Educational Inequality and Juvenile Crime:

An Area Based Analysis

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on the Wider
Benefits of Learning

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Executive Summary

Introduction and background

Crime reduction is a high priority for governments both past and present. Low levels of crime have also been recognised as important for economic growth (Lucas, 1988) and as one of the most graphic indicators of good social cohesion, which involves bonding and trust within and between communities, and also a common sense of citizenship and values (Maxwell, 1996). Crime reduction, therefore, is seen as important not only in reducing the economic costs to the nation, but also in increasing wider well-being and quality of life.

To reduce crime and increase societal well-being, we need to recognise that the motivations for committing crime operate at both the individual and the societal level. At the individual level, people may commit crime for their own gain, but also as a response to societal-level features, such as absolute and relative deprivation. The response by government and society has been to increase the costs and reduce the benefits of committing crime; sometimes directly through the penal, legal and security systems, but also indirectly by increasing individuals' stake in society. In order for the latter to be effective, we need to have policy levers working to reduce both absolute and relative deprivation.

This report considers the influence of one form of relative deprivation on crime, namely educational inequality. This is examined through an area-based analysis of the relationship between juvenile conviction rates for a range of offences and educational inequality based on maths Key Stage 3 scores in English local education authorities (LEAs). The focus on juvenile crime reflects a number of current public and policy concerns around young people, the quality of their life experiences and their resulting outcomes in terms of achievement and behaviour.

Key findings

There was an overall increase in educational inequality between the 1983 and 1985-born cohorts. Using aggregate area-level information from three cohorts of young people (born between 1983 and 1985) within each area, and controlling for other variables which might be supposed to have an effect on juvenile crime rates, we found that:

- there is evidence of a relationship between educational inequality and juvenile conviction rates for violent crime within local areas (significant at the 10% level); the change in educational inequality between the 1983 and 1985 cohorts was associated with an area average of 0.38 additional convictions per 1,000 students

- there is a further relationship between educational inequality and racially motivated crime (significant at the 5% level) with an area average of 0.09 additional convictions per 1,000 students for racially motivated offences resulting from the change in inequality between the 1983 and 1985 cohorts within local areas

- there was no significant relationship between our cohort-based measures of educational inequality and property-related crime (stealing from another person, or burglary in a dwelling).

Methodology

Three cohorts of young people within each of the LEAs in England were selected, based on the availability of data on conviction rates, educational inequality and average educational attainment. Since data came from different sources, our empirical analysis is restricted to three cohorts of young people born between 1983 and 1985.

Measures used
We generated area-based (LEA) measures relating to crime, educational attainment and educational inequality for the three cohorts. Juvenile conviction rates for violent crime, stealing from another person, burglary in a dwelling, and racially motivated offences were measured for individuals aged 15 in 1998, 1999 and 2000. For the first cohort, we calculated conviction rates from 1998 to 2003, for the second cohort from 1999 to 2003 and for the youngest cohort from 2000 to 2003.

The three cohorts took Key Stage 3 exams in 1997, 1998 and 1999, and this information is used to estimate educational inequality and educational attainment in each LEA. Therefore, we are able to look at the associations between educational inequality and conviction rates for each of these three cohorts for all LEA areas in England.

Other area-based indicators used in the analysis and included as controls are: average proportion of free school meal (FSM) eligibility; average pupil–teacher ratio; and average percentage of unauthorised half-days missed from school.

Data sources used
- Age-specific conviction rates came from the Offenders Index (OI) dataset, which recorded all convictions during four weeks of the year.

- Key Stage 3 maths results from the Pupil Level Annual School Census (PLASC) were used to provide measures of education level and educational inequality. Maths, rather than English or science, was used, as this was the only subject for which sufficiently fine-grained data (raw scores rather than level-based data) were provided.

- Other, LEA-based variables were obtained from the LEA School Information System (LEASIS), in particular the proportion of students eligible for FSMs, average pupil–teacher ratio across primary and secondary schools, and the percentage of secondary students with unauthorised half-days missed.

Analysis
To take into account the multilevel (cohorts within LEAs) and longitudinal aspects of the data, mixed-effects models incorporating both fixed effects (parameters associated with an entire population) and random effects (associated with individual units drawn at random from a population) were employed to examine the impact of cohort-specific

educational inequality on cohort-specific conviction rates.

Educational inequality, educational attainment, FSM eligibility, pupil–teacher ratio and proportion of unauthorised half-days missed are measured for each cohort in each LEA and are treated as fixed variables, as they do not vary over time. Estimated parameters indicate the impact of within-cohort differences in these factors on average conviction rates.

For more detail on the methods used, please see the full research report, available at: www.learningbenefits.net/Publications/ResearchReports.htm

Findings

We used area-based cohort measures for this analysis, so it should be borne in mind that the relationships we identify are between measures for cohorts located within local areas, and not between local areas per se.

Between the 1983 and 1985-born cohorts there was an overall increase in educational inequality. At an area level, this increment in inequality was associated with increases in conviction rates for some, but not all, offences.

In particular, we found evidence of a relationship between educational inequality and juvenile conviction rates for violent crime (significant at the 10% level), with higher levels of inequality associated with higher levels of violent crime such that the change in inequality between the 1983 and 1985 cohorts using the Theil index was associated with an area average of 0.38 additional convictions per 1,000 students. Although this level of significance would normally be considered at best a marginal result, we believe that here it provides good evidence of a genuine relationship, as discussed below.

There is a further relationship between educational inequality and racially motivated crime (significant at the 5% level) with an area average of 0.09 additional convictions per 1,000 students for racially motivated offences associated with the change in inequality between the youngest and oldest cohorts. There was no significant relationship between educational inequality and property-related crime (stealing from another person, or burglary in a dwelling).

Scaled up to a national level, the model predicts 1,041 convictions for violent crime and 121 convictions for racially motivated offences for the 1983 cohort (which we use as a benchmark). The predictions for the 1985 cohort are 1,263 and 172 convictions for violent crime and racially motivated offences, respectively. Therefore, the change in educational inequality between the 1983 and the 1985 cohorts, assuming a causal connection between inequality and crime, would result in 222 additional juvenile convictions for violent crime and 51 additional convictions for racially motivated offences across England.

There were some interesting associations of our control variables with conviction rates, although we remain cautious about the interpretation of these results. Both lower educational attainment rates and a higher proportion of FSM eligibility were associated with higher conviction rates for violent crime. This result is in accordance

with evidence provided by Ludwig, Duncan and Hirschfield (2001), who found that violent crime is strongly associated with poverty. But we also found that a worse pupil–teacher ratio was associated with higher conviction rates for violent crime and burglary in a dwelling (although our analysis does not account for teacher quality, which may also have an effect) and lower conviction rates for racially motivated offences.

Conclusions and implications

We believe that this report represents an important addition to the evidence base, providing robust evidence of an association between educational inequality and some forms of juvenile crime, notably violent and racially motivated crime.

Regarding the relationship between educational inequality and violent crime, while 10% is usually considered a borderline measure of significance we would argue that here it can be considered evidence of a genuine relationship for a number of reasons. First, the fact that there is a ceiling on attainment (i.e. students cannot obtain more than maximum marks) creates an inverse relationship between average attainment and educational inequality. This in turn affects the relationship between educational inequality and crime, and makes statistical significance harder to achieve. Second, the inequality measures used here (the Gini coefficient and the Theil index) give more weight to values in the middle of the distribution. However, given that individuals in the lowest part of the educational distribution may have the highest propensities to engage in criminal activities (Nilsson, 2004), this will again tend to reduce the apparent strength of the association between educational inequality and crime. Given these constraints, and the use of an appropriately designed methodology, we believe that the associations we report here are robust. However, no methodology of this type is entirely watertight against the possibility that unobserved variables may be driving the association, and we cannot demonstrate that the growth in educational inequality and the growth in conviction rates are causally connected.

While this research leaves many unanswered questions, including why inequality appears to be associated with violent crime but not property crime, these findings suggest that policies to reduce youth criminal behaviour would do well to consider relative, and not just absolute, levels of deprivation. They are thus supportive of the emphasis of many recent policy statements on relative deprivation, in line with current declared aims of the Government to simultaneously raise average attainment and to narrow the gap between high and low achievers (DfES, 2006; DCSF, 2007). The challenge is to find acceptable interventions that promote the twin goals of higher standards and greater educational equality, while also finding an appropriate balance between equity and overall growth in standards. The evidence suggests that the potential rewards could extend far beyond simply increasing the skills base and economic productivity of the nation.

Acknowledgements

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Tables and Figures

1. Introduction

It is self-evident that crime is of serious concern to government and wider society: crime creates victims and represents a reduction in social welfare. It also hampers economic growth and disrupts wider social relationships (Easterly et al., 2006; Lucas, 1988). Yet it is commonly argued that criminal behaviour is itself a response, however illegitimate, to the feeling of relative deprivation generated by a sense of inequality (see Cullen and Agnew, 2002, for a review of theories). This is not necessarily a statement of a moral position but of practical psychology. This sense of relative deprivation starts developing from an early age, as children are highly aware of their social position and the limitations it places on their future (Sutton et al., 2007; Hirsch, 2007). It is important to emphasise that the hypothesis here is that this is an effect of inequalities in access to resources rather than absolute levels of access.

Although the UK population has experienced important improvements in their quality of life and economic prosperity over the past 100 years, these improvements have not been spread equally (Hirsch, 2004). According to Hirsch, the income of the top 1% of the population has grown more rapidly than that of the bottom 10% since 1980. The poorest 10–20% of the population continue to leave school without qualifications and to have higher rates of poor basic skills. The poorest groups are more likely to live in unsafe and unpopular neighbourhoods and to live in fear of crime than the rest of the population (Home Office, 2000). Removing relative child poverty by 2020 has been accepted by many as an obligation for reasons of personal morality, but it is also an issue with profound social consequences. These levels of relative difference raise questions about the possible social and economic consequences. However, robust quantitative empirical evidence in this field is hard to find. We do not know of research that has clearly established the impact of relative deprivation, measured by income inequality, on crime reduction, although there is a considerable and growing body of evidence in relation to effects of inequality on health and well-being (Wilkinson et al., 1998; Pickett et al., 2005; Marmot et al., 1991). Some studies have found a strong statistical association with crime (Hsieh and Pugh, 1993; Fajnzylber et al., 2002), while others have found no association (Stack, 1984; Doyle et al., 1999).

Studies have also found that the association between income inequality and crime disappears with the inclusion of other forms of relative deprivation, in particular educational inequality (Preston and Green, 2005) and racial inequality (Blau and Blau, 1982. This raises the question of which inequalities are to be measured. This question is parallel to one in the literature on social mobility about the relative value of income, education and occupation as indicators of inequality between children in assessment of the attainment gap. These wider forms of relative deprivation can also cause alienation and breakdown of social ties, with potentially severe consequences for society (Darton et al., 2003).

We should not see this as a battle for dominance between different measures. It is certain that all three – income, education and occupation – interact in important ways, and it is likely that in different ways all three have independent effects on crime. In this report we focus on inequality in educational achievement as a driver of crime, but that is not to say that education is the most important measure of inequality or source of relative deprivation. We focus here on education because we are interested in exploring its positional impact and because we know from other evidence that

education has a significant effect on wider social outcomes such as crime and health (Haveman and Wolfe, 1984; Grossman, 2005; Feinstein et al., 2006).

The more specific research focus for this report is the investigation of whether differences in educational inequality between cohorts of young people in different local education authorities (LEAs) in England are associated with differences in conviction rates for different offences in those same LEAs. Our research hypothesis is that increases in educational inequality from one cohort of young people to the next will be associated with increasing crime for offences that are likely to result from a tension in social relations (for example, racially motivated offences). The analysis uses conviction rates aggregated to the level of LEA in England.[1] We link cohort-specific conviction rates to cohort-specific educational inequality, controlling for average cohort educational attainment, poverty, time away from school and school resources. It is differences between cohorts in educational inequality that are used as the main explanatory factor in the estimation of conviction rates over time.

Previous work by the Centre for Research on the Wider Benefits of Learning investigated the relationship between educational inequality and measures of social cohesion (which included violent crime) using cross-national datasets (e.g.Green et al., 2003; Preston and Green, 2003 and 2005). However, we believe that our report is the first to examine the relationship between educational inequality and crime at a sub-national level in England or the UK using such representative data.

In this report we start by providing a brief review of the main argument in criminological theories for the impact of relative deprivation on crime (Section 2.1) and of the main quantitative empirical studies in this area (Section 2.2). Section 3 describes sources of data and the construction of cohort-specific indicators within LEAs, and Section 4 covers methods for statistical analysis. Results are presented in Section 5 and conclusions and policy implications in Section 6.

2. Inequality as a determinant of crime: Theory and evidence

2.1 A brief theoretical review

Why should there be an association between relative deprivation and crime? Different theories have linked relative deprivation, especially measured by income inequality, to criminal activity. Messner and Tardiff (1986) classified these theories into neoclassical economic theory (e.g. Becker, 1968; Ehrlich, 1973 and 1996), Marxist theory (e.g. Gordon, 1973), anomie theory (e.g. Merton, 1938 and 1968), and macro-structural sociological theory (e.g., Blau and Blau, 1982). A summary of these and other criminological theories is provided in Appendix 1. We focus here on theoretical discussion of the view that the relativities in access to resources may be important per se, above and beyond any impact of absolute deprivation.

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[1] We use the term "local education authority" here as LEAs were the official entities which existed at the time when the data was compiled. LEAs have since been aligned with local authorities and are not now separately identified.

A number of economists have maintained that relative income impacts on individuals' decisions to engage in criminal activities, by affecting the relative weights given by individuals to income that can be generated from legitimate or illegitimate activities (Luiz, 2001; Marselli and Vannini, 1997). In other words, individuals' sense of fairness or unfairness from the nature of the income distribution can increase the relative probability to generate income from illegitimate activities rather than legitimate activities (Becker, 1968; Ehrlich, 1973).

Sociologists have suggested that among groups deprived by income or class there could be a lack of bridging and linking social capital, an increase in bonding social capital (which may have consequences for gang formation), a lack of upward mobility, and social disorganisation, all of which may cause higher levels of crime.[2] Agnew (1992) claimed that crime could be explained by the strain that individuals face throughout life, which is exacerbated by the degrees of inequality in society. Merton (1938, p. 223) argued that the moral mandate to achieve success exerts pressure to succeed by fair means if possible and by foul means if necessary. Frustration at blocked opportunities in an unequal society drives the poor to crime so they might access the material success enjoyed legally by the middle class. Blau and Blau (1982) went further, arguing that racial inequality, more than inequality based on achievement, may fan the frustrations that trigger crime.

The clear common denominator of these theories is the unambiguous positive relationship postulated between the distribution of income and crime. These theories also suggest that an important causal mechanism underlying this relationship is relative deprivation – how an individual (or group) perceives or experiences, as fair or unfair, the inequities in the distribution of income. Given that an individual experiences the distribution of income to be inequitable, two possible interdependent responses could result in higher rates of criminal activity. First, some individuals may resort to (property) crime to address their grievances. Second, the perceived unfairness may generate feelings of frustration and anger, which in extreme cases can manifest themselves as criminal (possibly violent) behaviour.

2.2 Empirical evidence

Although there are well-grounded theories explaining the mechanisms by which inequality may impact on crime, the quantitative empirical literature is less advanced in providing robust estimates about this relationship. Even for the case of relative deprivation measured by income inequality, where more data are available and more empirical analyses have been undertaken, results are inconclusive. Hsieh and Pugh (1993) concluded that income inequality is important in predicting violent crime, but is not important in predicting other forms of criminal behaviour. Applying the method of meta-analysis to 34 previous empirical studies, they reported 97% of correlation coefficients for violent crime with inequality to be positive, with 80% of the

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[2] The most basic form of social capital is **bonding** social capital, which coalesces around a single, shared identity, and tends to reinforce the confidence and homogeneity of a particular group. **Bridging** social capital refers to horizontal social networks that extend beyond homogenous entities. This form of social capital involves cross-cutting networks among people of various ethnic, cultural and socio-demographic backgrounds. **Linking** social capital is characterised by connections with individuals and institutions with power and authority. This is theorised in terms of vertical, rather than horizontal, networks within the social hierarchy.

coefficients being above 0.25. However, individual empirical studies had not established a clear relationship between the two. For example, Ehrlich (1973) found a significant (and positive) relationship between income inequality and property crime rates across US states in the 1960s, while Stack (1984) found no evidence of a relationship between income inequality and property crime across 62 nations. Fajnzylber, Lederman and Loayza (1998 and 2002), on the other hand, found income inequality to be positively associated with homicides and robbery rates in their panel data from more than 36 nations.

It is important to emphasise that even for those studies which clearly demonstrate a relationship, these findings are generally of statistical association rather than cause. Bourguignon (2000 and 2001) contended that the significant statistical relationship between income inequality and crime in a cross-section of countries may be due to unobserved factors simultaneously affecting inequality and crime, rather than to some causal relationship between these two variables.

Nor do those who used time series data offer clear evidence on the relationship between income inequality and crime rates. For example, both Allen (1996), using an ARIMA model with US national data, and Doyle, Ahmed and Horn (1999), using Ordinary Least Squares regressions with a panel data set of US states, found no significant effect of income inequality on property crime rates. On the other hand, in their analysis of 28 metropolitan areas in the US between 1975 and 1990, Fowles and Merva (1996) reported a stable association between household income inequality for several categories of violent crime. Doyle and his colleagues (1999), however, could not reproduce this result in their study of crime rates in 48 US states from 1984 to 1993. Analysis of national youth homicide arrests made in the US between 1967 and 1998 also failed to find a robust effect for income inequality (Messner, 1982; Messner et al., 2001). Quantitative analyses of the 1980s and 1990s, when inequality increased sharply in the US, have also offered little sustained support for the inequality–crime relationship.

Further studies by Preston and Green (2005) claimed that when inequality in education is included in cross-national analysis, the relationship between income inequality and crime becomes statistically insignificant. They concluded that inequality of educational outcomes was closely connected with income inequality, which in turn was closely connected with crime and social cohesion. Green, Preston and Sabates (2003) and Green, Preston and Janmaat (2006) showed that educational inequality had a negative association with a composite social cohesion index, which included a measure of violent crime. They found a negative and significant correlation of -0.765 between educational inequality and social cohesion and a negative and significant correlation of -0.616 between income inequality and social cohesion. However, in multivariate analysis, only the relationship between educational inequality and social cohesion remained statistically significant.

3. Data

One important finding for this report has emerged from this brief review of theoretical and empirical studies: the impact of relative deprivation may be differentially manifested in property crime and violent crime, so we included separate indicators of these offences as outcomes in our analysis. In fact, in their analysis of how

educational inequality, as a wider measure of relative deprivation, may be associated with forms of crime, Preston and Green (2003) suggest that the mechanism is through impacts on social relations, and hence, in particular, on violent crime.

3.1 Crime data

Juvenile convictions were obtained from the Offenders Index (OI) database (Home Office, 1998). The OI contains a history of criminal convictions from 1963 for England and Wales. There is no information on unsuccessful prosecutions and cautions. The sample of individuals is a census of all court cases that occur during four weeks of the year. The sampling weeks are the first week of March, the second week of June, the third week of September and the third week of November. The OI contains information on individuals' ages, so it is possible to calculate age-specific convictions.

In the selection of cohorts for the analysis we were limited by the need to observe aggregate data on conviction rates over time, educational inequality and educational attainment. Our empirical analysis is restricted to the three cohorts of young people born between 1983 and 1985.

A second limitation is that the indicator of crime used here is a series of measures for convictions for different criminal offences by young people. There are several steps between a criminal offence and its conviction and only 40–50% of the offences brought to justice are prosecuted (Wooler, 2007). This may call into question the validity of our outcome measure as an indicator of the incidence of crime. However, Machin and Marie (2004) contrasted the evolution of crime using recorded crime information from the police force areas and conviction rates from the OI data – the data that we use in this report. They found that conviction rates for young people stay close in trend to recorded incidents of crime because there seems to be less separation between offence and prosecution for young people than for other groups. Machin and Marie also found that change in area-level wages predict changes in crime using both indicators, suggesting that the underlying processes linking wages to crime are similar across different indicators of crime. We believe, therefore, that the conviction rate is a reliable indicator of crime; nonetheless, this caveat must be borne in mind.

We aggregated offences to the LEA level by linking petty crime areas – the area where the court has jurisdiction – to the LEA, taking into account boundary changes where possible. We assumed that no offences were committed across regions. This is a reasonable assumption for large areas, especially for juvenile crime. However, in the case of London, we combined 13 LEAs and respective courts into four main zones (North-East, North-West, South-East and South-West London). Three other LEAs had to be combined to match with the court-level data: Bournemouth and Dorset; Bracknell Forest, Slough, Windsor and Maidenhead, and Wokingham; and Essex, Southend and Thurrock. Without including the tiny LEA for the City of London we were left with 133 areas for the analysis.[3]

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[3] One particular data issue needed to be resolved. It was necessary to homogenise educational information using the current classification of 150 LEAs in England. Classification of LEAs changed between 1997 and 1998: there were 109 LEAs in England in 1996, and there are now 150 today. Large LEAs were divided into smaller authorities, in some cases up to four or five smaller units. We also

For each LEA, we calculated separate conviction rates for violent crime, stealing from another person, burglary in a dwelling, and racially motivated offences for individuals for our three cohorts, i.e. aged 15 in 1998, 1999 and 2000. For each cohort, we calculated conviction rates at age 15 and then for each subsequent year until 2003. Thus, for our oldest cohort we calculated conviction rates from 1998 to 2003 – i.e. when the cohort turned 16, 17, 18 and 19 – but for our youngest cohort only from 2000 to 2003 (see Figure 1, panels A to D for conviction rates for different offences).[4]

Convictions for violent crime (Home Office, 1998) include murder, manslaughter, endangering railway passengers, cruelty to children, abandoning children, death or injury to a person for dangerous driving, kidnapping, rioting, violent disorder, and firearms offences (we exclude from the OI grouping racially motivated offences using violence). Stealing from another person includes personal valuables of any amount. Burglary in a dwelling includes intent to commit burglary, with or without the use of violence. Racially motivated offences include wounding, assaulting, bodily harm, harassment, putting people in fear of violence or creating distress, and racially aggravated criminal damage.

To generate conviction **rates,** we divided the level of convictions for each LEA by the number of pupils aged 15. In order to account for population mobility, we factored in the growth rate of population aged 15–19 by LEA. Therefore, for conviction rates for the oldest cohort we used total number of students aged 15 in 1997, accounted for population growth between 1997 and 2003, and used this as denominator. For the middle and youngest cohorts, we used total number of 15-year-old students in 1998 and 1999 respectively, and accounted for population growth. Essentially, conviction rates are measured per 1,000 students.

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aggregated some LEAs when linking magistrates' courts to LEAs. We recalculated all statistics between 1996 and 1998 for LEAs that changed during this period.

[4] Unfortunately, linking magistrates' courts to LEA areas was only done for data up to 2003 for this study.

Figure 1: Conviction rates per 1,000 students for cohorts born in 1983, 1984 and 1985 (different offences)

Panel A: Conviction rates for violent crime

Panel B: Conviction rates for stealing from another person

Panel C: Conviction rates for burglary in a dwelling

Data source: Offenders Index

Panel D: Conviction rates for racially motivated offences

Data source: Offenders Index
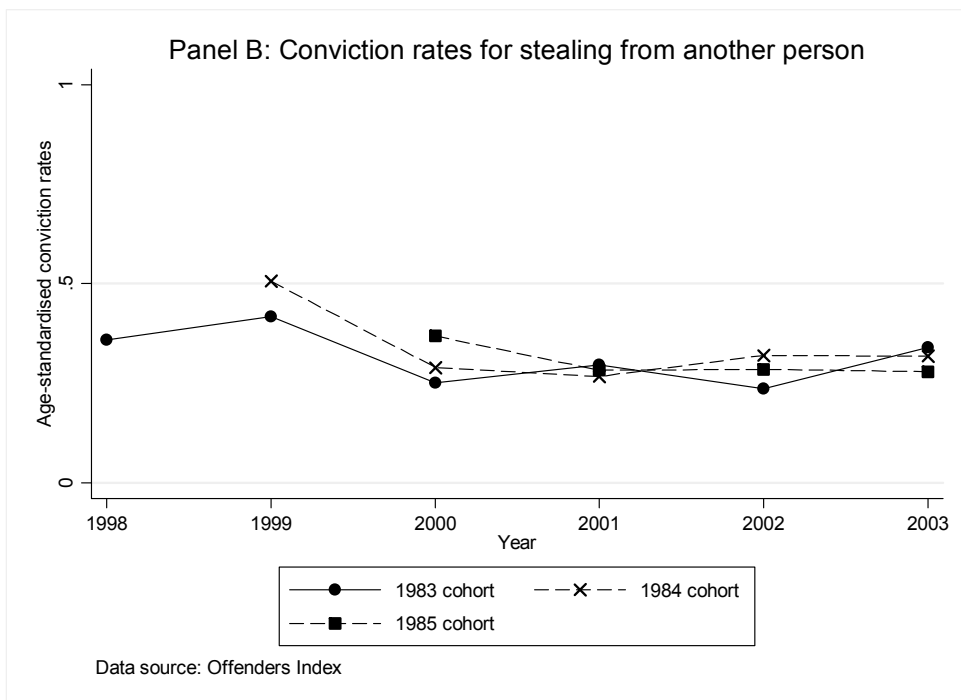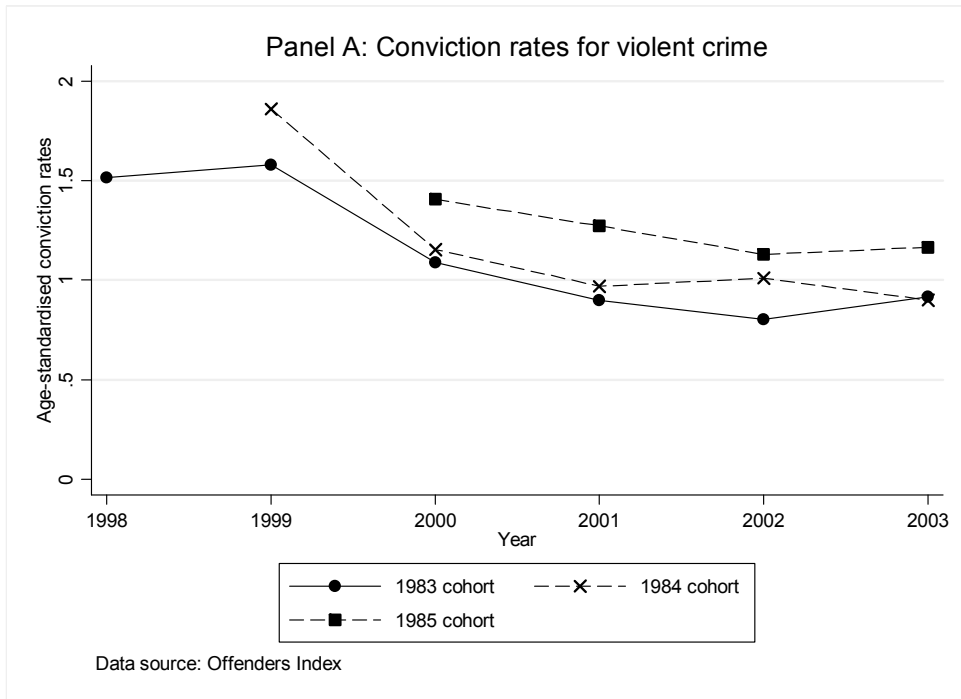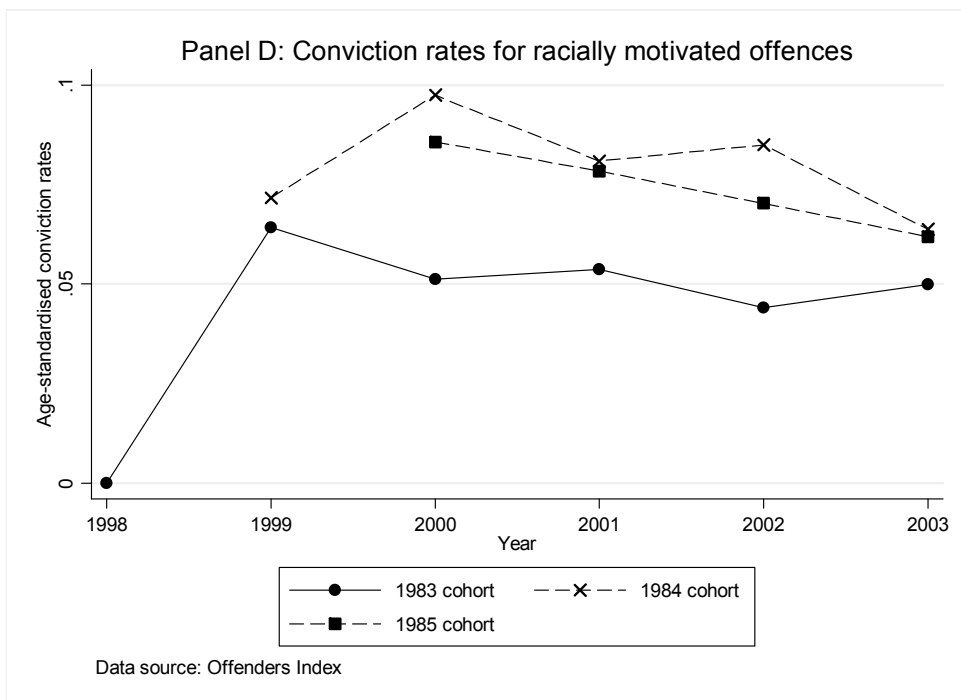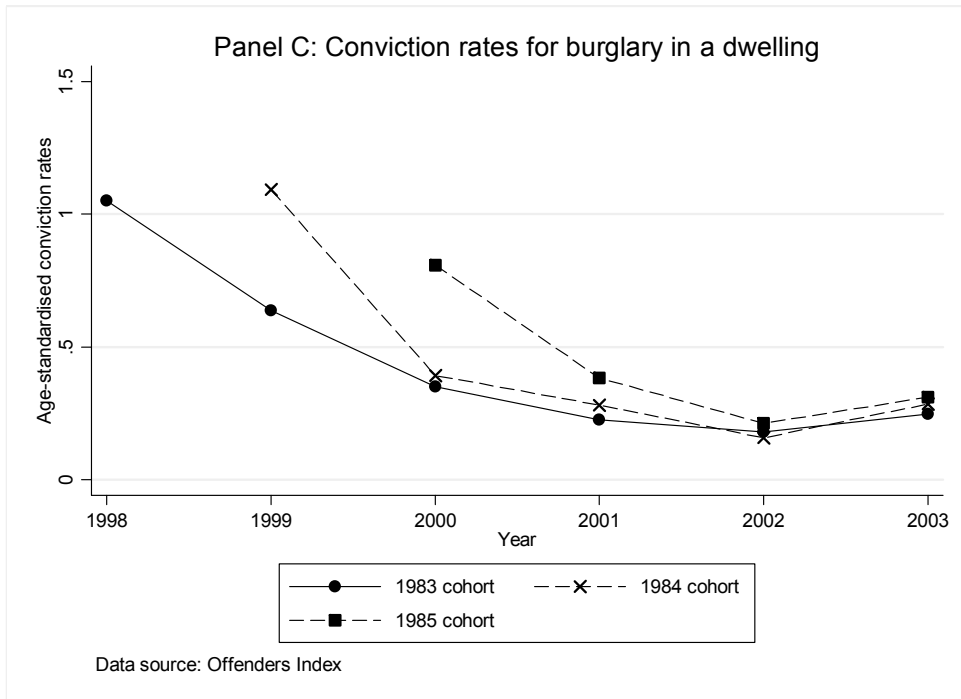
3.2 Educational inequality and educational attainment data

Measures of educational inequality and average educational attainment were
constructed from the Pupil Level Annual School Census (PLASC). Pupil-level
information on Key Stage 3 maths test scores was used to calculate educational
inequality and average educational attainment by LEA for each of the cohorts born
between 1983 and 1985. KS 3 exams are taken by pupils in state schools in England
and Wales at age 14. Therefore, measurements of educational inequality and
attainment use KS 3 results from 1997 to 1999. KS 3 marks range from 1 to 149. We

used maths test scores as this was the only variable with information on the raw marks obtained, whereas for other subjects information was reported in levels.

There are several ways to calculate inequality or spread in the distribution. In this report we use two of the most widely applied measures of inequality in the literature: the Theil index (which belongs to the family of Entropy indices); and the Gini coefficient.[5] The formula for the Theil index is:

$$T = \sum_{i=1}^{n} \left[\frac{s_i}{\sum_{j=1}^{n} s_j} \right] * \ln\left(\frac{s_i}{\bar{s}} \right)$$

Equation (1)

where each individual measurement of school attainment (s_i) relative to the average attainment ($\bar{s}$) is weighted by the share of the individual on the aggregate attainment for the population of interest (in this case all students in the LEA). The higher the value of the Theil index, the greater inequality in the distribution of test scores.

The Gini coefficient is defined as the area under the cumulative distribution of test scores and the perfect equality curve divided by the total area underneath the perfect equality line. It can be also obtained from the following formula of absolute mean differences for all pairs of individuals:

$$G = \frac{\sum_{i=1}^{n} \sum_{j=1}^{n} |s_i - s_j|}{2n^2 \bar{s}}$$

Equation (2)

The Gini coefficient ranges from 0 (total equality) to 1 (total inequality). Table 1 shows the increase in educational inequality measured by both indices for the 1983, 1984 and 1985 cohorts. Table 1 also shows the average KS 3 maths score over the years 1997 to 1999 that corresponds to the three cohorts.

Table 1: Descriptive statistics for cohort-specific inequality indices and average educational attainment

	Cohort 1983 in 1997	Cohort 1984 in 1998	Cohort 1985 in 1999
Inequality Theil index	0.0428	0.0435	0.0467
Inequality Gini coefficient	0.1619	0.1621	0.1687
Average KS 3 maths score	77.16	78.15	78.01
Source: PLASC			

[5] The Theil index and Gini coefficient satisfy the Pigou-Dalton Transfers Principle, which indicates that if a student from a lower part of the test scores distribution gets lower grades and a student in the higher end of the distribution gets higher grades and all other grades remain unchanged, then the numerical value of the inequality index should increase. The other properties satisfied by these measurements of inequality are symmetry and homogeneity. Symmetry indicates that changing the distribution from higher achievers to lower achievers and vice versa will not change the measurement of inequality, whereas homogeneity indicates that if all test scores increase by the same amount, the measurement of inequality should remain unchanged.

There are two important issues to highlight from these measurements of inequality which may have implications for estimation. First, since measurements of attainment have a ceiling (as students can only achieve the highest grade), there will be an inverse relationship between average attainment and educational inequality. In other words, inequality can only decrease as more pupils achieve the highest grades. This issue can increase the collinearity between educational inequality and educational attainment. The implication for estimation is that although estimated parameters are still unbiased, they will not have minimum variance. This makes statistical significance harder to achieve.

Second, both the Theil index and the Gini coefficient give more weight to values in the middle of the distribution. This may not be a reasonable assumption when researching the impact of educational inequality on crime, as individuals in the lowest part of the educational distribution may have the highest propensities to engage in criminal activities (Nilsson, 2004). The implication for estimation is that estimated parameters may be smaller than the true value, but can serve as a lower bound estimate.

3.3 Other controls measured at the LEA level

In our estimation we have incorporated controls for aspects of the school experience which we think likely to impact on involvement in criminal activity – poverty, school resources and unauthorised days missing school. These were obtained from the LEA School Information System (LEASIS). We do not have direct measures of all of these variables so, in some cases, proxies have been used. For example, we do not have the proportion of 14-year-olds in 1997, 1998 and 1999 living in poverty, by LEA. However, we have information on the proportion of secondary school students eligible for free school meals (FSMs), by LEA, in those years.

Poverty or deprivation was therefore measured using these statistics. To be eligible for FSMs, children must be in a household without a member working more than 24 hours a week, with a low income and with limited capital assets (Hobbs and Vignoles, 2007). FSM eligibility in 1997, 1998 and 1998 is a proxy measure of poverty or deprivation experienced by our cohorts, but not an exact one. Table 2 shows the decrease in FSM eligibility from 20% in 1997, to 19% in 1998, and to 18.5% in 1999.

Table 2: Descriptive statistics for control variables obtained from LEA School Information System

	1997	1998	1999
Proportion of FSM eligibility	19.71	19.13	18.54
Pupil–teacher ratio	16.55	16.69	16.81
Proportion unauthorised missed	1.10	1.17	1.14
Source: LEASIS			

Two other variables are also included in the analysis as controls: the percentage of secondary students with unauthorised half-day absences and average pupil–teacher ratio across primary and secondary schools. Areas with high percentages of unauthorised school absences may have high crime rates, as young people may be spending this time engaged in criminal activities. The pupil–teacher ratio, as a

measure of school resources, may have implications for student behaviour, which can, in turn, affect engagement in criminal activities. Table 2 shows very little variation in the proportion of unauthorised half-day absences between these cohorts. It also reveals that the pupil–teacher ratio increased marginally between 1997 and 1999.

4. Estimation Method

We use mixed-effects models (random and fixed effects) to estimate the impact of cohort-specific educational inequality on cohort-specific conviction rates over time. Mixed-effects models incorporate both fixed effects, which are parameters associated with an entire population, and random effects, which are associated with individual units drawn at random from a population. The following equation describes the model to be estimated:

$$C_{itj} = \beta_0 + \beta_1 t + \beta_2 t^2 + \beta_3 Inequality_{ij} + \beta_4 Attainment_j + \beta_5 Controls_{ij} + b_{0i} + b_{1i}t + b_j + \varepsilon_{itj}$$

$$(b_{1i} - \beta_{1i}) \sim N(0, \sigma_{b1i}), \qquad b_{0i} \sim N(0, \sigma_{b0i}), \qquad b_j \sim N(0, \sigma_{bj}), \qquad \varepsilon_{ii} \sim N(0, \sigma_\varepsilon).$$

Equation (3)

where $i = 1,2,3$ represents the three cohorts of young people, $t = 1,2,\ldots,6$ stands for the years where we have cohort-specific information on convictions (six years for the oldest cohort, five years for the middle cohort and four years for the youngest cohort), and $j = 1,2,\ldots,133$ corresponds to the 133 LEAs used in this analysis.

Our dependent variables (C) are conviction rates for violent crime, stealing from another person, burglary in a dwelling and racially motivated offences, which are measured for each cohort, in each LEA, over time. For these conviction rates, we modelled a quadratic trend (t and t^2) as crime tends to increase in teenage years and then decrease with age (Hansen, 2003). However, we do not expect the quadratic term to be significant, as we only have trends over a short period of time.

There are several components to this model of cohort-specific conviction rates over time. First is the average conviction rate, which is captured by the intercept of the equation (β_0). Second is the average trend, which is captured by the parameters of the quadratic function (β_1 and β_2). Third is the within-cohort, between-LEAs variability in the average conviction rates (cohorts in some LEAs have higher conviction rates than in others) and this is estimated by random effects at the intercept (b_{0i}). Fourth is the within-cohort, between-LEAs variability in trends, estimated by random effects around the slope (b_{1i}). Finally, the multilevel nature of the data, i.e. cohorts within LEAs, is captured with a random effect at the LEA level (b_j). The distribution of the random-effect parameters and the error term (ε_{itj}) are assumed to be normal and independent of each other (Pinheiro and Bates, 2000).[6]

The impact of cohort-specific educational inequality and educational attainment on average conviction rates is captured by the parameters β_3 and β_4 respectively.

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[6] Failure to incorporate the longitudinal and multilevel aspects of the data, i.e. repeated observations for cohorts within LEAs, would lead to an inflated estimate of the residuals. In other words, we would be incorporating known information as if it were unobserved and random.

Controls such as FSM eligibility, pupil–teacher ratio and proportion of unauthorised half-day absences are treated as fixed variables, as they do not vary over time.

4.1 Model selection

To test the appropriateness of mixed-effects estimation, we estimated the parameters of the model represented by equation (3) using Ordinary Least Squares (OLS) regression, which assumes that the population is homogeneous and ignores the multilevel structure of the data. We then used Maximum Likelihood methods to test the parameters with the incorporation of random intercept, random slopes and random effects at the LEA level in equation (3). The residual standard error obtained from the mixed-effects model for conviction rates for violent crime ($\hat{\sigma}_{me}$=0.86) is about three-quarters of the corresponding estimate obtained by OLS ($\hat{\sigma}_{ols}$=1.06). This indicates that the mixed-effects model has successfully accounted for the grouping structure of the data, by decreasing the variation of the standard error by almost 25%.

For other types of offences the corresponding standard errors are: for stealing from another person ($\hat{\sigma}_{me}$=0.43) and ($\hat{\sigma}_{ols}$=0.58); for burglary in a dwelling ($\hat{\sigma}_{me}$=0.51) and ($\hat{\sigma}_{ols}$=0.69); and for racially motivated offences ($\hat{\sigma}_{me}$=0.18) and ($\hat{\sigma}_{ols}$=0.20). All standard errors are significantly reduced. Higher reduction implies more heterogeneity in cohort-specific conviction rates between LEAs (for example cohort-specific conviction rates for burglary in a dwelling across LEAs) and hence mixed-effects models are more successful in capturing this heterogeneity.

One question that follows from this discussion is where to incorporate random effects. In practice, we have very little a priori information for selecting the appropriate specifications (Hsiao, 2003). We include a random effect to capture differences in intercepts and slopes as expressed in equation (3). Statistical tests are performed to compare this model against a model with random effects only at the intercept.

The different criteria used to assess the inclusion of random effects in the different models are shown in Table 3. These criteria are the Akaike Information Criterion (AIC) and the Bayesian Information Criterion (BIC). When comparing two models, we prefer the one with the lowest AIC and the lowest BIC. We also include the residual standard error obtained for each model. The model that incorporates random intercepts and random slopes minimises both AIC and BIC, and has the least variation in the residual standard error for all conviction rates.

Table 3: Assessment of random effects in the models

	Model with random intercept			Model with random intercept and random slope		
	AIC	BIC	Residual	AIC	BIC	Residual
Violent	5474	5535	0.89	5458	5530	0.86
Stealing	2896	2864	0.46	2887	2959	0.43
Burglary	3672	3749	0.53	3660	3733	0.51
Racial	816	739	0.18	805	733	0.18

Source: OI and LEASIS. Notes: AIC = - 2logLik + 2n_{par}, BIC = - 2logLik + n_{par}log(N), where n_{par} denotes number of parameters and N = total number of observations.

5. Results

Results from the mixed-effects regression models are shown in Table 4, using the Theil index as the measure of educational inequality.

Between the 1983 and 1985-born cohorts there was an overall increase in educational inequality, as demonstrated by the increase in the Theil and Gini Indices (see Table 1). At an area level, this change in inequality was associated with increases in conviction rates for some, but not all, offences.

We found that higher levels of educational inequality were associated with higher conviction rates for violent crime, whereby the growth in the average level of educational inequality between cohorts within LEAs is associated with 4.24 additional convictions per 1,000 students ($\beta_{3Vio} = 4.24$), but only at 10% statistical significance. Although this level of significance would normally be considered a marginal result, we believe that here, it provides good evidence of a genuine relationship, as discussed in Section 6. We also found that the change in levels of educational inequality between cohorts was associated with an additional one conviction per 1,000 students for racially motivated crimes. We did not find statistical evidence to show that educational inequality was associated with conviction rates for stealing from another person or for burglary in a dwelling.[7]

Average educational attainment was statistically associated with violent crime and with burglary in a dwelling. A higher level in average test scores for maths between cohorts was associated with 0.03 fewer conviction rates for violent crime (significant at the 5% level). A higher level in average maths test scores between cohorts was associated with 0.01 fewer conviction rates for burglary in a dwelling (significant at the 10% level).

With respect to controls, we found that higher levels of poverty between cohorts were associated with higher conviction rates for violent crime (significant at the 10% level). Higher (i.e. worse) pupil–teacher ratio between cohorts was associated with higher conviction rates for violent crime (significant at the 10% level), higher conviction rates for burglary in a dwelling (significant at the 5% level) and lower conviction rates for racially motivated offences. Higher proportion of unauthorised days away from school was not a statistically significant predictor of any of the indicators of crime analysed here.

Most of the trends in conviction rates were statistically significant. For violent crime, stealing from another person and burglary in a dwelling, we found a significant negative trend at decreasing rates, i.e. a U-shaped trend – conviction rates falling as young people grow up. For racially motivated offences, we did not find clear evidence of a significant trend in conviction rates.

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[7] These results are different from the ones presented in the executive summary. In the results section, we report the average change in conviction rates for changes in the explanatory variables (e.g. average change in educational inequality between cohorts). In the executive summary, we benchmark the increase in conviction rates for the youngest cohort against the oldest cohort. Hence, the predicted change in conviction rates is obtained by multiplying the estimated parameter (reported in Table 4) times the change in explanatory variables from the oldest cohort to the youngest cohort (reported in Table 1and Table 2).

Table 4: Mixed-effects parameters (s.e.) of trends for conviction rates (different offences)

Variable	Violent crime	Stealing from another	Burglary in a dwelling	Racially motivated
Time	-0.316	-0.092	-0.466	0.013
	(0.041)***	(0.021)***	(0.026)***	(0.008)
Time2	0.036	0.015	0.071	-0.003
	(0.008)***	(0.004)***	(0.005)***	(0.001)*
Education	4.243	-0.987	-0.638	0.972
Inequality (Theil)	(2.390)*	(1.119)	(1.558)	(0.427)**
Educational	-0.031	-0.004	-0.013	0.003
attainment	(0.013)**	(0.007)	(0.007)*	(0.002)
FSM	0.015	-0.002	-0.001	0.001
	(0.008)*	(0.004)	(0.004)	(0.001)
P–T ratio	0.077	-0.014	0.048	-0.013
	(0.042)*	(0.026)	(0.022)**	(0.006)*
Unauthorised	0.102	0.042	0.057	0.022
	(0.093)	(0.052)	(0.049)	(0.014)
Constant	1.81	1.09	1.02	0.21
	(1.48)	(0.80)	(0.83)	(0.23)
Standard deviations of random effects and error term				
	0.49	0.22	0.20	0.02
Random intercept	(0.06)***	(0.03)***	(0.01)***	(0.005)***
Random slope	0.14	0.10	0.61	0.06
	(0.02)***	(0.01)***	(0.03)***	(0.001)***
Random effect at	0.53	0.35	0.26	0.06
LEA level	(0.04)***	(0.02)***	(0.02)***	(0.006)***
Error term	0.86	0.43	0.51	0.18
	(0.02)***	(0.01)***	(0.01)***	(0.003)***
Number of observations	1957	1957	1957	1957
Number of LEAs	133	133	133	133

Source: OI, PLASC and LEASIS. Notes: Standard errors (s.e.) in parenthesis. Asterisks *, **, *** indicate significance at 10%, 5% and 1% level respectively. Results remained unchanged using the Gini coefficient, so these are reported in Appendix 2.

We also found that all random effects at the slope and intercept were statistically significant, indicating that we have captured individual heterogeneity both at the intercept and at the slope of trends in conviction rates. As cohorts were nested within LEAs, we found that the random effect that captured the heterogeneity at the level of LEA was also statistically significant for all types of offences.

Results outlined above remained unchanged when the model was estimated using the Gini coefficient. This is because the Theil index and the Gini coefficient have an

almost perfect linear relation (see Figure 2). This indicates that ordering LEAs according to educational inequality is not dependent on the measurement used. We include a table of results using the Gini coefficient as a measurement of inequality in Appendix 2.

Figure 2: Educational inequality in English LEAs: Theil index and Gini coefficient
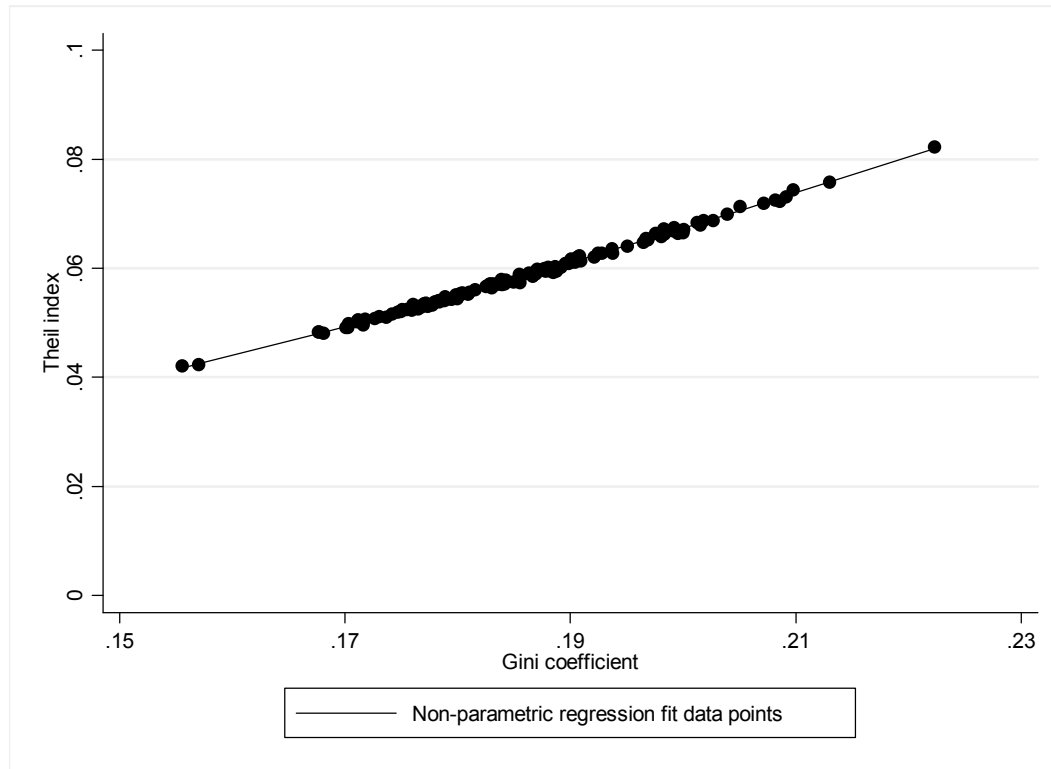
6. Conclusions

This report has focused on the links between educational inequality and conviction rates for violent crime, stealing from another person, burglary in a dwelling and racially motivated offences. Important criminological theories predict that the impact of relative deprivation, through individuals' experiences of unfairness in the distribution of social and economic resources, will lead to increasing crime. Most of the empirical literature in this area has looked at the relationship between inequality and crime using cross-country comparisons, but to our knowledge this relationship has not been investigated for different regions within a country (the exception being one study in Brazil by Puech, 2005), and not for different cohorts within regions. By gathering unique data on conviction rates over time for different offences for three cohorts of young people, this study aimed to investigate whether between-cohort changes in educational inequality were associated with differences in conviction rates over time.

We employed mixed-effect models to estimate the association of between-cohort changes in educational inequality on conviction rates. Mixed-effect models were important, as we were able to capture cohort heterogeneity in conviction rates. For example, conviction rates may be higher for one cohort in one LEA compared with

other cohorts in other LEAs. This heterogeneity was captured by the inclusion of random effects at the intercept when modelling conviction rates over time. Similarly, conviction rates may increase, decrease or remain unchanged over the observed period, and this heterogeneity was captured by the incorporation of random effects at the slope or linear trend. Furthermore, the analysis was carried out for three cohorts within each LEA. Hence, the multilevel structure of the data required the inclusion of random effects at the LEA level. This allowed us to capture differences in conviction rates between LEAs.

Results showed that higher levels of educational inequality between cohorts were associated with higher conviction rates for violent crime and for racially motivated offences, but not for stealing from a person or burglary in a dwelling. The average increase in educational inequality measured by the Theil index between the 1983 and the 1984 cohorts was 1.6% and between the 1983 and the 1985 cohorts was 9.1%. Our model predicts that the impact of these increases, holding other factors constant, would be to raise the average area-based conviction rate for violent crime to 1.9 from 1.8 per 1,000 students (comparing the oldest cohort with the middle cohort) and to 2.2 (comparing the middle cohort with the youngest cohort). Similarly, our model predicts an increase in average area-based conviction rates for racially motivated offences to 0.23 from 0.21 per 1,000 students (comparing the oldest cohort with the middle cohort) and to 0.30 (comparing the middle cohort with the youngest cohort).

Scaled up to a national level, based on an estimated 575,000 15-year-old students in state schools in England in 2002, the model predicts 1,041 convictions for violent crime and 121 convictions for racially motivated offences for the 1983 cohort (which we use as a benchmark). The prediction for the 1984 and 1985 cohorts for violent crime are 1,081 and 1,263 convictions, respectively. Similarly, predictions for racially motivated offences for these cohorts are 130 and 172 convictions, respectively. Therefore, the change in educational inequality between the 1983 and the 1985 cohorts, assuming a causal connection between inequality and crime, would result in 222 additional juvenile convictions for violent crime and 51 additional convictions for racially motivated offences across England. The change in educational inequality between the 1983 and the 1984 cohorts would result in 40 additional juvenile convictions for violent crime and 6 additional convictions for racially motivated offences across England under the above causality assumption.

Regarding the relationship between educational inequality and violent crime, while 10% is usually considered a borderline measure of significance, we would argue that here it can be considered evidence of a genuine relationship for a number of reasons. First, the fact that there is a ceiling on attainment (i.e. students cannot obtain more than maximum marks) creates an inverse relationship between average attainment and educational inequality. This, in turn, affects the relationship between educational inequality and crime, and makes statistical significance harder to achieve. Second, the inequality measures used here (Gini and Theil) give more weight to values in the middle of the distribution. However, given that individuals in the lowest part of the educational distribution may have the highest propensities to engage in criminal activities (Nilsson, 2004), this will again tend to reduce the apparent strength of the association between educational inequality and crime. Given these constraints, and the use of an appropriately designed methodology, we believe that, while we cannot demonstrate causality, the associations we report here are robust.

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We found the expected sign for the association between average educational attainment and violent crime, stealing from another person and burglary in a dwelling, whereby higher maths test scores between cohorts are associated with lower conviction rates. However, we only found a statistically significant relationship for violent crime and for burglary in a dwelling. The result linking higher levels of education with lower property crime has also been investigated by Feinstein and Sabates (2005) and Sabates (2007). These studies estimated the impact of participation in post-compulsory schooling on a broader definition of burglary and concluded that participation in education with income support, combined with increases in police resources, had significant impacts on reducing area-level burglary in England. Neither programme by itself was sufficient for generating reductions in crime.

There were some interesting associations of our control variables with conviction rates, although we remain cautious with the interpretation of these results. Together with educational inequality and educational attainment, a high proportion of FSM eligibility was associated with higher conviction rates for violent crime. This result is in accordance with evidence provided by Ludwig, Duncan and Hirschfield (2001), who found that violent crime is strongly associated with poverty. But we also found that higher (i.e. worse) pupil–teacher ratios were associated with higher conviction rates for violent crime and burglary in a dwelling (perhaps because of the impact of increasing teacher quality) and lower conviction rates for racially motivated offences.

6.1 Advantages and limitations

This report has several advantages over previous studies. First, in line with theory, the empirical estimation investigates the impact of educational inequality on conviction rates for particular offences. This requires area data. With individual-level longitudinal studies such as the UK cohort studies, this is difficult to achieve with sufficient sample size. Aggregation of data to area-level leaves very small cell sizes, given that offences are committed by a relatively small proportion of individuals (for example, only 1% of the 1958 British cohort had been found guilty in a magistrates' court by age 42, which represents around 90 cohort members). Undertaking the analysis by type of offence would reduce sample size even more.

Second, we looked at the association between educational inequality and conviction rates over time and we conditioned out cohort heterogeneity in the level of conviction rates and in the change in conviction rates. This aspect of the estimation strategy is important, as trends of conviction rates differ not only between cohorts within each area, but also between cohorts across areas. As we demonstrated, up to one-third of the variability in the error term will not be captured if individual heterogeneity is not taken into account. Failing to account for trends in conviction rates may provide misleading results, as it is possible that both conviction rates and educational inequality across areas move in the same direction over time. This has important implications, as our results showed that even when different offences have different trends, the increase in educational inequality is associated with violent crime and racially motivated offences.

Still, it may be argued that the association between educational inequality and crime at the LEA level may be due to a compositional effect, whereby differences in conviction rates in different areas are the result of the aggregate characteristics of the individuals who live in these areas (Gottfredson et al., 1991). Although this may be the case if we were not to have cohorts of young people within LEAs, the multilevel structure of the data allows us to investigate the impact of between-cohort variations in educational inequality within LEAs on conviction rates. Therefore, our study overcomes the compositional effect induced in aggregate-level analysis, although there may be a compositional effect between cohorts.

The compositional effect between cohorts opens up the possibility that other factors, such as behaviour, aspirations, expectations and motivation, differ between these three cohorts and hence what is thought to be the effect of inequality is actually driven by other factors. It is also possible that systematic differences in criminal or anti-social behaviour between cohorts prior to educational attainment and educational inequality are driving our results. As indicated by Feinstein and Bynner (2004), behavioural factors in childhood are strong determinants of both qualifications achieved and criminal record in adulthood.

Beyond the bounds of our study and further research

First, we do not know what is driving the increase in educational inequality between cohorts. Our research takes the increase in educational inequality between cohorts as given and links it to conviction rates. Unfortunately, with our data sources we are not able to model the determinants of area-level educational inequality and subsequently link these to area-level crime.

Second, not all crimes are prosecuted and convicted, only a proportion of all offences. Therefore, the actual relationship between inequality and convictions found here may be driven by the criminal justice system or by the police. In other words, it is possible that areas with increasing inequality have increasing prosecutions over time, which may explain our results. Or it may be that the police are increasingly likely to arrest in these areas. Our results do not distinguish between these important mechanisms of crime prevention and how educational inequality relates to each of them.

6.2 Implications

This report provides robust evidence that inequality matters. Above and beyond impacts of absolute access to resources, young people who grow up in school cohorts marked by higher levels of disparity in educational achievement are more likely to commit violent crime and racially motivated offences than those with less disparity. This is not an effect of stable characteristics of areas, as this is conditioned out through the method of looking at within-area differences between cohorts. It is not an effect of the poverty in the area experienced by these cohorts or of average attainment in the cohort. This report finds that if the Government wishes to be tough on the causes of crime as well as on crime itself, it must address issues of relative deprivation. This is a contentious finding and we cannot claim to have resolved all concerns about causality, but the study takes us beyond previous analysis, as stated by the main advantages of our research methods.

The differential effect of educational inequality by type of offence committed found here raises a question: why? Criminological theories predict that experiences of inequality, through feelings of anger and frustration, can induce an increase in property crime as well as in violent criminal behaviour. In this report, we found a statistically significant association of educational inequality with violent criminal behaviour and racially motivated offences, but not with property crime. Furthermore, our results are consistent with other quantitative studies suggesting that income inequality is associated with violent crime and not with property crime. Still, the reasons behind the impact of relative deprivation, either by experiences of inequalities in education or income, remain the topic of further research.

In this report we take the view that relative deprivation is a societal phenomenon, but it matters because it places pressure on individuals. Individuals will differ in their capacity to manage that pressure: disadvantage in access to resources or in the opportunity to grow up feeling confident and successful will impact on some, even if others experiencing the same impact will instead experience poverty or ill-health without criminal results. We see, therefore, responsibilities at both individual and societal levels. In this study we tested some of the dimensions of that societal responsibility.

Our findings support the emphasis of many recent policy statements on relative deprivation, and the Government's current declared aim to simultaneously raise average attainment and narrow the gap between high and low achievers (DfES, 2006; DCSF, 2007). This can only be achieved if those at the bottom of the educational attainment distribution are helped to progress at a greater rate than those above them. The challenge is to find acceptable interventions that promote the twin goals of higher standards and greater educational equality, achieving the appropriate balance of equity and overall growth in standards. We believe that differentiated programmes should be available, offering appropriate help and support to all, but appropriately graded and focused to provide personalised, progressive, universal intervention.

This is undoubtedly a challenge to all involved in the provision of education services. However, the evidence on the relationships between educational inequality and crime suggests that the potential rewards could extend far beyond simply increasing the skills base and economic productivity of the nation.

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Appendix 1: Summary of criminological theories

Theory	Description	Proponent
Classical	Crime occurs when the benefits outweigh the costs – when people pursue self-interest in the absence of effective punishments. Crime is a free-willed choice. See also Rational Choice; Deterrence.	Beccaria
Positivist	Crime is caused or determined. Lombroso placed more emphasis on biological deficiencies, whereas later scholars would emphasize psychological and sociological factors. Theorists use science to determine the factors associated with crime.	Lombroso; Guerry & Quetelet
Individual Trait	Criminals differ from non-criminals in a number of biological and psychological traits. These traits cause crime in interaction with the social environment.	Glueck & Glueck; Mednick; Caspi & Moffitt
Social Disorganization	Disorganized communities cause crime because informal social controls break down and criminal cultures emerge. They lack collective efficacy to fight crime and disorder.	Shaw & McKay; Sampson; Bursik & Grasmik
Differential Association; Social Learning; Subcultural	Crime is learned through associations with criminal definitions. These definitions might be generally approving of criminal conduct or be neutralizations that justify crime only under certain circumstances. Interacting with antisocial peers is a major cause of crime. Criminal behavior will be repeated and become chronic if reinforced. When criminal subcultures exist, then many individuals can learn to commit crime in one location and crime rates – including violence – may become very high.	Sutherland & Cressey; Skyes & Matza; Akers; Wolfgang & Ferracuti; Anderson
Anomie; Institutional-Anomie	The gap between the American Dream's goal of economic success and the opportunity to obtain this goal creates structural strain. Norms weaken and 'anomie' ensues, thus creating high crime rates. When other social institutions (such as the family) are weak to begin with or also weakened by the American Dream, the economic institution is dominant. When such an institutional imbalance exists – as in the United States – then crime rates are very high.	Merton; Messner & Rosenfeld
Strain/General Strain	When individuals cannot obtain success goals (money, status in school), they experience strain or pressure. Under certain conditions, they are likely to respond to this strain through crime. The strains leading to crime, however, may not only be linked to goal blockage (or deprivation of valued stimuli) but also to the presentation of noxious stimuli and the taking away of valued stimuli. Crime is a more likely response to strain when it results in negative effect (anger and frustration).	Cohen; Cloward & Ohlin; Agnew
Control; General Theory of Crime; Control Balance; Power	Asks the question, "Why don't people commit crime?" They assume that criminal motivation is widespread. The key factor in crime causation is thus the presence or absence of control. These controls or containment might be rooted in relationships (e.g., social bonds) or be	Hirschi; Reckless; Gottfredson; Hagan

Control	internal (e.g., self-control). Exposure to control also might differ by social location and by the historical period, such as the changing level and type of control given to males and females.	
Rational Choice; Deterrence	Building on classical theory, crime is seen as a choice that is influenced by its costs and benefits – that is, by its "rationality". Crime will be more likely to be deterred if its costs are raised (e.g., more effort required, more punishment applied), especially if the costs are certain and immediate. Information about the costs and benefits of crime can be obtained by direct experiences with punishment and punishment avoidance, and indirectly by observing whether others who offend are punished or avoid punishment.	Stafford & Warr; Patternoster; Cornish & Clarke; Matsueda
Routine Activities	Crime occurs when there is an intersection in time and space of a motivated offender, an attractive target, and a lack of capable guardianship. People's daily routine activities affect the likelihood that they will be an attractive target who encounters an offender in a situation where no effective guardianship is present. Changes in routine activities in society (e.g., women working) can affect crime rates.	Cohen & Felson
Labeling; Reintegrative Shaming	People become stabilized in criminal roles when they are labeled as criminal, are stigmatized, develop criminal identities, are sent to prison, and are excluded from conventional roles. Reintegrative responses are less likely to create defiance and a commitment to crime.	Lemert; Matsueda; Briathwaite; Sherman
Critical	Inequality in power and material well-being create conditions that lead to street crime and corporate crime. Capitalism and its market economy are especially criminogenic because they create vast inequality that impoverishes many and provides opportunities for exploitation for the powerful.	Bonger; Quinney; Greenberg; Currie; Colvin
Peacemaking	Crime is caused by suffering, which is linked to injustice rooted in inequality and daily personal acts of harm. Making "war on crime" will not work. Making peace is the solution to crime.	Quinney
Feminism	Crime cannot be understood without considering gender. Crime is shaped by the different social experiences of men and women and the power differences between them. Patriarchy is a broad structure that shapes gender-related experiences and power. Men may use crime to exert control over women and to demonstrate masculinity – that is, to show that they are "men" in a way consistent with societal ideals of masculinity.	Adler; Daly; Chesney-Lind; Messerschmidt
Developmental; Life Course	Crime causation is a developmental process that starts before birth and continues throughout the life course. Individual factors interact with social factors to determine the onset, length and end of criminal careers. They key theoretical issues involve continuity and change in crime. Some theories predict continuity across the life course; others predict continuity for some offenders and change for other offenders; and some	Moffitt; Sampson & Laub

	predict continuity and change for the same offenders.	
Integrated	These theories use components from other theories – usually strain, control and social learning – to create a new theory that explains crime. They are often life course theories, arguing that causes of crime occur in a sequence across time.	Elliott; Thornberry; Tittle; Cullen

Adapted from: Cullen, F.T. and Agnew, R. (2002). *Criminological Theory: Past to present – Essential readings.* **Los Angeles, CA: Roxbury.**

Appendix 2: Mixed-effects results using the Gini coefficient as a measure of educational inequality

Variable	Violent crime	Stealing from another	Burglary in a dwelling	Racially motivated
Time	-0.316	-0.092	-0.466	0.013
	(0.041)***	(0.021)***	(0.026)***	(0.008)
Time2	0.036	0.015	0.071	-0.003
	(0.008)***	(0.004)***	(0.005)***	(0.001)*
Education Inequality (Gini)	2.491	-0.573	-0.254	0.572
	(1.400)*	(0.655)	(0.913)	(0.250)**
Educational attainment	-0.031	-0.004	-0.013	0.003
	(0.013)**	(0.007)	(0.007)*	(0.002)
FSM	0.015	-0.002	-0.001	0.001
	(0.008)*	(0.004)	(0.004)	(0.001)
P–T ratio	0.077	-0.014	0.048	-0.013
	(0.042)*	(0.026)	(0.022)**	(0.006)*
Unauthorised	0.102	0.042	0.057	0.022
	(0.093)	(0.052)	(0.049)	(0.014)
Constant	1.55	1.15	1.02	0.15
	(1.52)	(0.81)	(0.86)	(0.24)
Standard deviations of random effects and error term				
Random intercept	0.49	0.22	0.20	0.02
	(0.06)***	(0.03)***	(0.01)***	(0.005)***
Random slope	0.14	0.10	0.61	0.06
	(0.02)***	(0.01)***	(0.03)***	(0.001)***
Random effect at LEA level	0.53	0.35	0.26	0.06
	(0.04)***	(0.02)***	(0.02)***	(0.006)***
Error term	0.86	0.43	0.51	0.18
	(0.02)***	(0.01)***	(0.01)***	(0.003)***
Number of observations	1957	1957	1957	1957
Number of LEAs	133	133	133	133

Source: OI, PLASC and LEASIS. Notes: Standard errors (s.e.) in parenthesis. Asterisks *, **, *** indicate significance at 10%, 5% and 1% level respectively.

Educational Inequality and Juvenile Crime: An Area Based Analysis

Crime reduction is a high priority for governments both past and present. Low levels of crime have also been recognised as important for economic growth (Lucas, 1988) and as one of the most graphic indicators of good social cohesion, which involves bonding and trust within and between communities, and also a common sense of citizenship and values (Maxwell, 1996). Crime reduction, therefore, is seen as important not only in reducing the economic costs to the nation, but also in increasing wider well-being and quality of life.

To reduce crime and increase societal well-being, we need to recognise that the motivations for committing crime operate at both the individual and the societal level. At the individual level, people may commit crime for their own gain, but also as a response to societal-level features, such as absolute and relative deprivation. The response by government and society has been to increase the costs and reduce the benefits of committing crime; sometimes directly through the penal, legal and security systems, but also indirectly by increasing individuals' stake in society. In order for the latter to be effective, we need to have policy levers working to reduce both absolute and relative deprivation.

This report considers the influence of one form of relative deprivation on crime, namely educational inequality. This is examined through an area-based analysis of the relationship between juvenile conviction rates for a range of offences and educational inequality based on maths Key Stage 3 scores in English local education authorities (LEAs). The focus on juvenile crime reflects a number of current public and policy concerns around young people, the quality of their life experiences and their resulting outcomes in terms of achievement and behaviour.

We found evidence of a relationship between educational inequality and juvenile conviction rates for violent crime within local areas (significant at the 10% level); the change in educational inequality between the 1983 and 1985 cohorts was associated with an area average of 0.38 additional convictions per 1,000 students. We further found a relationship between educational inequality and racially motivated crime (significant at the 5% level) with an area average of 0.09 additional convictions per 1,000 students for racially motivated offences resulting from the change in inequality between the 1983 and 1985 cohorts within local areas.

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