# Education Policy and Crime

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July 17, 2009

## 1    Introduction

In 1997, 75% of state and 59% of federal prison inmates in the U.S. did not complete high school (Harlow 2003).[1] Accounting for inflation, government expenditures on education increased by a factor of 1.2 between 1980 and 2005, while expenditures on police and law enforcement rose by a factor of 1.5 and expenditures on corrections more than tripled (with the largest increase coming in the 1980s).[2]

There is ample evidence that education reduces crime (see, e.g., Lochner 2004, Lochner and Moretti 2004). Furthermore, intensive early childhood programs targeted to disadvantaged children have also produced sizeable reductions in crime later in life (see, e.g., Lally, et al. (1998), Masse and Barnett (2002), Schweinhart, et al. (2005), and Temple and Reynolds (2007)). Although education policy has not been a major factor driving trends in crime over the past 25 years—high school completion rates have remained relatively stable since the 1980s, while crime has both risen and fallen dramatically during that time—it is natural to ask what role education policy does and should play in affecting crime rates in the U.S. Put another way, have we struck the right balance between police, prisons and schools? All three appear to reduce crime, but education and training have many benefits that prisons and police do not. In fact, Donohue and Siegelman (1998) argue that well-targeted preschool-type programs might be more cost-effective criminal deterrents than raising incarceration rates.

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[1]These figures exclude those who received a General Educational Development (GED) diploma. As shown in Cameron and Heckman (2003) and Heckman and LaFontaine (2006), individuals with a GED perform like high school dropouts rather than graduates in the labor market. Roughly 35% of state inmates and 33% of federal inmates completed their GED with more than two-thirds of these inmates earning their GED while incarcerated. A small percentage of those who did not receive a high school diploma had participated in some vocational or post-secondary courses. See Harlow (2003).

[2]Using the Consumer Price Index for Urban Consumers (CPI-U) to adjust for inflation, expenditures on primary, secondary, vocational, and higher education were $332.8 billion in 1980, while expenditures on police and corrections were $37.3 and $15.5 billion, respectively (Tables 417, 455, 490, 499, *Statistical Abstract of the United States, 1995*). Note that total expenditures for corrections in 1980 do not include any municipal-level expenditures. Expenditures on education, police, and corrections were $725.2, $94.6, and $65.1 billion in 2005 (Tables 481 and 522, *Statistical Abstract of the United States, 2009*)

In this chapter, we first discuss the relationship between education and crime from an economic perspective, developing a simple model that sheds light on key ways in which early childhood programs and policies that encourage schooling may affect both juvenile and adult crime. The model is grounded in human capital theory and is based on Lochner (1999, 2004). Next, we discuss evidence on the effects of education on crime, focusing on recent studies that attempt to address concerns associated with endogeneity and omitted variables. Consistent with the model developed in Section 2, these studies generally find that increases in education reduce most types of crime; although, they may increase some types of white collar crime. We then discuss the findings from a number of randomized experiments that offered high quality early childhood programs to disadvantaged pre-school-aged children. These studies generally report sizeable improvements in cognitive and educational outcomes along with reductions in juvenile delinquency and adult crime among children randomly selected for early childhood interventions. Finally, we conclude with a broader discussion of education policy and its potential role as a crime-fighting strategy.

## 2    The Economics of Education and Crime

In this section, we discuss the economics of crime and education. Why might education reduce crime and should its effects vary across different types of crimes? How might education and human capital policies help reduce crime? We begin with a simple economic model that formalizes a number of key channels through which education may affect crime. We then turn to a brief discussion of other factors that may help determine the relationship between education and crime.

### 2.1    A Two-Period Model of School, Work, and Crime

To better understand the effects of early childhood programs, education, and training on criminal behavior, we consider a simple two-period model of human capital investment, work, and crime. The model developed here abstracts from many things to focus attention on the effects of education and human capital based policies on crime. For a more detailed treatment of the lifecycle human capital investment problem and the age-crime profile, see Lochner (2004).

In the first period (adolescence), individuals may allocate their time to crime ($c_1 \geq 0$), work ($L_1 \geq 0$), and human capital investment ($I_1 \geq 0$) subject to the time constraint $c_1 + L_1 + I = 1$. In the second period (adulthood), individuals decide only between crime $c_2 \geq 0$ and work $L_2$ subject to $c_2 + L_2 = 1$. In considering time spent committing crime, it is useful to think generally about time spent planning and committing crimes, avoiding arrest, and simply 'hanging around' waiting for an opportunity to arise. As discussed below, one might also consider expected time spent in court or jail/prison as part of the time cost associated with crime.

While we do not explicitly model childhood, we assume that individuals enter the first period with a set of endowments that affect subsequent behavior. These endowments may be shaped by early family and public investments in children. As a result, they may be manipulated by early childhood interventions as well as school-based policies. We explicitly consider three types of endowments: 'learning ability' $A$, initial human capital levels $H_1$, and 'criminal propensity' $\theta$. It is useful to think of these three 'endowments' quite generally, as parameters which embody individual characteristics as well as the environment faced by individuals. For example, $A$ reflects anything that increases the productivity of human capital investments (either through formal schooling or more informal on-the-job training). This may include raw IQ, peers, or local school quality. Similarly, $\theta$ represents any factors that may affect the net expected returns to crime for an individual (e.g. criminal skill, preferences for risk, or a personal aversion to crime or prison).

Human capital investments through schooling and training improve adult skills $H_2$:

$$H_2 = H_1 + h(I, H_1; A), \tag{1}$$

where $h(\cdot)$ is increasing in each of its arguments (i.e. $h_j > 0$ for $j = I, H_1, A$) and there are diminishing marginal returns to investment (i.e. $h_{II} < 0$). These conditions ensure that education and training increase human capital at a diminishing rate. We further assume that students with higher levels of human capital, $H_1$, and learning ability, $A$, produce more human capital for any amount of investment ($h_{IA}, h_{IH} > 0$). Both ability and initial skill levels are, therefore, complementary with skill investment.

For each unit of time spent working, $L_t$, an individual earns $H_t$. Thus, $H_t$ reflects an individuals potential earnings if he devotes all his time to work. Investment, $I$, has no immediate payoff; however, it may be subsidized by the government at rate $s$. These subsidies more generally represent any incentives the government may provide for schooling or training.

Assume that time spent committing crime each period, $c_t$, yields a net return of $N(c_t, H_t; \theta)$, where for simplicity we abstract from uncertainty about punishment.[3] As noted earlier, the parameter $\theta$ represents any factors that may affect the net returns to crime for an individual. As such, $\theta$ is a function of early childhood investments, family background, neighborhoods, and police expenditures. In general, the net expected returns to crime, as well as the marginal returns to crime $N_c$, may be positive or negative. However, we assume that $N_{c\theta} > 0$, so persons with a high $\theta$ have a greater total and marginal expected return from crime.

For criminals, $N_c$ must be positive, but this need not be the case for non-criminals. Many individ-

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[3]We implicitly assume that any expected punishments are incurred during the period the crime is committed. It is not too unreasonable to assume that adolescents caught committing crime serve their prison time during adolescence and adults who are caught serve their prison time as adults. Dealing more explicitly with uncertainty and lags in punishment would not change the nature of the results discussed here. See Lochner (2004) for a lifecycle model that explicitly incorporates these features.

uals commit crime while working or attending school. This suggests that $N_{cc} < 0$ whenever $N_c > 0$ (i.e. if net returns to crime increase with the amount of time spent committing crime, they do so at a diminishing rate).[4] We, therefore, make this assumption throughout.

On the one hand, individuals with more human capital are likely to be better criminals as well as better workers. (White collar crimes like fraud and embezzlement are perfect examples.) On the other hand, more highly skilled workers experience greater losses in earnings while imprisoned, and they may also have a greater aversion to crime (as emphasized by Usher (1993)). In our analysis below, we assume that the positive effects of human capital on criminal returns weakly outweigh the negative benefits on expected costs associated with punishment, so $N_H \geq 0$, $N_{cH} \geq 0$ and $N_{HH} \leq 0$. Of course, for many property crimes, human capital is likely to have negligible effects on their returns (i.e. $N_H = 0$, a case not ruled out in our analysis).

### 2.1.1 The Individual's Decision

Taking $(A, H_1, \theta)$ and $s$ as given, individuals choose investment and time spent in work and crime to maximize the present value of lifetime earnings. Assuming a gross interest rate $R \geq 1$, and substituting in the time constraints, individuals

$$\max_{I, c_1, c_2} \{H_1(1 - I - c_1) + sI_1 + N(c_1, H_1; \theta)\} + R^{-1} \{H_2(1 - c_2) + N(c_2, H_2; \theta)\}, \tag{2}$$

subject to the human accumulation equation (1) and the time constraints $I \geq 0$, $c_1 \geq 0$, $c_2 \geq 0$, and $I + c_1 \leq 1$.

We assume that $s < H_1$, so that investment subsidies are not large enough to make investment more lucrative than work unless there is some future return on the investment. The problem yields the following interior first order conditions for $I$, $c_1$, and $c_2$:

$$H_1 - s = R^{-1} [(1 - c_2) + N_H(c_2, H_2; \theta)] h_I(I, H_1; A) \tag{3}$$

$$H_1 = N_c(c_1, H_1; \theta) \tag{4}$$

$$H_2 = N_c(c_2, H_2; \theta). \tag{5}$$

These conditions hold for individuals who allocate some time to each activity during adolescence and adulthood and are useful for studying investment, work, and crime at the intensive margin.[5] Individuals equate the marginal returns on investment and crime each period to their potential legitimate wage rate $H_t$ (less any investment subsidies in the case of investment). Because it is fixed at any point

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[4]If net marginal returns were positive and increasing, individuals would specialize, as will become obvious below.

[5]The second order conditions are not particularly informative. They do require that $N_{cc} < 0$, as assumed. While the second order conditions do not necessarily hold everywhere for all possible parameterizations, we assume that they hold at any given interior solution for the (local) comparative static results derived below.

in time, this wage rate reflects the price of time for individuals in choosing how much time to spend investing in new skills or on the commission of crime. Equation (3) shows that schooling provides returns in the form of higher future earnings from work and potentially from crime through increased human capital. For youth with high enough returns to crime or investment such that they choose not to work at all during adolescence (i.e. $I^* + c_1^* = 1$), conditions (3) and (4) reduce to a single first order condition equating the marginal returns on adolecent crime with the marginal returns on investment:

$$N_c(1 - I, H_1; \theta) - s = R^{-1} [(1 - c_2) + N_H(c_2, H_2; \theta)] h_I(I, H_1; A).$$

### 2.1.2 Policy Implications

We consider the implications of policies which may alter incentives to invest in human capital (i.e. changes in $s$), as well as earlier childhood policies that impact adolescent endowments $(A, H_1, \theta)$. Our results apply to individuals who spend some time in both school and on crime during adolescence and who spend some time committing crime and working during adulthood. In some cases, the effects of policy differ (as noted) for individuals who also spend some time working during adolescence vs. those who do not.

The following condition is useful for a number of results.

**Condition 1.** $N_{cH} \leq 1$.

This condition implies that human capital does not raise the returns to crime more than it raises the returns to legitimate work. It may not hold in the case of certain types of white collar crimes, but it is likely to hold for most common 'street' crimes like larceny, assault, or robbery.

We first discuss the effects of education subsidies, or policies that encourage schooling in general. The following result discusses the impacts of education subsidies on schooling and criminal activity.[6]

**Result 1.** *An increase in education subsidies, s: (i) increases investment in human capital; (ii) does not affect crime for working adolescents but reduces crime among non-working adolescents; and (iii) reduces adult crime if Condition 1 holds and increases adult crime otherwise.*

Education subsidies do not affect criminal behavior for adolescents who work, because the amount of time spent committing crime is only determined by their potential wage rate. Time spent investing trades off one-for-one with time spent working.[7] Non-working adolescents increase their investment and reduce their criminal activity in response to higher investment subsidies. For them, criminal activity necessarily trades off with investment, since $L_1 = 0$. As long as the returns to human capital

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[6]All results are derived formally in the Appendix.

[7]The fact that wage rates are unaffected by hours worked but criminal earnings are declining in time spent committing crime is key to this result. If wage rates depended on the number of hours worked, time spent committing crime during adolescence would be affected by an investment subsidy.

are higher in the legitimate sector than the criminal sector, education subsidies will reduce adult crime rates. In this case, an economy with larger education and training subsidies will be characterized by more training/education, less work, less crime, and lower earnings by adolescents. Adults will work more for higher wages, and they will commit less crime.

It is worth noting, however, that crimes with a higher return to skill than legitimate work will tend to increase (among adults) in response to education subsidies. Thus, it is possible that some forms of white collar crime may increase following policies that promote investment in skills.

Since parental inputs, family background, and early childhood programs operate on the endowment parameters $(A, H_1, \theta)$, understanding how these parameters affect individual decisions is important. We examine the effects of each of these parameters separately, beginning with the implications of policies that affect an individual's learning ability, $A$.

**Result 2.** *An increase in learning productivity, $A$: (i) increases investment in human capital if $N_{HH}$ is sufficiently close to zero; (ii) does not affect crime for working adolescents but reduces crime among non-working adolescents (if $N_{HH} \approx 0$); and (iii) reduces adult crime if Condition 1 holds and increases adult crime otherwise.*

Policies that increase learning ability, or the returns to investment more generally, have qualitatively similar effects as an increase in education subsidies. Not surprisingly, an increase in the productivity of schooling (or learning ability) causes individuals to invest more in their skills. Adolescent criminal activity is unaffected by changes in $A$ for working adolescents, since initial potential wage rates are fixed.[8] With higher rates of investment and the same amount of time allocated to criminal activity, time spent working must decline. Individuals simply substitute work for investment. More investment means higher levels of human capital and higher wage rates during adulthood. As long as the criminal returns to human capital are not too high, this lowers the amount of time spent committing crime and raises the amount of time spent working. Non-working adolescents commit less crime in response to an increase in $A$, since higher investment must trade off with time spent committing crime.

Policies that raise initial skill levels $(H_1)$ have quite different implications.

**Result 3.** *An increase initial skill levels, $H_1$, reduces crime among non-working adolescents if Condition 1 holds; otherwise, it increases adolecent crime.*

An increase in initial skills reduces juvenile crime as long as human capital is rewarded more in the labor market than the criminal sector. However, higher initial human capital has ambiguous effects

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[8]Of course, it is likely that individuals with a higher learning ability also have a higher initial skill level $H_1$ by the time they reach adolescence, in which case criminal activity during adolescence would be lower for those with high $A$ and $H_1$. The effects of $H_1$ on crime are discussed further below.

on investment, because it raises both the opportunity cost of and the return to investment. While it is unlikely that investment declines in $H_1$ enough to offset the positive effects of higher initial skills on adult human capital, it is not possible to generally sign the effects of changes in $H_1$ on adult crime. For most reasonable parameterizations; however, it is likely that an increase in initial skill levels reduces both adolescent and adult crime.

Finally, we discuss the effects of policies that alter the expected returns to crime. These policies may have their effects through socialization or simply through increasing the probability of arrest or incarceration.

**Result 4.** *A reduction in criminal returns, $\theta$, reduces adolescent crime for non-working adolescents. If Condition 1 holds and $N_{H\theta} \leq 0$, then a reduction in $\theta$ also: (i) increases schooling investments; (ii) reduces adolescent crime for non-working adolescents; and (iii) reduces adult crime.*

Since a lower criminal ability directly reduces the productivity of crime in all periods, individuals will choose to work more. By increasing incentives for work during adulthood, a reduction in the productivity of crime raises the returns to investment if the criminal returns to skill are not too high. Increased schooling investment increases adult wage rates and time spent working, which indirectly lowers adult crime rates (in addition to the direct effect of lower criminal ability). Thus, the endogeneity of schooling and labor supply leads to larger reductions in adult crime than would be predicted if either were held fixed.

- Briefly summarize findings and implications for policy

- Comment on Gallipoli and Fella (2009)?

## 2.2   Other Ways in Which Education May Affect Crime

- discount rates and time preference

- risk aversion

- social networks and peers

# 3   Evidence on Education and Crime

The empirical literature on education and crime has focused almost exclusively on the effects of educational attainment on post-school criminal activity; however, a few studies have attempted to estimate the 'effects' of school enrollment on contemporaneous crime. Given the simultaneity of enrollment and crime choices (do youth drop out of school because they want to sell drugs all day or

do they sell drugs because they dropped out of school?), this is a particularly daunting task and one that is often ill-defined. We summarize the current state of empirical evidence on these issues.

We have discussed four primary reasons schooling might affect crime: (i) education raises wage rates, which raises the opportunity costs of crime; (ii) education may directly affect the financial or 'psychic' rewards from crime; (iii) education may alter preferences for risk-taking or patience; and (iv) schooling may affect the social networks or peers of individuals. For most crimes (except, possibly, white collar crimes), one would expect these forces to induce a negative effect of schooling on crime.

Empirically, there is a strong negative correlation between educational attainment and various measures of crime. Freeman (1996) points out that more than two-thirds of all incarcerated men in 1993 had not graduated from high school. In the 1980 wave of the National Longitudinal Survey of Youth (NLSY), 34% of all men ages 20-23 with 11 or 12 years of completed schooling self-reported earning some income from crime, compared with 24% of those with a high school degree, and only 17% of those with more than twelve years of school (Lochner 2004). Similar differences are evident for other self-reported measures of both violent and property crime.

Early studies of the relationship between education and crime focused on their correlation conditional on measured individual and family characteristics using multivariate regression methods. For example, Witte and Tauchen (1994) find no significant relationship between educational attainment and crime after controlling for a number of individual characteristics. Grogger (1998) estimates a significant negative effect of wages on crime, but he finds no relationship between years of completed schooling and crime after controlling for individual wage rates. Of course, increased wages and earnings are important consequences of schooling. Thus, this study suggests that education may indirectly reduce crime through increased wage rates.[9]

These earlier studies must be interpreted with caution. A negative correlation between education and crime, even after controlling for measured family background and neighborhood characteristics, does not necessarily imply that education reduces crime. Standard regression studies are unlikely to estimate the causal effect of eduction on crime (i.e. the effect increasing someone's schooling on his criminal activity) for a number of reasons. First, unobserved individual characteristics like patience or risk aversion are likely to directly affect both schooling and criminal decisions. Individuals who choose more schooling (even after conditioning on observable characteristics) might also choose less crime regardless of their education level, in which case regression-based estimates do not identify the causal effect of schooling on crime. Second, using variation in crime and education across states or local communities may also produce biased estimates. Governments may face a choice between funding

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[9]Gottfredson (1985), Farrington, et al. (1986), and Witte and Tauchen (1994) explore the link between time spent in school and contemporaneous crime, concluding that time spent in school significantly reduces criminal activity. This type of analysis is particularly difficult to interpret given the simultaneous nature of the crime and schooling choices.

law enforcement and good public schools, which would tend to produce a spurious positive correlation between education and crime. Alternatively, unobserved characteristics about communities or their residents may directly affect the costs or benefits of both education and crime. For example, communities with few job opportunities that reward schooling may also be faced with severe gang problems. While it is often possible to account for permanent unobserved differences across communities by examining the relationship between changes in schooling and crime over time, such an approach cannot account for the effects of changing unobserved community characteristics. Third, reverse causality is another important concern, in which case traditional regression estimates may be confounded by the effect of criminal activity on schooling. Individuals who plan to heavily engage in crime (e.g. because they are particularly good at it, enjoy it, or live in areas with plenty of illicit opportunities) are likely to choose to leave school at a young age. Arrests or incarceration associated with juvenile crime may also cause some youth to drop out of school early. Finally, it is difficult to measure crime itself; instead, researchers are often forced to use measures of arrest or incarceration rather than actual crimes committed. It is possible that education reduces the probability of arrest and incarceration or the sentence lengths administered by judges. Estimates based on measures of arrest or incarceration will incorporate these effects in addition to any effects of education on actual crime.

Recently, economists have attempted to address these difficult issues through the use of instrumental variable (IV) estimation methods. In the context of estimating the effect of educational attainment on crime, an instrument is valid if it induces variation in schooling but is uncorrelated with other factors that directly affect criminal behavior (e.g. individual preferences or abilities). Intuitively, this approach exploits differences in educational attainment across individuals that arise in response to factors that have no direct effect on criminal decisions. An ideal instrument would randomly assign some youth to drop out of high school and others to finish high school. Then, comparing the differences in crime rates across these groups would identify the causal effect of high school completion on crime. In practice, we typically do not observe such perfect experiments, but researchers can sometimes come close.

Lochner and Moretti (2004) use changes in state-specific compulsory schooling laws over time as an instrumental variable for completed schooling to estimate the effects of education on arrest rates and the probability of incarceration among adult men. Intuitively, they measure the extent to which an increase in a state's compulsory schooling age leads to an immediate increase in educational attainment and reduction in subsequent crime rates for affected cohorts. This identifies the causal effect of schooling on crime as long as the changes in compulsory schooling laws are not related to changes in the underlying propensity to commit crime. Lochner and Moretti's (2004) analysis suggests that changes in compulsory schooling laws are exogenous and not related to prior trends in schooling

or state expenditures on law enforcement, so it appears to be a valid instrument.

Lochner and Moretti (2004) first use individual-level data on incarceration and schooling from the 1960, 1970, and 1980 U.S. Censuses to estimate the effects of educational attainment on the probability of imprisonment separately for black and white men. Their estimates control for age of the respondent (three-year age categories), state of birth, state of residence, cohort of birth, and state-specific year effects. Most importantly, controlling for state-specific year effects allows for the possibility that different states may have different time trends for law enforcement policies or may simply exhibit different trends in aggregate criminal activity. Identification comes from the fact that in any given state and year, different age cohorts will have faced different compulsory schooling laws during their high school years, causing them to acquire different levels of schooling and to commit crime at different rates. Interestingly, both ordinary least squares (OLS) and IV estimates are very similar and suggest that, on average, an extra year of school reduces the probability of imprisonment by slightly more than .1 percentage point for whites and by about .4 percentage points for blacks. Given the probability of incarceration for male whites without a high school degree averaged .83% across all three Census and the incarceration rate for male black dropouts was 3.6%, these effects are sizeable. OLS results suggest that completion of the twelfth grade causes the greatest drop in incarceration, while their is little effect of schooling beyond high school.

In their analysis of male arrest rates, Lochner and Moretti (2004) use state-level arrest rates by criminal offense and age (five-year age categories beginning at ages 20-24 through 55-59) from the FBI's Uniform Crime Reports (UCR) for 1960, 1970, 1980, and 1990. This data is linked to 1960-90 U.S. Census data on educational attainment and race to estimate regressions of the form:

$$\ln(A_{cast}) = \beta E_{ast} + \gamma B_{ast} + d_{st} + d_{sc} + d_{sa} + d_{ct} + d_{at} + d_{ac} + \varepsilon_{cast} \tag{6}$$

where $\ln(A_{cast})$ is the logarithm of the male arrest rate for crime $c$, age group $a$, in state $s$ in year $t$ (from UCR); $E_{ast}$ is either average education or the high school graduation rate for males in age group $a$ in state $s$ at time $t$ (from Census); $B_{ast}$ is the percent of males that are black in age group $a$ in state $s$ at time $t$ (from Census). They analyze arrest rates for the following crimes: murder, rape, assault, robbery, burglary, larceny, auto theft, and arson. In using log arrest rates, the effect of education on arrest rates is assumed to be the same in percentage terms for all types of crime.

The $d$'s in equation (6) represent indicator variables that account for unobserved differences across states, years, cohorts, and criminal offense types. The term $d_{st}$ allows for state-specific time effects, which is more general than including time varying observable state-level variables reflecting differences in public spending, economic conditions, or law enforcement. The inclusion of $d_{sc}$ allows the distribution of crimes or arrests across states to differ. Some states may focus arrests more heavily on one type of crime, while others focus on other types. Furthermore, the age distribution of arrestees need not be

the same across states – some age groups may be more prone to commit crimes in some states or the arrest policy with respect to age may differ across states. The term $d_{sa}$ absorbs long-run differences in age-arrest patterns across states. Crime-specific and age-specific trends in arrest common to all states are accounted for by $d_{ct}$ and $d_{at}$, respectively. Finally, $d_{ac}$ accounts for long-term differences in age-crime profiles across different types of criminal offenses.

Using OLS, Lochner and Moretti (2004) estimate that a one-year increase in average education levels in a state reduces state-level arrest rates by 11 percent. IV estimates suggest slightly larger effects, although they are not statistically different. These estimated effects are very similar to the predicted effects derived from multiplying the estimated increase in wages associated with an additional year of school by the estimated effects of higher wage rates on crime (from Gould, et al. 2002). This suggests that much of the effect of schooling on crime may come through increased wage rates and opportunity costs. Using OLS, Lochner and Moretti (2004) also estimate separate effects of education for different types of crime. These results suggest similar effects across the broad categories of violent (murder, rape, robbery, and assault) and property (burglary, larceny, motor vehicle theft, and arson) crime — a one year increase in average years of schooling reduces both property and violent crime by about 11-12%. However, the effects vary considerably within these categories. A one-year increase in average years of schooling reduces murder and assault by almost 30 percent, motor vehicle theft by 20 percent, arson by 13 percent, and burglary and larceny by about 6 percent. Estimated effects on robbery are negligible, while those for rape are significantly positive. This final result is surprising and not easily explained by standard economic models of crime.[10]

Lochner (2004) follows a similar approach to estimate the effects of average schooling levels on arrest rates for white collar crime (forgery and counterfeiting, fraud, and embezzlement) using UCR and Census data from 1960, 1970, and 1980. In contrast to the results for violent and property crimes, he estimates a *positive*, though statistically insignificant, effect of schooling on white collar arrest rates.

One obvious concern with these studies is their use of arrest and incarceration as measures of crime. It is possible that education improves the chances that someone evades arrest or conviction or that judges tend to give more educated defendants lighter prison sentences. While there is little direct evidence on these issues, Mustard (2001) finds negligible effects of defendant education levels on the sentence lengths they receive. Furthermore, results using self-reported measures of criminal activity in the National Longitudinal Survey of Youth (NLSY) support the case that education reduces actual violent and property crime and not just the probability of arrest or incarceration conditional on crime (Lochner 2004, Lochner and Moretti 2004).

A provocative recent study by Jacob and Lefgren (2003) explores the contemporaneous effects of

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[10]However, it is consistent with some specifications in Gould, et al. (2002), which suggests that local wage rates are positively correlated with local crime rates for rape.

school attendance on juvenile crime rates. To identify these effects, the study uses exogenous variation in teacher in-service days across jurisdictions over time, essentially comparing local juvenile crime rates on days when school is not in session to those when it is in session. Their findings suggest that school attendance reduces contemporaneous juvenile property crime while *increasing* juvenile violent crime. These results are consistent with an 'incapacitation effect' of school that limits participation in property crime. However, the increased level of interaction among adolescents facilitated through schools may raise the likelihood of violent conflicts after school. It is important to distinguish between the contemporaneous effects of school attendance and crime estimated in this study from the effects of educational attainment on subsequent crime estimated by Lochner and Moretti (2004) or Lochner (2004). There is no logical inconsistency between the findings of these studies.

NOTE: Need to expand the discussion above somewhat:

- discuss Ehrlich (1975) and Witte (1999) somewhere?

- add a table or two on results, social benefits from crime reduction

- add a brief discussion of other recent studies that attempt to deal with causality in examining effects of eduction on crime or directly measure effects of education policies:

  - Buonanno and Leonida (2006) on education and crime in Italy

  - Sabates and Feinstein (2007) on effects of education subsidies on crime in England

  - studies of Quantum Opportunities Program

  - other studies of effective programs that increase high school completion?

- discuss prison education programs and recidivism?

  - Gaes (2008)

  - Lattimore, Witte, and Baker (1990)

  - Tyler and Kling (2006)

  - Steurer, Smith, and Tracey (2001), Steurer and Smith (2006), Mitchell (2002)

# 4   Evidence on Early Childhood and Adolescent Human Capital-Based Policies

A growing body of evidence suggests that early childhood interventions can also substantially reduce adult crime rates. Most famously, the High/Scope Perry Preschool Program for disadvantaged minority children measured lifetime arrests for randomly assigned participants and non-participants. While

55% of all non-participants were arrested five or more times through age 40, only 36% of the preschool participants had been arrested that often (Schweinhart, et al., 2005). The Syracuse Family Development Program also produced large reductions in delinquency (Lally, et al., 1998). These findings lead Donohue and Siegelman (1998) to conclude that small, rigorous early intervention programs may pay for themselves through reduced crime rates alone, if they can be targeted to high-crime groups.

Programs targeted at high-crime adolescents have also shown promise. In their study of the Job Corps, Long et al. (1981) estimated the social benefits attributed to reduced criminal activity to be $4,500 (in 1990 dollars) per participant – almost 30% of the total social benefit of the program. The program entailed basic educational and vocational training for economically disadvantaged adolescents, and typically lasted 6-7 months.

These studies indicate that either individual preferences are very malleable and childhood and adolescent intervention programs can effectively reduce crime by altering the preferences of program participants (e.g. increase the psychic costs of crime or lower the rate of time preference), or market forces are at work and these programs raise the market skill levels of participants, which makes work and human capital investment more attractive than crime. Further study is needed to determine exactly how these programs achieve their reductions in crime and whether more comprehensive programs can attain the same levels of effectiveness.

Childhood investments and community/family influences are likely to affect all three types of endowments. In fact, much of the debate on early interventions revolves around whether programs achieve their long-term impacts through improvements in cognitive abilities (denoted by $A$), skill levels (as measured by $H_1$), or through improved socialization (as reflected in lower $\theta$). Positive investments and improvements in family influences reduce (or at least, do not raise) adolescent crime rates and are likely to lower adult crime rates even more. The relative impacts of different programs and backgrounds on crime, investment, and earnings will depend on what types of endowments are affected most and how market and criminal skills are formed. Influences which affect learning abilities most will tend to lower youth earnings and raise schooling. As a result, adult incomes will be higher and crime rates lower for most types of property crime. Crime among working adolescents will not be affected (unless there is learning-by-doing in the criminal or legitimate sector). In aggregate, adolescent crime should fall, because non-working youth will substitute out of crime and into investment.

Evidence of reduced criminal activity among adolescents attributed to early intervention programs, suggests that these programs raise initial market skills. These studies are also consistent with the idea that early or adolescent intervention programs reduce $\theta$ through socialization. In sum, they raise the returns to work relative to crime at all ages.

NOTE: Need to expand the discussion above and add additional recent studies:

- Temple and Reynolds (2007) on Chicago Child-Parent Centers

- Masse and Barnett (2002) on Abecedarian

- Heckman's new work on Perry Preschool?

- Deming (2009) on Head Start

# 5   Conclusions

Summarize evidence and provide implications for policy:

- social benefits of reduced crime from increased education (especially high school)

  - how can we increase high school graduation rates? what programs work?

- early childhood programs

  - which programs seem to reduce crime the most?

  - which populations are most affected?

  - expected savings from crime reduction?

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