Volume Title: Education, Income, and Human Behavior

Volume Author/Editor: F. Thomas Juster, ed.

Volume Publisher: NBER

Volume ISBN: 0-07-010068-3

Volume URL: http://www.nber.org/books/just75-1

Publication Date: 1975

Chapter Title: On the Relation between Education and Crime

Chapter Author: Isaac Ehrlich

Chapter URL: http://www.nber.org/chapters/c3702

Chapter pages in book: (p. 313 - 338)

12. On the Relation between Education and Crime

by Isaac Ehrlich

INTRODUCTION Theoretical attempts to explain participation in illegitimate activities often have been guided by the preconception that since crime is deviant behavior, its causes must be sought in deviant factors and circumstances determing behavior. Criminal behavior has traditionally been linked to an offender's allegedly unique motivation, which in turn has been ascribed to a unique "inner structure" (e.g., deviations from physiological and mental health, spiritual degeneration), to the impact of exceptional social or family circumstances (e.g., political and social anomalies, war conditions, the disruption of family life), or to both. The relation between education and crime has also been generally treated within this framework, for the issues raised have frequently centered upon the role of education in determining or affecting the motivation and propensities of juvenile delinquents.[1]

A reliance on a motivation unique to the offender as the major explanation of crime does not, in general, lead to the formulation of predictions regarding the outcome of objective circumstances. I also am unaware of any persuasive empirical evidence in support of a systematic relation between crime and traditional sociological variables.[2] An alternative and not necessarily incompatible point

[1] For an overview of the significance of education and the school in the area of juvenile delinquency, see Eichorn (1965).

[2] For example, Cohen (1964) reports low correlation between homicide rates and such social phenomena as illiteracy, industrialization, farm tenancy, density of rural population, and church membership.

of reference is that even if those who violate specific laws differ significantly in various respects from those who abide by the same laws, the former, not unlike the latter, do respond to *incentives:* costs and gains available to them in legitimate and illegitimate pursuits. Rather than resort to hypotheses concerning unique personal characteristics and social conditions affecting "respect for the law," penchant for violence, preference for risk, or, in general, preferences for crime, one may distinguish preferences from objective opportunities and examine the extent to which illegal behavior can be explained by the effect of opportunities, given preferences. This approach, due largely to initial efforts by Fleisher (1966) and Smigel-Leibowitz (1965) and a significant contribution by Becker (1968), has been used in my work on crime (Ehrlich, 1970, 1973) to develop an economic model of participation in illegitimate activities. The model emphasizes behavioral implications that may be tested against available empirical evidence. It has been applied to, and found largely consistent with, data on crime variations across states and over time in the United States.

This chapter discusses the possible effects of education upon various opportunities available to offenders. Because data required for systematic study of these effects are insufficient, this chapter emphasizes analytical issues. I start with a general exposition of the model of participation in illegitimate activities and derive a few propositions concerning the relation between education and crime. I then examine some empirical evidence bearing upon this relation from arrest, prison, and crime statistics.

THE OFFENDER'S CHOICES In spite of the diversity of activities defined as illegal, all such activities share some common properties. Any violation of the law may be thought of as potentially raising the offender's money or property income, the money equivalent of his psychic income, or both. In committing a violation, one also risks a reduction in income, however, for conviction entails "paying" a penalty, acquiring a criminal record, and other disadvantages. As an alternative to violating the law, a person may behave legally and earn an alternative legal income, which may also be subject to risks. In general, therefore, the net gain in both activities is subject to uncertainty.

A simple model of choice between legal and illegal activities can be formulated within the framework of the usual economic

theory of behavior under uncertainty. A central hypothesis of this theory is that if the two activities were mutually exclusive, one would choose to commit the violation (income prospect I), to take an alternative legitimate action (income prospect L), or to be indifferent between the two as his expected utility from the violation exceeded, fell short of, or was equal to that from the legal alternative—or, in symbols:

$$U^*(I) \gtreqless U^* (L) \tag{12-1}$$

where U^* denotes an expected utility operator.[3]

The "gain" associated with illegitimate behavior is a function of gross returns and various costs. The term *gross returns* denotes the value of the "output" of an offender's activity, the direct monetary and psychic income he reaps from accomplishing offenses of a specific crime category i. Particularly in the case of crimes involving material gains, gross returns are a function of the offender's skill and ability to commit offenses e_i and the level of various inputs K_i, including his own time, accomplices' services, tools, means of transportation, and other resources used for gathering information, planning and committing offenses, and disposing of stolen goods. In addition, payoffs on most crimes against property and on some crimes against the person depend in large measure on the amount of transferable assets and other human and non-human wealth available to potential victims of crime A_i, as well as on the latter's expenditure and efficiency at "self-protection" against victimization c_i. Thus, in general, illegitimate income Y_i can be thought of as a function of the productivity of both the offender and others:

$$Y_i = f_i(K_i, e_i, A_i; c_i) \tag{12-2}$$

For analytical convenience, this income is defined net of direct

---

[3] Note that by this hypothesis crime always "pays" if the variety of monetary and psychic costs and returns that offenders derive from crime, including their "pleasure" from risk, are taken into account. If an offender is free to choose, and always acts to maximize his utility given his opportunities, then his actual engagement in crime indicates that utility is thus maximized. Such a "positive" approach constitutes perhaps the main difference between this analysis and some traditional theories in criminology.

costs of purchased inputs, since those costs could be deducted with certainty from the gross returns.[4]

The monetary and psychic costs associated with illegitimate behavior generally include both immediate and delayed cost elements. Again for analytical convenience, the opportunity costs of the offender's time, which are represented by his returns from the alternative (legitimate) activity, are excluded. Only the costs incurred by the perpetrator if he is apprehended and convicted of the crime (including the prospect of losing the loot) are considered. One such cost element is the penalty that society imposes on convicted offenders in the form of a monetary fine, a prison term, probation, or a combination of these. Unlike a monetary fine, which is a unique quantity, the cost incurred in the case of, say, imprisonment is indirect and specific to the individual. It can be measured as the properly discounted value of his opportunity costs of time spent in prison and his psychic cost of detention, net of any benefits obtained during the period of incarceration. An additional cost possibly incurred by the offender if he is imprisoned, probationed, or even just arrested is a reduction in his future stream of income in legitimate activities as a result of the effect of a "criminal record" on job opportunities (including legal restrictions). This effect would leave a person with less freedom in choosing an optimum occupational mix throughout his working career. The discounted value in terms of income at time t of the future costs of fines, imprisonment, and other possible losses is denoted by F_i.

Since only apprehended and convicted offenders are subject to the loss of F, the final gain is uncertain. If the offender is assumed to have a subjective probability of being caught and punished p_i,

[4] Private self-protection against crime via watchdogs, guards, locks, and other safety devices increases the offender's direct costs of achieving any given gross payoff and reduces the probability that the crime can be carried out successfully. In addition, private self-insurance through the maintenance of valuables in safe-deposit boxes, the marking of personal property to reduce its marketability in stolen-goods markets, and refraining from specific consumption activities reduces the potential loss to the victim and the gain to the offender in case a crime is committed. Private defense against crime thus generates a probability distribution of net outcomes from crime rather than a sure return. Of course, even if the extent of private self-protection against crime were fully known, the gross return from criminal activity would still be subject to random variations. However, Y_i is treated here as having a unique magnitude in order to emphasize analytically the uncertainty associated with punishment and other potential costs of apprehension and conviction.

then according to the usual economic analysis, his expected utility from engaging in illegitimate activity is

$$U^*(I) = (1 - p_i) U(W + Y_i) + p_i U(W + Y_i - F_i) \quad (12\text{-}3)$$

where W denotes income from other sources which, for simplicity, is assumed to be known with certainty.[5]

The alternative legal gain that an individual can achieve by allocating his time and other purchased inputs to a legitimate activity l rather than to i is denoted by Y_l. Generally speaking, a legitimate activity can be regarded as safer than an illegitimate one since the latter includes the prospect of apprehension and punishment in addition to many conventional occupational hazards. Also, losses in legitimate activity may be partly offset by market insurance, whereas no such insurance is provided against punishment for crime. However, there is no full insurance against, say, unemployment — a hazard which is presumably more characteristic of legitimate activity — and legitimate returns in such a case may be reduced to $Y_l - D$, where $D > 0$. Given a probability of unemployment of μ, Eq. (12-1) can now be specified as

$$(1 - p_i) U(W + Y_i) + pU(W + Y_i - F_i)$$
$$\gtreqless (1 - \mu) U(W + Y_l) + \mu U(W + Y_l - D) \quad (12\text{-}4)$$

Equation (12-4) identifies the basic set of opportunities affecting the decision to participate in illegitimate activities: an individual's legitimate and illegitimate earning opportunities, the probability and severity of punishment, and the probability of (and losses from) unemployment in legitimate activity.

The preceding analysis of the offender's choice assumes that legal and illegal behavior are mutually exclusive. The decision to engage in illegal activity is not inherently an either/or choice, however, and in practice, offenders may combine a number of legitimate

---

[5] The expected utility in Eq. (12-3) is derived for simplicity on the basis of two contingencies only: getting away with the crime and being apprehended and punished. In practice, the criminal prospect includes more contingencies, depending upon the form and extent of the punishment imposed and the reward obtained. However, the analysis can easily be generalized to cover any finite number of states.

and illegitimate activities or switch occasionally from one to another during any given period throughout their lifetime. In addition, neither the probability of being apprehended and convicted nor the punishment if convicted is determined by society's actions alone, but may be modified by deliberate actions of offenders. For example, an offender can reduce his chances of being caught or of being charged with a crime by spending resources on covering his illegal activity, "fixing" policemen and witnesses, employing legal counsel, or, in general, by providing "self-protection." The relevant object of choice to an offender might be defined more appropriately as an optimum occupational mix: the optimum allocation of his time and other resources to competing legal and illegal activities.

An attempt to attack this more comprehensive decision problem via a one-period uncertainty model is formally presented in my studies of participation in illegitimate activities (Ehrlich, 1970, 1973), which contain detailed analyses and discussion of the issue. One result derived from that model is that the same set of variables identified in Eq. (12-4) as underlying an offender's decision to enter an illegitimate activity i, when defined in terms of marginal rather than total quantities, also determines the extent of participation in i. In particular, if earnings in both i and l are not subject to strong time dependencies such as those resulting from specific training or learning by doing, many offenders — especially those who are risk avoiders — have an incentive to participate in both activities, partly as self-insurance against the relatively greater risk involved in the full-time pursuit of a risky activity. In that case, entry into i, and the extent of participation in a given period, would be related positively to the absolute difference between current "wage rates" in i and l, $w_i - w_l$, and generally also to the probability of unemployment in l. They would be negatively related to both the probability of apprehension and punishment for crime p_i and the discounted value of the penalty per offense f_i. The analysis also implies that the greater the extent of participation in i and the greater the efficiency of self-protection, the greater the offender's incentive to provide such protection, and vice versa. "Professional" offenders are therefore likely to be underrepresented in arrest statistics, and the converse is true for occasional and less-skilled offenders (see Ehrlich, 1970, pp. 114–119). More importantly, the analysis shows why many offenders tend to repeat their crimes even after being apprehended and punished for previous

offenses. Even if there were no systematic variations in preferences for crime and attitudes toward risk from one period to another (these may, in fact, intensify), an offender is likely to make the same choice of an optimum participation in crime if the opportunities available to him remain unchanged. Indeed, it is plausible to assume that legitimate opportunities become much poorer relative to illegitimate opportunities in periods following conviction for crime because of the effect of having a criminal record on legitimate employment opportunities. Recidivism is thus not necessarily the result of an offender's myopia, erratic behavior, or lack of self-control, but rather may be the result of choice dictated by opportunities.

EDUCATION AND CRIME Is education likely to have a systematic effect on the incentive to participate in illegitimate activity?[6] If the main effect of education on occupational choices were through its role in directing the individual's motivation and propensities toward socially acceptable goals, one might expect to find a negative correlation across persons between education and all criminal activities. The model suggests that the relation between education and crime may be more intricate, however, since it depends in large measure on the way education affects the relative opportunities available to offenders in different illegitimate activities. Broadly speaking, "education"—by which here is meant schooling, legitimate training, and other indicators of human capital[7] — can be regarded as an efficiency parameter in the production of legitimate as well as illegitimate market and nonmarket returns. In addition, education may increase an offender's productivity at self-protection against apprehension and punishment for crime, as well as against various legitimate occupational hazards. Since education generally enhances the pecuniary part of both legitimate and illegitimate "wages," and thus

[6] Another interesting source of interaction between education and crime is the possible effect a person's education may have on the likelihood that he will become a *victim* rather than a *perpetrator* of crime, as a result of the systematic relation between education and efficiency at self-protection. The theoretical arguments and specific behavioral implications have been developed by Ehrlich and Becker (1972). Neil Komesar, of the University of Chicago, has been investigating this relation empirically in his doctoral research.

[7] Note that empirical measures of education are all wedded to legitimate activities and are not likely to reflect training specific to illegitimate activities.

the pecuniary opportunity cost of imprisonment and other losses,[8] and may reduce the probability of many hazards, its overall effect on participation in crime cannot be determined a priori and would depend on the extent of its relative effect on the productivities of inputs used to produce legitimate and illegitimate returns and to reduce the relevant risks.

Consider the following cases for illustration. If education were completely general in the sense that it enhanced by the same proportion legitimate and illegitimate wages, the discounted value of punishment per offense, and the marginal productivity of time spent in nonmarket activities without affecting the probability of unemployment or the probability of apprehension and punishment for crime or the relative preference for illegal activities,[9] then the individual's optimum allocation of time to competing activities would not necessarily be affected (see Ehrlich, 1970, p. 30). Higher education in this case would not deter participation in illegitimate activity. In contrast, if education were completely specific to, say, legitimate activity in the sense that it enhanced the legitimate wage w_l and the discounted value of the opportunity cost of imprisonment and other losses per offense f without affecting the opportunities available in illegitimate activity, then it would be likely to reduce the incentive to participate in crime. Moreover, since specific training introduces time dependencies because of its effect on future earnings, persons with such training have an incentive to specialize in one legitimate occupation at least as long as a large fraction of their working time is devoted to on-the-job training. Although no single pair of alternative legitimate and illegitimate activities may provide a perfect empirical counterpart for these extreme cases, the classification of illegal activities according to the degree of their complementarity with empirical measures of education may be analytically useful.

Suppose that pecuniary payoffs on index crimes against property

[8] Future losses resulting from a criminal record may be particularly harmful for individuals who have specific legitimate training and whose earnings are disproportionately high in specific legitimate occupations. The discounted value of the opportunity cost of imprisonment may also be disproportionately large for more educated people if their rate of borrowing against future earnings is relatively low.

[9] Alternatively, it may be assumed that both probabilities decline with education, but the relative reductions do not affect the incentive to participate in either i or l.

(robbery, burglary, larceny, and auto theft) were largely dependent on the level of transferable assets in the community — i.e., opportunities provided by potential victims of crime — and to a much lesser extent on education and training. Also assume that the relative preferences for legitimate and illegitimate activities were either proportionately related to or largely independent of the relative pecuniary returns from these activities. Several propositions concerning offenders' characteristics would follow in this case. Given the probability of apprehension and punishment and the length of time served in prison:

1   Those with a lower level of schooling and training, i.e., those with potential legal income well below the average, would have a relatively large wage differential in crimes against property and a relatively low opportunity cost of imprisonment and thus a relatively strong incentive to "enter" crimes against property. Moreover, according to this theory, they would also tend to spend more time at, or to "specialize" in, illegitimate activities relative to other offenders. In contrast, those with higher education — in particular, those with specific legitimate training — would have less incentive to participate in such crimes.[10]

2   Offenders committing crimes against property would tend to enter criminal activity at a relatively young age, essentially because lack of schooling and legitimate training are not important obstacles to such activities and because legitimate earnings opportunities available to young age groups may generally fall short of their potential illegitimate payoffs. Moreover, since entry of the very young into the legitimate labor force is restricted by child labor laws, compulsory schooling, and federal minimum wage provisions, their entry into criminal activity may frequently precede entry into legitimate activity.

[10] A lower level of education that generally results in lower legitimate earnings may also be related positively to index crimes against the person (murder, rape, and assault), although the relation here is less clear than in the case of crimes against property. On the one hand, a lower opportunity cost of time reduces the cost of engaging in time-intensive activities, and these crimes may well fit into this category because of the prospect of long imprisonment terms associated with them. On the other hand, little can be said about the interaction between education and malevolence or other interpersonal frictions leading to crimes against the person. Empirical evidence shows that crimes against the person prevail among groups known to exercise close and frequent social contact (see Ehrlich, 1970, pp. 8–11).

3 Those in school would have less incentive to participate in crime relative to those not enrolled since many of them specialize voluntarily in acquiring education and therefore would view their opportunity cost of time not in terms of their potential current earnings but in relation to the expected future returns on their investment in human capital. In addition, effective school attendance (enrollment net of truancy) poses a constraint on students' participation in crime because it leaves them with less time for the pursuit of all market activities—legitimate as well as illegitimate. Proposition 2 therefore applies, in particular, to youths not enrolled in school.

In contrast to index crimes against property, payoffs on crimes such as fraud, forgery, embezzlement, trade in illegal merchandise, and illegal commercial practices may depend on education and legitimate training in much the same way that legitimate earnings do.[11] Consequently:

4 The average educational attainment of offenders engaged in this class of crimes can be expected to be higher than that of offenders engaged in property crimes.

5 The typical age of entry into such crimes would be higher because entry would follow a longer period of specialization in schooling. In fact, because more highly skilled occupations may involve intensive on-the-job training during the initial period of the working career, entry into related illegitimate activities may occur later than entry into the labor market.

6 A general implication of this analysis concerns the educational attainments of offenders belonging to different racial groups. To the extent that occupational and wage discrimination against non-white workers is greater in legitimate than in illegitimate activities, the critical pecuniary wage differential $(w_i - w_l)^*$, which is the amount sufficient to induce all workers of equal preferences to enter an illegitimate activity i, would be associated with relatively high educational attainment of the worker in the case of nonwhites. Consequently, one may expect the average educational attainments of nonwhite offenders to exceed those of whites in many illegitimate activities.

---

[11] This dependence may be due partly to the fact that engaging in specific legitimate activities is a prerequisite for the commission of specific offenses, for example, embezzlement.

EVIDENCE
FROM ARREST
AND PRISON
DATA

In spite of the general interest in the relation between education and crime, very little detailed evidence on educational attainments of offenders by type of crime has been reported systematically in official crime statistics. Some direct information on the educational attainment of all prisoners in the United States is available on an aggregate level, cross-classified by age and sex.

A generally recognized problem with arrest and prison data is that they relate to offenders who have been apprehended and convicted of crime and who do not make up a representative sample of all offenders. The biases introduced via this selective sampling may be particularly severe where educational attainments of offenders are concerned, for education is likely to be negatively related to the probability of apprehension and conviction. Arrest and prison data are thus likely to understate the average educational attainments of all offenders. Nevertheless, some inferences might still be drawn from these data concerning the comparative educational attainment of offenders involved in different crimes, since the biases inherent in the data may apply uniformly to all crime categories. Another problem with the aggregate arrest and prison data is that, at best, they render possible inferences about only the simple (zero-order) correlation between measures of education and crime, whereas our propositions generally concern the partial cor-

TABLE 12-1
Median
number of
school years
completed by
prisoners and
labor force
participants
in the United
States, by age,
1960

	Males in prisons, reformatories, and jails			Males 14 yrs. old and over in civilian labor force		
Age	State	Federal	Jails and workhouses	Total	Laborers (excl. mine and farm)	Operatives and kindred workers
Total, 25 and over	8.5	9.0	8.9	11.0	8.3	9.1
25–29				12.3	9.8	11.0
30–34	8.9	9.4	9.5	12.1	8.9	10.1
35–44	8.4	9.0	9.2	12.0	8.5	9.8
45–54				10.1	8.0	8.7
55–64	7.9	8.3	8.5	8.7	7.0	8.2
65–74				8.5	6.4	8.0
75 and older	6.4	n.a.*	7.2	8.5	6.6	7.9

* n.a. = not available.

SOURCES: 1960 Census of the Population—Final Report PC(2)—8A (Table 25), U.S. Bureau of the Census, 1963a; and 1960 Census of the Population—Final Report PC(2)—5B (Table 8); U.S. Bureau of the Census, 1963b.

relation between these variables given the probability and severity of punishment.

Table 12-1 compares Bureau of the Census data on the median school years completed by all offenders in state, federal, and local jails and workhouses with schooling of all males in the civilian labor force and in two specific legitimate occupations. On the whole, male prisoners in all correctional institutions appear to have had less schooling than all male workers in the experienced civilian labor force, and the same holds for females (U.S. Bureau of the Census, 1963a, Table 25; 1963b, Table 8). The reported age-specific schooling attainments become more similar, however, when male prisoners are compared with male laborers (except mine and farm workers) and with operatives and kindred workers — two occupations most frequently stated to be the prisoners' major legitimate occupations (see Table 12-2). Federal prisoners appear

TABLE 12-2 *Stated legitimate occupation of male prisoners in the United States, 1960*	*State prisons*	*Federal prisons*	*Local jails and workhouses*
All prisoners, 1960 (number)	193,568	24,162	111,544
Never worked (percentage)	7.37	5.53	2.56
Worked in 1950 or later (percentage)	61.42	74.95	80.29
Last major occupation (percentage of those who worked in 1950 or later) Professional, technical, and kindred workers	1.63	3.58	1.64
Farmers and farm managers	1.04	1.54	0.78
Managers, officials, and props. (excl. farm)	2.14	5.49	2.34
Clerical and kindred workers	2.73	4.75	2.96
Sales workers	2.32	4.84	2.88
Craftsmen, foremen, and kindred workers	12.88	18.73	14.70
Operatives and kindred workers	19.29	22.37	20.80
Private household workers	0.12	0.12	0.22
Service workers (excl. household)	8.20	9.36	10.13
Farm laborers, unpaid family workers	5.48	4.64	6.96
Laborers (excl. farm and mine)	20.01·	12.67	20.14
Occupation not reported	24.15	11.91	16.45

SOURCE: U.S. Bureau of the Census (1963a, Table 25).

to be better schooled than state prisoners in all specific age groups, and this systematic difference may reflect the involvement of federal prisoners in a somewhat different set of offenses—more illegal commercial activities and fewer crimes against the person—from those in which state prisoners are involved.[12] The age-specific schooling attainments of prisoners in local jails and workhouses also appear higher than those of state prisoners, but since the census does not report the distribution of these prisoners by type of crime committed, it is difficult to draw inferences from this evidence alone. It is interesting to note that the median schooling attainments across these three correctional institutions are negatively correlated with the apparent degree of offender "specialization" in illegitimate activity: offenders in local jails and workhouses, who are "best schooled" among prisoners of all age groups, include the lowest proportion of those who never worked and the highest proportion of those who worked in 1950 or later (see Table 12-2). Since offenders convicted for crimes against property constitute the majority of offenders in all correctional institutions, this finding is consistent with the theoretical expectation that for this set of crimes, both the incentive to enter illegal activity and the extent of participation (specialization) should be negatively correlated with schooling and legitimate training.

A comparison of the age distribution of males in two legitimate occupations and in city arrests for various felonies in 1960 is given in Table 12-3. These statistics show that people in younger age groups constitute a greater proportion, and people in older age groups a smaller proportion, of total city arrests relative to the proportion they constitute of, say, construction workers and industrial laborers. There exist, however, significant differences in the age distribution of arrests across specific crime categories. In particular, total arrests for embezzlement, fraud, forgery, and counterfeiting include a much smaller proportion of juveniles and a greater proportion of persons 45 years old and over relative to

[12] In 1960, 54 percent of all state prisoners were convicted of index crimes against property (robbery, burglary, larceny, and auto theft), 24.7 percent for crimes against the person (homicide, assault, and sex offenses), and 10 percent for embezzlement, fraud, and forgery (see *Characteristics of State Prisoners, 1960, National Prisoner Statistics,* 1960, p. 10). In contrast, in 1965, 25 percent of all federal prisoners were convicted for interstate transportation of motor vehicles, 8.3 percent for forgery, 17.9 percent for violations of drug laws, and 29.7 percent for "other federal offenses" (see U.S. Bureau of Prisons, 1965, Table A9).

Employment or crime category	Age group			
	15–19	*20–24*	*25–44*	*45 and over*
Construction workers	7.96*	11.76	44.63	32.65
Industrial laborers	7.13*	13.21	47.00	32.66
Total city arrests	14.05	12.21	42.96	24.91
Robbery	30.95	20.30	30.30	2.90
Burglary	36.43	15.60	19.50	2.69
Larceny	31.48	11.63	22.12	7.83
Auto theft	58.91	12.29	11.62	1.21
Murder and manslaughter	13.60	17.38	49.17	18.78
Assault	12.66	16.64	53.31	13.90
Gambling	3.11	10.14	53.40	33.13
Embezzlement and fraud	5.02	15.31	63.30	15.65
Forgery and counterfeiting	13.33	20.78	46.69	18.09
Buying and receiving property	25.43	17.50	35.37	10.02

* For age group 14 to 19.

SOURCES: U.S. Bureau of the Census (1963c, Table 1); Federal Bureau of Investigation (1961, p. 92).

index crimes against property.[13] These findings are generally consistent with the proposition, noted earlier, that crimes against property are typically committed by the relatively young because they have less investment in legitimate occupations.

Strong empirical support for the proposition that school enrollment and participation in criminal activity are negatively correlated is provided in Simpson and Van Arsdol's 1967 study of juvenile referrals to the Los Angeles County probation department. They found that the delinquency rate among juveniles 14 to 17 years old who were not enrolled in school was about 2.5 times higher than the rate for those who were enrolled, but that no large difference existed in the rate of delinquency for enrollees with educational attainment above or below the modal educational achievement. On this basis, they conclude that ". . . school enrollment per se, regardless of relative achievement, presents a deterrent to delinquency" (Simpson & Van Arsdol, 1967, p. 39).

[13] In all arrest statistics, the representation of older age groups is relatively small. This is due partly to the fact that older and more experienced offenders are more efficient at self-protection than younger offenders and are thus better able to avoid arrest.

The official census publications do not contain direct information on the educational attainment of convicted offenders by race. Census data on schooling attainments of all inmates of institutions in the United States in 1960 indicate, however, that the median number of years of school completed by nonwhite males in the age group 25 to 34 was 8.9, compared with 8.7 for whites (U.S. Bureau of the Census, 1963a, Table 22). The respective data for nonwhite and white females were 9.0 and 8.2. In contrast, the ranking of the schooling attainments of white and nonwhite males and females in the experienced civilian labor force was reversed: 12.2 for white males and 12.3 for white females, as against 10.1 for nonwhite males and 11.3 for nonwhite females (U.S. Bureau of the Census, 1963a, Table 8). Moreover, the rankings of the schooling attainments of white and nonwhite inmates of older ages were also reversed from those in the age group 25 to 34 and conformed to their respective rankings in the civilian labor force. A possible explanation for these conflicting rankings may have to do with the varying proportions of different categories of offenders in different age groups among inmates of closed institutions. Although the overall proportion of prisoners to inmates of all closed institutions is about one-third (the other two-thirds being in homes for the aged or for neglected children and in various closed hospitals), the proportion of prisoners in the age group 25 to 34 should be much greater, since the latter group is the mean and modal age group of all prisoners. The greater median school attainment of nonwhite inmates in this age group is consistent with the proposition that discrimination in legitimate occupations might result in a higher level of educational attainment for nonwhite offenders.

EVIDENCE FROM CRIME STATISTICS Since crime statistics are based on complaints of victims and statements of witnesses to crime and are collected independently of an offender's arrest or conviction, they are free of much of the selective sampling biases inherent in arrest and prison data. However, they do not provide direct information on offenders' characteristics, and such information must be inferred indirectly. In work on participation in illegitimate activities (Ehrlich, 1970, 1973), information on the rate of specific offenses across states in the United States from three decennial censuses has been used to test the basic propositions of the model via a cross-state regression analysis employing ordinary least squares and simultaneous equation estimation tech-

niques. A major advantage of such analysis is that it permits statistical control of variations across states in measures of average probability and severity of punishment for specific crimes, unemployment and income characteristics, and various demographic variables. Thus partial correlations can be estimated between the rate of specific offenses and each of their explanatory variables. Part of the empirical analysis was consequently devoted to the econometric specification and actual testing of proposition 1, presented earlier.

According to the theoretical analysis, given the probability and severity of punishment for crime, and assuming that pecuniary returns from legitimate and illegitimate activities were either proportionately related to or statistically independent of nonpecuniary returns from these activities, the crime rate in each state is expected to be a positive function of the mean (pecuniary) differential returns from crime ($\overline{w}_i - \overline{w}_l$). Information concerning monetary returns from specific crimes $\overline{w}_i$ is presently unavailable on a state-by-state basis, and so the relevant legitimate earning opportunities $\overline{w}_l$ cannot be estimated directly. It is postulated that the average illegal payoffs of crimes against property depend primarily on the level of transferable assets in the community—that is, on opportunities provided by potential victims of crime—and, to a much lesser extent, on the offender's education and legitimate training. The relative variation in the average potential illegal payoff $\overline{w}_i$ may be approximated by the variation in, say, the median value of transferable assets per family or family income across states W.[14] The preceding postulate and the previous discussion under Education and Crime also imply that those in a state with legitimate returns well below the median have greater differential returns from property crimes and hence have more incentive to participate in such crimes than those in states with incomes well above the median.[15]

[14] More precisely, the assumption is that given the relative distribution of family income in a state, variations in average potential payoffs on property crimes can be approximated by the variation in the level of the *entire* distribution. If the income distribution is of the log normal variety, it can be shown that the variation in its level would be reflected by an equal proportional variation in its median value. The relative variation in *potential* payoffs on property crimes may be an unbiased estimator of the relative variation in *actual* payoffs if (private) self-protection of property by potential victims were proportionally related to their wealth. See Ehrlich and Becker (1972) for an elaborate discussion of the relation between the two.

[15] This argument appears to be consistent with one made by Adam Smith who noted that "the affluence of the rich excites the indignation of the poor, who

The variation in the mean legitimate opportunities available to potential offenders across states $\overline{w}_l$ may therefore be approximated by the variation of the mean income level of those below the state's median. Partly because of statistical considerations, the latter was computed somewhat indirectly, by the percentage of families below one-half of the median income in a state, denoted X ("income inequality").[16] Since X is a measure of the *relative* distance between legitimate and illegitimate opportunities available to potential offenders $\overline{w}_i/\overline{w}_l$, changes in W, X held constant, would amount to equal percentage changes in the absolute wage differential $\overline{w}_i - \overline{w}_l$. Given the full cost of punishment per offense f_i and the probability of apprehension and conviction p_i, an increase in W might then have a positive effect on the incidence of crimes against property, similar to the effect of an increase in income inequality X.

In this empirical implementation the extent of punishment is measured by the length of the effective incarceration period of convicted offenders. If punishment for crime were solely by imprisonment, an increase in the median income W, X held constant, would cause an equal proportional increase in the pecuniary "wage differential" from crime as well as in the opportunity cost of imprisonment to all offenders, and its net effect on crime rates might then be null if changes in the level of pecuniary income did not affect the relative preference for legal and illegal activities (see the discussion above under Education and Crime). In contrast, an increase in income inequality, W held constant, would imply a decrease in both legitimate earnings opportunities and the opportunity cost of

---

are often both driven by want and prompted by envy, to invade his possessions" (Smith, 1937, p. 670). By our reasoning, since potential gains from crimes against property are assumed to be largely independent of education and legitimate training, those with legitimate earning opportunities well below the average would have a greater incentive to commit such crimes regardless of possible envy or hate they may feel toward the more affluent members of society.

[16] An increase in X, with median (and mean) family income held constant, implies a decrease in the mean income of relatively poor families $\overline{w}_p$ and an increase in the mean income of the relatively rich $\overline{w}_r$. Since the latter have an incentive to specialize in legitimate market activities, the increase in $\overline{w}_r$ may have very little negative impact on the total amount of property crimes committed in the community, but the decrease in $\overline{w}_p$ is certainly expected to increase it. This argument regarding the effect of changes in X on crimes against property does not apply equally to crimes against the person because there is no a priori reason to assume that the majority of families with income above the median level do not participate at all in such crimes. The statistical advantage of using X in lieu of $\overline{w}_p$ in the regression analysis is that the correlation of $\overline{w}_p$ with W is high, whereas the correlation of X with W is much weaker.

imprisonment to offenders. In practice, however, a major proportion of offenders convicted for property crimes are punished by means other than imprisonment.[17] Consequently, both income inequality and the median income level are expected to be positively related to the incidence of property crimes in the cross-state regressions.[18]

Table 12-4 shows estimates of the partial elasticities of rates of specific crimes against property to changes in income inequality X and in the median family income W across states. These elasticities were derived from the following regression equation:[19]

$$ln\left(\frac{Q}{N}\right)_i = a_i + b_{1i}lnP_i + b_{2i}lnT_i + c_{1i}lnX + c_{2i}lnW$$

$$+ e_1 lnNW + \mu_i \quad (12\text{-}5)$$

where $\left(\frac{Q}{N}\right)_i$ = rate of the ith crime category: the number of offenses known per state population in year t

P_i = ratio of number of commitments to state and federal prisons to number of offenses known to have occurred in the same state ("probability of imprisonment") in year t

T_i = average time served in state prisons by offenders first released in year t

[17] According to rough estimates, 53 percent of those convicted of robbery, 77 percent of those convicted of burglary and larceny, and 82 percent of those convicted of auto theft are punished by means other than imprisonment in state and federal prisons; see Ehrlich (1970, Table R-1).

[18] By the preceding argument, the estimated regression coefficients associated with X might still be biased upward, and those associated with W downward, relative to what their values would have been with the full cost of imprisonment held constant. Opposite biases on the value of these two coefficients can also be expected, however, as a result of "spillover effects" unaccounted for in the cross-state regression analysis; offenders may migrate from one state to another in response to the different opportunities available in different states. It can be shown that such spillover effects on the incidence of crime would overstate the estimated partial effect of W and understate that of X.

[19] Measures of age composition of the population and of unemployment and labor force participation rates were also introduced into the regression analysis, but were excluded in the final regressions because the signs of their coefficients were found to be unstable across most of the specific regressions, and the ratios of the estimated coefficients to their standard errors were found to be relatively small. The exclusion of these variables had virtually no effect on the estimates of c_1 and c_2 reported in Table 12-4.

$W =$ median family income in year t

$X =$ percentage of families whose income is less than one-half of W

$NW =$ percentage of nonwhites in the population in year t

$\mu_i =$ a disturbance term

$ln =$ natural logarithm

A discussion of the econometric specification of the model, the estimating techniques employed, and the many problems in the construction of specific variables used to measure the pertinent theoretical variables, which is avoided here for lack of space, may be found in Ehrlich (1970, 1973). It should be noted, however, that to obtain efficient estimates of the regression coefficients, the regression equation (12-5) was weighted by the square root of the population in each state, since an analysis of residuals in unweighted regressions indicated the presence of heteroscedasticity, which was negatively related to population size. (Such heteroscedasticity is consistent with the hypothesis that the stochastic variable μ is homoscedastic at the individual level.)

Despite the shortcomings of the data and the crude estimates for some of the desired statistics, the results of the regression analysis appear to be highly consistent with the proposition that those with lower schooling levels and training, and hence lower potential legal income, have a relatively greater tendency to engage in crimes against property. The rates of robbery, burglary, larceny, and auto theft are found to vary positively with the measures of income inequality and median family income across states in all specific regressions and census years investigated. In Table 12-4 the regression coefficients c_{1i} and c_{2i}, which are estimates of the elasticities of $(Q/N)_i$ with respect to X and W, are generally greater than unity, and virtually all exceed twice their standard errors.[20] Moreover,

---

[20] The coefficients c_{2i} may reflect, in part, the effect of urbanization on the rate of specific crimes (by greater accessibility to criminal opportunities in metropolitan areas) because W is highly correlated with the level of urbanization across states. This may be one reason why the absolute values of c_{1i} in regressions using 1940 and 1950 data are lower than those in the 1960 regressions: the dependent variables in 1940 and 1950 are "urban crime rates," whereas those in 1960 are state rates. Also note that X and W in the 1940 regressions were calculated on the basis of data on wage and salary earnings of workers rather than family income data (unavailable in 1940), and therefore the estimates of c_{1i} and c_{2i} in that year are not exactly comparable with those of the other years.

		1940		1950	
		OLS*		OLS	
Crime category		X	W	X	W
Robbery	β	.7222	1.6608	.4798	1.7278
	β/S.E.§	.9294)	(4.2214)	(.7008)	(3.2329)
Burglary	β	1.6939	.8327	1.8697	1.1891
	β/S.E.	(2.8321)	(.8003)	(3.5361)	(2.0207)
Larceny	β	3.7371	.6186	3.3134	1.9784
	β/S.E.	(6.5307)	(2.2095)	(6.1904)	(4.8461)
Auto theft	β				
	β/S.E.				
All crimes	β			2.2598	1.5836
against	β/S.E.			(4.8419)	(4.5210)
property					

TABLE 12-4 Weighted regression estimates of the partial elasticities of rates of crimes against property with respect to measures of income inequality (X) and median family income (W) across states in the United States in 1940, 1950, and 1960

* OLS = ordinary least squares estimates.

† 2SLS = estimates derived by a two-stage least squares procedure.

‡ SUR = seemingly unrelated regression estimates derived by applying Aitken's generalized least squares to the system of all four property crimes following a method devised by Zellner (1962).

§ β = elasticity estimate; S.E. = standard error of β.

SOURCE: Ehrlich (1970, Tables 3 and 5).

point estimates obtained from several 1960 regressions employing different estimation techniques are highly consistent. In contrast, X and W were found to have a lower effect on the incidence of murder, rape, and aggravated assault, and the regression coefficients (c's) associated with X and W in regressions for these crimes were generally less than twice their standard errors (see Ehrlich, 1970, Tables 2 & 6; 1973). The finding that variations in X and W have a relatively larger and more significant effect on the incidence of crimes against property than on the incidence of crimes against the person lends credibility to proposition 1 and to the choice of these income variables as indicators of relative "earnings" opportunities in property crimes.

In addition to testing proposition 1, I also attempted to test directly the partial effect of mean educational attainments on the rate of specific crimes across states. This was done by expanding the regression model [Eq. (12-5)] to include the percentage of males in the age group 15 to 25, census estimates of the unemployment rate for urban males, and the mean number of school years completed by the population over 25 years of age (hereafter designated by symbol Ed). Given the economic and demographic characteris-

1960		1960			
OLS		2SLS†		SUR‡	
X	W	X	W	X	W
1.8409	2.9086	1.279	1.689	1.409	2.120
(2.8247)	(4.2628)	(1.660)	(1.969)	(1.853)	(2.548)
2.0452	1.7973	2.000	1.384	2.032	1.581
(5.0209)	(4.0414)	(4.689)	(2.839)	(4.776)	(3.313)
1.6207	2.6893	1.792	2.229	1.785	2.241
(3.1092)	(5.1392)	(2.992)	(3.465)	(2.985)	(3.502)
1.8981	2.8931	2.057	2.608	2.054	2.590
(4.2556)	(6.3527)	(4.268)	(5.194)	(4.283)	(5.253)
2.0547	2.3345	2.132	1.883		
(5.8090)	(6.1923)	(5.356)	(4.246)		

tics of the population, one might expect a negative correlation between Ed and all specific crimes, assuming that education does play some role in directing individual motivation and propensities along socially desirable avenues. The results with respect to the partial effect of Ed were disappointing, however, for they showed a positive and significant association between Ed and (particularly) crimes against property across states in 1960 (see Ehrlich, 1970, App. R, Tables R-7 & R-14). One possible explanation for these results is that Ed works as a surrogate for the average permanent income in the population: Given the distribution of *current* family income (approximated by X and W), the average schooling attainments may be an efficient indication of the long-run level of income and thus of the true level of transferable assets in a state. Since the latter are expected to be positively correlated with illegitimate opportunities (as is W), the positive partial regression coefficient associated with Ed in the regression for property crimes may not, then, be so surprising. Another possible explanation is that given X and W, Ed may be negatively related to the level of unreported crimes, which is particularly high for crimes against property (see Ehrlich, 1970, pp. 54–55, and Table R-1, p. 132). Since education

may increase the efficiency of law-enforcement agencies and the general public in reporting crime, it might, *ceteris paribus,* be positively related to all the reported crime rates, particularly to rates of crime against property.

In contrast to the disappointing results obtained in testing the partial effect of *Ed* on specific crime rates, interesting and plausible results were obtained for the partial effect of education on the effectiveness of law-enforcement activity across states. In the context of testing the interaction between crime and law enforcement through a simultaneous equation model, an attempt was made to estimate an aggregate production function of law-enforcement activity: estimates of the probabilities of apprehension and imprisonment for crime *P* were regressed on total expenditures for police activity and other variables. Given the level of expenditure on police, the crime level itself, the size and density of the population, and income inequality, it was found that the partial effect of *Ed* on *P* was positive and statistically significant; the estimated elasticity is 2.4 (see Ehrlich, 1973). Since higher educational attainments among the state population would presumably also be reflected in higher educational attainments among all law-enforcement agents, this result may be interpreted as evidence for the role of education of both the potential victims and law-enforcement agents as an efficiency parameter in the production of law-enforcement activity.

CONCLUSION The approach one takes in analyzing the relation between education and crime is not independent of the approach one takes in analyzing the determinants of crime itself. An economic approach to criminality, as developed here and elsewhere, emphasizes the role that objective market opportunities play in determining entry into, and the extent of participation in, illegitimate activities. In this chapter I have attempted to analyze the relation between education and crime by concentrating on the role education may have in determining such opportunities. The analysis suggests that education does not have a uniform effect on illegitimate and legitimate opportunities, but has an effect which varies according to the complementarity of schooling and legitimate training with inputs employed in producing legitimate and illegitimate returns. I have postulated, however, that given the probability of punishment and the length of imprisonment, education would bias relative opportunities away from crimes against property, which constitute the bulk of all felonies in the United States, and increase the cost of crimes against

the person. This postulate, and other related ones, are found to be not inconsistent with empirical evidence from arrest and prison data, as well as from crime statistics.

Perhaps the most important finding reported in this chapter is the positive and statistically significant association between the extent of income inequality, measured as the relative density of the lower tail of the family-income distribution, and the rate of all specific crimes against property across states in three census years.[21] There also exists some evidence of a positive association between inequality in earnings and the dispersion in schooling across regions in the United States (see, for example, Chiswick, 1967), as well as a growing body of empirical evidence confirming the importance of education and on-the-job training in determining the distribution of labor and personal income (see Mincer, 1969). A logical inference from these findings is, then, that the extent of specific crimes against property is directly related to inequalities in schooling and on-the-job training. Moreover, it is essentially the inequalities in the distribution of schooling and training, not their mean levels, that appear to be strongly related to the incidence of many crimes. This indicates a social incentive for equalizing schooling and training opportunities which is independent of ethical considerations or a specific social welfare function, provided, of course, that equalizing educational opportunities would also lead to a greater equality in the distribution of actual educational attainments and legitimate earnings. Answers to the question of whether it would pay society to spend more resources in order to promote equality in educational opportunities as a deterrent to crime and to the question of what the optimal expenditure for that purpose should be would depend not only on the effect of such expenditure on the actual distribution of earnings opportunities but also on the extent to which alternative methods of combating crime "pay."[22]

A general implication of this analysis concerns rehabilitation

[21] This finding is consistent with a similar one by Fleisher (1966), who reported a positive association between aggregate arrest rates and the difference between the incomes of the highest and second-to-lowest quartiles/of families, based on a regression analysis using intercity and intracity data. His analysis and method of estimation are, however, different from those here, and some of the results are statistically insignificant.

[22] Tentative results obtained in my study of the effectiveness of law-enforcement activity through police and courts indicate that in 1960, for example, law enforcement "paid" (indeed, "overpaid") in the sense that the marginal revenue from apprehending and convicting offenders, measured in terms of the resulting lower social cost of crime, exceeded the marginal cost of such activity.

programs for offenders. If criminal behavior were primarily the result of a unique motivation of offenders, rehabilitative efforts would need to emphasize psychological and other related treatment of convicted offenders. This analysis and the empirical findings indicate, however, that criminal behavior is to a large extent also the result of the relative earnings opportunities of offenders in legitimate and illegitimate activities, and these may shift toward the latter following apprehension and conviction for crime. This suggests that rehabilitation efforts intended as an effective deterrent against recidivism must emphasize specific training of offenders for legitimate activities (perhaps along with other treatments) prior to their release from prison. Much more research is needed, however, in order to confirm the effectiveness of such rehabilitation efforts and of programs for equalizing schooling and training opportunities in deterring participation in specific crimes.

References

Becker, Gary S.: "Crime and Punishment: An Economic Approach," *Journal of Political Economy*, vol. 76, no. 2, pp. 169–217, March 1968.

Chiswick, Barry R.: "Human Capital and Personal Income Distribution by Region," unpublished Ph.D. dissertation, Columbia University, New York, 1967.

Cohen, Joseph: "The Geography of Crime," in David Dressler (ed.), *Readings in Criminology and Penology*, 2d ed., Columbia University Press, New York, 1964, pp. 301–311.

Ehrlich, Isaac: "Participation in Illegitimate Activities: An Economic Analysis," unpublished Ph.D. dissertation, Columbia University, New York, 1970.

Ehrlich, Isaac: "Participation in Illegitimate Activities: A Theoretical and Empirical Investigation." *Journal of Political Economy*. vol. 81, pp. 521–565, May–June 1973.

Ehrlich, Isaac, and Gary S. Becker: "Market Insurance, Self-Insurance and Self-Protection," *Journal of Political Economy*, vol. 80, pp. 623–648, July–August 1972.

Eichorn, John R.: "Delinquency and the Educational Systems," in Herbert C. Quay (ed.), *Juvenile Delinquency: Research and Theory*, D. Van Nostrand Company, Inc., Princeton, N.J., 1965, pp. 25–40.

Federal Bureau of Investigation: *Uniform Crime Reports in the U.S., 1960*, Government Printing Office, Washington, 1961.

Fleisher, Belton M.: *The Economics of Delinquency*, Quadrangle Books, Inc., Chicago, 1966.

Mincer, Jacob: *The Distribution of Labor Incomes: A Survey,* National Bureau of Economic Research, New York, 1969, (Mimeographed.)

Simpson, Jon E., and Maurice D. Van Arsdol, Jr.: "Residential History and Educational Status of Delinquents and Non-Delinquents," *Social Problems,* vol. 15, no. 7, pp. 25–40, Summer 1967.

Smigel-Leibowitz, Arleen: "Does Crime Pay? An Economic Analysis," unpublished M.A. thesis, Columbia University, New York, 1965.

Smith, Adam: *The Wealth of Nations,* Modern Library, Inc., New York, 1937.

U.S. Bureau of Prisons: *Characteristics of State Prisoners, 1960, National Prisoner Statistics,* Government Printing Office, Washington, 1960.

U.S. Bureau of Prisons: *Federal Bureau of Prisons, Statistical Tables, Fiscal Year 1965,* Government Printing Office, Washington, 1965.

U.S. Bureau of the Census: *1960 Census of the Population, Special Reports. Inmates of Institutions,* Government Printing Office, Washington, 1963*a.*

U.S. Bureau of the Census: *Special Reports, Educational Attainments,* Government Printing Office, Washington, 1963*b.*

U.S. Bureau of the Census: *Special Reports, Occupations by Industry,* Government Printing Office, Washington, 1963*c.*

Zellner, Arnold: "An Efficient Method of Estimating Seemingly Unrelated Regressions and Tests for a Regression Bias," *Journal of the American Statistical Association,* vol. 57, pp. 348–368, June 1962.