controls show no consistent effects across the different ages. For example, the number of schools the child has attended only influences bullying at 11 and family financial pressures only have a significant impact on bullying at 7. Focusing upon being bullied at age 11, it is apparent that children who were bullied at an earlier age have a higher probability of being bullied later on. Specifically, a 1 standard deviation increase in experiencing bullying at age 7 increases the probability of being frequently bullied at age 11 by 1.6%.[11]

As mentioned above, the *NCDS* includes information on whether the child bullies other children at age 16. In the final column of Table 3 we replace the dependent variable in equation (1) with a binary indicator of whether the parent thinks that their child bullies others at age 16. Children who experienced spells of bullying at 7 and 11 are more likely to be bullies by the time they reach 16. Interestingly, the same set of individual characteristics is associated with being bullied and being a bully. The only noticeable exception is that fighting with other children is associated with a higher probability of being a bully. Again due to issues of causality, the covariates are measured at age 7.

IV. School Bullying and Educational Attainment

Methodology

To explore how bullying affects human capital accumulation within a multi-variate context, we specify an ordered probit model as follows:

$$e_i^T = \beta_0 + \beta_1 bullied_i + \boldsymbol{X}_i'\phi + \varepsilon_{i2} \quad (2)$$

where e_i represents the individual's observed level of education; T denotes the time period at which educational attainment is measured (1974, 1981, 1991 or 2000, i.e. when the individual

[11] This calculation is based on the mean sample characteristics of individuals. The 1.6% effect is derived by multiplying the marginal effect, 0.0313, by the standard deviation of the bullying index at age 7, 0.5197.

is aged 16, 23, 33 or 42, respectively); $bullied_i$ denotes the level of bullying experienced by individual *i* (which is defined at age 7 or 11) and $\boldsymbol{X}_i$ denotes a vector of explanatory variables. When exploring the effects of being a bully at 16, we replace $bullied_i$ with the binary indicator as defined in Section III.

As stated in Section II, we measure education in two ways: firstly, by the number of O levels or equivalent accumulated by the child at age 16. We focus initially on the accumulation of this specific type of education since this is the type of human capital predominately accumulated at age 16. This index ranges from 0 to 9 such that some individuals have no O levels, whilst, at the other end of the spectrum, there are children who have nine or more O levels. Secondly, we follow Dearden *et al.* (2002) by specifying an educational attainment index defined on the 5-point scale as described in Section II. In order to explore the effect of bullying on human capital accumulation beyond school age, we construct three educational attainment indices with the information given by the individual at ages 23, 33 and 42.

The explanatory variables given in $\boldsymbol{X}_i$ are divided into three groups: school quality; family background; and ability, and are largely based on the specifications of Dearden *et al.* (2002), Dustmann *et al.* (2003), and Ermisch and Francesconi (2001). We adopt one of the standard measures of school quality – class size (the number of pupils per teacher in the school) defined at the secondary stage of education, i.e. post age 10. We also include dummy variables to control for whether, at the age of 16, the individual attended a secondary modern school, a technical school, a comprehensive school (i.e. non selective and state run), a grammar school (higher ability and state run) or a private school. We also control for whether the individual attended a single sex school at age 16 as well as a set of dummy variables indicating whether the school lacked library, sports or other facilities. We also include information indicating whether the teacher considers the mother or father to be interested in the child's educational progress at age 16. Family background controls include parents' occupation, the years of education of the parents, the number of older siblings and the number of younger

siblings, whether either parent belonged to a library and the frequency at which parents read to the child.[12] We also control for family difficulties during childhood, including the death of a parent, parental separation, unemployment and alcohol problems. To further proxy for family resources, we include dummy variables indicating whether the individual had a private room for studying at age 16 and whether he/she received free school meals. In order to proxy ability, we include the individuals' scores attained in reading and mathematics tests at the age of 11.

Results

As mentioned above, we analyse two measures of educational attainment; the number of O levels attained at 16 and an index of the highest level of education attained. Due to the comprehensive set of explanatory variables, for reasons of brevity, in Table 4, we present full estimation results in the case of one model only – namely the model where the dependent variable is the number of O levels attained at 16. In Table 4 the effects of being bullied at 7 and 11 are shown in the first two columns and being a bully in the final column.[13] It is apparent that being bullied at 7 or 11 and being a bully at 16 are all characterised by statistically significant negative estimated coefficients. Table 5 summarises the marginal effects relating to the key variables of interest where the dependent variable is the number of O levels acquired at age 16. In Table 5 Panel A, the marginal effects relating to the bullying variables, reading and mathematics test scores and class size are reported for the probability of having no O levels and the probability of having 9 or more O levels at 16. Table 5 Panel B replicates Panel A but is based upon the predicted values of bullying derived from estimating equation (1) in order to control for the personal characteristics and/or circumstances which influence bullying.

[12] The frequency that parents read to the child is based on a four point index where 0 denotes never, 1 hardly ever, 2 occasionally and 3 denotes at least every week.

[13] In general, the results from estimating equation (1), shown in Table 4, tie in with the existing literature. Whether the individual is male, attended a comprehensive school, went to a school lacking science facilities, had siblings, received free school meals or had an unemployed parent all have negative effects on educational attainment at age 16 as is the case with class size and experiences of bullying. Factors enhancing educational attainment are: whether the individual attended a grammar school; a single sex school; ability scores in maths and reading; the age the respondent's parents left school; whether the parents belonged to a library; the frequency at which parents read to the child; and whether the parents showed an interest in their off-spring's schooling. Other factors of influence include parent's socio-economic background.

We report the marginal effects of class size and school test scores as a comparison to the impact of bullying since these effects have received a lot of attention in the economics literature (see, for example, Card and Krueger, 1992, and Dearden *et al*., 2002). In the case of class size, this is also the case in the political arena with Government commitment and resources in the U.K. directed towards the reduction in class sizes especially at the primary school level. The interest in class size effects may stem from the fact that class size is regarded as one aspect of the provision of education which can be directly influenced by Government policy.

It is apparent in Table 5 Panel A that for our sample of 8,477 individuals, having been bullied at school at ages 7 and/or 11 exerts a statistically significant negative impact on the number of O levels accumulated at age 16 since the marginal effects indicate that achieving no O levels at age 16 is positively associated with being bullied at 7 and 11. Conversely, at the other end of the spectrum, experiences of bullying, i.e. being the victim or the perpetrator, decrease the probability of having 9 or more O levels. In addition, the influence of experiencing bullying upon the probability of having no O levels is greater, the closer the bullying episode is to the timing of the examinations, i.e. the age 11 effect represents the largest marginal effect and differs in magnitude to the age 7 effect at the 1 per cent level. Indeed if being bullied at 7 and/or 11 are entered simultaneously, the age 11 effect always dominants with the age 7 effect generally driven to insignificance.[14]

Interestingly, although class size has been a key issue in both the public policy debate and the academic literature, it is noticeable that the marginal effects from bullying always outweigh the effects of class size and that the difference between these two influences is statistically significant at the 1 per cent level. Such findings suggest that the economics

[14] This finding suggests that it is the temporal proximity of the event to the educational attainment period that is of importance, rather than the persistence of bullying as argued by Farmer (1995). Consequently, we have explored whether persistent bullying throughout school impinges upon educational attainment. We replace the index of the frequency of bullying at ages 7 and 11 with the following two dummy variables: whether the child is bullied at both ages; and whether the child is bullied only at one point in time, i.e. age 7 or 11. The results (not shown for brevity) indicate that persistent school bullying does matter – increasing the probability of the child having no O levels at age 16 by 3.9%, and no education at the ages of 23 and 33 by 3.5%.

literature should pay some attention to the effects of bullying on educational attainment. Based on mean individual characteristics (see Table 2), an increase in class size by 1 standard deviation increases the probability of having no O levels by approximately 0.9% and decreases the probability of having nine or more O levels by 0.09%. Similarly, the impact of a 1 standard deviation increase in bullying at age 11 increases the probability of having no O levels by around 1.7% and decreases the probability of having 9 or more O levels by 0.02%. The influence from both test scores is much larger than either the effects of being a victim of bullying or class size, *ceteris paribus*. For example, a 1 standard deviation increase in the maths (reading) test score decreases the probability of having no O levels by 23.5% (2.8%). Being a bully is associated with a relatively high probability of having no O levels at 7.8%. This effect is much larger than that found from being a victim of bullying. Moreover, the difference in the effects is statistically significant at the 1 per cent level. Such results tie in with the analysis of Le *et al*. (2005) who find that bullying others is one of the main behavioural problems which influences the probability of leaving school early in Australia.[15]

In Table 5 Panel B, we replace each measure of bullying with its predicted value estimated from equation (1). The direction of the effects is the same as in Panel A, where bullying has a larger impact at the lower end of the educational attainment scale. Noticeably, the marginal effects for the predicted measures of bullying are larger than those found in Panel A. Based upon a 1 standard deviation increase in the prediction of being bullied at 11, the probability of having no O levels increases by 3.5% and the probability of having 9 or more O levels decreases by 0.05%. Similarly, the prediction of being a bully at 16 is associated with an 18% (0.08%) higher (lower) probability of having no (9 or more) O levels. Hence, conditioning bullying upon observable characteristics approximately doubles the marginal effects.

[15] We have replaced the bullying index at ages 7 and 11 with two binary variables signifying whether the child was sometimes or frequently bullied at age 7 or 11. The estimated coefficients of the dummy variables are negative and statistically significant with the frequently bullied dummy variable being characterised by the largest marginal effect.

In Table 6, which has the same structure as Table 5, we estimate equation (2) where the dependent variable is educational attainment at age 23. Interestingly, class size has no significant impact at either end of the educational attainment hierarchy, but the effects of the tests scores and bullying exhibit similar patterns to those in Table 5. For example, a 1 standard deviation increase in bullying at age 11 increases the probability of having no education by around 1.6% and decreases the probability of having a degree by 0.27%. Again, those who are bullies rather than the victims of bullying experience the largest detrimental effects having a 11.3% higher probability of having no education and a 1.5% lower probability of having a degree.

In Table 7, we consider the effects of bullying on human capital accumulation at 33 (Panels A and B) and 42 (Panels C and D). The effects of bullying remain at both 33 and 42 where a 1 standard deviation increase in being bullied at 11 increases the probability of having no education by 1.5% (age 33) and 1% (age 42) respectively (Panels A and C). The magnitude of the effect of bullying others remains at around 11% for ages 33 and 42. It is apparent from Table 6 Panel B and Table 7 Panels B and D that the effects at both ends of the education attainment index remain when predicted bullying is included, although once again the effects are extenuated. Interestingly, class size only has a significant detrimental influence on educational achievement at 16. In accordance with Harmon and Walker (2000), we find that educational attainment later on in life is unaffected by class size, whereas an individual's experience of bullying affects educational attainment over the life cycle.[16,17]

[16] Our focus is on educational qualifications, which are recognised in the labour market. There is also information on ability test scores at ages 7 and 11 in the *NCDS*, which enable us to explore the effect of bullying on these early measures of ability. We have estimated equations for maths and reading ability test scores at ages 7 and 11 using the same covariates as in equation (2), excluding the ability measures. The results suggest that bullying at both ages has a large and significant influence on maths and reading scores. Moreover, bullying has a larger effect on the maths score than on the reading score and, for both measures of ability, the adverse effect of bullying is larger at age 11 than at age 7. In addition, if the predicted test scores (conditioned on bullying) are included in the educational attainment equations, the significant direct influence of bullying on educational attainment remains.

[17] We have also analysed whether bullying influences incremental changes in education between 23 and 33 and 33 and 42. Between the ages of 23 and 33 (33 and 42) 11.6% (9.5%) of individuals increase their educational attainment. Defining a dummy variable, which equals unity if the individual has experienced an increase in educational attainment, reveals that a 1 standard deviation increase in being bullied at age 7 decreases the probability of an increase in education between 23 and 33 by 1.4%. Similarly, focusing upon being bullied at age 11, we find that the probability of experiencing an increase in educational attainment between 23 and 33 is

V. School Bullying and Earnings

Methodology

Finally, we analyse the impact of school bullying on wages received in adulthood. Summary statistics for wages are shown in the final rows of Table 1 across the bullying categories. Clearly, wages at age 23 are higher for those individuals who did not experience bullying at school, with the wage differential being the most pronounced between those who have never been bullied and those who were frequently bullied at school. Such a wage differential is not apparent however across the bully and the non bully groups. To investigate these sample characteristics further, we augment a standard Mincerian semi log wage equation with the bullying index to ascertain whether wages are affected by school bullying. The wage equation, which is estimated by ordinary least squares (OLS), is specified as follows:

$$\ln\left(Wages\right)_i^T = \gamma_0 + \gamma_1 bullied_i + \boldsymbol{Z}_i^T{}'\theta + \boldsymbol{E}_i^T{}'\pi + \varepsilon_{i3} \qquad (3)$$

where T denotes the time period at which wages and the covariates are measured (1981, 1991 or 2000, i.e. when the individual is aged 23, 33 or 42, respectively). In vector $\boldsymbol{Z}$, we control for a standard set of variables, see Willis, 1986, including gender, a quadratic in labour market experience, marital status, industry, occupation, firm size and part-time employment, each measured at time T.[18] Controls for highest educational attainment at time T are included in vector $\boldsymbol{E}$ which consists of four dummy variables: O levels; A levels; diploma/teaching/nursing qualification; or degree level education. We consider employees only and control for sample selection bias by including an inverse mills ratio term in $\boldsymbol{Z}$ controlling for the probability of being an employee.[19] Given the debate in the econometrics literature over

lowered by 1.6%. Being bullied at either 7 or 11 has no significant impact upon educational changes between 33 and 42. Being a school bully at age 16 decreases the probability of incremental educational attainment between 23 and 33 (33 and 42) by 3.3% (3.2%).

[18] Experience is defined as the number of years in the labour market across all jobs held since leaving full time education. The industrial classifications are as follows: energy and water; extraction of minerals and ores; metal goods, engineering and vehicles; other manufacturing; construction; distribution, hotels and catering, banking and finance; and other services. The occupational dummy variables are given by: professional, intermediate, skilled, semi-skilled and unskilled.

[19] Being bullied at school may affect the labour market status of the individual as well as their earnings. In order to calculate the inverse mills ratio term, we model labour market status via a multinomial logit framework (distinguishing between being employed, self-employed, unemployed and out of the labour market) controlling for

the value of such corrections (see, for example, Puhani, 2000), we also present uncorrected estimates. When investigating the effects of being a bully on educational attainment, we replace the bullied index with a binary indicator of whether the child was a bully at age 16.

Results

The findings presented in Tables 5, 6 and 7 suggest that school bullying has a detrimental effect on human capital accumulation, which may influence wages received during adulthood. Hence, we explore how bullying influences wages received at the ages of 23, 33 and 42. Our findings are reported in Tables 8, 9 and 10 for wages at ages 23, 33 and 42 respectively. Table 8 presents the determinants of wages at age 23 based on a sample of 3,971 employees. In Panel A, a standard Mincerian wage equation is estimated for employees as a reference case, based on a quadratic in experience, educational attainment, marital status, firm size, whether the individual is employed on a part-time basis, industry and occupational dummy variables. We report two specifications: one which controls for sample selection into employment; and one without the correction. The estimated coefficient on the sample selection term controlling for the probability of being an employee is negative and significant indicating that its exclusion would bias wages upwards. Although the inverse mills ratio reveals that sample selection is important, the returns to education and experience are largely unaffected by its inclusion. The results presented in Table 8 Panel A conform with the existing literature, indicating that higher levels of educational attainment are associated with higher wages. In Panel B of Tables 8, 9 and Table 10, we augment the standard mincerian wage equation reported in Panel A with the bullying index and the binary indicator of whether the individual was a bully at 16.[20]

Being bullied at school has a statistically significant negative influence on earnings. Indeed, a 1 point move up the bullying index at age 7 (11) decreases the wage by

gender, being disabled, marital status, the presence of dependent children under 5, the presence of dependent children aged between 6 and 16, health status, household size, educational attainment and whether the individual was bullied. Our findings suggest that the probability of being self-employed relative to being employed is reduced by having been bullied at 11 which also increases the probability of being unemployed relative to being employed. School bullying at both ages increases the probability of the individual not being in the labour market relative to being an employee. Full results from estimating the sample selection equation are available on request.

approximately 3.1% (2.8%), *ceteris paribus*.[21] Noticeably, there is no significant effect from whether the individual was a school bully at 16. In Table 8 Panel C, we further explore the effects of bullying by interacting the bullying controls with educational attainment. The interaction terms are insignificant revealing that bullying does not influence the returns to education.

Table 9 (10) reveals that 4,619 (4,886) individuals are employees by the age of 33 (42). Noticeably, the influence of school bullying on earnings at 33 is larger than that at age 23. A 1 point move up the bullying index at age 7 (11) decreases the wage received at age 33 by approximately 5.1% (4.7%), *ceteris paribus*. Interacting the bullying variables with educational attainment reveals that at age 33 bullying serves to reduce the returns to O levels, A levels and vocational qualifications. Again, there is no effect on wages from bullying others at either 33 or 42. By the age of 42, bullying does not appear to influence wages, see Table 10.[22]

School Bullying and Lifetime Earnings

Finally, we explore the implications of school bullying for lifetime earnings. Figures 1 and 2 present two estimated experience-earnings profiles: for those individuals who did not experience school bullying; and for those who were frequently bullied at school, at ages 7 and 11 respectively.[23] Both figures clearly show that those who were frequently bullied at either 7 or 11 have a lower experience-earnings profile. The turning point of the experience-earnings profile for those who were never bullied at 7 or 11 occurs at 15 years 11 months, see Table 11.

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[20] The results presented in Table 8 Panels B and C and Tables 9 and 10 are based on a specification which corrects for sample selection. These findings are all robust to excluding the sample selection term.

[21] We investigate whether the effect of bullying on wages remains once we control for the effect of bullying on educational attainment by employing the predicted values from equation (2). The results indicate that the negative effect of bullying at ages 7 and 11 on wages received at age 23 remains when we allow bullying to influence educational attainment.

[22] Arguably, the effect of being bullied or a bully in the wage equation might be capturing the individual's attitude or personality. The influence of bullying on wages across the life cycle is robust to including measures of the individual's personality/attitude, based on the *BSAG* score, in the set of explanatory variables.

[23] The experience-earnings profiles are based on pooled wage equations estimated by panel fixed effects (pooling wage data at ages 23, 33, 42) and estimated separately for individuals who did not experience any bullying and for those individuals who experienced bullying frequently. The estimates are based on equation (3) omitting the bullying controls and the male dummy which is time invariant. The results are shown in Table 11. Following Murphy and Welch (1990), we experimented with higher order polynomial terms in experience but these were always insignificant. There is no effect from being a school bully on wages, see Tables 8, 9 and 10, and so experience-earnings profiles were not estimated for the being a bully/non-bully dichotomy.

In contrast, the turning point of the experience-earnings profile for those who were frequently bullied at 7 occurs at a higher level of experience, 16 years 6 months. Conversely, for those individuals who were frequently bullied at 11 the turning point occurs at 12 years and 11 months.[24] Hence, individuals bullied nearer to entrance into the labour market are those most adversely affected. For those individuals frequently bullied there is evidence of lower earnings and growth in earnings over the life cycle, *ceteris paribus*. Overall, our findings suggest that school bullying influences earnings over the life cycle in terms of both the shape and position of the experience-earnings profile.[25,26]

IV. Conclusion

Our empirical findings suggest that school bullying has an adverse effect on human capital accumulation both at and beyond school. Much focus in the existing literature has been directed towards primary schools where bullying appears to be more prevalent. Our findings suggest that it is also important to curb bullying in secondary schools in order to alleviate the adverse effects on human capital attainment. We find that these adverse effects are consistently larger if bullying occurred when the individual was aged 11, i.e. closer to the examination period.

Interestingly, being a school bully has a larger impact upon educational attainment than being bullied by other children. This finding may reflect the fact that being a school bully is measured closer to the child's examination period, i.e. at age 16, although the same characteristics influence both being bullied and being a bully. Conversely, being a victim of school bullying impinges upon labour market earnings later in life, whilst there is no

[24] It should be noted that the predicted turning points lie within the potential range of experience observed in the data. Our results should be interpreted with this caveat in mind.

[25] On entering the labour market, i.e. experience of one year, the wage differential between those not bullied and those frequently bullied at age 11 is £39 per month. Moreover, at the peak of the profile for those not bullied, the wage differential between these individuals and those frequently bullied is estimated to be around £116 per month. This is consistent with the impact of bullying at 33 (a maximum of 17 years in the labour market) where the effects of bullying upon wages are larger than at ages 23 or 42 – see Tables 8, 9 and 10.

[26] We have also explored whether bullying influences the returns to experience. Tests whether the experience terms in Table 11 differ across the never bullied and frequently bullied categories always reject the null hypothesis that the experience effects are the same. We have also analysed whether the return to experience is influenced by bullying via pooling the data across employees and interacting the experience terms with the incidence of

significant influence from being a bully. Hence, being a victim of bullying has longer lasting scarring effects than for those who are the perpetrators of bullying.

Given the current British Government's focus on alleviating bullying at school, our findings should be of interest to policy-makers as well as serving to stimulate further academic interest in this important area of research. In order to facilitate research in this area, the collection of more recent individual level data on this crucial aspect of children's experiences at school is imperative. In addition, there is a shortage of statistics on bullying at an aggregate level which has hindered attempts to ascertain the nature of trends in bullying behaviour.[27] In order to alleviate the adverse effects of bullying at school and to effectively deploy Government funding in this area, it is apparent that policy-makers need to be better informed about children's experiences of bullying at school.

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bullying. The interaction effects are however always found to be statistically insignificant, implying that the return to experience is not directly influenced by the experience of bullying.

[27] For example, the lack of comparable data on bullying at a national level has prevented the State of London's Children Report (2004) to determine whether or not the level of bullying in London is in decline relative to the rest of the country.

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Table 1: Educational Attainment, Wages and Bullying at Ages 7, 11 and 16

	NEVER BULLIED		SOMETIMES BULLIED		FREQUENTLY BULLIED		BULLY	NON BULLY
	Aged 7	Aged 11	Aged 7	Aged 11	Aged 7	Aged 11	Aged 16	Aged 16
Number of O levels at Age 16								
0	43.10%	43.51%	50.20%	52.19%	62.59%	69.64%	64.72%	45.41%
1	12.54%	12.25%	11.54%	12.33%	11.56%	10.23%	9.91%	12.29%
2	11.05%	11.06%	9.81%	9.53%	10.88%	8.91%	7.87%	10.79%
3	5.68%	5.40%	4.91%	5.08%	2.04%	3.30%	5.25%	5.26%
4	5.26%	5.45%	4.79%	3.68%	2.49%	2.31%	2.33%	5.09%
5	5.50%	5.31%	4.26%	4.68%	4.31%	2.31%	2.92%	5.16%
6	5.55%	5.57%	5.19%	4.97%	2.95%	1.65%	2.92%	5.41%
7	5.80%	5.76%	4.26%	3.62%	1.81%	0.66%	1.72%	5.29%
8	3.82%	4.01%	3.58%	2.63%	0.91%	0.33%	2.04%	3.66%
9 or above	1.71%	1.69%	1.45%	1.29%	0.45%	0.66%	0.29%	1.62%
Educational attainment at 23								
No education	41.64%	42.04%	48.87%	51.08%	61.00%	67.33%	63.85%	43.96%
O level	39.30%	38.85%	34.67%	34.48%	31.29%	26.40%	29.74%	37.85%
A level	6.92%	6.92%	6.32%	5.84%	2.95%	2.31%	2.92%	6.69%
Diploma/Teaching/Nursing	1.51%	2.26%	1.45%	1.11%	0.45%	0.66%	0.00%	1.41%
Degree	10.63%	10.91%	10.74%	7.48%	4.31%	3.30%	3.50%	10.08%
Educational attainment at 33								
No education	38.47%	38.84%	38.70%	47.69%	57.14%	63.37%	60.64%	40.85%
O level	31.95%	31.73%	31.69%	29.22%	26.98%	20.79%	25.66%	31.02%
A level	6.20%	5.76%	6.14%	5.14%	2.72%	2.31%	2.92%	5.93%
Diploma/Teaching/Nursing	10.88%	11.48%	10.83%	8.71%	7.48%	10.23%	7.29%	10.51%
Degree	12.50%	12.22%	12.64%	9.23%	5.67%	3.30%	3.50%	11.96%
Educational attainment at 42								
No education	34.65%	34.69%	34.64%	43.07%	51.93%	57.76%	57.14%	36.33%
O level	30.45%	31.13%	30.28%	28.05%	29.25%	19.80%	25.92%	29.60%
A level	5.87%	5.76%	5.88%	4.91%	2.49%	2.97%	2.92%	5.69%
Diploma/Teaching/Nursing	14.11%	11.48%	14.27%	12.33%	9.30%	14.85%	9.91%	14.06%
Degree	14.92%	13.35%	14.93%	11.63%	7.03%	4.62%	4.08%	14.31%
Log real wage rate at 23	5.926	5.916	5.903	5.926	5.841	5.823	5.915	5.911
Log real wage rate at 33	6.619	6.618	6.640	6.635	6.463	6.472	6.622	6.558
Log real wage rate at 42	6.677	6.669	6.666	6.683	6.554	6.560	6.668	6.658

Table 2: Summary Statistics

Key Variables	Mean	Standard Deviation
Individual Characteristics		
Number of O levels at age 16	2.0560	2.6288
Index of highest educational attainment at age 23	1.0639	1.4901
Index of highest educational attainment at age 33	1.3334	1.6491
Index of highest educational attainment at age 42	1.5094	1.7114
Bullied at age 7	0.3973	0.5861
Bullied at age 11	0.2733	0.5197
Bully at age 16	0.0870	0.2819
Male	0.4948	0.5000
Number of older siblings at age 16	0.9023	1.3092
Number of younger siblings at age 16	0.9409	1.2316
Child had a room to do homework at age 11	0.7110	0.4533
Child received free school meals at age 11	0.0790	0.2698
Mathematics test score at age 11	16.6275	10.8105
Reading comprehension test score at age 11	15.5542	7.1526
Child spent time in school before the age of 5	0.2720	0.4450
Frequency father read to child at age 7	2.0117	0.8785
Frequency mother read to child at age 7	2.3187	0.7663
School Characteristics		
Class size (pupil-teacher ratio) at age 11	23.7921	8.9315
Attended comprehensive school at age 16	0.4883	0.4999
Attended grammar school at age 16	0.1027	0.3036
Attended technical college at age 16	0.0047	0.0685
Attended a single sex school at age 16	0.2043	0.4032
Parent-teacher association in school at age 7	0.1626	0.3690
School lacked library facilities at age 16	0.1779	0.3824
School lacked sports facilities at age 16	0.2788	0.4484
School lacked science facilities at age 16	0.1865	0.3895
School lacked other facilities at age 16	0.8407	0.3659
Family Characteristics		
Father professional occupation (child aged 16)	0.1662	0.3723
Father non-manual occupation (child aged 16)	0.1061	0.3079
Father skilled manual occupation (child aged 16)	0.2811	0.4496
Father semi-skilled manual occupation (child aged 16)	0.0845	0.2781
Father unskilled manual occupation (child aged 16)	0.0911	0.2877
Mother professional occupation (child aged 16)	0.0217	0.1457
Mother non-manual occupation (child aged 16)	0.3314	0.4707
Mother skilled manual occupation (child aged 16)	0.0242	0.1536
Mother semi-skilled manual occupation (child aged 16)	0.0751	0.2636
Mother unskilled manual occupation (child aged 16)	0.0649	0.2463
Age father left full-time education	16.4209	1.2575
Age mother left full-time education	16.3605	1.0400
Mother belonged to library in past 12 months at age 11	0.4239	0.4942
Father belonged to library in past 12 months at age 11	0.3979	0.4895
Father and mother shown interest in child's education at age 11	0.4135	0.4925
Mother is a native English speaker	0.9756	0.1544
Family difficulties – father dead by age 7	0.0105	0.1019
Family difficulties – mother dead by age 7	0.0029	0.0542
Family difficulties – separated, widowed or divorced by age 7	0.0307	0.1724
Family difficulties – unemployed parent by age 7	0.0294	0.1689
Family difficulties – alcohol problems for parent by age 7	0.0088	0.0936
OBSERVATIONS	8,477	

Table 3: The Determinants of Bullying at Ages 7, 11 and 16

	BULLIED				**BULLY**	
	AGED 7		*AGED 11*		*AGED 16*	
	M.E.	TSTAT	M.E.	TSTAT	M.E.	TSTAT
Individual Characteristics						
Bullied at age 7	–		0.0313	*(16.08)*	0.0071	*(3.23)*
Bullied at age 11	–		–		0.0109	*(2.21)*
Male	0.0074	*(2.67)*	0.0086	*(4.74)*	0.0010	*(3.67)*
Mathematics test score aged 7	-0.0042	*(1.93)*	0.0009	*(0.63)*	-0.0030	*(1.02)*
Mathematics test score aged 7 squared	0.0003	*(1.49)*	-0.0001	*(1.15)*	0.0002	*(0.84)*
Reading comprehension test aged 7	0.0014	*(1.61)*	0.0001	*(0.27)*	-0.0004	*(0.31)*
Reading comprehension test aged 7 squared	-0.0004	*(1.86)*	-0.0001	*(0.99)*	0.0001	*(0.33)*
Disabled at age 7	0.0105	*(1.46)*	0.0126	*(2.18)*	-0.0017	*(0.19)*
Child wears glasses at age 7	0.0109	*(1.98)*	0.0055	*(1.36)*	-0.0053	*(0.72)*
Child is unattractive at age 7	0.0109	*(2.22)*	0.0100	*(2.69)*	0.0150	*(2.36)*
Child has erratic movement at age 7	0.0273	*(3.25)*	-0.0055	*(1.44)*	-0.0038	*(0.38)*
Child has leg problems at age 7	-0.0045	*(0.60)*	0.0093	*(1.54)*	0.0045	*(0.40)*
Child has speech problems at age 7	0.0285	*(1.71)*	0.0095	*(0.93)*	0.0314	*(1.69)*
Birth-Weight	-0.0001	*(2.15)*	-0.0001	*(1.29)*	0.0001	*(0.85)*
Body Mass Index at age 7	-0.0011	*(1.47)*	0.0001	*(0.26)*	-0.0008	*(0.82)*
BSAG personality traits score at age 7	0.0008	*(4.48)*	0.0006	*(5.55)*	0.0004	*(1.99)*
Child prefers time alone at age 7	0.0175	*(9.82)*	0.0017	*(1.46)*	-0.0041	*(1.64)*
Child is upset by new environments at age 7	0.0284	*(9.29)*	0.0056	*(2.75)*	0.0020	*(0.49)*
Fights other children at age 7	0.0033	*(1.44)*	0.0007	*(0.43)*	0.0216	*(6.56)*
School Characteristics						
Child spent time in school before age 5	-0.0025	*(0.79)*	-0.0016	*(0.82)*	-0.0042	*(0.98)*
Number of schools attended by age 7	0.0009	*(0.46)*	0.0041	*(3.01)*	0.0015	*(0.62)*
Child attends special education classes at age 7	0.0072	*(1.08)*	0.0075	*(1.43)*	0.0055	*(0.62)*
Number of pupils at the school age 7	0.0001	*(1.54)*	0.0001	*(1.44)*	0.0001	*(0.44)*
Family Characteristics						
Lives in care at age 7	0.0047	*(0.50)*	-0.0068	*(1.42)*	0.0137	*(1.07)*
Unemployed parent at age 7	-0.0063	*(0.74)*	-0.0063	*(1.29)*	0.0099	*(0.86)*
Moved region by age 7	0.0063	*(1.94)*	0.0027	*(1.22)*	0.0018	*(0.39)*
Family had financial problems at age 7	0.0313	*(4.68)*	0.0051	*(1.14)*	0.0212	*(2.75)*
CONTROLS	Region, Father's Occupation					
Chi Squared (42)	457.22 *p=[0.000]*		848.53 *p=[0.000]*		193.82 *p=[0.000]*	
Pseudo R Squared	0.0350		0.0810		0.0645	
OBSERVATIONS	8,477					

Notes: (i) M.E. denotes Marginal Effect; (ii) Focusing upon those children who are bullied by others (i.e. columns one and two), the marginal effect is based on the probability that the child is frequently bullied.

Table 4: Educational Attainment and Bullying (Dependent Variable = Number of O Levels at 16)

	BULLIED				BULLY	
	COEF	*TSTAT*	*COEF*	*TSTAT*	*COEF*	*TSTAT*
Individual Characteristics						
Bullied at age 7	-0.0528	*(2.39)*		–		
Bullied at age 11		–	-0.0815	*(3.15)*		
Bully at age 16		–		–	-0.1974	*(2.79)*
Male	-0.1147	*(4.56)*	-0.1109	*(4.40)*	-0.1161	*(4.61)*
Number of older siblings at age 16	-0.0670	*(5.97)*	-0.0662	*(5.90)*	-0.0648	*(5.78)*
Number of younger siblings at age 16	-0.0494	*(4.12)*	-0.0492	*(4.11)*	-0.0448	*(3.68)*
Child had a room to do homework at age 11	0.1082	*(3.24)*	0.1070	*(3.21)*	0.1076	*(3.22)*
Child received free school meals at age 11	-0.3088	*(5.49)*	-0.3061	*(5.44)*	-0.3140	*(5.58)*
Mathematics test score at age 11	0.0556	*(29.91)*	0.0554	*(29.73)*	0.0557	*(29.95)*
Reading comprehension test score at age 11	0.0099	*(3.00)*	0.0099	*(2.99)*	0.0098	*(2.98)*
Child spent time in school before the age of 5	0.0367	*(1.31)*	0.0359	*(1.28)*	0.0364	*(1.30)*
Frequency father read to child at age 7	0.2383	*(1.74)*	0.0356	*(1.99)*	0.0346	*(1.94)*
Frequency mother read to child at age 7	-0.1014	*(0.46)*	0.0449	*(2.27)*	0.0451	*(2.27)*
School Characteristics						
Class size (pupil-teacher ratio) at age 11	-0.0026	*(2.03)*	-0.0026	*(2.05)*	-0.0028	*(2.09)*
Attended comprehensive school at age 16	-0.0636	*(2.11)*	-0.0618	*(2.05)*	-0.0640	*(2.12)*
Attended grammar school at age 16	0.4871	*(10.62)*	0.4872	*(10.62)*	0.4872	*(10.63)*
Attended technical college at age 16	0.2062	*(1.16)*	0.2047	*(1.14)*	0.2063	*(1.15)*
Attended a single sex school at age 16	0.2007	*(5.73)*	0.1998	*(5.69)*	0.2010	*(5.73)*
Parent-teacher association in school at age 7	0.0154	*(0.45)*	0.0176	*(0.51)*	0.0140	*(0.41)*
School lacked library facilities at age 16	0.0356	*(1.04)*	0.0346	*(1.01)*	0.0357	*(1.05)*
School lacked sports facilities at age 16	-0.0248	*(0.80)*	-0.0234	*(0.75)*	-0.0253	*(0.82)*
School lacked science facilities at age 16	-0.0782	*(2.30)*	-0.0781	*(2.29)*	-0.0770	*(2.26)*
School lacked other facilities at age 16	0.1233	*(3.43)*	0.1234	*(3.43)*	0.1254	*(3.49)*
Family Characteristics						
Father professional occupation (Child aged 16)	0.1391	*(2.95)*	0.1403	*(2.98)*	0.1415	*(3.00)*
Father non-manual occupation (Child aged 16)	0.0539	*(1.08)*	0.0569	*(1.14)*	0.0531	*(1.06)*
Father skilled manual occupation (Child aged 16)	-0.0346	*(0.83)*	-0.0361	*(0.86)*	-0.0376	*(0.90)*
Father semi-skilled manual occupation (Child aged 16)	-0.0793	*(1.39)*	-0.0805	*(1.41)*	-0.0793	*(1.39)*
Father unskilled manual occupation (Child aged 16)	-0.0288	*(0.53)*	-0.0294	*(0.54)*	-0.0246	*(0.45)*
Mother professional occupation (Child aged 16)	-0.0774	*(0.89)*	-0.0816	*(0.94)*	-0.0753	*(0.87)*
Mother non-manual occupation (Child aged 16)	-0.0551	*(1.78)*	-0.0566	*(1.83)*	-0.0556	*(1.80)*
Mother skilled manual occupation (Child aged 16)	-0.1489	*(1.82)*	-0.1523	*(1.86)*	-0.1519	*(1.86)*
Mother semi-skilled manual occupation (Child aged 16)	-0.1043	*(1.99)*	-0.1039	*(1.98)*	-0.1007	*(1.93)*
Mother unskilled manual occupation (Child aged 16)	-0.0405	*(0.72)*	-0.0437	*(0.78)*	-0.0406	*(0.72)*
Age father left full-time education	0.0565	*(4.76)*	0.0558	*(4.69)*	0.0562	*(4.74)*
Age mother left full-time education	0.1006	*(6.79)*	0.1012	*(6.81)*	0.1013	*(6.85)*
Mother belonged to library in past 12 months at age 7	0.1509	*(4.75)*	0.1503	*(4.72)*	0.1525	*(4.80)*
Father belonged to library in past 12 months at age 7	0.1178	*(3.74)*	0.1199	*(3.81)*	0.1185	*(3.76)*
Father/mother shown interest in child's education at age 7	0.3830	*(12.63)*	0.3842	*(12.67)*	0.3830	*(12.63)*
Mother is a native English speaker	0.0349	*(0.44)*	0.0304	*(0.39)*	0.0269	*(0.34)*
Family difficulties – father dead by age 7	0.2383	*(1.74)*	0.2381	*(1.74)*	0.2409	*(1.76)*
Family difficulties – mother dead by age 7	-0.1014	*(0.46)*	-0.1027	*(0.46)*	-0.1019	*(0.46)*
Family difficulties – separated, widowed or divorced by age 7	-0.1179	*(1.46)*	-0.1162	*(1.43)*	-0.1155	*(1.43)*
Family difficulties – unemployed parent by age 7	-0.2880	*(2.70)*	-0.2877	*(2.70)*	-0.2894	*(2.70)*
Family difficulties – alcohol problems for parent by age 7	0.2758	*(1.87)*	0.2737	*(1.85)*	0.2711	*(1.84)*
Chi Squared (42)	4521.44	*p=[0.000]*	4566.24	*p=[0.000]*	4566.10	*p=[0.000]*
Pseudo R Squared	0.1789		0.1791		0.1790	
OBSERVATIONS	8,477					

Table 5: Educational Attainment and School Bullying: Dependent Variable= The Number of O Levels at Age 16; Marginal Effects

PANEL A	NO O LEVELS		NINE + O LEVELS		NO O LEVELS		NINE + O LEVELS		NO O LEVELS		NINE + O LEVELS	
	M.E.	TSTAT	M.E.	TSTAT	M.E.	TSTAT	M.E.	TSTAT	M.E.	TSTAT	M.E.	TSTAT
Class Size	0.0010	*(2.03)*	-0.0001	*(1.93)*	0.0010	*(2.05)*	-0.0001	*(1.95)*	0.0011	*(2.09)*	-0.0001	*(1.98)*
Reading test score	-0.0039	*(3.00)*	0.0001	*(2.97)*	-0.0039	*(2.99)*	0.0001	*(2.96)*	-0.0039	*(2.98)*	0.0001	*(2.95)*
Maths test score	-0.0218	*(9.91)*	0.0002	*(6.35)*	-0.0217	*(9.72)*	0.0002	*(6.36)*	-0.0218	*(9.94)*	0.0002	*(6.36)*
Bullied at 7	0.0207	*(2.39)*	-0.0002	*(2.25)*	–		–		–		–	
Bullied at 11	–		–		0.0319	*(3.15)*	-0.0003	*(2.81)*	–		–	
Bully at 16	–		–		–		–		0.0782	*(2.78)*	-0.0005	*(3.17)*
Chi Squared (42)	4521.44 *p=[0.000]*				4566.24 *p=[0.000]*				4566.10 *p=[0.000]*			
Pseudo R Squared	0.1789				0.1791				0.1790			
PANEL B	NO O LEVELS		NINE + O LEVELS		NO O LEVELS		NINE + O LEVELS		NO O LEVELS		NINE + O LEVELS	
	M.E.	TSTAT	M.E.	TSTAT	M.E.	TSTAT	M.E.	TSTAT	M.E.	TSTAT	M.E.	TSTAT
Class Size	0.0011	*(2.08)*	-0.0001	*(1.98)*	0.0011	*(2.15)*	-0.0001	*(2.03)*	0.0011	*(2.16)*	-0.0001	*(2.05)*
Reading test score	-0.0038	*(2.93)*	0.0003	*(2.91)*	-0.0037	*(2.89)*	0.0001	*(2.87)*	-0.0037	*(2.88)*	0.0001	*(2.86)*
Maths test score	-0.0217	*(9.81)*	0.0002	*(6.36)*	-0.0218	*(9.83)*	0.0002	*(6.35)*	-0.0217	*(9.84)*	0.0002	*(6.34)*
Bullied at 7 (predicted)	0.1602	*(4.21)*	-0.0007	*(4.77)*	–		–		–		–	
Bullied at 11 (predicted)	–		–		0.3478	*(3.09)*	-0.0028	*(2.81)*	–		–	
Bully at 16 (predicted)	–		–		–		–		0.1793	*(5.84)*	-0.0008	*(5.31)*
Chi Squared (42)	4533.48 *p=[0.000]*				4490.21 *p=[0.000]*				4550.80 *p=[0.000]*			
Pseudo R Squared	0.1793				0.1792				0.1799			
OBSERVATIONS	8,477											

Notes: (i) M.E. denotes Marginal Effect; (ii) Control variables are as shown in Table 4.

Table 6: Educational Attainment and School Bullying: Educational Attainment at Age 23; Marginal Effects

PANEL A	NO EDUCATION		DEGREE		NO EDUCATION		DEGREE		NO EDUCATION		DEGREE	
	M.E.	TSTAT	M.E.	TSTAT	M.E.	TSTAT	M.E.	TSTAT	M.E.	TSTAT	M.E.	TSTAT
Class Size	0.0007	*(1.25)*	-0.0001	*(1.25)*	0.0007	*(1.26)*	-0.0001	*(1.26)*	0.0007	*(1.29)*	-0.0001	*(1.29)*
Reading test score	-0.0043	*(3.29)*	0.0007	*(3.37)*	-0.0043	*(3.28)*	0.0007	*(3.36)*	-0.0043	*(3.29)*	0.0007	*(3.37)*
Maths test score	-0.0206	*(6.47)*	0.0035	*(7.01)*	-0.0206	*(6.38)*	0.0035	*(7.03)*	-0.0207	*(6.53)*	0.0035	*(7.01)*
Bullied at 7	0.0215	*(2.36)*	-0.0037	*(2.34)*	–		–		–		–	
Bullied at 11	–		–		0.0302	*(2.84)*	-0.0052	*(2.80)*	–		–	
Bully at 16	–		–		–		–		0.1133	*(3.82)*	-0.0148	*(4.88)*
Chi Squared (42)	3627.91 *p=[0.000]*				3646.74 *p=[0.000]*				3651.83 *p=[0.000]*			
Pseudo R Squared	0.2424				0.2425				0.2428			
PANEL B	NO EDUCATION		DEGREE		NO EDUCATION		DEGREE		NO EDUCATION		DEGREE	
	M.E.	TSTAT	M.E.	TSTAT	M.E.	TSTAT	M.E.	TSTAT	M.E.	TSTAT	M.E.	TSTAT
Class Size	0.0001	*(1.31)*	-0.0001	*(1.31)*	0.0007	*(1.37)*	-0.0001	*(1.37)*	0.0008	*(1.38)*	-0.0001	*(1.38)*
Reading test score	-0.0042	*(3.21)*	0.0007	*(3.29)*	-0.0042	*(3.18)*	0.0007	*(3.26)*	-0.0042	*(3.17)*	0.0007	*(3.24)*
Maths test score	-0.0206	*(6.41)*	0.0035	*(7.00)*	-0.0206	*(6.41)*	0.0035	*(6.90)*	-0.0206	*(6.43)*	0.0035	*(6.94)*
Bullied at 7 (predicted)	0.1674	*(4.48)*	-0.0019	*(6.41)*	–		–		–		–	
Bullied at 11 (predicted)	–		–		0.3636	*(3.15)*	-0.0616	*(3.15)*	–		–	
Bully at 16 (predicted)	–		–		–		–		0.1859	*(5.84)*	-0.0209	*(8.22)*
Chi Squared (42)	3653.87 *p=[0.000]*				3600.11 *p=[0.000]*				3625.36 *p=[0.000]*			
Pseudo R Squared	0.2431				0.2429				0.2439			
OBSERVATIONS	8,477											

Notes: (i) M.E. denotes Marginal Effect; (ii) Control variables are as shown in Table 4.

Table 7: Educational Attainment and School Bullying: Educational Attainment at Ages 33 and 42; Marginal Effects

PANEL A: Aged 33	NO EDUCATION		DEGREE		NO EDUCATION		DEGREE		NO EDUCATION		DEGREE	
	M.E.	TSTAT	M.E.	TSTAT	M.E.	TSTAT	M.E.	TSTAT	M.E.	TSTAT	M.E.	TSTAT
Bullied at 7	0.0174	*(2.04)*	-0.0053	*(2.04)*	–		–		–		–	
Bullied at 11	–		–		0.0285	*(2.85)*	-0.0087	*(2.84)*	–		–	
Bully at 16	–		–		–		–		0.1135	*(3.93)*	-0.0272	*(5.00)*
PANEL B: Aged 33												
Bullied at 7 (predicted)	0.1388	*(3.80)*	-0.0315	*(5.15)*	–		–		–		–	
Bullied at 11 (predicted)	–		–		0.2443	*(2.87)*	-0.0742	*(2.88)*	–		–	
Bully at 16 (predicted)	–		–		–		–		0.1452	*(4.68)*	-0.0328	*(6.29)*
PANEL C: Aged 42												
Bullied at 7	0.0111	*(1.40)*	-0.0047	*(1.40)*	–		–		–		–	
Bullied at 11	–		–		0.0187	*(2.01)*	-0.0079	*(2.01)*	–		–	
Bully at 16	–		–		–		–		0.1283	*(4.69)*	-0.0411	*(6.16)*
PANEL D: Aged 42												
Bullied at 7 (predicted)	0.1268	*(3.62)*	-0.0406	*(4.80)*	–		–		–		–	
Bullied at 11 (predicted)	–		–		0.1701	*(2.48)*	-0.0714	*(2.48)*	–		–	
Bully at 16 (predicted)	–		–		–		–		0.1150	*(4.03)*	-0.0380	*(5.14)*
OBSERVATIONS	8,477											

Notes: (i) M.E. denotes Marginal Effect; (ii) Control variables are as shown in Table 4; (iii) Across all models the probability that all the coefficients are jointly equal to zero is rejected at the 1% level.

Table 8: Wages and School Bullying: Dependent Variable = Log Wages at 23 (Summary Results)

PANEL A: REFERENCE CASE: WITHOUT BULLYING

	SAMPLE SELECTION		NO SAMPLE SELECTION	
	COEF	TSTAT	COEF	TSTAT
Intercept	5.4738	*(9.34)*	5.4253	*(8.43)*
Male	0.3367	*(24.13)*	0.3364	*(24.12)*
Experience	0.0218	*(2.16)*	0.0219	*(2.07)*
Experience squared	-0.0023	*(1.83)*	-0.0023	*(1.84)*
O Level	0.0663	*(4.72)*	0.0676	*(4.82)*
A Level	0.0863	*(3.90)*	0.0868	*(3.92)*
Diploma/Teaching/Nursing	0.2000	*(3.88)*	0.1984	*(5.06))*
Degree	0.1131	*(4.50)*	0.1122	*(4.45)*
Inverse Mills Ratio	-0.0733	*(2.63)*	–	
R Squared	0.3203		0.3192	

PANEL B: INCLUDING BULLYING

	COEF	TSTAT	COEF	TSTAT	COEF	TSTAT
O Level	0.0635	*(4.50)*	0.0642	*(4.56)*	0.0660	*(4.70)*
A Level	0.0814	*(3.76)*	0.0831	*(3.75)*	0.0859	*(3.88)*
Diploma/Teaching/Nursing	0.1949	*(3.81)*	0.1969	*(3.82)*	0.1994	*(3.86)*
Degree	0.1106	*(4.39)*	0.1093	*(4.35)*	0.1127	*(4.48)*
Bullied at 7	-0.0305	*(3.23)*	–		–	
Bullied at 11	–		-0.0283	*(2.77)*	–	
Bully at 16	–		–		-0.0151	*(0.52)*
R Squared	0.3221		0.3215		0.3203	

PANEL C: BULLYING AND INTERACTIONS WITH EDUCATION

	COEF	TSTAT	COEF	TSTAT	COEF	TSTAT
O Level	0.0516	*(3.16)*	0.0699	*(4.63)*	0.0676	*(4.77)*
A Level	0.0801	*(3.14)*	0.0813	*(3.35)*	0.0867	*(3.88)*
Diploma/Teaching/Nursing	0.2217	*(3.82)*	0.2128	*(4.13)*	0.2008	*(3.89)*
Degree	0.0844	*(2.93)*	0.1207	*(4.49)*	0.1166	*(4.57)*
Bullied at 7	-0.0438	*(3.20)*	–		–	
Bullied at 7×O Level	0.0279	*(1.37)*	–		–	
Bullied at 7×A Level	0.0019	*(0.05)*	–		–	
Bullied at 7×Diploma/Teaching/Nursing	-0.1214	*(1.48)*	–		–	
Bullied at 7×Degree	0.0663	*(1.63)*	–		–	
Bullied at 11	–		-0.0278	*(2.87)*	–	
Bullied at 11×O Level	–		-0.0262	*(1.46)*	–	
Bullied at 11×A Level	–		0.0134	*(0.27)*	–	
Bullied at 11×Diploma/Teaching/Nursing	–		-0.1007	*(0.86)*	–	
Bullied at 11×Degree	–		-0.0579	*(1.19)*	–	
Bully at 16	–		–		-0.0081	*(0.20)*
Bully at 16×O Level	–		–		-0.0329	*(0.47)*
Bully at 16×A Level	–		–		0.0135	*(0.11)*
Bully at 16×Diploma/Teaching/Nursing	–		–		-0.0659	*(0.89)*
Bully at 16×Degree	–		–		-0.2065	*(1.00)*
R Squared	0.3230		0.3227		0.3203	
OBSERVATIONS	3,971					

Notes: (i) Controls in each panel are included for marital status, part time, firm size, occupation and industry; (ii) White's corrected standard errors for heteroscedasticity are reported.

Table 9: Wages and School Bullying: Dependent Variable = Log Wages at 33

PANEL A: INCLUDING BULLYING

	COEF	TSTAT	COEF	TSTAT	COEF	TSTAT
O Level	0.2143	*(9.92)*	0.2155	*(9.96)*	0.2212	*(10.26)*
A Level	0.3269	*(8.02)*	0.3285	*(8.03)*	0.3368	*(8.25)*
Diploma/Teaching/Nursing	0.2767	*(8.82)*	0.2782	*(8.89)*	0.2848	*(9.06)*
Degree	0.5185	*(7.20)*	0.5194	*(7.27)*	0.5319	*(7.62)*
Bullied at 7	-0.0510	*(3.44)*	–		–	
Bullied at 11	–		-0.0471	*(2.91)*	–	
Bully at 16	–		–		0.0423	*(1.21)*
R Squared	0.5684		0.5680		0.5838	
Observations	4,619					

PANEL B: BULLYING AND INTERACTIONS WITH EDUCATION

	COEF	TSTAT	COEF	TSTAT	COEF	TSTAT
O Level	0.2451	*(9.38)*	0.2288	*(9.25)*	0.2302	*(10.57)*
A Level	0.3864	*(7.85)*	0.3610	*(8.16)*	0.3454	*(8.33)*
Diploma/Teaching/Nursing	0.3089	*(8.03)*	0.3059	*(8.46)*	0.2944	*(9.20)*
Degree	0.5156	*(4.89)*	0.5437	*(6.35)*	0.5321	*(7.82)*
Bullied at 7	-0.0141	*(0.62)*	–		–	
Bullied at 7×O Level	-0.0736	*(2.19)*	–		–	
Bullied at 7×A Level	-0.1628	*(2.24)*	–		–	
Bullied at 7×Diploma/Teaching/Nursing	-0.0762	*(1.32)*	–		–	
Bullied at 7×Degree	0.0249	*(0.50)*	–		–	
Bullied at 11	–		-0.0079	*(0.36)*	–	
Bullied at 11×O Level	–		-0.0417	*(1.09)*	–	
Bullied at 11×A Level	–		-0.1343	*(1.22)*	–	
Bullied at 11×Diploma/Teaching/Nursing	–		-0.0985	*(2.08)*	–	
Bullied at 11×Degree	–		-0.0969	*(1.80)*	–	
Bully at 16	–		–		0.0794	*(0.27)*
Bully at 16×O Level	–		–		-0.2554	*(2.16)*
Bully at 16×A Level	–		–		-0.3118	*(2.20)*
Bully at 16×Diploma/Teaching/Nursing	–		–		-0.2813	*(2.23)*
Bully at 16×Degree	–		–		0.0044	*(0.01)*
R Squared	0.5694		0.5833		0.5836	
OBSERVATIONS	4,619					

Notes: (i) Controls in each panel are included for marital status, part time, firm size, occupation and industry; (ii) White's corrected standard errors for heteroscedasticity are reported.

Table 10: Wages and School Bullying: Dependent Variable = Log Wages at 42

	COEF	TSTAT	COEF	TSTAT	COEF	TSTAT
O Level	0.1459	*(5.86)*	0.1460	*(5.80)*	0.1523	*(5.95)*
A Level	0.2673	*(5.77)*	0.2663	*(5.73)*	0.2719	*(5.85)*
Diploma/Teaching/Nursing	0.1639	*(5.36)*	0.1633	*(5.33)*	0.1671	*(5.45)*
Degree	0.3627	*(10.05)*	0.3610	*(9.97)*	0.3678	*(10.15)*
Bullied at 7	-0.0143	*(0.87)*	–		–	
Bullied at 11	–		-0.0281	*(1.55)*	–	
Bully at 16	–		–		0.0928	*(1.96)*
R Squared	0.4645		0.4647		0.4648	
Observations	4,886					

Notes: (i) Controls in each panel are included for marital status, part time, firm size, occupation and industry; (ii) White's corrected standard errors for heteroscedasticity are reported.

Table 11: Panel Fixed Effects Wage Equations

PANEL A: SAMPLE = NEVER BULLIED AT SCHOOL AT AGE 7		
	COEF	TSTAT
Experience	0.13097	*(19.28)*
Experience squared	-0.00408	*(12.85)*
Turning Point	15 Years & 11 Months	
R Squared	0.2011	
Observations	8,796	
PANEL B: SAMPLE = FREQUENTLY BULLIED AT SCHOOL AGE 7		
	COEF	TSTAT
Experience	0.12414	*(5.72)*
Experience squared	-0.00387	*(3.92)*
Turning Point	16 Years & 6 Months	
R Squared	0.2397	
Observations	670	
PANEL C: SAMPLE = NEVER BULLIED AT SCHOOL AT AGE 11		
	COEF	TSTAT
Experience	0.13354	*(21.34)*
Experience squared	-0.00420	*(14.49)*
Turning Point	15 Years & 11 Months	
R Squared	0.2010	
Observations	5,401	
PANEL D: SAMPLE = FREQUENTLY BULLIED AT SCHOOL AT AGE 11		
	COEF	TSTAT
Experience	0.16862	*(6.53)*
Experience squared	-0.00648	*(5.12)*
Turning Point	12 Years & 11 Months	
R Squared	0.2501	
Observations	466	

Notes:
(i) Controls in each panel are marital status, part time, firm size, education, occupation and industry dummy variables; (ii) The turning points are estimated from:

$$\frac{\partial \ln Wage}{\partial Exp} = \hat{\theta}_1 + 2\hat{\theta}_2 Exp = 0$$

where *Exp* represents experience and $\hat{\theta}_1$ and $\hat{\theta}_2$ are the estimated coefficients given in Table 11.

Figure 1: Estimated Experience-Earnings Profiles by Bullying at Age 7

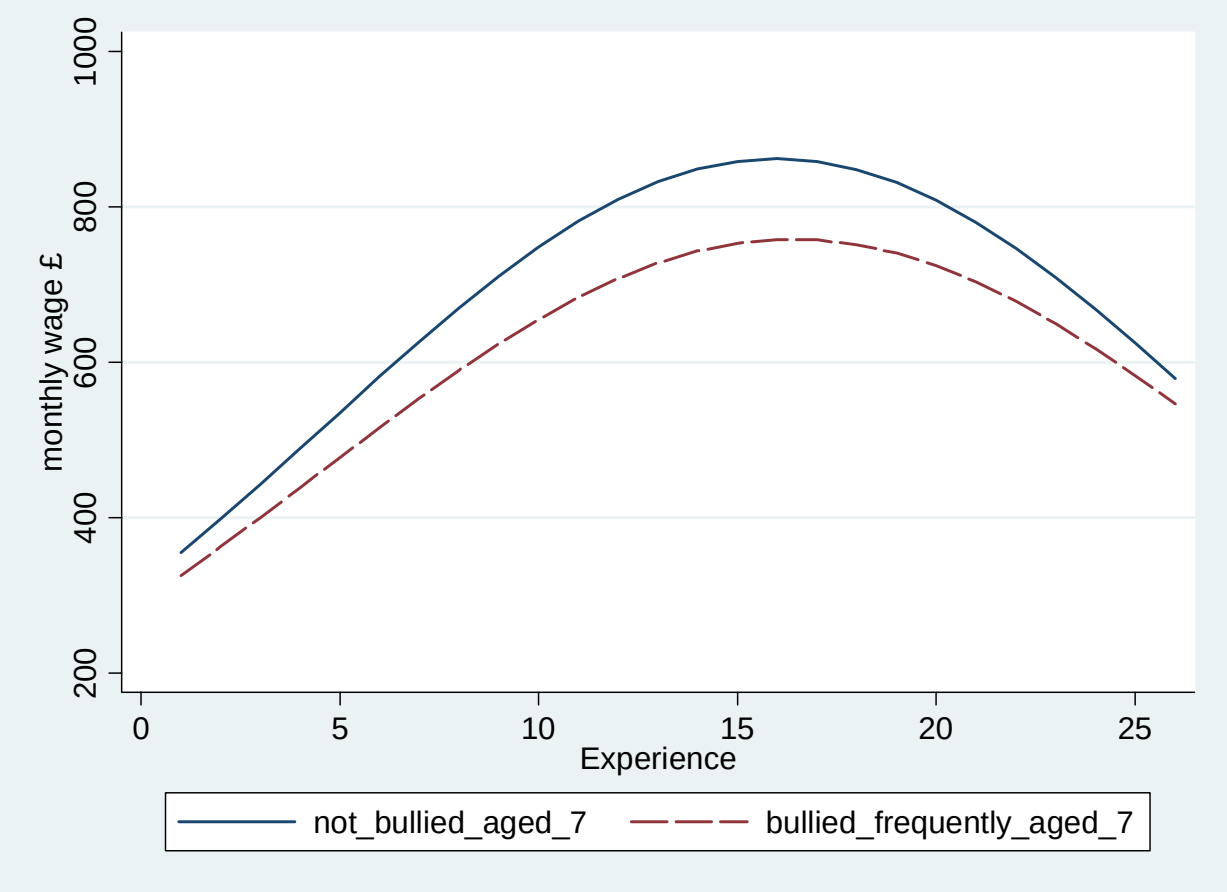

Figure 2: Estimated Experience-Earnings Profiles by Bullying at Age 11