
Like Godfather, Like Son

Exploring the Intergenerational Nature of Crime

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ABSTRACT

Sons (daughters) with criminal fathers have 2.06 (2.66) times higher odds of having a criminal conviction than those with noncriminal fathers. One additional paternal sentence increases sons' (daughters') convictions by 32 (53) percent. Compared to traditional labor market measures, the intergenerational transmission of crime is lower than that for high school completion but higher than that for poverty. At the intensive margin, the intergenerational crime relationship is as strong as those for earnings and years of schooling. Parental human capital and parental behaviors can account for 60–80 percent of the intergenerational crime relationship. Paternal role-modeling also matters.

I. Introduction

Crime runs in the family. Though this statement may elicit thoughts of the stereotypes depicted in movies like *The Godfather* and television series like

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[Submitted March 2010; accepted May 2011]

ISSN 022-166X E-ISSN 1548-8004 © 2012 by the Board of Regents of the University of Wisconsin System

The Sopranos, this stylized fact actually has a long history in criminology.^{1,2} The key findings from this literature are that family background (in general) and parental criminality (in particular) are among the strongest predictors of an individual's criminal activity, stronger even than own income or employment status. These important findings imply that if we want to fully understand the etiology of crime, we need to have a clear understanding of the familial nature of crime.

Having a clear understanding of the role of the family in determining crime and the mechanisms that underlie this familial relationship can also help identify the potential effects of various policies on criminal behavior. For instance, if the parent-offspring correlation in crime is simply due to the existence of some common external factor, such as poverty, then policies aimed at reducing poverty may also reduce crime. But, if the observed intergenerational relationship is produced by a behavioral model, such as a role-model hypothesis in which children directly observe and model their parents' behavior, then policies that appear to be successful at reducing crime today may reduce crime even further in the future. Furthermore, if the parent-offspring correlation in crime is due to the direct transfer of criminal behavior, then incarcerating parents could potentially lower crime rates among children by removing bad role models and by forcing children to update their beliefs about the consequences of criminal behavior and the likelihood of getting caught. On the other hand, incarcerating parents could increase crime rates among children by breaking up families and destabilizing home environments, by pushing children into poverty, or by preventing the necessary transfer of productive human capital from one generation to the next.

In addition, studying the intergenerational crime relationship is a natural extension of the intergenerational mobility literature. Economists have extensively studied intergenerational correlations in traditional labor market outcomes, such as earnings and educational attainment, because we think that they tell us something important about the society that we live in. To what extent does society promote efficiency and equality of opportunity? Studying the intergenerational transmission of dis-

1. See Rowe and Farrington (1997) and the historical references therein.

2. The modern literature dates back to the seminal work of Glueck and Glueck (1950), who find that 66 percent of delinquent boys had a criminal father compared to 32 percent of nondelinquents in a sample of boys raised in Boston, Massachusetts. Additional evidence of an intergenerational criminal relationship has been found across multiple data sets, cities and countries. Several British studies, including Ferguson (1952), Wilson (1987), and Farrington and West (1990), also find that an individual's criminality is related to that of his family members. See Gregory (2004) for a review of these and other British studies. Using data from the Stockholm Birth Cohort Study (SBC), Janson (1982) finds that 9.8 percent of boys with noncriminal fathers are delinquent compared to 19.9 percent of those with criminal fathers. This positive correlation exists even within different social classes. Murray, Janson, and Farrington (2007) also use the SBC data and find that parental incarceration has no effect on children's offending, over and above parental criminality. Other recent studies include Farrington, Coid, and Murray (2009) who use data from the Cambridge Study in Delinquent Development and Van de Rakt, Nieuwebeerta, and Apel (2009) who use register data from the Netherlands; both were recently published in a special issue of the *Journal of Criminal Behavior and Mental Health* concerning the intergenerational transmission of antisocial behavior. Findings from the Rochester Youth Development Study and the Pittsburgh Youth Study are reviewed in Thornberry (2009) and Thornberry et al. (2003), respectively. See Van de Rakt, Nieuwebeerta, and de Graaf (2008) for a brief review.

advantage in terms of poverty, welfare dependency, and crime speaks directly to these questions.

Despite these arguments, both the economics of crime literature and the intergenerational mobility literature have, as a rule, largely ignored the relationship between an individual's own criminality and that of his parents.³ One notable exception is Duncan et al. (2005), who report intergenerational correlations between mothers and their children for 17 behaviors and attitudes (both good and bad) measured during adolescence using the 1979 National Longitudinal Survey of Youth (NLSY79). They find striking support for the hypothesis that "likes beget likes" and, with regards to criminality, that daughters whose mothers were ever convicted are more than five times as likely to have juvenile crime convictions themselves.⁴ They also present some indirect evidence in support of both genetics and the role-model hypothesis as mechanisms underlying the intergenerational relationship. However, Duncan et al.'s (2005) work is limited in the scope with which it can study intergenerational criminality, since the NLSY79 does not include data on adult criminality, crime type, or sentence type. Furthermore, the NLSY79 only includes data on maternal criminality, which may be an important limitation given that men account for the lion's share of arrests and criminal convictions.

Our paper improves upon the existing literature by providing a thorough descriptive analysis of the intergenerational criminal relationship using data from the Stockholm Birth Cohort Study. This data set contains administrative crime records for a cohort of more than 15,000 individuals born in 1953 (and residing in Stockholm in 1963) and their fathers. These data are particularly suited to our purposes, since they also include important information concerning individual, family and neighborhood characteristics. In addition, our register-based crime data provide a nice complement to the past use of survey data (for example, Duncan et al. 2005), given concerns about misreporting illegal behavior.^{5,6}

3. Rather, when studying the determinants of crime, economists tend to emphasize those factors illuminated in Becker's (1968) economic model of crime, for example the probability and severity of punishment as well as the returns to legitimate employment.

4. Other exceptions include Case and Katz (1991), Williams and Sickles (2002), and Hjalmarsson and Lindquist (2010). Using data from the Boston Inner City Youth Survey, Case and Katz (1991) find that children with a family member in jail are 8 percentage points more likely to report committing a crime in the last year. Using the 1958 Philadelphia Birth Cohort Study, Williams and Sickles (2002) find that 15 percent of criminals report having a father who was arrested during the respondent's childhood while just 6 percent of noncriminals report that their father was arrested. Using data from the Stockholm Birth Cohort Study, Hjalmarsson and Lindquist (2010) find that the proportion of sons with a record of drunk driving is 2.3 times larger for sons whose fathers have a conviction for drunk driving than for sons whose fathers have not been convicted. For daughters, the proportion is 7.8 times larger.

5. Kling, Ludwig, and Katz (2005) report large differences between survey and administrative data concerning arrests. These differences bias their regression results using the survey data toward zero—making them insignificant, which demonstrates the potential importance of having access to administrative crime data.

6. The data limitations mentioned here are not specific to the NLSY79 alone. Most previous studies of intergenerational associations in crime have limitations due to small sample sizes, unrepresentative samples, and/or self-reported crime data. Furthermore, these data sets tend to lack information concerning adult criminality and focus mainly on boys. On the other hand, the few European studies that have access to large samples using criminal register data lack the information concerning individual, family and neighborhood characteristics necessary to explore the mechanisms driving familial similarities in criminal behavior. See Van de Rakt, Nieuwebeerta, and de Graaf (2008) for a discussion of the strengths and weaknesses of the available data sets.

The first stage of our empirical analysis documents the existence of a significant intergenerational criminal relationship between fathers and their children. At the extensive margin, sons whose fathers have at least one sentence have 2.06 times higher odds of having at least one criminal conviction than sons whose fathers do not have any sentence. At the intensive margin, each additional sentence of the father increases the expected number of sons' convictions by 32 percent. In addition, the father-daughter intergenerational relationships are generally just as strong as, or stronger than, those for sons. We also find that the magnitudes of these relationships are fairly robust across the types of crimes committed by the cohort member and the types of sentences of the father; that is, the baseline intergenerational relationships do not appear to be driven by, for instance, particularly violent criminals or fathers with particularly harsh sentences, for example, incarceration.

A comparison of our main results with those from the more traditional literature on intergenerational associations in education and earnings demonstrates that the father-offspring association in crime is weaker at the extensive margin than the father-offspring association in high school and college completion. But it is stronger than the father-offspring association in poverty. At the intensive margin, the father-son association is just as strong as those for log earnings and years of schooling, while the father-daughter intensive margin associations are stronger.

The second stage of our empirical analysis estimates the above regressions separately for sons and daughters and adds a large set of controls to proxy for the various transmission mechanisms highlighted in our theoretical discussion. When the full set of controls is included, we find that our regression approach can account for most, but not all, of the father-offspring association in crime. At the extensive margin for both sons and daughters, and at the intensive margin for daughters, 60–80 percent of the father-child crime correlation can be accounted for by our measures of parental human capital and parental behaviors.

There are several candidate explanations for the remaining father-child crime relationship. One possibility is that our controls are imperfect proxies for the underlying mechanisms, as our extensive set of controls is clearly not exhaustive. Alternatively, the remaining father-child relationship may be attributed to mechanisms that appear in our theoretical discussion, but for which we have no proxies: the direct transference of criminal capital or role-modeling. To explore this possibility, we conduct two additional empirical exercises. The first focuses on the timing of the father's crime, while the second examines the quality of the father-child relationship. The results from these two exercises provide indirect evidence that is consistent with role-modeling playing a role in the reproduction of crime from one generation to the next; however, the findings are also consistent with other potential explanations.

The remainder of this paper is structured as follows. Section II presents a brief theoretical discussion. Section III describes the data set and presents summary statistics. Section IV presents our estimates of the intergenerational criminal relationship and compares these estimates to those for the legitimate labor market. Section V explores the mechanisms underlying this relationship. Finally, we summarize our results and discuss their generalizability and policy implications in Section VI.

II. Theory

When researchers measure intergenerational associations in criminal behavior, they commonly estimate an equation of the following form:

$$(1) \quad Crime_{child} = \alpha + \beta Crime_{father} + \epsilon_{child},$$

where $Crime_{child}$ and $Crime_{father}$ are some measures of criminal activity, ϵ_{child} is a residual, and β measures the strength of the intergenerational association. Although empirical researchers typically make no claims regarding the causality of this relationship, it is useful to consider what transmission mechanisms β actually represents.

In the Becker and Tomes (1979) model, fathers transmit human capital to their children through genetics and by making conscious investments in their children's human capital. Fathers can also transmit human capital to their children through the power of example, by instilling norms, and by providing access to high-quality social and professional networks and positive neighborhood environments.⁷ Father-child correlations in productive human capital can, in turn, produce correlations in criminal behavior, due to the negative relationship between human capital and crime (Lochner 2004, 2010).⁸

The Becker and Tomes (1979) model stresses the importance of the investment decisions of parents. The quality of such decisions and the efficacy of these investments, however, may be determined in part by "good" parenting practices (Mayer 1997; Duncan et al. 2005; Akee et al. 2010; Björklund, Lindahl, and Lindquist 2010) or by family culture and norms (Becker and Tomes 1979; Yeung, Duncan, and Hill 2000; Mason 2007; Björklund, Lindahl, and Lindquist 2010). We should, therefore, include parenting practices and family culture in our list of potential mechanisms that affect the degree of transmission of important characteristics across generations. In our setting, it may be particularly important to allow for the possibility that negative behaviors, such as alcohol or drug abuse, may be transmitted from one generation to the next due to parental instability, poor parenting practices, or "destructive" family cultures.

If father-child correlations in criminal behavior were solely driven by correlations in productive human capital and negative parental behaviors, then controlling for these factors would fully explain β . However, it is likely that fathers transmit a part of their criminal human capital as well. Children may, for example, be introduced

7. Evidence concerning the importance of neighborhoods is provided by Ludwig, Duncan, and Hirschfield's (2001) and Kling, Ludwig, and Katz's (2005) analyses of the Moving to Opportunity experiment. For instance, the latter finds that, relative to control groups, the offer to relocate to lower-poverty areas reduces arrests among female youths for violent and property crimes and arrests among male youths for violent crimes, though an increase in property crime and other problem behaviors was also observed for males.

8. Using adoption data with information on criminal convictions of all four parents of adopted children, Hjalmarsson and Lindquist (2011) demonstrate that intergenerational associations in crime are due to both prebirth factors (genetics, pre- and perinatal environment) and to postbirth, environmental factors. Meghir, Palme, and Schnabel (2011) demonstrate that parental education has a significant negative impact on children's crime. In related work, Carneiro, Meghir, and Patey (2010) report a negative causal effect of maternal education on children's antisocial behavior and crime. Akee et al. (2010) demonstrate that parental income has a causal impact that lowers the probability of minor offences among children and lowers the likelihood that a child self-reports that he/she has sold drugs.

to their father's network for obtaining and selling drugs or they may learn from their father how to steal a car.⁹ Criminal parents may also act as criminal role models and pass on antisocial norms and behaviors to their children (Duncan et al. 2005).¹⁰

Given the unique nature of our data, we will be able to control for numerous measures of parental human capital, parental behaviors, and parenting styles, as well as for children's (partially inherited) cognitive and noncognitive abilities. Once these are controlled for, the important question remains as to whether or not fathers' criminality has a direct impact on the criminal behavior of their children.

III. Data

Our data come from the Stockholm Birth Cohort Study, which was created in 2004/2005 by means of a probability matching of two previously existing longitudinal data sets.¹¹ The first is the Stockholm Metropolitan Study, which consists of all children born in 1953 who were living in the Stockholm metropolitan area on November 1, 1963. The second is The Swedish Work and Mortality Database. The work in this paper is based solely on data from the original Stockholm Metropolitan Study, which consists of 15,117 individuals: 7,719 men and 7,398 women. Our data cover the entire birth cohort and are in no way affected by the matching procedure used to create the Stockholm Birth Cohort Study.

The most important feature of the Stockholm Metropolitan data is that they contain crime records of both the birth cohort and their fathers.¹² The birth cohort crime records come from two complementary data sources—the child welfare committees (CWC) and the national police register. The CWC data capture whether a cohort member has a record of juvenile delinquency in the greater Stockholm area between the ages of seven and 19, while the police register captures criminal activity (convictions and sentences) nationwide committed by our sample between ages 13 and

9. Evidence of the transference of crime specific capital has recently been found for juvenile peer groups incarcerated in the same facilities (Bayer, Hjalmarsson, and Pozen 2009). See also Fox Butterfield's (2002) article in the *New York Times* entitled, "Father Steals Best: Crime in an American Family."

10. Social learning theory posits that individuals learn to engage in crimes through their associations with others, such as peers, classmates, neighbors, and families. Parents, in particular, can serve as role models for their children. They can teach their children (either explicitly or by example) beliefs that are favorable to crime, instead of teaching them that crime is wrong. Social learning is the predominant theory used to explain, for example, the intergenerational transmission of intimate partner violence (Hines and Saudino 2002).

11. Carl-Gunnar Janson and Sten-Åke Stenberg managed and provided the original cohort data, Denny Vågerö organized the followup data and Reidar Österman managed the probability matching of the two data sets. Preparing data from the Stockholm Birth Cohort Study is an ongoing collaborative effort by the Swedish Institute for Social Research and by Centre for Health Equity Studies, partly financed by the Swedish Research Council. For a complete description of the project and data set, see Stenberg and Vågerö (2006) and Stenberg et al. (2007). Codebooks describing all of the data are available at <http://www.stockholmbirthcohort.su.se/>.

12. In the original Stockholm Metropolitan Study, fathers were identified using three sources: (1) the 1964 national register of population and income, (2) information from the parish register's office from 1953, and (3) interviews with the cohort members' mothers. The primary goal was to collect information on "rearing" or "social" fathers; hence, fathers may be biological-, adoptive-, or stepfathers.

31. Because both data sets have strengths and weaknesses, we use both in the analysis rather than focusing on a single source of cohort member crime data. Specifically, while the CWC data allow us to study juvenile criminal acts (not all of which would be serious enough to end up in the police register), one can only look at the extensive margin in the CWC data and offenses committed outside of the Stockholm metropolitan area are not observed. In contrast, the police register data are national and allow us to consider the intensive margin (that is, number of convictions or sentences), but has limited juvenile data, since many juveniles were not formally charged and convicted. Table 1 presents a list of variables that we create from these two sources of data and summary statistics for male and female cohort members.

The CWC data were obtained from social registers held by each municipality in the greater Stockholm metropolitan area. These data identify whether a cohort member committed a delinquent act that resulted in an intervention by the CWC between the ages of seven and 19 as well as the type of behavior: stealing, violent crimes, alcohol abuse or narcotics, and other offenses. We create dummy variables indicating whether the cohort member has a record in each of the four crime categories, as well as a variable indicating whether he or she has any record in the CWC data. These are presented in Panel A of Table 1. Delinquent behavior is much more prevalent among males than females, as just 6 percent of females have any record in the CWC data compared to 20 percent of males. For both males (16 percent) and females (4 percent), stealing is the most common delinquent behavior.

Because social registers outside of the Stockholm metropolitan area were not searched, cohort members cannot appear in the CWC register until they have moved into the area and disappear from the register upon leaving the municipality. Of the 15,117 cohort members, 1,373 boys and 1,353 girls (that is, 18 percent of the birth cohort) were not born in the area, but rather moved into the area some time before November 1, 1963 (that is, before age 10). Also, by November 1, 1970, 503 boys and 444 girls (that is, 6 percent of the birth cohort) had left the area. For these individuals, data from the CWC are censored.¹³

The national police register is not censored and contains records of offenses that lead to an official report to the CWC or to a conviction. These crime data are divided into seven crime categories including violent crime (crimes against persons), stealing, fraud, vandalism, traffic crimes (that lead to a court conviction, for example, driving without a license or under the influence of alcohol), narcotic crimes, and other crimes. For each year from 1966 to the first half of 1984 (that is, when the cohort members are aged 13 through 31), we know the number of offenses in each

13. The 947 individuals who are not living in the Stockholm area on November 1, 1970 were previously identified according to the "project address book." However, this address book has since been de-identified, that is personal identification numbers have been removed, and a record of these movers has not been maintained. Thus, the best we can do to identify the movers is to consider those not living in the Stockholm area according to the 1970 census, which is conducted throughout the year (that is, not just in November). We identify 859 individuals (461 males and 398 females) who have left Stockholm. These individuals, however, are not systematically different than those who stayed in terms of their crime records in the national police register (at both the extensive and intensive margins) and the father's records. As expected, however, they do have, on average, significantly fewer CWC records.

crime category as well as the sentence that was received; the 1966 data are a summary of all reported crimes reported up to and including 1966.

For each crime category (and overall), we create two variables. The first measures the extensive margin, that is, whether the cohort member has *any* record of the offense in the police register. The second measures the number of such offenses or the intensive margin. These are displayed in Panels B and C of Table 1, respectively. Again, males are much more criminal (33 percent of males versus 7 percent of females have a record in the police register) and theft is the most prevalent crime category;¹⁴ 19 percent of males and 4 percent of females have committed a theft. The average number of crimes committed by males in the sample is 3.4 while the female average is 0.40.

Finally, we create extensive and intensive margin variables that describe the sentences recorded in the police register for each cohort member. For each conviction, we have information on the two most serious sentences. We create three sentencing categories—prison, probation, and treatment—that correspond to the sentencing data available for the father, as described below.¹⁵ Summary statistics for these variables are presented in Panel D of Table 1. 6 percent of males and less than 1 percent of females have at least one prison sentence; 25 and 5 percent of males and females, respectively, have a probation sentence. Finally, 2 percent of males and less than 1 percent of females are sentenced to treatment.

The Stockholm Metropolitan study also collected criminal records for the father from the police register, though no criminal records were collected for mothers.¹⁶ Specifically, we can identify the number of times that the father appears in the national police register and his sentence for three time periods: pre-1953 (before the birth of the cohort member), 1953–59 (until the cohort member is six), and 1959–72 (until the cohort member is 19). Possible sentences are probation (which includes a fine), imprisonment, and exemption from punishment due to psychiatric care or alcohol treatment. Though we cannot identify the types of crimes associated with each of the fathers' sentences, we do know whether the father was charged with

14. The Cambridge Study in Delinquent Development follows a sample of London boys also born in 1953. Using this data, Farrington and Wikström (1994) show that by age 25, 32.1 percent of the Stockholm birth cohort boys and 32.6 percent of the London boys had criminal records. Tillman (1987) reports that 33 percent of all men born in 1956 and living in California at the time of his study had been arrested at least once between the ages of 18 and 30. Wolfgang, Figlio, and Sellin (1972) report that 35 percent of all Philadelphia men born in 1945 had been arrested by the age of 18. For Denmark, Damm, and Dustmann (2007) report that 31 percent of their postreform, male refugees have been convicted of a crime by age 21. Anna Piil Damm was also kind enough to calculate for us that 25 percent of all Danish men have a criminal record by age 30.

15. A prison sentence for the cohort member can include both juvenile and adult incarceration. Any sentence with a probationary component is included in the probation category. We also include fines as well as sentences for which there is no registered sanction (these may include waivers of prosecution, probation, or a fine) in the probation category. The treatment category includes sentences for psychiatric care as well as drug and alcohol treatment.

16. The data on fathers' criminality were extracted from the 1973 official police register and matched to individuals by using their national registration numbers. The process used to identify father's registration numbers resulted in one boy and three girls having two fathers with criminal records; in these cases, the criminal records of both fathers were summed together. However, 122 fathers (0.8 percent), distributed equally between cohort boys and girls, could not be identified in this manner.

Table 1
Descriptive Statistics of Crime Variables

Variable	Definition	Males (n = 7,719)		Females (n = 7,398)	
		Mean	Standard Deviation	Mean	Standard Deviation
Panel A: Cohort Member Juvenile Delinquency Variables					
Source: Child Welfare Committees—Social Register					
<i>Crime_juvenile</i>	1 if has record of any offense from 1960–72	0.20	0.40	0.06	0.23
<i>Steal_juvenile</i>	1 if was caught stealing, petty theft, motor vehicle theft, burglary, and other theft from 1960–72	0.16	0.36	0.04	0.20
<i>Violent_juvenile</i>	1 if caught committing violent crime from 1960–72	0.07	0.25	0.01	0.08
<i>Narcotic_juvenile</i>	1 if commit alcohol or narcotics abuse from 1960–72	0.04	0.19	0.02	0.15
<i>Other_juvenile</i>	1 if other offense, driving and sex, from 1960–72	0.04	0.21	0.00	0.04
Panel B: Cohort Member Adult Crime Variables—Extensive Margin					
Source: National Police Register					
<i>Crime</i>	1 if any crime prior to 1984	0.33	0.47	0.07	0.26
<i>Violent</i>	1 if violent crime prior to 1984	0.08	0.27	0.01	0.10
<i>Steal</i>	1 if theft prior to 1984	0.19	0.39	0.04	0.21
<i>Fraud</i>	1 if fraud offense prior to 1984	0.06	0.24	0.02	0.13
<i>Traffic</i>	1 if traffic offense prior to 1984	0.15	0.36	0.01	0.11
<i>Narcotic</i>	1 if narcotic offense prior to 1984	0.04	0.20	0.01	0.10
<i>Vandalism</i>	1 if vandalism offense prior to 1984	0.06	0.24	0.00	0.06
<i>Other</i>	1 if other offense prior to 1984	0.13	0.34	0.01	0.10
Panel C: Cohort Member Adult Crime Variables—Intensive Margin					
Source: National Police Register					
<i>CrimeSum</i>	Number of crimes prior to 1984	3.43	15.35	0.40	4.01
<i>ViolentSum</i>	Number of violent crimes prior to 1984	0.21	1.21	0.02	0.25

<i>StealSum</i>	Number of thefts prior to 1984	1.60	9.97	0.14	1.16
<i>FraudSum</i>	Number of fraud offenses prior to 1984	0.27	2.10	0.10	1.14
<i>TrafficSum</i>	Number of traffic offenses prior to 1984	0.10	0.59	0.01	0.11
<i>NarcoticSum</i>	Number of narcotic offenses prior to 1984	0.65	4.16	0.07	1.69
<i>VandalismSum</i>	Number of vandalism offenses prior to 1984	0.20	1.56	0.04	0.59
<i>OtherSum</i>	Number of other offenses prior to 1984	0.39	1.75	0.03	0.69

Panel D: Cohort Member Extensive and Intensive Margin Sentencing Variables

Source: National Police Register

<i>Sentence</i>	1 if at least one sentence prior to 1984	0.26	0.44	0.05	0.22
<i>Prison</i>	1 if at least one prison sentence prior to 1984	0.06	0.24	0.00	0.06
<i>Probation</i>	1 if at least one probation/and or fine sentence prior to 1984	0.25	0.43	0.05	0.21
<i>Treatment</i>	1 if at least one sentence to an institution for treatment	0.02	0.15	0.00	0.05
<i>SentenceSum</i>	Number of sentences prior to 1984	0.72	2.03	0.09	0.57
<i>PrisonSum</i>	Number of prison sentences prior to 1984	0.13	0.70	0.01	0.16
<i>ProbationSum</i>	Number of probation and/or fine sentences prior to 1984	0.56	1.49	0.08	0.46
<i>TreatmentSum</i>	Number of sentences for treatment in an institution	0.03	0.22	0.00	0.05

Panel E: Father Crime Variables—Extensive Margin

Source: National Police Register

<i>Father</i>	1 if at least one sentence prior to 1972	0.12	0.32	0.13	0.33
<i>ProbationFather</i>	1 if at least one probation sentence prior to 1972	0.08	0.28	0.09	0.28
<i>PrisonFather</i>	1 if at least one prison sentence prior to 1972	0.03	0.18	0.04	0.19
<i>DrivingFather</i>	1 if at least one drunk driving sentence prior to 1972	0.04	0.18	0.04	0.21
<i>ExemptFather</i>	1 if at least one exempt sentence prior to 1972	0.01	0.07	0.00	0.07

Panel F: Father Crime Variables—Intensive Margin

Source: National Police Register

<i>FatherSum</i>	Number of sentences prior to 1972	0.25	1.09	0.28	1.10
<i>ProbationFatherSum</i>	Number of probation sentences prior to 1972	0.12	0.46	0.13	0.50
<i>PrisonFatherSum</i>	Number of prison sentences prior to 1972	0.08	0.63	0.08	0.61
<i>DrivingFatherSum</i>	Number of drunk and dangerous driving sentences prior to 1972	0.05	0.31	0.06	0.35
<i>ExemptFatherSum</i>	Number of exempt sentences prior to 1972	0.01	0.14	0.01	0.12

drunk or dangerous driving during each time period. Panels E and F of Table 1 present summary statistics at the extensive and intensive margins for each father sentencing category. About 12 percent of the fathers have at least one sentence on their record (that is, at any time prior to 1973).¹⁷ 8 percent have a probationary sentence, 3 percent have a prison sentence, 4 percent have a drunken driving sentence, and just 1 percent receives an exempt sentence.

Finally, an extensive set of controls will be used in the analysis, the choice of which is motivated by the human capital approach to intergenerational transmission discussed in Section II. Definitions and summary statistics for these variables are presented in Appendix Table A1.

IV. Intergenerational Criminal Associations

A. Extensive and Intensive Margin Intergenerational Criminal Associations

Table 2 presents estimates of the intergenerational crime relationship between fathers and their sons and daughters. Each cell corresponds to a separate regression. The dependent variable in each regression can be identified by the column and panel headings. Panel A measures cohort member crime at the extensive margin, according to whether the cohort member has a particular type of crime conviction or sentence through age 31 in the police register. Panel B considers the same measures at the intensive margin, that is, the number of convictions or sentences. Panel C considers those extensive margin crime categories that can also be observed in the Child Welfare Committee records, that is, when the cohort member is between the ages of seven and 19.¹⁸ In all specifications, the father crime variable is measured at the same margin as the child crime variable; we consider whether the father has *any* sentence at the extensive margin and the number of sentences at the intensive margin. All extensive margin specifications are estimated using logistic regressions and odds ratios are presented, while incidence rate ratios estimated from negative binomial models are presented for the intensive margin specifications.

Column 1 of Panel A indicates that compared to sons whose fathers do not have any sentence, the odds of having at least one conviction by age 31 in the police register for sons whose fathers have at least one sentence is 2.06 as high. Daughters whose fathers have at least one sentence have 2.66 times the odds of having at least

17. Williams and Sickles (2002) report that 7 percent of the fathers in their sample from the Philadelphia Birth Cohort Study had been arrested at least once during the cohort member's childhood. These data are reported by the son about his father and exclude arrests prior to the sons' childhood, both of which may bias the number downward. According to Rowe and Farrington (1997), 28 percent of the London boys from the Cambridge Study in Delinquent Development have fathers with a criminal conviction. However, nearly all of these fathers (about 94 percent) had a working-class occupation (skilled, semiskilled, or unskilled manual worker) and are not representative. If we look at fathers with a similar socioeconomic status in 1963 using the SBC data, we find that 18 percent have been convicted of a crime.

18. There is significant overlap between the data from the social register and the police register for those aged 13 to 19. Crime in the SBC data peaks at age 17. Stealing is by far the most prevalent crime at this age. Of those who commit crimes, 12 percent make their debut by age 13. By age 19, 58 percent have made their debut. In the United States, arrest rates peak between age 16 and 18 (Blumstein 1995).

one conviction compared to daughters with noncriminal fathers. Column 1 of Panel C indicates that this relationship has fully developed by the time the children reach age 19; the odds ratios are 2.13 for sons and 3.24 for daughters. At the intensive margin (Panel B), we see that one additional sentence of the father increases the expected number of sons' convictions by 32 percent and daughter convictions by 53 percent; the corresponding incidence rate ratios (IRR) are 1.32 and 1.53. Thus, there is strong evidence of an intergenerational criminal relationship at both the extensive (adult and juvenile) and intensive margins for sons and daughters. Children are not only more likely to become a criminal when they have a criminal father, but the degree to which they partake in criminal activity is strongly related to the intensity of their father's criminal careers. Finally, both of the extensive margin father-daughter crime relationships presented in Column 1 are significantly greater than their father-son counterparts; the intensive margin relationship is only significantly different at a 15 percent level.¹⁹

Columns 2–8 of Table 2 assess whether a particular type of cohort member crime is driving the overall intergenerational relationship and whether the results are robust to excluding certain crime categories. Panel A indicates that the relationship between whether the father has any sentence and whether the son has any record in the police register is fairly consistent across each of the son's crime categories: The odds ratios are 2.48 (violent), 2.27 (steal), 2.17 (vandalism), 2.16 (fraud), 1.99 (other), 1.98 (narcotic), and 1.86 (traffic). No single category is driving the overall relationship in Column 1. The father-daughter relationship varies somewhat more across crime categories, though the odds ratio is significantly greater than one for every category other than vandalism: 3.02 (violent), 3.07 (steal), 1.64 (vandalism), 3.52 (fraud), 2.89 (other), 3.89 (narcotic), and 2.73 (traffic). Though the standard errors are fairly large, the father-daughter relationships for stealing, fraud, and narcotics are still significantly greater than the father-son relationships at the 5 percent level; it is these crime categories that are driving the significant difference observed overall between sons and daughters in Column 1. Panels B and C of Table 2 indicate the same basic pattern at the intensive margin and juvenile extensive margin, respectively; the overall intergenerational crime relationship observed in Column 1 is not being driven by any single crime category and is remarkably consistent across crime categories.

We have also considered the possibility that a particular father sentencing category (prison, probation, exempt for treatment, or drunk and dangerous driving) is driving the overall intergenerational crime relationship presented in Column 1 of Table 2. At both the extensive and intensive margins, this does not appear to be the case. In fact, at the extensive margin, the odds ratios resulting from regressions of the child's overall conviction record on each of the four sentencing categories are remarkably similar, ranging from 1.99 for drunk and dangerous driving to 2.23 for probation. (Results available upon request.)²⁰

19. Note, however, that it is not the case that having a criminal father is a precondition for daughters to be criminals. Just 26 percent of daughters with records in the police register have a father with at least one sentence.

20. One may have expected fathers with prison sentences to be more criminal than fathers with other sentences and that this would have a greater impact on the child's criminal behavior. No evidence of this is seen. At the extensive margin, the odds ratio associated with a father having any prison sentence is not

Table 2
Extensive and Intensive Margin Intergenerational Relationships for Sons and Daughters

	Crime Type							Sentence Type				
	Any type (1)	violent (2)	steal (3)	fraud (4)	vandalism (5)	traffic (6)	narcotic (7)	other (8)	Any type (9)	Prison (10)	Probation (11)	Treatment (12)
Panel A: Father and Cohort Member Crime Measured at the Extensive Margin												
<i>Sons</i>												
2.064** [0.147]	2.481** [0.257]	2.267** [0.176]	2.160** [0.254]	2.170** [0.260]	1.861** [0.158]	1.981** [0.277]	1.990** [0.176]	2.002** [0.147]	2.397** [0.277]	1.997** [0.148]	2.524** [0.448]	
<i>Daughters</i>												
2.657** [0.283]	3.017** [0.746]	3.065** [0.387]	3.518** [0.654]	1.635 [0.746]	2.731** [0.617]	3.891** [0.929]	2.888** [0.724]	2.760** [0.339]	3.770** [1.421]	2.815** [0.347]	4.098** [2.121]	
Panel B: Father and Cohort Member Crime Measured at the Intensive Margin												
<i>Sons</i>												
1.323** [0.061]	1.401** [0.102]	1.319** [0.090]	1.253** [0.079]	1.330** [0.076]	1.321** [0.075]	1.328** [0.092]	1.306** [0.068]	1.270** [0.041]	1.320** [0.072]	1.245** [0.038]	1.303** [0.098]	
<i>Daughters</i>												
1.526** [0.130]	1.408** [0.145]	1.668** [0.148]	1.480** [0.148]	1.137 [0.157]	1.446* [0.258]	1.612** [0.237]	1.315 [0.185]	1.532** [0.096]	1.495** [0.232]	1.517** [0.090]	1.465** [0.170]	

		Crime Type						Sentence Type			
Any type	violent	steal	fraud	vandalism	traffic	narcotic	other	Any type	Prison	Probation	Treatment
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Panel C: Father and Cohort Member Juvenile (Ages 7–19) Crime Measured at the Extensive Margin											
<i>Sons</i>											
2.128**	2.483**	2.247**				1.794**	1.804**				
[0.165]	[0.269]	[0.184]				[0.279]	[0.255]				
<i>Daughters</i>											
3.239**	2.527**	3.453**				3.185**	2.478				
[0.368]	[0.795]	[0.450]				[0.549]	[1.449]				

Notes: * significant at 5 percent, ** significant at 1 percent (based on robust standard errors). Panel A presents the results of regressing whether the cohort member has any record of the crimes or sentences listed across the top of the table in the official police register on whether the father has any sentence. Panel B estimates the same specifications at the intensive margin; that is regressions of the number of records of cohort member crimes/sentences on the number of father sentences. Panel C replicates Panel A using juvenile delinquency measures of cohort member crime (from the CWC) for the categories of crimes that are available. All extensive margin specifications are estimated with logistic regressions and odds ratios are reported, while all intensive margin specifications are estimated as negative binomial models and incidence rate ratios are reported. All specifications are estimated separately for sons (n = 7,719) and daughters (n = 7,399).

One critique of the father-child relationships presented in Columns 1–8 of Table 2 is that the father and child variables do not capture exactly the same thing. For children, we have measures of convictions and crime types while we only have sentence types for fathers. To address this issue, Columns 9–12 of Table 2 present extensive (Panel A) and intensive (Panel B) margin results that look at the sentences of both the cohort member and father. We look overall and for three sentencing categories: prison, probation, and treatment (that is, exempt sentences for fathers). We see that a son (daughter) whose father has at least one sentence is 2.002 (2.760) times more likely to have a sentence himself; once again, the father-daughter relationship is significantly stronger than those for sons. These results are very similar to the estimates presented in Column 1 for cohort member convictions. At the intensive margin, one additional sentence of the father increases the expected number of sons' (daughters') sentences by 27 (53) percent (the corresponding estimates in Column 1 were 32 and 53 percent). Thus, the baseline intergenerational criminal relationship appears to be robust to how cohort member criminality is defined.

Finally, we have looked at the relationship between cohort member crime and father sentencing categories in an attempt to answer the question of whether the father-child relationship is stronger for "like" categories.²¹ Stronger crime-specific relationships would suggest that the intergenerational transmission of crime is, at least in part, driven by the transference of crime-specific capital or role-model mechanisms. Given the lack of paternal crime-type data, we examined whether the cohort member violent crime—father prison relationship is stronger than that with other crime and sentencing categories, assuming that both violent offenders and those sentenced to prison are the most serious criminals in our data. We find that sons with fathers sentenced to prison at least once are 2.1 times more likely to have a violent crime conviction in the police register than sons with nonincarcerated fathers. But, this relationship is not stronger than that between a father's prison sentence and any of the other crime categories. The same pattern is seen at the intensive margin. At the extensive margin for juvenile delinquency, however, the father prison—son violent crime relationship is, in fact, stronger than the other crime categories. This could be because the violent crimes category is a better measure of severity for juveniles than adults; that is, each adult crime category may contain some serious crimes. But, it could also be that a father's incarceration (or growing up in a single mother household with no positive male role model) is more likely to manifest itself in angry boys, who vent their anger with violent behavior.²²

significantly greater than those associated with having fathers who are "less severe" criminals. And, at the intensive margin, the IRR for the number of father prison sentences is, in fact, less than that for the other sentencing categories. This, perhaps surprising, result could occur for a number of reasons: (i) the number of prison sentences is an imperfect measure of criminal intensity, as one very long sentence could include a number of crimes, (ii) incarcerating a father can increase child criminality by disrupting a child's routine and decreasing supervision but can decrease child criminality by removing a negative influence, and/or (iii) these fathers may have never played an active role in their child's upbringing to start with.

21. Results available upon request.

22. We also consider whether there is a crime-specific relationship for drunk and dangerous driving. For sons, we do not see evidence that a father's drunk and dangerous driving sentence is more strongly related to cohort member convictions for traffic, narcotic, and other offenses. However, there is some evidence for daughters of a particularly strong relationship between father drunk and dangerous driving and daughter traffic and narcotic offenses.

B. A Comparison of Intergenerational Associations in Crime to Intergenerational Associations in Education and Earnings

Before continuing with our exploration of the intergenerational associations in crime, we compare the strength of these associations to measures of intergenerational associations in education and earnings.²³ In Column 1 of Panel A of Table 3, we have used the Stockholm Birth Cohort data to calculate the odds ratio of a son or daughter completing a college education given that his/her father has also completed college. Here we see that the transmission of college education is almost twice as strong for daughters and three times as strong for sons than our extensive margin measure for criminal convictions. The odds ratios for *not* having a high school degree given that a cohort member's father has *not* completed high school are 1.4 and 1.95 times larger for daughters and sons, respectively, than our extensive margin measures of criminal conviction. It is likely that the no high school and crime populations overlap to a larger extent than the college and crime populations, which could partly explain why the no high school association is closer to the crime association than the college association. Lastly, we have estimated the father-offspring association in poverty, which we define as having earnings below the 25th percentile (see Column 3 of Panel A). These odds ratios are actually quite a bit smaller than our odds ratio for crime.²⁴

At the intensive margin, both the father-son sentencing-crime relationship and the father-son sentencing-sentencing relationship are of the same size as the father-son associations in earnings and years of schooling reported in Björklund, Lindahl, and Plug (2004) (see columns 1 and 2 of Panel B of Table 3).²⁵ For daughters, the incidence rate ratios reported in Columns 3 and 4 of Panel B imply stronger intensive margin relationships than those found for earnings and schooling, while the OLS coefficients reported in Columns 5 and 6 of Panel B imply weaker intensive margin relationships. The difference between these two estimation methods lies mainly in how they deal with the skewness present in the data due to the large number of zeros. For this reason, the intensive margin results produced by the negative binomial regression model are preferable to the simple OLS coefficients.

V. Exploring the Father-Child Criminal Correlations

A. An Initial Regression Analysis

As discussed in Section II, there are a number of transmission mechanisms that may give rise to father-child correlations in crime. This section estimates regressions

23. Descriptive statistics for cohort members' education and earnings are at the bottom of Appendix Table A1.

24. They may, however, suffer from a downward bias, since we only have one year of fathers' earnings available to us. Offsprings' earnings are averaged over 11 years when they are between the ages of 38 and 48 years old.

25. We use estimates from Björklund, Lindahl, and Plug (2004) because we have only one year of fathers' earnings and because we do not have a good measure of fathers' years of schooling. Thus, the data that we do have would not produce reasonable estimates of the intergenerational associations in earnings and schooling.

Table 3
Comparison of the Intergenerational Association in Crime with Intergenerational Associations in Education and Earnings

Panel A: Extensive Margin Odds Ratios						
	College (1)	No High School (2)	Earnings < 25p (3)	Crime (4)		
Father-son	6.437*** (0.588)	4.023*** (0.403)	1.440*** (0.118)	2.064*** (0.147)		
Father-daughter	4.657*** (0.429)	3.687*** (0.467)	1.395*** (0.098)	2.657*** (0.283)		
Panel B: Intensive Margin OLS Coefficients						
	Incidence Rate Ratios			OLS Coefficients		
	Log Earnings (1)	Years of Schooling (2)	Crime Sum (3)	Number Sentences (4)	Log Crime Sum (5)	Number Sentences (6)
Father-son	0.260*** (0.005)	0.243*** (0.002)	1.323*** (0.061)	1.270*** (0.041)	0.277*** (0.097)	0.234*** (0.037)
Father-daughter	0.203*** (0.006)	0.211*** (0.002)	1.526*** (0.130)	1.532*** (0.096)	0.197 (0.127)	0.062*** (0.013)

Notes: Columns 1, 2, 3, and 4 of Panel A report extensive margin odds ratios for college, no high school, earnings below the 25th percentile and crime, respectively. Logistic regressions run separately for sons and daughters are used to estimate these odds ratios. The odds ratio for sons' and daughters' crime are the same as those reported in Table 2. OLS estimates of the marginal effects for log earnings and years of schooling are reported in Columns 1 and 2 of Panel B. These estimates are representative of the whole Swedish population and are taken from Tables 3 and 4 in Björklund, Lindahl, and Plug (2004). Columns 3 and 4 in Panel B report the incidence rate ratios seen earlier in Tables 3 and 5 (above). Columns 5 in Panel B reports OLS coefficients of the regression of $\log(\text{CrimeSum})$ on $\log(\text{FatherSum})$. Column 6 in Panel B reports OLS coefficients of the regression of the number of sons' sentences on the number of fathers' sentences.

that attempt to proxy for these various underlying mechanisms with a large set of controls (see Appendix Table A1). The purpose of these regressions is not to make causal statements about particular variables or mechanisms; rather, we want to assess the extent to which the intergenerational relationship— β in Equation 2—can be accounted for by the full set of controls.

$$(2) \quad C_{ihn}^c = \alpha + \beta C_{ihn}^f + A_{ihn} \delta + E_{ihn} \gamma + S_{ihn} \lambda + P_{ihn} \varpi + \mu_n + \varepsilon_{ihn}$$

The overall conviction record for cohort member i in household h and neighborhood n , C_{ihn}^c , is regressed on the father's overall sentencing record, C_{ihn}^f . A_{ihn} proxies for cognitive and noncognitive abilities, which have been shown to be strongly correlated between fathers and children and important for various labor market outcomes (see, for example, Grönqvist, Öckert and Vlachos 2010). We include school grades and IQ test scores on verbal, spatial, and math components from sixth grade for all cohort members as well as scores on four tests (instructions, verbal, spatial, and technical) taken upon entering the military for sons. The score from a psychological evaluation of the son's ability to function under stress proxies for noncognitive ability.²⁶

E_{ihn} proxies for parents' earnings and financial investments in their children. This vector includes the father's net income in 1963. But because this single-year measure of income is a poor proxy for permanent income (Solon 1992), we also include the father's nationality, 1960 employment status, and occupation-based social class in 1953 and 1963. We also control for mothers' and fathers' schooling, S_{ihn} , to help proxy for permanent income and human capital.

Finally, P_{ihn} includes a number of variables that proxy for parenting practices, family culture and norms, and parental instability. Included are measures of alcohol abuse, drunkenness, mental health, and parental deaths from 1953 to 1972, the receipt of any means-tested social support between 1953 and 1972, and the number of years of support.²⁷ P_{ihn} also includes whether the cohort member was allowed to smoke or to be absent from school when not sick.

Lastly, we include neighborhood fixed effects, μ_n , where the neighborhood is the cohort member's district of residence in 1963. Cohort members lived in more than 600 such neighborhoods at age 10; the mean number of cohort members from the same neighborhood is about 23. Such fixed effects could capture unobservable information about the community's economic status, criminality, schools, peers, etc.²⁸

26. The importance of noncognitive skills during adolescence has recently been emphasized in economics (Heckman and Rubenstein 2001; Osborne Groves 2005; Grönqvist, Öckert, and Vlachos 2010) and has a long history in the crime and delinquency literature (see Miller and Lynam (2006) for a review). Grönqvist, Öckert, and Vlachos (2010) use the same military draft data and provide a detailed discussion of the psychological evaluation process used.

27. The social support variables are included in P given that Swedish families who rely on means-tested assistance are a more negatively selected group with respect to various noneconomic, social problems (Stenberg 2000). These variables could also be included in E , however, as they also proxy for long run socioeconomic status.

28. The vectors of controls were chosen to proxy for the potential mechanisms underlying the father-child crime relationship, β . As such, known determinants of an individual's criminality, such as own earnings and education, are not included in these specifications. We do have data on earnings for when cohort members are 38–48 years old. Our crime data, on the other hand, stop at age 31. We also know the education level of each cohort member. Adding these two variables to the regressions run in Column 2 of Table 4 does not affect the reported estimates.

We cannot proxy directly for all of the mechanisms described in Section II, including the direct transference of criminal capital and role-model mechanisms. As such, these unobservables are included in the error term, ε_{ihn} .

Table 4 presents the results of estimating Equation 2 separately for sons and daughters at both the extensive (Panels A and B) and intensive (Panels C and D) margins. Extensive and intensive margin specifications are estimated with logistic and negative binomial models, respectively. For the sake of brevity, only the odds ratios and IRRs corresponding to father's criminality are reported.²⁹ Column 1 of Table 4 presents the raw relationship while Column 2 adds in the full set of observable controls. Neighborhood fixed effects are included separately in Column 3 since this results in a sample size reduction (some neighborhoods contain so few cohort members so as to be perfect predictors of cohort member criminality); neighborhood fixed effect regressions also do not converge at the intensive margin for daughters.

Column 1 of Panel A presents the baseline result that sons whose fathers have at least one sentence have 2.06 times higher odds of having at least one criminal conviction than sons whose fathers do not have any sentence. The corresponding marginal effect is equal to 17.2 percentage points. Adding the full set of observable controls decreases the odds ratio to 1.217, with an associated marginal effect of 4.3 percentage points. Thus, approximately 20 percent of the father-son association is left unaccounted for.³⁰ Even with neighborhood fixed effects, sons with criminal fathers still have 1.288 times the odds of having a criminal record.³¹

The pattern of extensive margin results for daughters presented in Panel B of Table 4 is very similar. Daughters whose fathers have at least one sentence have 2.657 times the odds of having a criminal record themselves or a marginal effect of 8.4 percentage points. Controlling for observables decreases the odds ratio to 1.492 (a marginal effect of 2.4 percentage points) and leaves about 30 percent of the father-daughter extensive margin relationship unexplained.³² Neighborhood fixed effects have little effect, though again we note the decreased sample size.

Panels C and D present the intensive margin results for sons and daughters. One additional sentence of the father increases the expected number of sons' convictions by 32 percent. The IRR is 1.030 when the observables are included and 1.059 with neighborhood fixed effects. Thus, almost all of the father-son intensive margin crime relationship can be accounted for using observable controls. Finally, one additional

29. Regression coefficients for all control variables are reported in Electronic Appendix Table 1, which can be found on the authors' homepages.

30. $100 * (1 - [(2.064 - 1) - (1.217 - 1)] / (2.064 - 1)) = 20$ percent

31. Neighborhood effects do not play a significant role in our extensive or intensive margin analyses. Though neighborhood characteristics do affect crime, they do not account for the father-child crime correlation. One possible explanation is that we are already capturing all of the relevant attributes of the neighborhood with the other controls. However, there is little effect on the father-child crime relationship when neighborhood effects are included prior to the other controls. Alternatively, our measure of neighborhood may be imperfect.

32. Note that one individual is dropped from the daughter analysis when observable controls are added because there is no information on the father's social class in 1953 and 1963. Since the data set includes values for two types of missing, and we do not know which category this individual falls in, we omit her from the regression.

Table 4

Exploring the Relationship Between Father and Child Criminality at the Extensive and Intensive Margin

	(1)	(2)	(3)
Panel A: Extensive Margin for Sons			
Father	2.064** [0.147]	1.217* [0.100]	1.288** [0.116]
Sample size	7,719	7,719	7,335
Panel B: Extensive Margin for Daughters			
Father	2.657** [0.283]	1.492** [0.187]	1.570** [0.213]
Sample size	7,399	7,398	5,385
Panel C: Intensive Margin for Sons			
<i>FatherSum</i>	1.323** [0.061]	1.03 [0.021]	1.059* [0.024]
Sample size	7,719	7,719	7,717
Panel D: Intensive Margin for Daughters			
<i>FatherSum</i>	1.526** [0.130]	1.225** [0.086]	n.a.
Sample size	7,399	7,398	
Controls for			
SES	NO	YES	YES
Ability	NO	YES	YES
Unstable household	NO	YES	YES
Social support	NO	YES	YES
Household attitudes	NO	YES	YES
Neighborhood fixed effects	NO	NO	YES

Notes: Robust standard errors in brackets. * significant at 5 percent; ** significant at 1 percent. Extensive margin specifications (Panels A and B) estimate logit regressions and present odds ratios while intensive margin specifications (Panels C and D) estimate negative binomial regressions and present incident rate ratios. SES controls include a set of dummy variables capturing father's social class in both 1953 and 1963, whether the father is Swedish, whether the father is employed in 1960, father's net income in 1963, and four dummy variables indicating whether the father and mother have a high school education or college. Ability controls for both sons and daughters include verbal, spatial, and math tests scores on a sixth grade IQ test and sixth grade marks. Additional cognitive (instructions, verbal, spatial, and technical) and non-cognitive (psychological assessment) ability controls are included for sons and obtained from the tests upon entering the military draft. Unstable household controls include measures of parental alcoholism, drunkenness, mental illness and death from 1953 to 1972. Two social support variables are included—whether they received any support and the number of years of support from 1953 to 1972. Household attitudes include indicators for whether the child was absent from school when not sick and whether their parent allowed them to smoke. Missing observations are replaced with the variable mean and dummy variables indicating that the observations are missing are included but not presented in the above table. Note that the sample size decreases when neighborhood fixed effects are included because some neighborhoods have so few people included that the neighborhood is a perfect predictor of cohort member criminality; these individuals get dropped from the analysis. In addition, the negative binomial model for daughters with neighborhood fixed effects does not converge.

sentence of the father increases the expected number of daughters' convictions by 53 percent. With the full set of controls, 43 percent of the father-daughter intensive margin relationship is left unexplained (IRR = 1.225).

Thus, Table 4 indicates that at the intensive margin for sons all of the father-child crime correlation can be accounted for by our set of controls. At the extensive margin for both sons and daughters, and the intensive margin for daughters, 60–80 percent of the father-child crime correlation can be accounted for by our extensive set of controls. The remaining, unexplained portion of the father-child relationship could be due to measurement error if our observable controls are imperfect proxies for the corresponding underlying mechanisms. Alternatively, the remaining father-child relationship may be due to the mechanisms for which we have no proxies, that is, the direct transference of criminal capital or role-modeling.³³

B. Timing of Fathers' Crime

This section considers whether the father-child relationship depends on the timing of the father's sentence. We place our criminal fathers into three categories: (i) those who *only* have sentences before 1953 (recall that all cohort members are born in 1953), (ii) those who *only* have sentences after 1953, and (iii) those who have sentences in both periods. Table 5 presents the results of regressing cohort member crime measures on all three of these father sentencing variables separately for males and females.³⁴

We find that the post-1953 estimates are larger than the pre-1953 estimates in every specification, though these differences are only statistically significant in three specifications: male juvenile delinquency ($p = 0.0133$), adult male crime at the intensive margin ($p = 0.0684$), and adult female crime at the intensive margin ($p = 0.0254$). It is important to note that these results are not being driven by the post-1953 only fathers being worse criminals; they have not built up a criminal history prior to 1953.³⁵ Though these two groups of fathers differ in terms of birth year and sentence type (pre-1953 only fathers are more likely to have prison and probation sentences), they do not differ in terms of education and income. In addition, the results are not sensitive to controlling for father's year of birth and the same pattern is seen when focusing on paternal incarceration in each period.³⁶

33. To the extent that mother's and father's criminal behavior are correlated, mother's criminality could be an important unobservable. But this does not seem to be an issue, given that the results in Column 2 of Table 4 are not sensitive to whether the observable mother controls (education, drunkenness, and death) are included.

34. We do not include the set of observable controls in these regressions because our aim is to see how the raw father-child crime relationships vary with the timing of the father's crime. In addition, almost all of the controls are measured in 1953 or later. It is therefore highly likely that controls would have a larger impact on the post-53 coefficients than on the pre-53 coefficients, making it difficult to compare the magnitudes of these coefficients.

35. Of course, this does not rule out the possibility that individuals with only post-1953 sentences committed crimes prior to 1953, but were not caught. Nor does it rule out the possibility that those with post-1953 sentences have committed worse offenses that simply took longer to prosecute.

36. Because of the small sample of incarcerated fathers, however, these estimates are much less precise; four of the six p -values resulting from tests that compare the pre- and postestimates are less than 0.23 and one is less than 0.10.

Table 5
Timing of Father Criminality

	(1)	(2)	(3)	(4)	(5)	(6)
	Dependent Variable: Crime as a Juvenile		Dependent Variable: Crime as an Adult			
	Extensive Margin		Extensive Margin		Intensive Margin	
Father crime pre-1953 only	1.510** [0.195]	2.753** [0.522]	1.676** [0.189]	2.294** [0.411]	1.178 [0.135]	1.273 [0.179]
Father crime in pre- and post-1953 periods	3.807** [0.673]	4.069** [0.889]	3.777** [0.686]	3.683** [0.748]	1.230** [0.060]	1.370** [0.113]
Father crime post-1953 only	2.247** [0.236]	3.275** [0.488]	2.024** [0.199]	2.549** [0.366]	1.498** [0.116]	1.895** [0.282]
Wald Test for H0: pre-1953 only = post-1953 only (<i>p</i> -value)	0.0133	0.4411	0.1928	0.6277	0.0684	0.0254
Sample	Male 7,719	Female 7,399	Male 7,719	Female 7,399	Male 7,719	Female 7,399
Observations						

Notes: Robust standard errors in brackets. * significant at 5 percent; ** significant at 1 percent. Extensive margin specifications are estimated with a logit model and odds ratios are presented. Intensive margin specifications are estimated with a negative binomial model and incident rate ratios are presented. No additional controls are included.

Why are children whose fathers only have sentences after they are born more likely to have a record themselves than children whose fathers only have sentences before they are born? One explanation that is consistent with these results is the hypothesis that fathers serve as role models for crime, where the bad example set by the father before the child is born should matter less than that after the child is born; that is, when he can observe the bad behavior.³⁷ Alternatively, if the father's behavior acts as a catalyst for his son's genetic predisposition to commit crime, then the interpretation of our timing analysis may be less of a role-model effect and more of an interaction effect between the father's behavior and the son's genetic predisposition. It could also be that fathers who "mature out" of crime due to marriage and/or fatherhood may adopt a more proactive, anticrime parenting strategy.³⁸ The incarceration results (discussed in Section IVA) suggest that removing the father from the household prevents the fathers from transmitting skills and behaviors that would increase the returns to participating in the legitimate labor market. The extent to which this is the case depends on the length of the father's sentence, which we cannot observe, and whether he was living in the household to start with. Unfortunately, our data do not allow us to disentangle these various mechanisms. Regardless of which story is correct, these types of hypotheses all support the idea that parental behavior matters for children's outcomes, that is, they are all "behavioral" models of intergenerational transmission.

C. Quality of the Father-Child Relationship

This section assesses how the father-child relationship varies with the quality of that relationship using a subsample of 1,600 males and 1,528 females whose mothers were interviewed in 1968.³⁹ (This subsample is comparable to the entire sample in terms of cohort member and paternal crime.) Mothers were asked to characterize the relationship between their husband and child on a scale of 1 to 5, ranging from "unusually good" to "unusually poor." We created a dichotomous variable called "closeness," which equals one if the mother answered "unusually good" and zero otherwise; 58 percent of mothers report such a relationship.

Table 6 presents the results of estimating logistic regressions of childhood delinquency at the extensive margin, separately for males and females, on whether the

37. Duncan et al. (2005) used a similar timing experiment to assess the importance of role-modeling in intergenerational transmission. Their analysis looked at depression, drug use, marijuana use, self-esteem, and gender-role attitudes. They only find evidence of role-modeling for their measure of gender-role attitudes.

38. The findings from the desistance from crime literature highlight the potential importance of marriage and parenthood (see, for example, Decker and Lauritsen 2002 and references therein).

39. For a complete description of the Family Survey and the Family Survey Sample, see Codebook I at <http://stockholmbirthcohort.su.se/>. For evidence concerning the overall representativeness of the Family Survey Sample see Björklund, Lindahl, and Lindquist (2010). For the purpose of drawing the sample of the family study, the cohort (that was still in the Metropolitan area as of November 1, 1963) was split into five strata on the basis of the test scores from the school study. All of those with the 5 percent highest scores (high strata) and 5 percent lower scores (low strata) were included in the survey. Every fifth individual from the medium strata (90 percent of scores in the middle), nonresponse strata (did not take test), and incomplete test score strata was drawn.

Table 6
Quality of the Father-Child Relationship

	Dependent Variable: Crime as a Juvenile					
	(1)	(2)	(3)	(4)	(5)	(6)
Father crime	2.486*** [0.4793]	1.670** [0.4916]	0.923 [0.3362]	2.664*** [0.8545]	1.854 [0.7792]	0.925 [0.4974]
Closeness		0.435* [0.0704]	0.488*** [0.0903]		0.310*** [0.1008]	0.367*** [0.1296]
Father crime *closeness		2.088* [0.8170]	2.290* [0.9963]		2.428 [1.5998]	1.253 [0.9843]
Controls	No	No	Yes	No	No	Yes
Sample	Male	Male	Male	Female	Female	female
Observations	1,600	1,600	1,600	1,528	1,528	1,528

Notes: Robust standard errors in brackets: * significant at 10 percent, ** significant at 5 percent, *** significant at 1 percent. Extensive margin specifications are estimated with a logit model and odds ratios are presented. Regressions are weighted using the inverse of the probability that an individual is included in the Family Study. The full set of controls used in Column 2 of Table 4 is also used here.

father has any sentence, closeness, and an interaction between the two.⁴⁰ Both sons and daughters with low-quality relationships with their fathers are much more likely to have a record of juvenile delinquency. More importantly, the odds ratio for the interaction term is both statistically significant and much larger than one for sons (2.29), even when the full set of controls is included.⁴¹ Sons who have an “unusually good” relationship with their fathers (as characterized by their mothers) behave more like their fathers—for better or worse—than those with lower-quality relations.

This result is consistent with a role-model hypothesis; an individual is more likely to use someone with whom they have an unusually good relationship as a role model.⁴² Another consistent explanation is that “close” fathers play a larger role in their children’s lives. If such a father causes disruptions in the household, for example, by being convicted or incarcerated, then their child may have a higher propensity toward crime due to the unstable and stressful household environment. Finally, similar to the role-modeling hypothesis, it may not be that children who are close to their fathers are modeling their behaviors, but rather that they are acting as a consequence of the values transmitted to them by their fathers. Given the potential policy implications, this is an important distinction. If this pattern is driven by behavioral role-modeling, then separating children from their parents (for example, incarceration) may be an effective policy tool to curb the children’s crime. But, if it is the result of the transmission of values, then incarcerating a father may be less effective. Instead, policies aimed at shaping family and children values, perhaps through the school system, may be more effective.

VI. Conclusion

In our analysis of the crime data available in the Stockholm Birth Cohort Study, we find strong evidence of an intergenerational (father-offspring) criminal relationship. This relationship is seen for both sons and daughters and at both the extensive and intensive margins. It also persists across both offspring crime categories and paternal sentencing categories. Regressions that include a large set of control variables, the choice of which are motivated by a human capital approach to the intergenerational transmission of crime, can explain most of the father-offspring crime relationship. The remaining father-offspring crime relationship may be, at least in part, explained by the crime-specific transference of criminal capital and the role-model hypothesis—two mechanisms that arise in our theoretical discussion for which we do not have proxies.

40. In this experiment, we focus only on juvenile delinquency, since the question was posed to these mothers in 1968 when their children were 13 years old.

41. We have also calculated the marginal effects of the interaction terms using the `inteff` command in STATA. They are in line with the odds ratios reported in Table 6. They are positive and weakly significant for sons and positive but insignificant for daughters.

42. Duncan et al. (2005) interact father’s traits with the extent to which the child reports a negative relationship with their father. They find that the father-child relationship is stronger when the relationship is reported to be better, which is consistent with our findings. Their analysis looks at depression, anger and gender-role attitudes.

The results of two additional analyses were consistent with a role-model hypothesis. First, we found that the timing of the fathers' crime mattered for the criminality of the children. Second, we found that sons who have an "unusually good" relationship with their fathers (as characterized by their mothers) behave more like their fathers—for better or for worse—than those with lower-quality relations. Given that we do not have detailed crime categories for the fathers, we are limited in the extent to which we can look for a crime-specific relationship. The only evidence that we see of such a pattern is for the relationship between fathers' drunk driving sentences and daughters' narcotics and other offenses, which includes drunk driving.

Because our study is based on a 1953 Stockholm birth cohort, it is certainly important to discuss the external validity of our results. On the one hand, there are a number of arguments to make in support of their generalizability. First, contrary to popular belief, Sweden is not a country free from crime. A recent victimization study conducted by the EU ICS (2005) concluded that the level of crime in Sweden is medium high relative to the rest of the EU. In addition, official crime statistics for murder and motor vehicle thefts, arguably the two best documented and most comparable crimes across countries, indicate that while murder is fairly rare in Sweden, the motor vehicle theft rate tends (in most years) to be higher in Sweden than in the United States and is well above the European average.⁴³ Second, we documented that our cohort of Swedish men has similar cumulative offending rates as comparable samples of men in London, California, Philadelphia, and Denmark (see footnote 14). Third, if one believes that genetics matter for criminal behavior, then these types of arguments should not be Sweden specific. Finally, the criminology literature has documented similar trends and patterns in the development and structure of crime in Sweden, Western Europe, and North America (Westfelt 2001; Sarnecki 2003); that is, there is no Sweden-specific theory of crime (Sarnecki 2003).

On the other hand, Sweden's unique social welfare policies provide an economic safety net to all Swedish citizens. Policies such as these could feasibly mitigate the effect of having a criminal parent. Likewise, the facts that prison sentences in Sweden (historically and today) tend to be shorter than in countries like the United States and Great Britain (Marnell 1972, Pratt 2008) and that Swedish prison policies tend to be more family friendly (Murray, Janson, and Farrington 2007) may decrease the generalizability of our study. At the same time, it is precisely these kinds of institutional differences that make Sweden such an interesting country to study.⁴⁴

Given the important role played by parental human capital in accounting for the father-child crime relationship, education policies are likely to have long-run effects on the level of crime in society. Recent studies that support the idea that parental education has a negative impact on children's crime include Carneiro, Meghir, and Pary (2010), Hjalmarsson and Lindquist (2011), and Meghir, Palme, and Schnabel (2011). Our work also points toward the potential importance of behavioral models, such as the role-model hypothesis, in explaining the intergenerational crime rela-

43. A complete table is available from the authors upon request.

44. It is also worth noting that the intergenerational correlations in education and income tend to be lower in Sweden than in the United States (see, for example, Black and Devereux 2010).

tionship. Such models imply that policies that successfully reduce crime today may reduce crime even further in the future through a “second generation” effect.

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Table A1
Summary Statistics and Variable Definitions for Controls

Variable	Variable Definition	Mean	Standard Deviation
Social class based on father's occupation in 1953 Source: 1953 occupational data (Codebook 2)			
<i>Uppermiddle53</i>	1 if classified as upper, middle class	0.13	0.34
<i>lowerwhitecollar53</i>	1 if classified as lower middle class, officials and nonagricultural employees	0.31	0.46
<i>lowerentrepreneur53</i>	1 if classified as lower middle class, entrepreneurs	0.06	0.24
<i>skilledbluecollar53</i>	1 if classified as working class, skilled workers	0.27	0.45
<i>unskilledbluecollar53</i>	1 if classified as working class, unskilled workers	0.19	0.39
<i>missing53type1</i>	1 if social class is missing; note there are two types of missing but difference is unclear	0.02	0.13
<i>missing53type2</i>	1 if social class is missing; note there are two types of missing but difference is unclear	0.02	0.14
Social class based on father's occupation in 1963 Source: 1963 occupational data (Codebook 2)			
<i>Uppermiddle63</i>	1 if classified as upper, middle class	0.17	0.38
<i>lowerwhitecollar63</i>	1 if classified as lower middle class, officials and nonagricultural employees	0.35	0.48
<i>lowerentrepreneur63</i>	1 if classified as lower middle class, entrepreneurs	0.08	0.27
<i>skilledbluecollar63</i>	1 if classified as working class, skilled workers	0.22	0.41
<i>unskilledbluecollar63</i>	1 if classified as working class, unskilled workers	0.16	0.37
<i>missing63type1</i>	1 if social class is missing; note there are two types of missing but difference is unclear	0.02	0.14

(continued)

Table A1 (continued)

Variable	Variable Definition	Mean	Standard Deviation
<i>missing63type2</i>	1 if social class is missing; note there are two types of missing but difference is unclear	0.01	0.09
Nationality and parental employment and education			
Source: 1960 Census (Codebook 2)			
<i>swedish?</i>	1 if Swedish, regardless of country of birth	0.96	0.19
<i>swedish missing</i>	1 if nationality is missing	0.06	0.24
<i>employhh60</i>	1 if household head is employed in 1960 census	0.91	0.28
<i>employhh60 missing?</i>	1 if 1960 employment status of household head is missing	0.06	0.25
<i>father high school</i>	1 if father has high school education	0.16	0.36
<i>father college</i>	1 if father has college education	0.08	0.28
<i>mother high school</i>	1 if mother has high school education	0.05	0.21
<i>mother college</i>	1 if mother has college education	0.02	0.13
Father's Income			
Source: Register of Population and Income 1964 (Codebook 2)			
<i>father income</i>	father's net income (earned and unearned) in 1963, in '000s of kronors	29.33	19.94
<i>father income missing?</i>	1 if father's net income is missing	0.17	0.37
Sixth grade test scores and attitude questions			
Source: The School Study (Codebook 1)			
<i>verbal</i>	Total number of points on verbal opposites test given in May 1966 (that is sixth grade); ranges from 0-40	24.66	6.40
<i>spatial</i>	Total number of points on spatial test (metal folding) given in May 1966 (that is sixth grade); ranges from 0-40	22.70	6.73

<i>math</i>	Total number of points on numerical series test given in May 1966 (that is sixth grade); ranges from 0–40	20.71	7.68
<i>spatial missing?</i>	1 if spatial test score is missing	0.11	0.31
<i>math missing?</i>	1 if numerical test score is missing	0.11	0.31
<i>absence</i>	1 if individual absent from school at least once when not sick	0.27	0.42
<i>smokeyes</i>	1 if individual believes students should be allowed to smoke in school	0.24	0.40
<i>absence missing</i>	1 if survey question about school attendance is missing	0.12	0.33
<i>smokeyes missing</i>	1 if survey question about smoking in school is missing	0.11	0.32
Sixth grade marks			
Source: Marks and Applications for Secondary School (Codebook 2)			
<i>grade6marks</i>	average marks for spring of sixth form	322.85	67.90
<i>grade6marks missing</i>	1 if average marks are missing	0.06	0.24
Additional ability measures for sons			
Source: Draft Board Data (Codebook 2)			
<i>dinstructions</i>	Stanine score of instructions military draft board test; ranges from 1–9	5.38	1.72
<i>Dverbal</i>	Stanine score of verbal military draft board test; ranges from 1–9	5.42	1.82
<i>Dspatial</i>	Stanine score of spatial military draft board test; ranges from 1–9	6.00	1.65
<i>Dtechnical</i>	Stanine score of technical military draft board test; ranges from 1–9	5.03	1.84
<i>Dcognitive missing</i>	1 if cognitive draft board test (verbal, spatial, or technical) missing	0.14	0.35
<i>Dpsychological</i>	Psychological ability to function under stress; ranges from 1–9	4.94	1.88
<i>Dpsych missing</i>	1 if psychological draft board test is missing.	0.15	0.36

(continued)

Table A1 (continued)

Variable	Variable Definition	Mean	Standard Deviation
Unstable Household Measures			
Source: Social Registers (Codebook 2)			
<i>alcpars372</i>	1 if either parent is identified as an alcoholic from 1953 to 1972	0.04	0.21
<i>fatherdrunk</i>	1 if father was ever fined or sentenced for drunkenness from 1953 to 1972	0.03	0.17
<i>motherdrunk</i>	1 if mother was ever fined or sentenced for drunkenness from 1953 to 1972	0.00	0.05
<i>psychpar5372</i>	1 if either parent showed signs of mental illness or psychiatric problems, ranging from depression to suicide, from 1953 to 1972	0.07	0.25
<i>fardeath5372</i>	1 if father died between 1953 and 1972	0.01	0.12
<i>momdeath5372</i>	1 if mother died between 1953 and 1972	0.01	0.09
<i>anysocsupp</i>	1 if family received any social support from 1953 to 1972	0.21	0.41
<i>yrsocsupp</i>	number of years of social support from 1953 to 1972	1.01	2.83
Cohort Members' Education			
Source: Longitudinal Database Concerning Education, Income and Occupation (Primary SBC Code Book)			
<i>Cohort member NO high school</i>	1 if sun2000niva_old_00 = 1 or 2	0.16	0.37
<i>Cohort member college</i>	1 if sun2000niva_old_00 = 5 or 6 or 7	0.22	0.42
Cohort Members' Earnings			
Source: Longitudinal Database Concerning Education, Income and Occupation (Primary SBC Code Book)			
<i>Cohort member earnings</i>	Real log average earnings 1991–2001 (in 2001 prices)	12.17	0.73