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Does parental income matter for onset of offending?

Abstract:
Although several established theories of crime often suggest an association between socio-economic background and youth criminal involvement, the empirical evidence for such claims diverges considerably. The aim of this paper is to re-investigate the relationship between family income and criminal charges by exploiting the rich register data available in Norway. The longitudinal data sources used in the study encompass the entire resident population from five birth cohorts, and allow us to identify youths charged with crimes committed from 1992 to 2004 and link information on these youths with information on family earnings for several years. In a criminal career perspective, our outcome variable is the age of first offence (onset). We find that family academic resources are more important than family income for all kinds of offences, except for serious theft.

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Introduction

In several fields of social research there is an empirically established relationship between socio-economic status (SES) and a range of outcomes such as educational attainment, income, health, divorce etc. Usually, higher SES reduces the probability of negative outcomes. It is therefore somewhat surprising that a large empirical literature investigating the relationship between SES and crime has not been able to provide convincing evidence, although most criminological theories hypothesize that such a relationship does exist. It has, in fact, been quite forcefully argued that the SES-crime relationship is a "myth" (Tittle et al., 1978) or at least very weak (Tittle & Meier, 1990; Dunaway et al., 2000; Wikström & Butterworth, 2006). Some have also argued that there are different causal processes among the lower and higher classes, so that the average association disappears (Wright et al., 1999). SES may be operationalized in many ways, but is usually a measure of income or a correlated proxy for income or educational level. Income is, however, usually measured with considerable error and this may account for the missing relationship (Bjerk, 2007). Furthermore, there are also several studies concluding that a strong relationship between SES and crime does indeed exist (Braithwaite, 1981; Jarjoura et al., 2002; Hay & Forrest, 2009). Thus, this issue is clearly not settled.

In a criminal career perspective (Blumstein et al., 1986), we find it most relevant to study the *onset* of offending, although there might also be such an association between SES and crime for the frequency of offending, length of criminal career as well as desistance. Understanding patterns of the onset of offending is, however, particularly important as early offending is likely to have consequences for future offending (Becker, 1963; Sampson & Laub, 1993).

The purpose of this article is to provide further empirical evidence for discussing the relevance of income for registered crime using very reliable and detailed measures of income. The data used encompasses both Norwegian administrative data on adolescents' registered offences as well as measures of parental income, measured as parents' average income over the period since the year the child is born until 10 years old and other background variables, most notably the parents' level of education. We also discuss the relative importance of long-term vs short-term measures of income, and the relative importance of parental income vs educational level. Importantly, our data on income and education are measured with great reliability largely avoiding the problems of measurement error so prevalent in surveys. The sample is five entire birth cohorts of boys, born 1982 to 1986 in Norway, yielding a sample of $N=127,823$.

Controversies on the SES–crime relationship

Why would family SES be associated with adolescent crime?

As Tittle (1983: 334) has noted, a thorough discussion of theories on SES and crime would be imply discussing *all* criminological theories, but precisely *how* SES would lead to crime is not well specified in several of the theories and may even include prejudiced assumptions about the traits of lower class people (Tittle, 1983). Although we agree that there are several unclear theoretical issues in this literature, we find two theoretical positions particularly relevant for the motivation of our study.

First, there are objective structural conditions that have direct effects on adolescents' outcomes, in the way that structure put constrains on what we may term individual's life chances (Breen, 2005). These are the resources available to individuals that determine the structural opportunities and may lead to limitations in the fulfilment of their goals and hopes. The family's economic and social capital becomes important for the child's future outcomes because of the resources available to the child, which may lead to sequences of cumulative advantages and/or disadvantages. For example, children from families with low economic and academic resources have fewer opportunities to get support from their parents financially and culturally, leaving them disadvantaged compared with children from more affluent backgrounds in school, throughout adolescence and later in life. The mechanisms from opportunity structures to crime might then be through strain-like mechanisms (Merton, 1968) or as a cost-benefit consideration of alternatives (Becker, 1968), where crime may be a rational adaptation to a situation with limited legal opportunities. Explaining the relationship between financial resources and non-acquisitive crime may be less straightforward, but limited opportunities and perceived injustice may also generate anger and frustrations which lead to violence and other non-acquisitive crimes (Agnew, 1992).

Second, economic strains may affect parenting skills and the socialization of children. Conger et al. suggest a general model to explain how family economic problems are translated into both problem behaviour and negative outcomes for the children (Conger et al., 1992; Conger et al., 1994). In short, they propose that low income, job disruptions, high debt and similar economic problems 'affect individual distress and family relations through the daily strains or pressures they create in family economic life' (Conger et al., 1994: 543). The link to adolescent development is, however, an indirect one through the effect it has on parental mood and marital conflicts. Struggles over money occur not only between parents, but also between parents and children, as it becomes difficult for parents to provide the standard of living desired by their children. This situation leads to parental bad moods and

increased risk of further hostile and aggressive behaviours, especially an increased number of marital conflicts. The parents' aversive behaviour towards their children increases the risk of adolescent conduct problems. Children are more likely to become troublesome as they learn coercive techniques at home and find themselves with few friends and at risk of developing social problems. In sum, economic stress and practical problems reduce parents' ability to provide good parenting and give children the emotional support they need. The effect of low socio-economic status on adolescent offending is then mediated through family management practices (Lazelere & Patterson, 1990; Sampson & Laub, 1993; Fergusson et al., 2004).

Previous studies

Contrary to these theoretical assumptions, the claim from an early literature review was that crime is spread relatively evenly across levels of socio-economic statuses (Tittle et al., 1978). This led to debates on whether this finding could be due to measurement issues on crime and/or SES (Braithwaite, 1981; Thornberry & Farnwort, 1982). Tittle & Meier (1990) repeated the review ten years later focusing explicitly on various specifications of the SES-crime relationship, but reached the same basic conclusion: the association between SES and crime is weak or negligible. Importantly, data on self-reported crime or registered crime led to the same conclusion. Furthermore, distinguishing between various specifications of SES, types of crimes, or the seriousness of the crimes did not alter this conclusion.

Some later studies have concluded along similar lines. Sampson and Laub (1993) found that total income the past month had no direct association with crime. They nevertheless argued that the structural variables had an impact of family functioning, which was strongly correlated with crime. A more thorough discussion is presented by Dunaway et al (2000), who used self-report data of an adult sample to specify the SES-crime relationship using several measures of SES and crime. They used both graded scales (income and years of education), an underclass specification (eg unemployed, receiving benefits) and type of occupation, while controlling for basic confounders. They conclude that SES is a fairly weak correlate of crime with the exception of a slight association for violent crimes among non-whites. Wright et al (1999) found no direct association between SES and delinquency when using a scale of occupational status based on educational level and income associated with each occupation. They also checked this finding with direct measures of income and education, and alternative specification of delinquency, but with the same results. A recent British study found no association between parent's occupational status and adolescent crime (Wikström & Butterworth, 2006: 62).

Other studies come to the opposite conclusion. Fergusson et al (2004) found a strong relationship between paternal occupational status at birth and childrens' offending, although it disappeared when controlling for confounders. Hay and Forrest (2009) found that family earnings below the official poverty level at age nine were strongly correlated with repeated delinquency aged 10–14. An even stronger relationship was found for persistent poverty. Similarly, Jarjoura et al (2002) found that persistent poverty was strongly associated with delinquency, but an association with short-term poverty was also uncovered. Moreover, Bjerk (2007) was able to reverse basic findings of no effect of income on criminal involvement by accounting for measurement error with an instrumental variable approach. In a Norwegian setting, Pedersen (2000) found that both parents' occupation, reception of welfare benefits and number of books in the home was related to both self-reported crime and arrests, and Skardhamar (2009) found that low parental income from work at age 11 was related to children's subsequent criminal careers.

One reason for such diverging conclusions across studies may be measurement errors in income (Bjerk, 2007). There is no standard for measuring SES in this context and the kinds of measures varies greatly across studies. Most measures are some way or another related to income or closely correlated proxies for income. While criminological studies have come far in how to measure crime, there are several reasons why measures of income may be prone to measurement errors. First, short-term measures of income are unreliable because income can vary greatly from one year to the next, particularly among those with unstable employment and the self-employed. Longer-term measures of economic resources are therefore preferable. Second, in youth surveys, information about social background is often reported by the adolescents, although they may obviously lack precise knowledge of either parents' income or educational. Third, income might include several sources, such as salary and wages, earnings from self-employment, capital income, social benefits or a combination of these. People may also answer according to what they earn including or excluding taxes etc. It is our impression that few studies have collected income measures with sufficient detail (see eg Tittle & Meier, 1990; Dunaway et al., 2000). Similar arguments can be made about parental occupational status and educational level, although these are obviously somewhat easy to measure with accuracy at least in cases where the parents provide the information.

We contribute to the literature by analyzing very high quality and detailed register data on income, education and onset of offending. The main focus on income is supplemented with further assessments of the relative importance of income and parental education. Norwegian register data makes measurement errors and sample bias negligible compared to previous studies of the same topic and,

thus, helps us to reach more robust conclusions. We study the onset of offending after the age of ten while distinguishing between several different types of offending. Many previous studies has focused on the most disadvantaged groups (Conger et al., 1992; Hay & Forrest, 2009), but if opportunities are *gradually* distributed, we would expect an effect of crime throughout the distribution of economic resources. Thus, one strength of our approach is that we are able to study the effects over *entire* distribution of earnings for the families of the cohorts we study.

Context: Scandinavian welfare states

The impact of SES may depend on the social context. Esping-Andersen has argued that the Nordic countries represent one particular type of welfare regime, with its 'fusion of universalism and generosity and […] comprehensive socialization of risks' (Esping-Andersen, 1999: 79). Economic hardship can have immediate consequences for the child, but this is ameliorated by the welfare system. The social security and public education system in Norway is supposed to meet the basic needs of all children and create more equal opporunities for education and work. Consequently, the explanatory power of economic factors for criminal involvement or other economic and social problems might thus be limited. Parental resources, therefore, should not limit one's opportunities to succeed in life. However, systematic differences in intergenerational transfers of resources do exist also in Norway in important domains such as income (Hansen, 2001) and working life (Mastekaasa, 2004) as well as family formation and dissolution (Lyngstad, 2006). This suggests that the welfare state is not able to entirely eliminate all structural disadvantages. Still, Norway is generally considered one of countries in the western world where opportunities are the most equally distributed and where the welfare system may largely limit the most adverse outcomes of low SES. This suggests that the effect of SES should be less in Norway than in countries where there are larger social inequalities, but the opposite is also possible: being economically disadvantaged in a society where most are doing well and opportunities are perceived as being equal may be even more stressful.

Data and methods

We extracted our data from Norwegian administrative registers. Every resident in Norway has a personal ID number and this ID is used to link together an individual's data from different registers and over time. The registers cover the total Norwegian resident population. As such, many of the limitations associated with survey data, such as the data being limited to a geographical area or containing only a small number of observations, do not plague our study. Furthermore, the only attrition from the data is natural—that is, due to death and emigration—and the data is generally of

good quality and coverage. We use data from the population registers to identify parent-child relations and place of residence.

Given the generally very low offending rates for girls, we focus entirely on male offending. Our population comprises five entire birth cohorts, born 1982-1986. This gives N=127.823 boys. Their registered offences are analyzed from the year they turn 10 years old and through 2004, which is the most recent year for which data is available for research. The use of administrative data on crime may be regarded as a weakness of our study, as it may also reflect bias in police's priorities, detection rates and class justice. However, self-reported crime data also suffers from problems. Studies indicate, for example, that a sizeable proportion of youths with official arrest records fail to report that they have been arrested when asked in surveys (Kirk, 2006). However, despite such obvious differences in the reporting or definition of outcome measures of crime, it has been shown that both kinds of data largely result in similar conclusions (Pedersen, 2000; Farrington et al., 2003; Kirk, 2006). Given the specific problems associated with possible police discrimination of foreign-looking individuals (Sollund, 2006) as well as the host of problems specific to the study of immigrants and minority children, we exclude all youths with immigrant background from our sample[1].

Variables

Individual level data on *charges* where gathered from the official crime statistics based on police data. The term "charges" is, however, used in this context in a slightly different manner than its strict legal sense. A reasonable interpretation of the term "charge" in this context is that the individual in question was a serious suspect for the recorded crime. It refers to persons who were the alleged offenders when a criminal investigation was considered solved by the police and the case was subsequently closed. A person who was arrested and charged at an earlier stage in an investigation, but subsequently released and no longer considered a suspect, does not turn up in the charge data. The suspects in the charge data are recorded regardless of whether they later receive convictions or sanctions. For this reason, the data therefore also include information on persons under the age of criminal responsibility (age 15). An advantage of using charges rather than final sanctions or convictions is that a fair amount of criminal cases do not end in a conviction. Still the category is much more likely to reflect a crime committed than arrests only. This also makes it less likely that our data would be affected by any bias in legal procedures in court due to income or economic resources, i.e. the rich be able to afford better lawyers.

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[1] More specifically, we exclude youths who have themselves immigrated to Norway as well as children born in Norway to two foreign-born parents.

The legal code differentiates between misdemeanours and serious crimes, where the former are less serious offences dominated by traffic offences and shoplifting. In the present study, we will present results for all offences, all serious crimes as well as for four more specific categories of offences: serious theft, theft misdemeanours, violent crime, and drug offences. (Results from other specifications gave largely similar results and are therefore not reported here). These categories are based on standard classification of offences as used in the official crime statistics in Norway.[2] The distinction between serious crimes and misdemeanours was only relevant for theft since the categories of offences related to violence, drugs and property damage almost exclusively consisted of serious crimes[3].

The variables on parental income from work are constructed based on records from the Norwegian social security administration. The yearly income variable in the social security records reports the sum of earnings from employment or self-employment as well as work-related social security benefits. Data on welfare benefits, such as social assistance or rent vouchers, were not available for the full period needed for this study and were therefore not included in the income definition used here. Thus, our measure does not include *all* income sources, but all work-related earnings. The main variable of interest in much of this paper will be the average annual parental income from the year a relevant cohort member was born up to and including the year the cohort member turned 10 years old, a total of 11 years. We study the entire long-term income distribution by creating dummy variables for each income decile. We also include a variable for number of years in the same period of time for which each parent had a positive income from work, thus providing a more direct measure of number of years employed.

Information on parental educational level is taken from the National Education Database. Although there will be some cases in which parents' educational level changed over time , we use highest recorded fulfilled education by either parent the year the child was 10 years old. A three-group classification is created based on the International Standard Classification of Education (ISCED97).[4] *Low* corresponds to primary school (levels 0–2), *medium* to secondary school (levels 3–4), and *high* to university level (levels 5–6).

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[2] The Norwegian official crime statistics is found here: http://www.ssb.no/english/subjects/03/05/a_krim_tab_en/ and standard categories are defined here: http://www.ssb.no/emner/03/05/nos_kriminal/vedleggb.pdf

[3] The share of crimes were 99.5% for violence, and 99.9% for drug-related offences in the period 1992-2004.

[4] See URL: http://www.ssb.no/stabas/.

We also include a series of dummy variables for place of residence, as there are geographical variations in offending as well as income. There are dummies for living in the four largest cities in Norway and for each county for those living outside these cities. These dummies should capture any geographical variation and is not of interest as such.

Method

In order to be able to analyse the relationship between crime and several different characteristics simultaneously, we estimate Cox proportional hazard models (see eg Lancaster, 1990) for time to first offence, where time is measured as (fractions of) years since 10th birthday[5]. Censoring takes place at the end of the observation period (2004), which occurs at different ages (18-22) for the different cohorts studied. This age range should nonetheless capture the first offence both for early as well as relatively late onset.

For each outcome, we employ identical procedures of estimating three different model specifications and report results in terms of hazard ratios. The first basic specification – referred to as Model 1 (M1) – includes only dummy variables for cohort and decile of the parental income distribution. In order to examine whether the income-crime relationship may be explained in part or whole by parental education, the second specification – Model 2 (M2) – includes dummy variables on parents' level of education. Finally, the third specification – Model 3 (M3) – also includes variables on the number of years the mother and father were employed during the cohort member's childhood (up to age 10). There may be differences in both economic conditions as well as crime rates in different parts of the country and we therefore also include regional variables in M3.

Results

Table 1 presents some basic statistics on the percentage of youths charged with at least one offence in various categories prior to age 19. The statistics are reported for charges prior to age 19 in order to make the observation periods for the different cohorts comparable.[6] In the remaining analyses, however, each cohort is followed as far as the data allows, with sensoring at the end of 2004. This corresponds to age 18 for the youngest cohort and age 22 for the oldest cohort. From the age of 10 to 18, 17.8 % of the boys were charged with at least one offence. Approximately 10 % were charged with at least one crime. Theft crimes are the largest category, with approximately 5 % being charged with at

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[5] Time is actually measured in days but reported in fractions of years to make it easier for the reader to interpret the results relative to ages of onset.

[6] Members of the 1986 cohort are only observed up until the year they reach age 18 (in 2004).

least one such crime prior to age 19. The overall percentage charged with at least one offence first increases slightly from the 1982 to the 1983 cohort, but declines again for the later cohorts. A broadly similar pattern across cohorts is apparent for the various categories of crime as well.

Table 1. Percentage of youths charged with at least one offence before age 19

| | **All** | **Cohort** | | | | |
		1982	**1983**	**1984**	**1985**	**1986**
Any offence	17.8	18.1	18.8	18.5	17.0	16.8
Any misdemeanour	11.9	12.0	12.7	12.3	11.5	11.3
Any crime	10.4	10.8	11.1	11.0	9.8	9.4
Theft, misdemeanour	3.2	3.5	3.5	3.3	3.0	2.9
Theft, crime	4.9	5.5	5.2	5.2	4.7	3.9
Violence	2.7	2.6	2.9	2.9	2.7	2.5
Drugs	2.5	2.8	3.0	2.6	2.1	2.0
Property damage	4.3	4.1	4.4	4.4	4.4	4.0
Alcohol-related	2.5	2.5	2.8	2.7	2.3	2.1
Other	4.0	4.2	4.3	4.3	3.7	3.6

Figure 1 reports non-parametric (smoothed) hazard plots for the onset of criminal activity for various categories of offences based on deciles of parental income for the males in our cohorts. Further information on the deciles of the income distribution can be found in Table A.1 in the Appendix. The hazard is interpretable as the instantaneous probability of committing an offence (of type k) at time t given not having committed an offence (of type k) prior to t.

Figure 1. **Smoothed hazard plots for time (in years) to first offence after ten years old. By decile of parental income. Any offence and for serious crimes only**

A) Any offence
B) Serious crimes
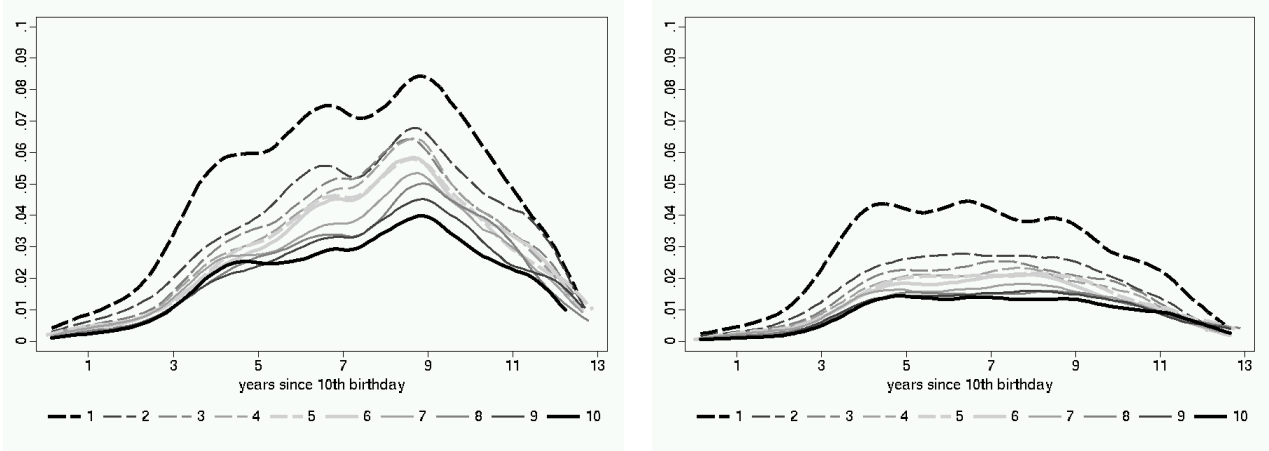
The age-onset curves by income decile for an offence of any type, as presented in Figure 1A, all have a global maximum around 19 years of age, but there are smaller humps or peaks in the hazards at earlier ages, roughly around 14 and 16 years of age. Figure 1B presents similar plots for serious crimes and indicates lower hazards with less humps and an earlier peak, at least for the lowest income decile. Despite differences in shape, both figures suggest that there is a relationship between parental income and involvement in criminal activity, with large differences in the hazard curves for youths from the lowest and highest deciles of the parental income distribution. There is little difference between the curves for the middle income deciles, but this is not surprising given that the differences in income between these deciles are relatively small (see Table A.1 in the Appendix).

Figure 2. Smoothed hazard plots for time (in years) to first offence after ten years old. By decile of parental income. Different kinds of offences

A) Serious Theft   B) Theft misdemeanours

C) Drug crimes   D) Violence
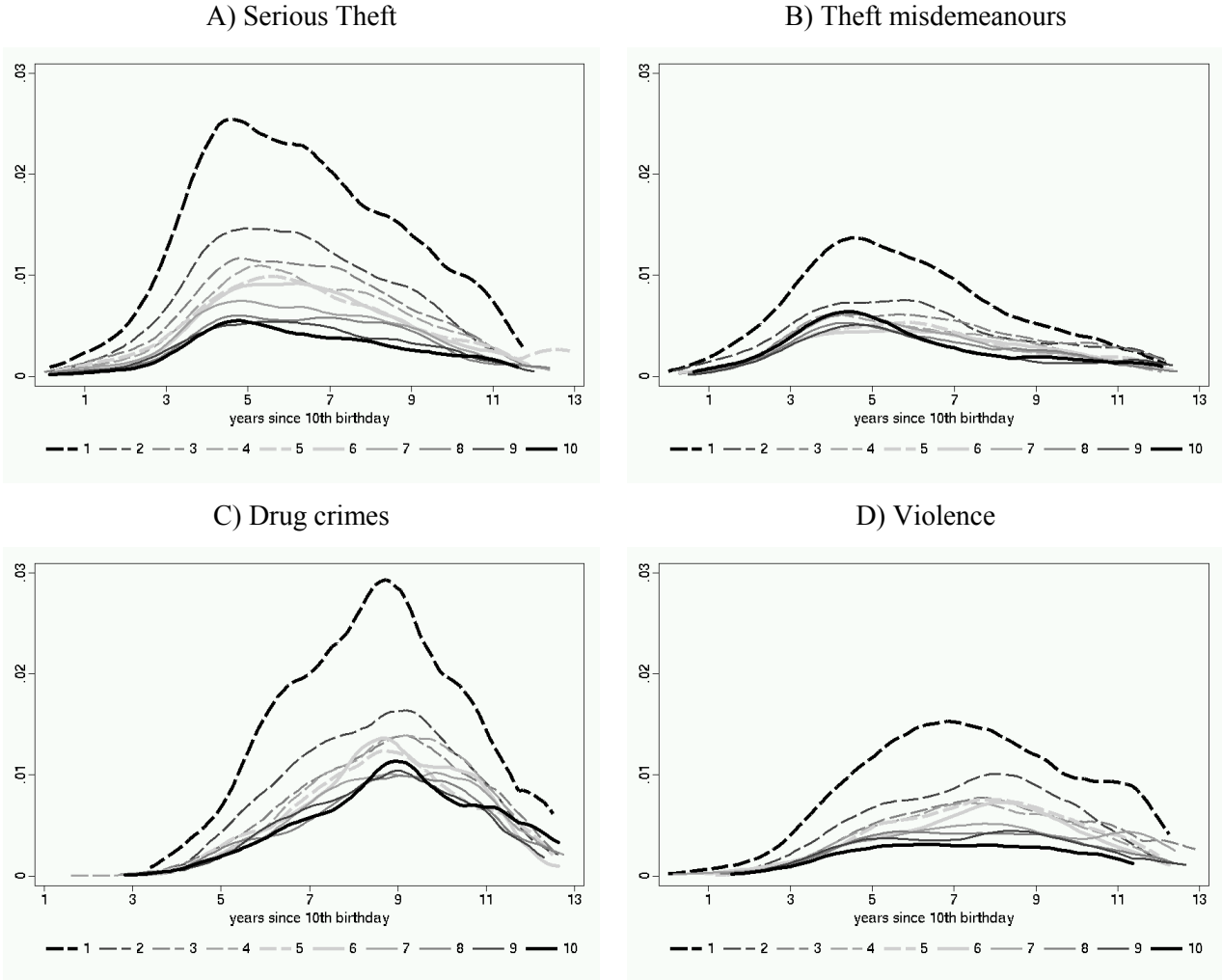
Similar plots of hazard rates are made for different types of offending in Figure 2, where several interesting features are apparent. Firstly, the curves for the individual categories clearly indicate different patterns of onset for different types of offences. Onset of theft misdemeanours and serious theft tends to take place in the early to mid-teen years, whereas involvement in violent crime as well as drug-related offences appear to start in the later teenage years. This differing pattern of onset for different categories of offences largely accounts for the multiple peaks apparent in the aggregate categories in Figure 1. Secondly, while there are quite large differences between the hazards for the highest and lowest income deciles for all the categories, the difference appears more pronounced between the lower end and middle of the distribution rather than at the higher end of the income distribution. Furthermore, the figure suggests that the relationship between crime and income might

differ according to the type of crime being discussed, but the general impression given by the figures is that the association with income is indeed pronounced for all types of offences and apparent throughout the income distribution.

Multivariate analysis

The main results from the regression analyses are reported as plots in this section; full parameter estimates are provided in the Appendix. The plots display the estimated hazard ratios for time to offence. Note that the 5th income decile and low level of education for mother and father are the references for the dummy variables presented. The hazard ratios can range from zero to infinity, where no effect is indicated by the relevant hazard ratio not being statistically significant from 1. The star and circle symbols in the figure indicate the point estimates for the hazard ratios from the different specifications, whereas the horizontal lines through the symbols represent the 95 % confidence interval around those point estimates. The log likelihood for each model is reported in each plot and show that the relative improvement in fit is statistically significant for inclusion of further covariates in M2 and then again in M3. This is so for all analyses and is not discussed further here. Given that the non-parametric hazards by income decile in Figures 1 – 3 are largely proportional, the results from Model 1 can be interpreted as broadly reproducing the insights as reported in the previous section. Thus, Model 1 serves as a benchmark or very basic specification by which to compare results from further specifications.

Figure 3. Hazard ratios for time to first offence, by parental long-time income deciles and educational level. Any offences and serious crimes only

A) Any offence

B) Any serious crime
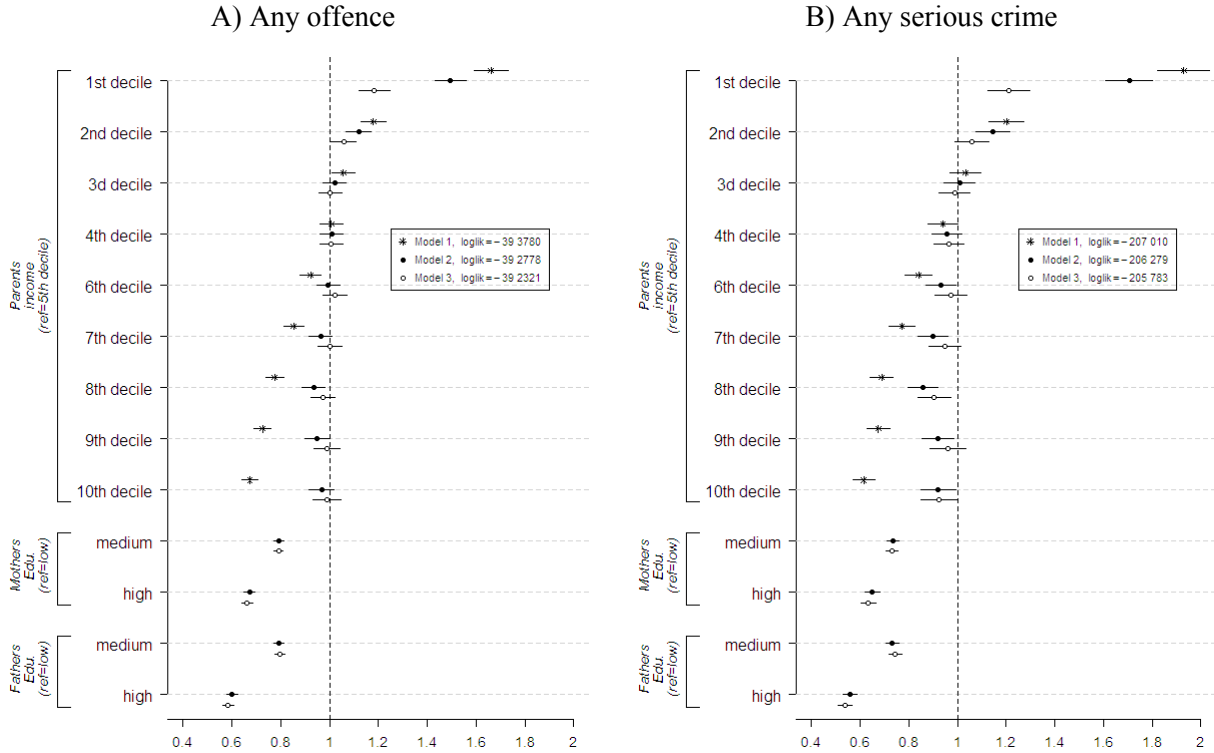
Figure 3A shows results for any offence. In M1, there is a clear association between parent's income and onset of offending *throughout the income distribution*. The most striking insight is, however, that simply including variables on parents' level of education largely eliminates the relationship between income and offending in the middle and higher end of the income distribution. Although the more elaborate specification of M3 does not entirely eliminate the effect of the lower income deciles, the estimated hazard ratios for low income deciles are greatly reduced. Since M3 includes variables on parental employment histories, the reduction in the effect of the lower income deciles in M3 compared to M2 is an indication that the actual mechanism behind the "effect" of the lower income deciles might actually be related to parents' lack of employment rather than an income effect per se.

A couple of subtle technical points should be noted in order to interpret and properly appreciate the value of the results presented in Figure 3A. In M2 we would expect that there will be some degree of correlation between parents' level of education and parental income. Similarly, in M3 there will be some correlation between parental employment histories, parental education and parental income. Such multicollinearity in the explanatory variables can potentially lead to large standard errors for the

coefficients and thus make it more difficult to achieve statistically significant results.[7] However, the confidence intervals around the estimated coefficients for the income variables are only slightly larger for M2 and M3 compared to M1. Thus, our findings of a lack of significant effect in the middle and higher end of the distribution cannot be explained away by increased statistical uncertainty attributable to some degree of multicollinearity in our explanatory variables. Of course, this is in turn an end effect of the very large number of observations in our analysis as well as the fact that we still observe sufficient variation in income within education levels, and vice versa, in our data.

The plot of hazard ratios for serious crimes only, displayed in Figure 3B, gives essentially the same results as for all offences: in M1, there is a gradual decrease in hazard ratios by increasing income. This association is eliminated when controlling for parents' education in M2 except for the case of the two lowest income deciles. Even for the two lowest income decile the association is also greatly reduced in the more elaborate specification in M3. Thus, the relationship between parental income, educational level and children's onset seem to be independent of the seriousness of the offences.

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[7] This is more likely to be a great problem in studies with few observations or with insufficient variation in the data.

**Figure 4.** **Hazard ratios for time to first offence, by parental long-time income deciles and educational level. Parental income measured years old. Different types of offences**

A) Serious Theft

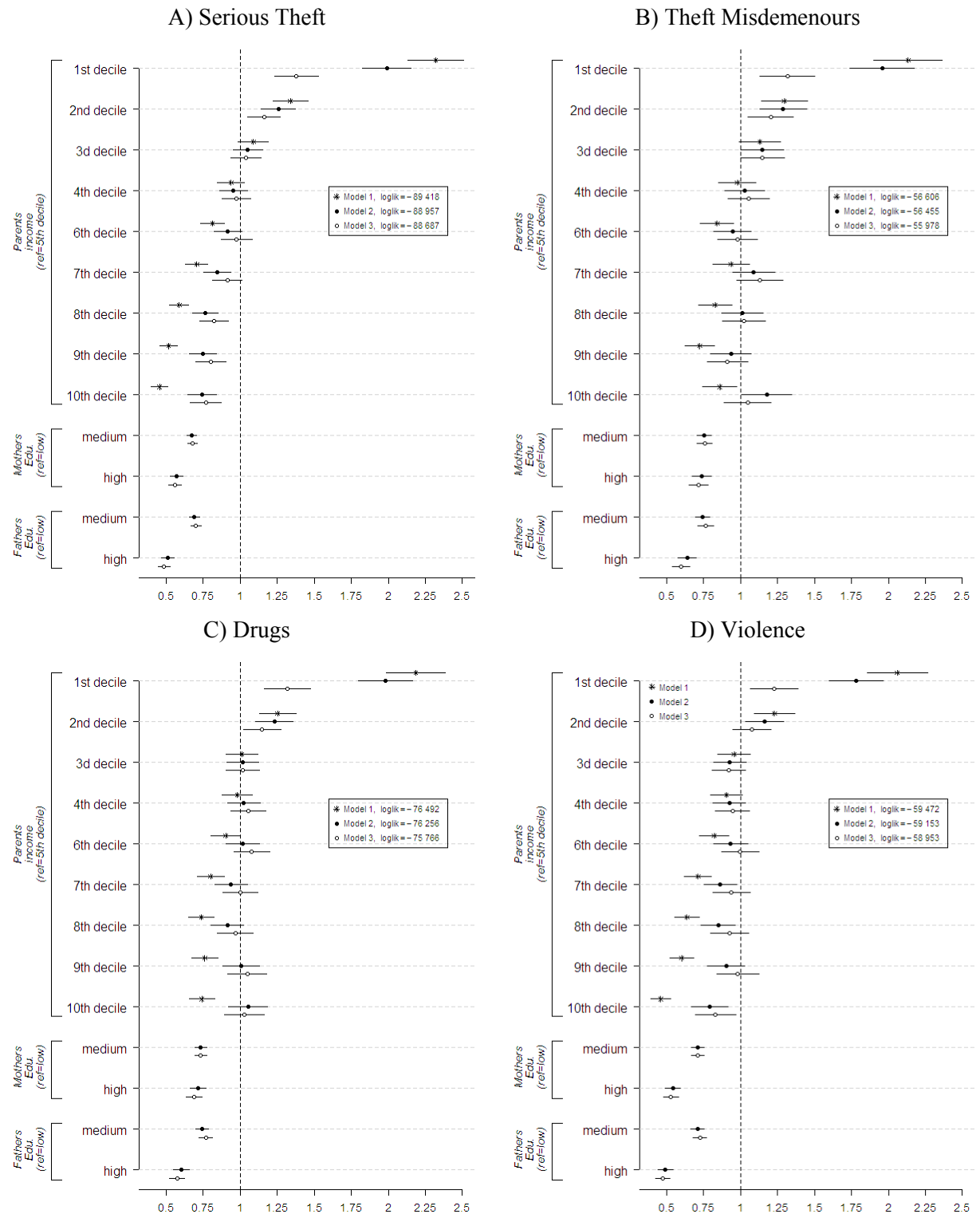B) Theft Misdemenours

C) Drugs

D) Violence

Figure 4 presents the results from analyzes of the four more specific categories of offences. For each offence type, M1 indicates a clear relationship between parental income in childhood and offending throughout the income distribution. For all the crime categories in M2 and M3, parental income in the bottom two income deciles continues to imply higher hazard of onset compared to the middle of the income distribution. Whereas the lack of association between income and crime is also apparent for the middle and higher end of the distribution in M2 and M3 for three of the four crime types, serious theft is a clear exception. For serious theft, parental income at the higher end of the income distribution – starting at the 7th or 8th decile – is also clearly associated with less offending behaviour compared to income at the middle of the income distribution. In other words, a possible effect of income extends both to the lower and upper end of the distribution for serious crime, but not for the other types of offences. There is little difference in hazard ratios between the 3rd to 6th deciles, but the income differences between those deciles are also quite small, see Table A.1 in the Appendix.[8]

Short-term measure of income

So far we have utilized income data over full 10-year period of childhood for our youth cohorts. Bjerk (2007) argued that long-term income is what matters and that the diverging previous results on the association with offending in earlier studies might be because measurement error in short-term measures of income lead to an attenuation bias in estimated coefficients. Hay (2009) also argued that it is more relevant to measure persistent poverty rather than using a short-term definition. To address this issue, we repeat the analysis using parents' income as measured in one year only, when the child is 10 years old.[9] Since measurement error due to a short-term income variable would be expected to result a failure to find an effect of income (Bjerk, 2007), we concentrate here on results for serious theft only, since this is the only type of crime for which we find very convincing income results with a better measure, i.e.this is the kind of crime where the association was strongest in the previous analyses and did not disappear when controlling for confounders. The results are shown in Figure 5. Note that the point estimates for income are not directly comparable to the previous analysis using 10 year income because the distribution and the decile boundaries change somewhat. However, the main pattern is comparable: there is a strong association between parents' income and serious theft, with declining hazard rates towards higher incomes. When controlling for confounders, the fourth through tenth deciles have clearly overlapping confidence intervals; this was not the case in the analyses using long-term income. Considering M1, the change in relative fit between these models was only slight. The

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[8] Note also that we did perform similar estimations with dummy variables for categories of income according to set increments rather than income deciles, but this did nothing to change the main substantive insights of the analysis.

[9] The choice of income at age 10 is motivated by that background variables are often available for the start of an observation period. However, estimation with income from other ages yielded largely the same results as for parental income at age 10.

estimates for parents' educational level are the roughly same as before. Our findings therefore lend some credence to the suggestion that long-term income is a more reliable measure than short-term and that there is some danger of incorrectly claiming that an income effect is non-existent or weak when using short-term income measures. However, we did find in part a similar pattern also when using short-term measures of income. This is in line with the findings of Hay & Forrest (2009).

Figure 5. Hazard ratios for time to first serious theft, by parental income deciles and educational level. Parental income measured at 10 years old
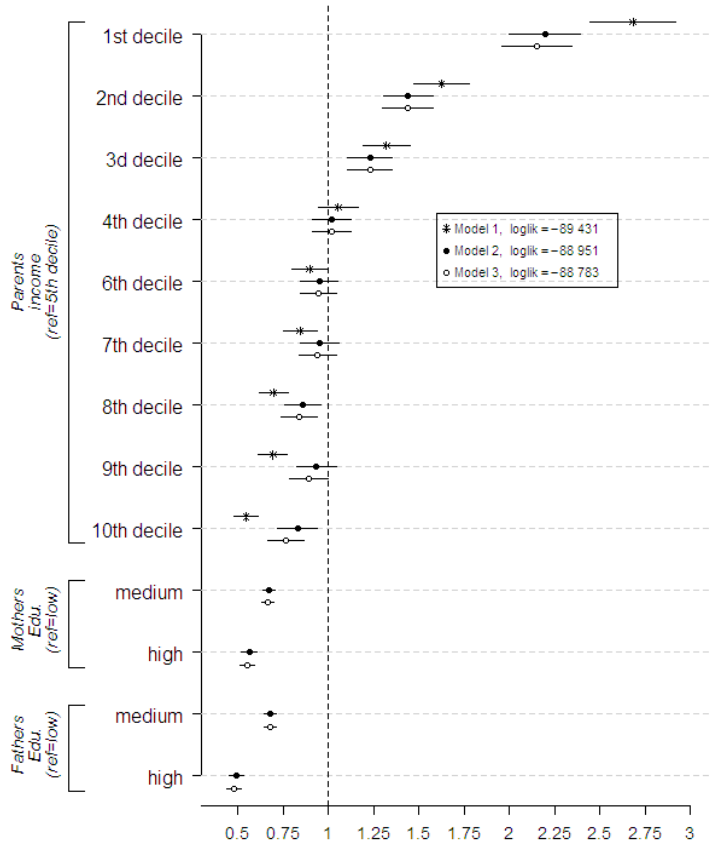
Discussion

Contrary to some previous studies (Tittle & Meier, 1990; Sampson & Laub, 1993; Wright et al., 1999; Dunaway et al., 2000), but in accordance with other studies (Jarjoura et al., 2002; Fergusson et al., 2004; Hay & Forrest, 2009), we found that there is a strong bivariate association between parents' income and children's onset of offending. We found that the hazard of onset decreases with increasing parental income over the *entire* long-term income distribution, although the strongest association is in the lowest deciles. Those findings suggest that there are then important differences along a continuum

that is not limited to the most disadvantaged groups only. Moreover, we observe a similar pattern for all types of offending and for both serious and non-serious crimes, so that this pattern does not seem to be offence-specific or only related to the more serious offences.

However, when controlling for parents' educational level, the association between parental income and children's crime disappears except for in the two lowest income deciles. We can then conclude that family academic resources seem to be more important than monetary resources. However, there remains a strong correlation between low income and crime after controls. Further controls for place of residence and number of years of parental employment did not substantially alter the results for the upper deciles of the income distribution, but did reduce the hazard ratios substantially for those in the two lower deciles. A main reason for persistent low income can itself be lack of employment and it is therefore difficult to conclude that the "effect" of low income is related to income itself or unstable parental employment.

Our findings are consistent with theories emphasizing the importance of opportunity structures (Becker, 1968; Merton, 1968) as well as how economic stress affects family functioning (Conger et al., 1992) as these are not mutually exclusive theories, but we may add some nuances. Several previous studies have primarily focused on family poverty rather than the differences along the entire income distribution (eg Conger et al., 1992; Jarjoura et al., 2002; Fergusson et al., 2004; Hay & Forrest, 2009). The phenomena to be explained is therefore on *gradual* differences rather than restricted to only the most disadvantaged, although our results confirm that the most disadvantaged also remain the most important group. It is notable that our results are similar across all offence types with only one exception: for serious theft, there continues to be a gradual decrease in the hazard for onset more or less throughout the income distribution also after controlling for other confounders. This is interesting as serious theft is the kind of offence that is the most directly related to material gain and thus compatible with theories suggesting that crimes may substitute for lack of legal income (Becker, 1968; Merton, 1968).

An advantage for our study is the measure of long-term average income level in the family, as measures of income taken at only one point in time may be unreliable and induce considerable noise, thus making it difficult to establish statistically significant relationships between income and crime (Bjerk, 2007). We present results for income from just one year for serious theft in order to assess the extent to which our data supports such claims. The relationship between income and involvement in serious theft does appear clearer when we use a long-term income measure rather than a short-term

one. It is important to note here that much of the reason why we are still able to confirm a relationship between crime and income with a "noisy" short-term income measure is related to our very large sample size. In studies with much smaller samples, the added noise induced by a short-term income measure can lead to income parameters not being statistically significant. Thus, our findings confirm the general ideas presented by Bjerk (2007) and are broadly in line with the findings of Hay & Forest (2009), who also find a stronger effect of long-term poverty compared to short-term poverty for crime.

There are of course some limitations to our study. Obviously, the nature of our data prevents us from studying qualitative aspects of the family situation. It is therefore not possible here to assess the more specific mechanisms through which low SES leads to crime. Although this must be left for future research, we have established that this is an important topic that needs to be investigated further. Second, family type may change and children will to a varying degree live in varying household compositions. Divorce is increasingly common and the parents may get a new partner that may – or may not – contribute to the economic resources available to the child. It is unclear both theoretically and empirically whether one should consider a child's SES to change if eg their mother marry a wealthy or highly educated man. We have used data on both mother and father independent on family type and family changes. In most cases, we assume that both parents contribute to the child's welfare – although it is also clear that this may vary in some cases. The measurement of family SES in the new family forms is an important issue for future research.

Our findings may of course be context-specific and, if so, we would expect that the effect of income would be *smaller* in Norway than in eg the US or UK, due to the generous Norwegian welfare system. The context may, however, explain why parental education is more important than income. One possibility is that ones' opportunities are not primarily limited by family monetary sources, as basic rights to education etc. are provided for by the state in Norway. The most adverse living conditions due to purely economic aspects of low family income are thus largely ameliorated through social benefits and other welfare services to the family and children. In this context, parents' academic resources may become more important relative to income by means of success in school and fostering healthy cognitive development. Cross–national studies are needed to answer such questions.

It should be noted that lack of employment, low income, and low educational attainment may also be the result of other (unobserved) negative attributes of the parents which results both in their own poor labour market performance and leads to behavioural difficulties among their offspring. Those who have persistently low income from work tend to be a particularly selected group on many

characteristics including disabilities, somatic and mental health problems, substance abuse, and a range of other characteristics that keeps them out of the labour force. Such characteristics may be the mediators of the effect of low SES on offending, so the search for the actual mechanisms behind the relationship between low income and crime should be sought on both a structural level as well as relative to family functioning.

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Additional tables and full estimation results

Table A.1. Summary of variables related to parental income and employment

	Parents' average annual income (in G)	Years in employment – mother	Years in employment - father
Mean	8.36	6.85	10.2
Std. dev.	3.64	3.93	2.14
Deciles :			
10th	4.48	0	8
20th	5.74	2	10
30th	6.56	4	11
40th	7.28	6	11
50th	7.99	8	11
60th	8.74	9	11
70th	9.61	10	11
80th	10.72	11	11
90th	12.55	11	11

Notes: Parents' average annual income and the number of years of employment are reported for the years from the birth of the child through to the year the child turned 10 years old, a total of 11 years.

We use G to standardize across income years. G is the National Insurance Scheme's basic amount which is regulated by Parliament each year in accordance with wage growth. In 1992, this amount was 36 500 NKr. In 1992, the 10th decile would be 163520 NKr.

Table A.2. Summary Statistics for Covariates

	Number of observations	Percentage
Mother's Education:		
No information available	1069	0,8
Low education	38165	29,9
Secondary education	53743	42,0
Higher education	34827	27,3
Father's Education:		
No information available	2499	1,9
Low education	27424	21,5
Secondary education	63972	50,1
Higher education	33929	26,5
Cohort:		
1982	25804	20,2
1983	25120	19,7
1984	25095	19,6
1985	25487	19,9
1986	29318	20,6
Place of residence:		
Oslo	8426	6,6
Bergen	6093	4,8
Trondheim	3812	3,0
Stavanger	2904	2,3
Østfold (county)	6538	5,1
Akershus (county)	13256	10,4
Hedmark (county)	5295	4,1
Oppland (county)	5172	4,1
Buskerud (county)	6358	5,0
Vestfold (county)	6141	4,8
Telemark (county)	4798	3,8
Aust-Agder (county)	3417	2,7
Vest-Agder (county)	5019	3,9
Rogaland (county excluding Stavanger)	9072	7,1
Hordaland (county excluding Bergen)	7449	5,8
Sogn og Fjordane (county)	3636	2,8
Møre og Romsdal (county)	8097	6,3
Sør-Trøndelag county (excluding Trondheim)	3734	2,9
Nord-Trøndelag (county)	4036	3,2
Nordland (county)	7655	6,0
Troms (county)	4644	3,6
Finnmark (county)	2272	1,8

Table A.3. Full estimation results for all offences (corresponding to figure 3A)

	Model 1		Model 2		Model 3	
	Haz. Ratio	**Std.Err.**	**Haz. Ratio**	**Std.Err.**	**Haz. Ratio**	**Std.Err.**
Income (ref=5th)						
1st decile	1,661	0,035	1,494	0,032	1,183	0,033
2nd decile	1,179	0,027	1,119	0,026	1,057	0,025
3d decile	1,055	0,024	1,020	0,024	1,002	0,024
4th decile	1,007	0,023	1,009	0,024	1,006	0,024
6th decile	0,922	0,022	0,995	0,024	1,021	0,025
7th decile	0,853	0,021	0,964	0,024	1,000	0,025
8th decile	0,775	0,019	0,934	0,024	0,973	0,025
9th decile	0,725	0,018	0,949	0,025	0,987	0,027
10th decile	0,673	0,018	0,967	0,027	0,989	0,029
Cohort (ref=1982)						
1983	0,983	0,015	0,979	0,015	0,981	0,015
1984	0,961	0,016	0,953	0,015	0,954	0,016
1985	0,874	0,015	0,865	0,015	0,862	0,015
1986	0,860	0,016	0,847	0,016	0,846	0,016
Mother's education (ref=low)						
Medium			0,792	0,010	0,790	0,010
High			0,672	0,012	0,661	0,012
Unknown			0,647	0,040	0,684	0,042
Father's education (ref=low)						
Medium			0,791	0,010	0,795	0,010
High			0,600	0,011	0,585	0,011
Unknown			1,213	0,044	0,948	0,041
Number of years mother employed (ref=0)						
1					0,967	0,025
2					1,014	0,028
3					1,025	0,029
4					1,048	0,029
5					1,012	0,028
6					1,003	0,027
7					1,070	0,028
8					0,993	0,026
9					0,964	0,026
10					0,961	0,025
11					0,920	0,020
Number of years father employed (ref=0)						
1					1,028	0,074
2					1,075	0,073
3					0,943	0,061
4					0,969	0,061
5					0,955	0,057
6					0,977	0,055
7					0,914	0,049
8					0,894	0,045
9					0,842	0,041
10					0,804	0,037
11					0,681	0,029
Place of residence (20 dummies not reported)						
Log likelihood	**-393 780**		**-392 778**		**-392 321**	

Table A.4 Full estimation results for serious crimes (corresponding to figure 3B)

	Model 1		Model 2		Model 3	
	Haz. Ratio	**Std.Err.**	**Haz. Ratio**	**Std.Err.**	**Haz. Ratio**	**Std.Err.**
Income (ref=5th)						
1st decile	1,929	0,054	1,705	0,049	1,211	0,045
2nd decile	1,201	0,037	1,145	0,036	1,059	0,035
3d decile	1,033	0,033	1,008	0,033	0,988	0,033
4th decile	0,940	0,031	0,956	0,032	0,964	0,032
6th decile	0,840	0,028	0,931	0,032	0,973	0,034
7th decile	0,771	0,027	0,898	0,031	0,949	0,034
8th decile	0,688	0,025	0,859	0,031	0,904	0,034
9th decile	0,675	0,024	0,919	0,034	0,960	0,037
10th decile	0,615	0,023	0,920	0,036	0,923	0,038
Cohort (ref=1982)						
1983	0,963	0,021	0,957	0,021	0,960	0,021
1984	0,928	0,021	0,919	0,021	0,920	0,021
1985	0,817	0,020	0,808	0,019	0,802	0,019
1986	0,778	0,020	0,764	0,019	0,762	0,019
Mother's education (ref=low)						
Medium			0,733	0,013	0,732	0,013
High			0,649	0,016	0,634	0,015
Unknown			0,673	0,052	0,730	0,056
Father's education (ref=low)						
Medium			0,732	0,013	0,745	0,013
High			0,559	0,015	0,538	0,014
Unknown			1,370	0,062	0,946	0,051
Number of years mother employed (ref=0)						
1					0,951	0,033
2					0,974	0,037
3					0,995	0,037
4					1,017	0,038
5					0,990	0,037
6					0,961	0,036
7					0,996	0,036
8					0,946	0,034
9					0,893	0,033
10					0,877	0,031
11					0,852	0,026
Number of years father employed (ref=0)						
1					1,048	0,091
2					1,073	0,088
3					0,956	0,075
4					0,979	0,075
5					0,935	0,069
6					0,943	0,065
7					0,822	0,056
8					0,865	0,054
9					0,777	0,047
10					0,716	0,041
11					0,581	0,031
Place of residence (20 dummies not reported)						
Log likelihood	**-207 010**		**-206 279**		**-205 783**	

Table A.5 Full estimation results for serious theft (corresponding to figure 4A)

	Model 1		Model 2		Model 3	
	Haz. Ratio	**Std.Err.**	**Haz. Ratio**	**Std.Err.**	**Haz. Ratio**	**Std.Err.**
Income (ref=5th)						
1st decile	2,319	0,096	1,989	0,084	1,379	0,075
2nd decile	1,339	0,061	1,257	0,059	1,160	0,057
3d decile	1,088	0,052	1,052	0,051	1,037	0,052
4th decile	0,937	0,047	0,954	0,048	0,975	0,050
6th decile	0,812	0,042	0,915	0,048	0,976	0,052
7th decile	0,705	0,038	0,844	0,047	0,912	0,052
8th decile	0,587	0,034	0,764	0,045	0,824	0,050
9th decile	0,516	0,031	0,747	0,046	0,801	0,052
10th decile	0,456	0,029	0,742	0,049	0,769	0,053
Cohort (ref=1982)						
1983	0,938	0,031	0,930	0,030	0,931	0,030
1984	0,894	0,030	0,883	0,030	0,882	0,030
1985	0,773	0,028	0,763	0,027	0,755	0,027
1986	0,668	0,026	0,655	0,025	0,649	0,025
Mother's education (ref=low)						
Medium			0,673	0,017	0,677	0,017
High			0,572	0,022	0,561	0,022
Unknown			0,653	0,072	0,711	0,078
Father's education (ref=low)						
Medium			0,691	0,018	0,701	0,018
High			0,510	0,022	0,486	0,021
Unknown			1,347	0,087	0,864	0,066
Number of years mother employed (ref=0)						
1					0,915	0,045
2					0,919	0,050
3					1,006	0,053
4					0,923	0,050
5					0,874	0,048
6					0,874	0,048
7					0,896	0,048
8					0,821	0,046
9					0,821	0,045
10					0,821	0,045
11					0,787	0,036
Number of years father employed (ref=0)						
1					0,910	0,107
2					0,959	0,106
3					0,857	0,092
4					0,975	0,098
5					0,746	0,077
6					0,781	0,075
7					0,691	0,065
8					0,723	0,063
9					0,660	0,056
10					0,626	0,049
11					0,509	0,037
Place of residence (20 dummies not reported)						
Log likelihood	**-89 418**		**-88 957**		**-88 688**	

Table A.6 Full estimation results for theft misdemeanours (corresponding to figure 4B)

	Model 1		Model 2		Model 3	
	Haz. Ratio	**Std.Err.**	**Haz. Ratio**	**Std.Err.**	**Haz. Ratio**	**Std.Err.**
Income (ref=5th)						
1st decile	2,133	0,118	1,958	0,111	1,317	0,095
2nd decile	1,296	0,079	1,289	0,080	1,203	0,079
3d decile	1,130	0,071	1,147	0,073	1,148	0,076
4th decile	0,977	0,064	1,028	0,068	1,057	0,071
6th decile	0,840	0,057	0,944	0,065	0,978	0,069
7th decile	0,936	0,062	1,089	0,074	1,129	0,079
8th decile	0,828	0,057	1,011	0,071	1,021	0,075
9th decile	0,723	0,052	0,934	0,069	0,911	0,070
10th decile	0,858	0,059	1,176	0,086	1,047	0,081
Cohort (ref=1982)						
1983	0,937	0,039	0,930	0,039	0,931	0,039
1984	0,868	0,038	0,860	0,037	0,858	0,037
1985	0,779	0,036	0,771	0,035	0,759	0,035
1986	0,783	0,037	0,770	0,036	0,762	0,036
Mother's education (ref=low)						
Medium			0,753	0,025	0,757	0,025
High			0,738	0,033	0,714	0,033
Unknown			0,527	0,083	0,562	0,088
Father's education (ref=low)						
Medium			0,742	0,026	0,763	0,027
High			0,638	0,032	0,597	0,030
Unknown			1,643	0,134	1,053	0,102
Number of years mother employed (ref=0)						
1					0,938	0,060
2					0,915	0,065
3					0,989	0,069
4					0,819	0,061
5					0,861	0,062
6					0,853	0,061
7					0,934	0,064
8					0,809	0,058
9					0,855	0,059
10					0,835	0,057
11					0,797	0,046
Number of years father employed (ref=0)						
1					1,300	0,192
2					1,106	0,164
3					1,076	0,150
4					1,084	0,148
5					0,938	0,128
6					0,865	0,114
7					0,933	0,115
8					0,925	0,106
9					0,696	0,081
10					0,743	0,079
11					0,591	0,058
Place of residence (20 dummies not reported)						
Log likelihood	**-56 606**		**-56 455**		**-55 978**	

Table A.7 Full estimation results for drug crimes (corresponding to figure 4C)

	Model 1		Model 2		Model 3	
	Haz. Ratio	**Std.Err.**	**Haz. Ratio**	**Std.Err.**	**Haz. Ratio**	**Std.Err.**
Income (ref=5th)						
1st decile	2,185	0,101	1,980	0,094	1,317	0,079
2nd decile	1,253	0,064	1,231	0,064	1,148	0,063
3d decile	1,011	0,055	1,016	0,056	1,017	0,057
4th decile	0,979	0,053	1,023	0,057	1,054	0,059
6th decile	0,902	0,050	1,015	0,058	1,078	0,063
7th decile	0,799	0,047	0,938	0,056	1,000	0,061
8th decile	0,737	0,044	0,913	0,056	0,966	0,061
9th decile	0,759	0,045	1,006	0,062	1,047	0,068
10th decile	0,741	0,045	1,052	0,068	1,028	0,070
Cohort (ref=1982)						
1983	0,912	0,030	0,906	0,030	0,907	0,030
1984	0,797	0,028	0,790	0,028	0,788	0,028
1985	0,623	0,026	0,616	0,025	0,608	0,025
1986	0,578	0,028	0,567	0,027	0,563	0,027
Mother's education (ref=low)						
Medium			0,732	0,021	0,732	0,021
High			0,716	0,028	0,689	0,027
Unknown			0,536	0,070	0,595	0,077
Father's education (ref=low)						
Medium			0,743	0,022	0,767	0,023
High			0,602	0,026	0,573	0,025
Unknown			1,613	0,112	0,982	0,082
Number of years mother employed (ref=0)						
1					0,952	0,054
2					1,001	0,061
3					0,958	0,059
4					1,003	0,061
5					0,999	0,060
6					1,012	0,060
7					1,024	0,060
8					0,922	0,055
9					0,967	0,057
10					0,865	0,052
11					0,847	0,042
Number of years father employed (ref=0)						
1					1,084	0,140
2					0,970	0,124
3					0,986	0,115
4					0,829	0,100
5					0,934	0,104
6					0,871	0,093
7					0,805	0,083
8					0,827	0,079
9					0,692	0,066
10					0,653	0,058
11					0,485	0,040
Place of residence **(20 dummies not reported)**						
Log likelihood	**-76 492**		**-76 256**		**-75 766**	

Table A.8 Full estimation results for violence (corresponding to figure 4D)

	Model 1		Model 2		Model 3	
	Haz. Ratio	**Std.Err.**	**Haz. Ratio**	**Std.Err.**	**Haz. Ratio**	**Std.Err.**
Income (ref=5th)						
1st decile	2,061	0,105	1,782	0,093	1,226	0,082
2nd decile	1,229	0,069	1,161	0,066	1,076	0,065
3d decile	0,956	0,057	0,928	0,056	0,920	0,057
4th decile	0,904	0,055	0,924	0,057	0,946	0,059
6th decile	0,821	0,051	0,932	0,059	0,998	0,064
7th decile	0,712	0,047	0,863	0,057	0,939	0,064
8th decile	0,637	0,043	0,849	0,059	0,924	0,066
9th decile	0,600	0,041	0,901	0,065	0,982	0,073
10th decile	0,459	0,035	0,791	0,063	0,831	0,069
Cohort (ref=1982)						
1983	0,982	0,039	0,974	0,039	0,975	0,039
1984	0,934	0,039	0,924	0,039	0,924	0,039
1985	0,852	0,038	0,842	0,038	0,833	0,037
1986	0,761	0,037	0,746	0,037	0,744	0,036
Mother's education (ref=low)						
Medium			0,708	0,022	0,711	0,022
High			0,542	0,026	0,529	0,025
Unknown			0,633	0,088	0,707	0,097
Father's education (ref=low)						
Medium			0,708	0,023	0,725	0,024
High			0,490	0,026	0,471	0,025
Unknown			1,401	0,110	0,885	0,084
Number of years mother employed (ref=0)						
1					1,024	0,063
2					0,923	0,064
3					1,015	0,069
4					0,968	0,067
5					0,966	0,066
6					1,008	0,067
7					0,959	0,064
8					0,983	0,065
9					0,937	0,062
10					0,867	0,058
11					0,796	0,045
Number of years father employed (ref=0)						
1					1,129	0,158
2					0,899	0,129
3					0,824	0,113
4					0,893	0,116
5					0,751	0,098
6					0,799	0,097
7					0,733	0,086
8					0,729	0,079
9					0,710	0,074
10					0,653	0,064
11					0,493	0,045
Place of residence (20 dummies not reported)						
Log likelihood	**-59 472**		**-59 153**		**-58 953**	

Table A.9. Full estimation results for serious theft, one-year measure of income (corresponding to figure 5)

	Model 1		Model 2		Model 3	
	Haz. Ratio	Std.Err.	Haz. Ratio	Std.Err.	Haz. Ratio	Std.Err.
Income (ref=5th)						
1st decile	2,681	0,120	2,196	0,101	2,151	0,099
2nd decile	1,624	0,079	1,439	0,070	1,437	0,070
3d decile	1,319	0,067	1,229	0,062	1,228	0,062
4th decile	1,054	0,056	1,015	0,054	1,016	0,054
6th decile	0,896	0,050	0,948	0,053	0,944	0,052
7th decile	0,842	0,048	0,953	0,054	0,940	0,053
8th decile	0,696	0,042	0,858	0,052	0,837	0,050
9th decile	0,693	0,041	0,933	0,057	0,891	0,054
10th decile	0,544	0,035	0,828	0,055	0,762	0,051
Cohort (ref=1982)						
1983	0,925	0,030	0,921	0,030	0,924	0,030
1984	0,883	0,030	0,879	0,030	0,880	0,030
1985	0,763	0,027	0,758	0,027	0,757	0,027
1986	0,661	0,026	0,655	0,025	0,653	0,025
Mother's education (ref=low)						
Medium			0,667	0,017	0,666	0,017
High			0,561	0,021	0,550	0,021
Unknown			0,750	0,082	0,734	0,080
Father's education (ref=low)						
Medium			0,678	0,018	0,679	0,018
High			0,492	0,021	0,477	0,020
Unknown			0,987	0,062	0,930	0,059
Place of residence						
(20 dummies not reported)						
Log likelihood	**-89 431**		**-88 951**		**-88 783**	