Chapter 52

THE ECONOMICS OF CRIME

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Abstract

Crime is a major activity in the US, with implications for poverty and the allocation of public and private resources. The economics of crime focuses on the effect of incentives on criminal behavior, the way decisions interact in a market setting; and the use of a benefit–cost framework to assess alternative strategies to reduce crime. This essay shows that most empirical evidence supports the role of incentives in the criminal decision: legitimate labor market experiences, sanctions including incarceration, and the risk of apprehension all influence decisions to engage in crime. By putting crime into a market setting, economic analysis highlights the difficulty of reducing crime through incapacitation: when the elasticity of supply to crime is high, one criminal replaces another in the market; and thus the importance of deterring crime by altering behavior. Most analyses show that "crime pays" in the sense of offering higher wages than legitimate work, presumably in part to offset the risk of apprehension. But some important facts about crime – long term trend increases and decreases; the geographic concentration of crime; the preponderance of men and the young in crime – seem to go beyond basic economic analysis.

JEL codes: J22; K42

1. Introduction

Should I mug you or burgle your home, abscond with the company treasury, sell or buy illegal drugs, cheat on my income tax, shoplift?

How will the chances of apprehension or the magnitude of criminal penalties or legitimate employment and earnings opportunities affect my decision to commit crime?

Should you buy locks and window gates, take out theft insurance, avoid walking in the park at night, or hire private guards to protect your business or residence?

Should you support additional taxes for more police, more prisons, or juvenile delinquency prevention programs?

Should the police put more officers on the street or use modern surveillance technologies to monitor public places or develop extensive community policing programs?

The questions that motivate the economic analysis of crime make for headlines in the tabloids or for police dramas on the television. Headlines aside, the economics of crime is an important area of research in the US for several reasons.

First, because crime is a major activity. In 1997 the police reported 13.5 million crimes or 5079 crimes per 100,000 residents, while citizens reported that they were victimized by crime nearly three times as frequently – 36.8 million crimes.[1] On the 1991 National Survey of Drug Abuse, 2.6% of adults reported that they had committed a felony[2] in the past year, which given under-reporting of crimes, suggests that on the order of 4%

[1] US Bureau of Census Statistical Abstract of the US 1997, Tables 314, 315, 324.

[2] The felonies reported were: stolen a car, used force or a weapon to get money, broken into a house, beaten someone badly, sold an illegal drug, or been arrested for a serious offense.

of adults committed serious crimes.[3] On the order of 30% of adult males are arrested for a serious crime at one time in their lives (Blumstein et al., 1986, p. 57). In 1997 approximately 1.7 million Americans were incarcerated[4]; over 3.2 million adults were under probation and about 0.7 million were paroled.[5] In total, 2.9% of adult US residents were "under supervision" by the criminal justice system.

The vast bulk of those arrested, admitting to crime, and incarcerated are male, so that 1 in 20 adult men was "under supervision" by the criminal justice system in 1997.[6] Based on 1990s rates of first incarceration, the Justice Department estimates that approximately 9% of American men will be in prison at one point in their lives![7]

The vast bulk of those arrested, admitting to crime, and incarcerated are young. In 1995, for example, 72% of persons arrested were aged 13–34, whereas 13–34 year olds make up just 32% of the population. Similarly, in 1991, 67% of state prison inmates were aged 18–34, whereas 18–34 year olds make up just 34% of the adult (18 or older) population group.[8] In 1995 law enforcement agencies made 2.9 million arrests of persons aged less than 18; some 1.4 million juveniles were taken into police custody, and roughly 0.5 million juveniles were on probation in the mid-1990s.[9] The age and gender pattern of crime seems universal. Arrest rates rise with age, peak in the mid to late teens or early twenties, then fall (Hirschi and Gottfredson, 1983; Blumstein et al., 1986, Fig. 1.2). A disproportionate number of those involved in crime are black, which creates a major social problem in America's inner cities.

Given the high levels of crime, it is not surprising that crime prevention is a major economic activity. In 1997 the public budget for the criminal justice system was on the order of 100 billion dollars – nearly half spent on police, a third on corrections, and the remaining fifth on judicial and legal activities. Updating a 1985 study of private security programs, Hallcrest Systems, Inc estimated that in 1991 the budget for private security

[3] Greenwood et al. (1994) estimate the under reporting to be 41.2% by comparing actual to reported arrests for California. See D.8.

[4] The Bureau of Justice Statistics reports 1,725,842 inmates in custody in June 1997. Sixty-one percent of this group were in state prisons, 33% in local jails, and the remaining 6% in federal prisons. See Bureau of Justice Statistics, Prison and Jail Inmates at Midyear 1997, January 1998, NCJ-167247, Table 1.

[5] Probation and parole data relate to 31 December 1996 and thus understate the numbers relative to the inmate population in mid-1997. See US Department of Justice Probation and Parole Population Reached Almost 3.9 Million Last Year, August 14, 1997.

[6] Ninety-four percent of the prison population, 90% of the jail population, and 79% of the persons on probation were male in 1995 (Bureau of Justice Statistics, Characteristics of Adults on Probation, 1995 (USGPO, Dec. 1997) p. 3.

[7] US Bureau of Justice Statistics, Lifetime Likelihood of Going to State or Federal Prison 3/97 NCJ-160092.

[8] US Bureau of Justice Statistics, Sourcebook of Criminal Justice Statistics 1996, Table 4.4 gives distributions of arrests and the population by age. US Bureau of the Census, Statistical Abstract 1997 Table 356, for the age of prisoners, and Table 33 for the age of the population.

[9] US Department of Justice Statistics, Sourcebook of Criminal Justice Statistics 1996, Table 4.6 gives arrest rates, Table 4.25 gives juveniles taken into police custody.

exceeded that for public law enforcement by some 73% (Cunningham et al., 1991).[10] In 1997 over 2 million persons worked in "protective service" occupations exclusive of firefighters. In addition to police and corrections officials, there were nearly 0.75 million private guards, detective agencies and protective service firms (Industry standard industrial classification code SIC 7381 and 7382) massively increased their employment from 62,000 in 1964 to over 690,000 workers in early 1998.

The economics of crime is also important because crime is closely related to poverty, social exclusion, and other economic problems. Most criminals have limited education and labor market skills, poor employment records, and low legitimate earnings. For instance, the 1991 Survey of State Prison Inmates reports that two-thirds had not graduated high school, though many had obtained a general equivalency degree (US Department of Justice, Bureau of Justice Statistics, 1993). Among 25–34 year olds, approximately 12% of all male high school dropouts were incarcerated in 1993. The average AFQT score of criminals is below that of non-criminals. A disproportionate number of criminals report that they were jobless in the period prior to their arrest.

What is true for criminals is also true for victims. Persons from disadvantaged or low income groups are over-represented among the victims from crime. Victimization surveys show that blacks are more likely to be victims of violent crime than whites and are also more likely to be victims of property crimes, despite owning less property. The rate of victimization for violent crimes (which range from robbery to assault to rape) is inversely related to household income, while the rate of victimization for property crimes rises only modestly with income.[11] Benefit–cost assessments of social interventions to help disadvantaged young men, such as the Job Corps or the Perry Pre-School early education experiment, depend critically on cost savings from reductions in crime.

The economics of crime is also important because crime is an area of extreme behavior that puts economic analysis to a rigorous test. Crime is inherently risky, so that attitudes toward risk are critical in decision-making. Criminal behavior is subject to strategic gaming by the police, criminals, and the public, per the Prisoner's Dilemma. Social interactions among potential criminals, potential victims, and the criminal justice system, moreover, go beyond the price system. An increase in the number of criminals can reduce the likelihood of being caught for a crime, augmenting the incentive to commit crime, or it may induce others into crime by setting an example.

Since Becker (1968), economists have increasingly studied the determinants and conse-

[10] This is a highly speculative number due to "a paucity of information based on rigorous empirical research" (Cunningham et al., 1991, p. 2). The claim that private security forces "dwarf public law enforcement ... by 2 1/2 time" (p. 1) seems excessive. Current Population Survey data show more police and detectives in the public service, and sheriffs bailiffs and other law enforcement officers than guards outside the public sector. US Bureau of Labor Statistics Employment and Earnings, January 1998.

[11] US Department of Justice, Bureau of Justice Statistics, Sourcebook of Criminal Justice Statistics, 1996, Tables 3.2 for personal victimization and Table 3.20 3.21 for property victimization. The 1996 Criminal Victimization Survey shows no trend in property victimization by income group until the $75,000 or more household income class, which has a modestly higher rate (304.6 per 100,000) than households with less than $7500 income (282.7 per 100,000). US Department of Justice Web Site, cv96.txt, November 1997 NCJ-165812.

quences of crime, but researchers from other disciplines dominate the area. Criminology is a distinct field of its own, with professional journals and specialized expertise.[12] Psychology and sociology are important because crime runs in families, raising issues about genetic predispositions and the effect of family background on criminal propensities. Hernnstein (1996) has argued that criminals differ along many dimensions from the non-criminal population: they have "criminogenic traits" that reach back to childhood delinquency, score lower on IQ tests, evince problem psychological behavior, and have a genetic source was well. Many criminologists stress the role of childhood experiences, particularly child abuse (Widom, 1997), as a determinant of youth criminal behavior. Ethnographers have developed rich analyses of the youth gangs which provide the social setting for much crime.[13] And, as debates over the death penalty and legalization of drugs and sexual harassment highlight, normative concerns play a great role in defining crime and appropriate punishment.[14]

This essay focuses on what economics brings to the table: insights into the effect of incentives on criminal behavior, the way decisions interact in a market setting; and the use of a benefit–cost framework to assess alternative strategies to reduce crime. Because so much research is done outside of economics proper, the essay examines what other social scientists as well as economists have contributed in these areas.[15]

2. Measures and magnitudes

There are four basic sources of statistics on criminal activities in the US: administrative records on crimes reported to the police, gathered by the Federal Bureau of Investigation though its Uniform Crime Reporting Program from law enforcement agencies around the country; the National Victimization Survey, an annual survey that asks whether citizens have been victimized in various ways and whether they reported the offense to the police; general surveys of the population that include modules of questions on criminal activities; and specialized data sets that focus on criminal activity, including longitudinal surveys of the crime behavior of given cohorts, surveys of prisoners, and the like.

[12] Outside of academe, there is a criminal justice community that provides statistics on crime and that monitors alternative crime prevention or rehabilitation strategies, such as random preventive patrolling or quick police response and community policing. The Web Site of the Bureau of Justice Statistics offers easy access to data and reports; the National Archive of Criminal Justice Data at the University of Michigan is a repository of diverse data files.

[13] See the wide range of disciplines of author's in James Q. Wilson *Crime and Public Policy* (ICS Press, 1983) and his 1996 book with Joan Petersilia, *Crime*.

[14] Isaac Ehrlich's findings on the deterrent effects of capital punishment in the 1970s caused an uproar among researchers, in part because Ehrlich was addressing an issue of criminal justice about which people have deep moral feelings. A panel from the National Academy of Science reviewed the work as part of its study of the effectiveness of sanctions, found some data errors, but did not overturn the thrust of Ehrlich's case. See Vandaele (1978).

[15] I have benefited from joint work with Jeffrey Fagan. See Fagan and Freeman (1997).

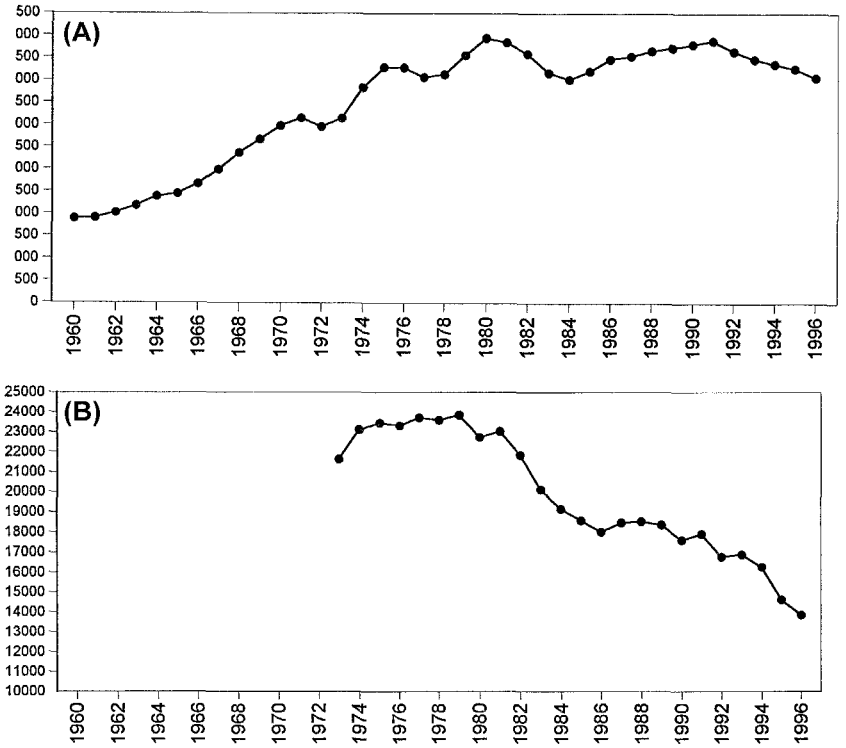

Fig. 1. (A) Uniform crime reporting rate of index offences per 100,000 inhabitants. *Source*: tabulated from Maguire and Pastore (1996, Table 3.106), with 1996 update from US Department of Justice Website. (B) US Department of Justice, Bureau of Justice Statistics, Criminal Victimization in the United States 1996, Changes 1995–1996 with Trends 1993–1996, NCJ-151658, combined with US Department of Justice, Bureau of Justice Statistics, Criminal Victimization in the United States, 1973–1992 Trends (July 1994) for 1973–1992 data. The Bureau of Justice Statistics redesigned the victimization survey so that victimizations from 1993 are not comparable to those in earlier years. I adjusted the older series for comparability with the new series using the reported number of victimizations on the new definition in the overlap year 1992 as reported in Taylor (1997, Table 1). Specifically, I multiplied the sum of victimizations (household and personal) from Bureau of Justice Statistics, Criminal Victimization in the United States, 1973–1992 Trends, Table 1, by a proportionality factor of 42,834/33,649 to reflect the change in definition.

Fig. 1 records the "index crime rate" – the FBI's compilation of major crimes[16] – from 1960 to 1997 and the rate of personal and household victimizations from crime, beginning in 1973 (when the survey was first taken), adjusted as described in the figure note for comparability over time on the basis of the 1993 change in the survey. The two series differ considerably. Victimization rates are roughly three times the crime rates known to

[16] The index includes seven major crimes: murder and non-negligent manslaughter, forcible rape, robbery, aggravated assault, burglary, larceny theft, and motor vehicle theft.

police because victims do not report all crimes.[17] Victims differentially report crimes to the police for several reasons. The benefits of reporting a crime may be small – the police are unlikely to retrieve your stolen bicycle or wallet, so why spend the time and effort reporting the theft? Some crimes are committed by intimates, whom the victim may not want to punish or who can wreak vengeance on the victim. On the other hand, car thefts are almost always reported, because the victim will receive insurance money.

The index crime rate rose sharply in the 1960s and 1970s – the great crime wave that brought crime to the forefront of national discussion – levelled off in the 1980s and dropped in the 1990s. By contrast, the victimization rate falls sharply from the 1980s through the 1990s. Whereas in 1997 the UCR crime rate was 15% below its 1980 peak level, the victimization rate was 39% below its 1980 level. One reason for the differential pattern is that the rate of reporting crimes to police rose over the period. Boggess and Bound (1993) estimate that this accounts for about one-quarter of the differential trend and hypothesize that much of the remaining difference is due to increased police filing of reports. Decomposing crimes by type, most of the discrepancy is for crimes that "are known to be poorly measured both by the UCR and (victims survey)", while series that are well-measured, such as motor vehicle theft, robbery, and burglary, are more closely aligned.

The crime wave was followed by a massive rise in arrests and incarceration. The number of persons arrested in the US rose from 6.3 million in 1970 to 14.2 million in 1995. Even greater, however, was the increase in the number of persons incarcerated in state and federal prisons and in jails. The increase is truly astounding. Over 1.7 million persons were incarcerated in jail or prison in 1997 compared to less than one-tenth that number 30 years earlier! The rate of increase of incarceration averaged 5–6% a year in the 1990s, implying that the numbers in prison and jail will continue to rise sharply. Fig. 2 shows the exponential growth in the rate of incarceration in state and federal prisons from 1950 to 1997.

The third source of information on criminal activity comes from the perpetrators of crime themselves. Standard surveys often include crime modules, which ask respondents to detail their criminal actions. For instance, the 1980 National Longitudinal Survey of Youth asked, "On this form are descriptions of types of activities that some young people can get into trouble for. I want you to read each item and put a check mark in the category that best describes the number of times in the last year you have done the activities described" and then listed 17 crimes such as shoplifting; attacking someone with the idea of hurting or killing them; selling hard drugs; auto theft, and so on. Some 40% of young men in the NLSY admitted in 1980 that they had committed crimes in the previous year. In the 1989 Boston Youth Survey 23% said that they had committed crimes (Free-

[17] There are differences between the series in crimes included. Victims cannot report that they were murdered. The victimization survey does not ask about victimless crimes. But crime by crime, the UCR data show smaller levels, and victims on the Victimization Survey report that they only tell the police about a third of crimes. See US Bureau of Justice Statistics, Sourcebook of Criminal Justice Statistics 1996, Table 3.32.

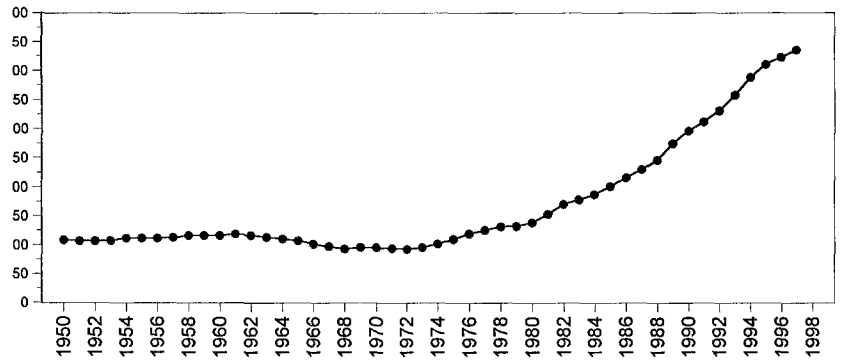

Fig. 2. Rate of sentenced prisoners in state and federal prison institutions per 100,000 inhabitants. *Source*: Maguire and Pastore (1997, Table 6.21), with 1996 and 1997 updates from US Department of Justice Website.

man, 1992 , Table 6.3). The National Household Survey of Drug Abuse, conducted in 1991 asked similar questions of the entire population.[18]

Arrest, incarceration data and self-reported crime data show that persons who commit crime are a distinct group: they tend to be young, male, high school dropouts with troubled family histories and low scores on standardized tests. There is, however, one demographic characteristic on which self-reported crime data is inconsistent with administrative data: race. Blacks make up a disproportionate number of those arrested and incarcerated for crime but report committing crimes at the same rate as whites. This difference created controversy in the 1970s, for it suggested that the criminal justice system was ripe with discrimination: why else would groups with similar self-reported rates of criminal activity have such disproportionate arrest and incarceration outcomes? However, when Hindelang et al. (1981) compared self-reports of arrests with police records in Seattle, they found that white youths reported their arrests reasonably accurately while black youths greatly under-reported their arrests. Measurement error in the form of lower reports of crime by blacks thus seems to be the most plausible explanation of the difference between the administrative and self-report data. The problem with the self-reported arrest data for African Americans led one researcher to exclude blacks from his analysis of self-reported criminal behavior (Bushway).

2.1. Participation in crime and offenses per criminal

The supply of crime from a given group can be decomposed in various ways. One way, which parallels analyses of labor supply, is to decompose the supply of crimes per person (CPP) in the non-institutional population into: the number of persons who commit crimes in the group – the criminal participation rate (CPR) and the number of criminal offenses

[18] The responses on this survey are comparable to those on the NLSY for the relevant age group (Greenwood et al., 1996, Table D-10).

per active criminal (λ):

$$\text{CPP} = \text{CPR} \times \lambda. \tag{1}$$

Since young men commit most crimes, it is natural to use the young male population (say those aged 18–34) as the base for estimating the CPP. Because the age-gender composition of the population changes more slowly than crime numbers, however, the criminal activity rate of young men moves much like the overall crime rate. The implication is that despite the strong demographic component of crime, changes in crime rates depend more on behavior, as reflected in age-crime offense rates, than on changes in the demographic composition of the population. This is in fact the conclusion of various studies that have looked at the effect of demographic changes on crime (see Phillips and Votey, 1990; Levitt, 1997).

Evidence on offenses per active criminal (λ) is hard to come by. There are problems of definition – is drug selling one crime or many depending on how many drug sales are made? – and issues in the reliability of self-reported criminal behavior, perhaps because of systemic measurement error in self-reports (Spelman, 1994). In any case, studies report widely varying numbers. Studies of prisoners suggest an average number of crimes of approximately 60–180 per year (Marvell and Moody, 1994, Table 1 summarize the evidence). But because a small number of criminals report that they committed a large number of crimes, the median number of offenses per prisoner is just 12–15 per year, and relatively many criminals commit only one or two crimes, giving an entirely different picture of the extent of criminal activity per criminal.[19] Since prisoners are a high offending group, moreover, their crime rates should exceed those of the non-incarcerated population. Criminologists also estimate crimes per criminal by asking persons arrested how many times they were arrested; and dividing the number of arrests by police data on the arrests per crime. These estimates suggest a rate of offenses per criminal of around 11 (Marvell and Moody, 1996, p. 112). Finally, we have numbers of crimes reported by youths on household surveys. In the NLSY, non-incarcerated youths who admit having committed crimes report 7 crimes over the year.

While the average number of crimes differs among studies, all estimates of offenses per criminal show a highly skewed distribution. This was first documented in Wolfgang et al.'s (1972) study of "chronic offenders" in a cohort of men born in Philadelphia in 1945 and has been replicated in other data sets, including the report of Tracy et al. (1985) on a 1958 Philadelphia cohort. The original Philadelphia study found that 18% of delinquents committed 52% of criminal offenses; the follow-up estimated that 23% of delinquents committed 61% of offenses. In addition, the Philadelphia study found that adult criminals come disproportionately from juvenile delinquents. Greenwood et al. 1996 estimate that

[19] This will bias downward the number committing crime and bias upward the estimated reduction in crime from incapacitation. Consider a non-institutional population of 100 with 100 crimes, which are committed by 25 people who commit 4 crimes each. Assume the jails hold 2 high-propensity criminals, who commit 50 crimes. The estimated population committing crimes would then be 2, whereas in fact it is 25. See Cohen and Canela-Cacho (1994) for analyses of the potential decline in the incapacitation effect as the number of prisoners grows.

in California, the upper half of the distribution of offenders in prison committed 10.6 crimes per year while those in the lower half of offenders committed 0.6 crimes per year. That a small group commits the bulk of offenses has impelled some analysts to examine the pay-offs to an incarceration strategy that would focus on that minority (Greenwood and Abrahamse, 1982).

The criminal participation rate and offense rates per criminal in (1) are truncated statistics, since they refer to the non-incarcerated population. For some purposes it is useful to consider the incarcerated criminals and active criminals as the relevant criminal population for analysis. If this population was roughly constant, incarceration would greatly reduce the number of crimes, particularly if society imprisoned chronic offenders. In fact, the massive 1970–1990s increase in the number of incarcerated persons in the US did not reduce the crime rate by anything like the amount that one would expect if there was a constant population of criminals (Zimring and Hawkins, 1991; Freeman, 1992).[20] The implication is that the total supply of criminals varies with circumstances and thus that incarcerated criminals or their criminal actions were at least partially replaced in the market during 1970–1990. From the perspective of economics, the decline in the returns to crime associated with rising incarceration must have been offset by increases in the other incentives to commit crime – for instance, by falls in legitimate earnings relative to criminal earnings over this period.

3. Crime in a market context

Viewed through the lenses of the standard economic model of decision-making, individuals choose between criminal activity and legal activity on the basis of the expected utility from those acts. If W_c is the gain from successful crime, p the probability of being apprehended, S the extent of punishment, and W is earnings from legitimate work, the decision-maker will choose to commit crimes in a given time period rather than do legitimate work when:

$$(1 - p)U(W_c) - pU(S) > U(W). \tag{2}$$

This equation has three implications for empirical analysis.

First, it implies that crime must pay a higher wage than legitimate activities. With $p \simeq 0$, $U(W_c) > U(W)$ only if $W_c > W$. As p rises the gap between W_c and W must increase to maintain the advantage of crime. Successful crime must pay off more the greater the chance of being apprehended.

Second, Eq. (2) implies that attitudes toward risk, measured by the curvature of U, will

[20] To see this, consider what a 1 million person increase in the number of incarcerated criminals would do to the crime rate if, say, each incarcerated person would have committed 12 crimes per year. Absent any replacement of these criminals, crimes would drop by 12 million. That the number of crimes did not drop by this amount implies that the non-incarcerated population replaced some of the crimes. Using calculations like this, Freeman (1996) shows that the "propensity to commit crime" by non-incarcerated persons rose sharply in the 1980s.

influence the decision to commit crimes: risk averse persons will respond more to changes in the chances of being apprehended than to changes in the extent of punishment, holding fixed the expected net income from crime ($(1 - p)W_c - pS - W$).

Third, and most important, Eq. (2) shows that the major factors that affect the decisions to commit crime – criminal versus legitimate earnings, the chance of being caught, and the extent of sentencing – are intrinsically related. Someone who accepts (2) as a valid description of the decision to commit crime cannot argue that tougher sentences will work to reduce crime whereas improvements in the legitimate opportunities of criminals cannot do so, and conversely.

Eq. (2) is a two activity, one period model that treats crime and legitimate work as substitutes. The model can be expanded in various ways to allow for: additional allocations of time;[21] the effect of crime in one period on future legitimate and criminal earnings; the risk that a criminal is victimized by other criminals; the degree of social opprobrium for crime, and, perhaps most important in light of empirical analyses, the possibility that crime and legal work are not exclusionary acts. You can commit crimes while holding a legal job or can shift from crime to legal work and back again, depending on relative rewards. Still, there is a virtue to the simple equation: it highlights the major variables on which most empirical work focuses.

3.1. The market

The individual decision to commit crime is, of course, only the first part of any economic analysis. To get the supply of crimes and criminal participation equations for the population, aggregate (2) across individuals to obtain the supply curves of crime:

$$\text{CPP} = f(W_c, p, S, W) \quad \text{or} \quad \text{CPP} = f(1 - p)W_c - pS - W), p), \tag{3}$$

$$\text{CPR} = g(W_c, p, S, W) \quad \text{or} \quad \text{CPR} = g(1 - p)W_c - pS - W, p), \tag{4}$$

where the first term represents the expected value of crime versus legal work, and p measures risk.Most empirical work on the economic determinants of crime estimates the response of crime or criminals with respect to each determinant variable separately rather than imposing the expected value structure on the data. In part this because the studies often concentrate on measuring one or another of the determinants of crime accurately, and risk getting poorer estimates for the variable of interest by imposing the expected value form on data when other elements may be badly measured.

The demand side of the crime market is a downward sloping relation between numbers of crimes and criminal earnings. Victimless crimes – drugs, prostitution, gambling – are

[21] It is possible to expand the model in ways that make the predictions ambiguous. Block and Heinecke and Witte do this by allowing time spent in legal and illegal activities to enter the utility function directly. Witte and Schmidt do this by expanding the number of time outcomes. These expansions in turn lead to peculiar results when the utility function is subject to decreasing absolute risk aversion, such as predicting that increased unemployment lowers crime (because it lowers income, and thus willingness to undertake risky crimes).

normal consumer goods that consumers will buy less of when the price (a function of W_c) rises. But the amount of victims' crime should also be negatively related to W_c or to the expected reward to crime ($(1 - p)W_c - pS - W$) in a demand type relation. One reason is that additional crimes are likely to induce society to increase p or S, cutting the rewards to crime. Another is that as criminals commit more crimes, they will move from more lucrative crimes to less lucrative crimes.

An upward sloping supply curve to crime and downward sloping "demand" relation produce a market clearing level of crime and rewards to crime, comparable to the market clearing wages and employment for other occupations or industries. While the simple demand-supply framework fails to explain some important phenomenon, such as the concentration of crime in geographic areas or over time, or to allow for the adverse effect of crime on legitimate earnings, it has an important implication for the efficacy of mass incarceration in reducing crimes.

3.2. The market model and incapacitation

A major benefit of incarceration is that it removes criminals from civil society so that they cannot commit additional offenses. Given the wide variation in crimes committed by criminals, incarceration of chronic offenders should have a particularly large effect in reducing crime. The reduction in crime due to incarceration is known as the incapacitation effect, and can be analyzed using a demographic accounting framework (see Greenwood, 1983; Blumstein et al., 1986). Arithmetically, if you lock up someone who commits, say, 10 muggings a year in a dark alley, and no one replaces that criminal in the alley, the number of muggings should drop by 10.[22]

Until the US greatly increased its inmate population, most analysts viewed the incapacitation effect as a powerful one: increase the number of inmates tenfold, as the US did from 1964 to 1994, and surely the crime rate would plummet. But estimates of the incapacitation effect over the 1977–1986 suggest that crime should have dropped to zero (Zimring and Hawkins, 1991) or at least have fallen more sharply than it did (Freeman, 1996a), whereas crime rates remained high. Something is evidently missing from the standard incapacitation analysis.

The market model tells us what is missing and directs attention to the additional information needed to assess more accurately the benefits of incapacitation. The standard incapacitation model implicitly assumes an inelastic supply curve to crime. With a zero elastic supply curve, an inward shift in the curve due to incapacitation reduces crime commensurate with the shift. But if the supply of crime has some positive elasticity, the effect of the shift will necessarily be less (see Fig. 3). In the extreme, an infinitely elastic supply curve to crime implies that locking up one criminal "creates" another criminal or increases the rate at which existing criminals commit crimes (λ), so that incapacitation has no effect on crime rates. In terms of supply and demand, the impact of increased incapa-

[22] Greenwood and Abrahamse (1992) and Greenwood and Turner (198) provide more sophisticated analysis of incapacitation. Blumstein et al. (1978) National Academy of Sciences report also considers incapacitation in

citation (ΔI) on the supply of criminals is:

$$\Delta C = \eta \Delta I/(\varepsilon + \eta), \tag{5}$$

where η is the elasticity of demand for crime and ϵ is the elasticity of supply of crime.

From the perspective of Eq. (4), estimates of the effects of various incarceration strategies on crimes – such as the 1994 Rand analysis of California's Mandatory Sentencing Law (Greenwood et al., 1994) – overstate the benefits of incapacitation.[23] Had these and other analysts considered the incapacitation effect in the context of a market model, they would predict more modest gains in crime reduction from incapacitation.

4. Evidence on the supply of crime

Most empirical research on the economics of crime focuses on factors that affect the supply of criminal activities. Some researchers stress the poor legitimate labor market opportunities of potential criminals – low hourly pay and high rates of joblessness (Freeman, 1996b; Grogger, 1997; and the literature reviews by Freeman, 1983, 1995; Chiricos, 1987). Others stress the deterrent effects of apprehension and penalization (Ehrlich, 1973; Levitt, 1997; Benson et al. 1994; and the literature review by Cameron, 1998). Yet others stress the effect of changes in the demand for crime, due say to increased demands for drugs, on criminal earnings. Empirical work has analyzed the relation between crime rates and its potential determinants over time and across areas (sometimes with fixed effects to focus on changes in variables within an area); and across individuals, often on a longitudinal basis. Studies of individuals include three major cohort studies gathered by criminologists years ago – two from Philadelphia and the Glueck study from Boston.[24] Paralleling other areas of labor economics, researchers have increasingly sought "instruments" – exogenous changes in factors that shift either supply or demand for crime – to identify response parameters in highly interdependent market models.

The bulk of the evidence indicates that the elements in Eq. (2) do in fact influence crime. Studies of the effect of legitimate opportunities on criminal behavior have focused on the presumed impact of unemployment and inequality in incomes on property crimes. Studies of the effect of sanctions on criminal behavior have concentrated on the effect of arrest rates and incarceration as deterrents to crime. Most studies of criminal incomes find that crime offers low skill men higher hourly wages than legitimate activities, though the often

[23] The Rand study does not try to model the effects of deterrence. Thus, it is unclear whether its estimates of the total effects of incarceration are biased upward or downward.

[24] Gluecks' Unraveling Juvenile Delinquency (Glueck, 1950). This is a longitudinal study of 500 delinquents and 500 matched controls constructed in 1939, consisting of white males aged 10–17 from several Boston neighborhoods who had been committed to juvenile correctional institutions, with controls from the Boston public schools.

intermittent nature of criminal work does not translate higher wages into higher annual incomes for criminals.

4.1. The effect of legitimate opportunities: unemployment

Much early work on the relation between the labor market and crime focused on the effect of unemployment on the level of crime, though unemployment is only one measure of how potential criminals fare in the legitimate job market. In general, these studies found that higher rates of unemployment (lower employment-population rates) are associated with higher levels of crime, but that the relation is not particularly strong. (Freeman, 1983) Chiricos' (1987) review, inclusive of studies done outside the US and of work in the early 1980s, gave a more positive assessment of the impact of unemployment on crime, noting stronger results for studies in the1970s than earlier periods.

Ensuing work has confirmed a relation between unemployment and crime. Most time series analyses find that crime rates rise with joblessness. Cantor and Land (1985) reported a positive effect of lagged unemployment on crime. Land et al. (1990) showed that this relationship is stronger at the intracity level compared to intercity or national comparisons (see also Land et al. 1990). Examining 10-year changes in crime and economic conditions across 582 counties from 1979 to 1989, Gould et al. (1998) found that a one point increase in unemployment raised property crimes by 2.2%. Lee gives comparable results for 58 standard metropolitan statistical areas from 1976 to 1989 (an effect of unemployment on crime of 1.1 to 1.4%). Freeman and Rodgers (1999) report an elasticity for youths of crime to point increases of unemployment of 1.5% across states with the inclusion of state and time dummy variables. Engberg (1999) finds that areas of a city where employment falls have rising homicide rates.

As nearly all studies of crime rates across areas include unemployment in the local labor market as a covariate, an interesting way to assess the robustness of the unemployment-crime relation is to examine the estimated coefficients on unemployment in studies focused on other issues. In several studies using pooled time series cross-city data Levitt (1995, 1996, 1997) finds a positive relation between unemployment in an area and property crimes, including auto thefts, even after inclusion of both time and area dummy variables, but he also reports a negative relation between unemployment and violent crimes in some cases. In a study using pooled time series state data, he finds a strong link between unemployment and property crimes for both juveniles and adults, but finds little link between unemployment and violent crimes (Levitt, 1997). In another study, however, using city data, Cullen and Levitt report little relation between unemployment and crime. Butcher and Piehl (1998) obtain a positive link in cross-area data but the relation disappears when area fixed effects are added to the analysis. Using data on individuals, however, they find a positive link between crime and local unemployment rates.

Even the largest estimated effects of unemployment rates on crime are much too small to explain the variation in crime. The time series fact is that between the 1960s and 1980s the crime rate rose massively while unemployment trended up just slightly. The area fact is

that in any given period crime rates differ massively across SMSAs whose unemployment rates vary much less.

There is stronger support from data on individuals that crime is linked closely to unemployment. Nearly all studies find that persons prone to unemployment are more likely to commit crimes and that people who commit crimes are more likely to do so during spells of unemployment. Thornberry and Christenson (1984) find that in the 1945 Philadelphia cohort unemployment had significant effects on crime, largely for African American youths and youths from blue-collar backgrounds. Using the same data set, Witte and Tauchen (1994) found that employment (but not wages) was related to crime. Sampson and Laub (1993) re-analyzed data from the Gluecks' 1939 Boston cohort and found that measures of job stability during early adult years (17–25) were inversely related to adult arrest rates for several crime types and that job stability during ages 25–32 had a significant negative effect on crime participation during later (32–45) adult years. Elliot (1994 , Table 1) reports that persons who have engaged in "serious violent behavior" are more likely to terminate this if they are employed than if they are unemployed.

Farrington et al. (1986) used interview data from the Cambridge Study of Delinquent Development, a longitudinal study of 411 adolescent males, to show that property crime rates were higher when subjects were unemployed, but that crime was more likely only among unemployed youths who held attitudes more favorable to offending. Those who generally were law-abiding did not commit crimes during periods of unemployment. The crime-unemployment relationship was also stronger among youths with histories of low status jobs.

Studies with ex-offenders also show that unemployment (and legal earnings) affects crime. In the Transitional Aid Research Project (TARP), a randomized experiment that tested the effects of income supports for ex-offenders from Texas and Georgia released from prison in 1976–1977 (Rossi et al., 1980). Needels (1994) found that employment and (legal) earnings have strong significant negative effects on subsequent crimes following release from prison: in a ten year follow-up of Georgia releasees, criminal activity was markedly lower among those with higher legal earnings.

Thus, unemployment is related to crime, but if your prior was that the relation was overwhelming, you were wrong. Joblessness is not the overwhelming determinant of crime that many analysts and the public a priori expected it to be. Why?

4.2. The porous boundary between legal and illegal work

Perhaps the major reason is that crime and legitimate work are not exclusive activities. Eq. (2) makes the crime/legitimate work decision a dichotomous one, but this is an over-simplification. The border between illegal and legal work is porous, not sharp. Some persons commit crimes while employed – doubling up their legal and illegal work. Some persons use their legal jobs to succeed in crime (Myers, 1983). Some criminals shift between crime and work over time, depending on opportunities. Fagan and Freeman (1997) review a number of studies that show the doubling up of crime and work at a moment in time and the movement of persons who commit crimes between crime and

work over time. These studies find that even experienced drug dealers often hold legal jobs, possibly to tide themselves over during periods when the drug business is especially dangerous; that youths shift between crime and work with some regularity; and that employment has only a modest effect on whether or not they commit any crime. Using the NLSY, Freeman has shown that among youths who report committing crimes, only those on the verge of incarceration have greatly reduced legitimate employment.

This conclusion is supported by ethnographic work that finds that many youths view crime and legal work as valid ways to make money and choose one or other depending on market opportunities. Anderson (1990, 1994) describes how young males in inner city Philadelphia regard the drug economy as a primary source of employment, and how their delinquent street networks are their primary sources of status and social control. Hagedorn (1988, 1994a,b), Padilla (1992, 1993), and Moore (1992) offer similar descriptions for various ethnic groups in different cities. Participants in the illegal economies in these studies regularly engage in a variety of income-producing crimes, including drug selling, fencing, auto theft, petty theft and fraud, commercial extortion, and residential and commercial burglary and in legal work as well. Young inner city men use the language of work ("getting paid," "going to work") to describe their crimes.[25] Sanchez-Jankowski (1991) argues in fact that an "entrepreneurial spirit" is the "driving force in the work view and behavior of gang members" (p. 101) that pushes them to engage in the profitable world of drug sales or auto theft. Bourgois (1989), on other hand, stresses the importance of non-pecuniary factors, claiming that drug dealers prefer the "more dignified workplace" of drug selling than the low wages and "subtle humiliations" of low level legal jobs (p. 41).

One interpretation of the porous boundary between crime and legitimate work is that young offenders are engaged in an active process of income optimization, taking advantage of economic opportunities that present themselves. Decentralized drug markets or numbers running offer youths the chance to earn income through occasional work at hourly rates higher than conventional second jobs, making it attractive even for those with full-time legal work to shift over. Fagan (1992, p. 121) points out that drug dealers may even have incentives to hold legal jobs while earning higher incomes from drug sales: expanding networks of contacts, building some legitimate work experience for the future, and developing an escape route should legal or social pressures push them out of the business. Freeman (1995) applies an ecological model of foraging animals to crime-prone youth: they wander city streets with a reservation wage for crime and a reservation wage for legal work, and undertake either act when the potential benefits exceed the relevant reservation wage.

All of this work has one important implication for the economics of crime: it suggests but does not prove that youths shift sufficiently readily between legal and illegal work so as to make the elasticity of the supply of crime quite high.

[25] See, for example: Sullivan (1989), Padilla (1992), Taylor (1990), Williams (1989). Felix Padilla describes how gang members in a Puerto Rican Chicago neighborhood regarded low-level drug sellers in their gang as "working stiffs" who were being exploited by other gang members.

4.3. The effect of legitimate opportunities: earnings inequality and legitimate earnings

From the 1973 through the 1990s the real earnings of the less skilled young men who constitute the bulk of the crime-prone population fell, while income inequality rose greatly. According to (2) this should have increased the rate of crime. Falls in legitimate earnings reduce the payoff to legal work (W). Assuming that wages from crime depend positively on the income of the higher paid (the more they have the more the criminal can steal), increases in the wages of the higher paid will also add to the payoff to crime. But rises in inequality that are associated with increases in the real income of both groups may have no such effect, and even when incomes rise at the top and fall at the bottom, the higher paid may respond to increased crime by taking more protective actions, such as moving to gated communities, installing security systems, and the like, which will partially offset the effects of inequality on crime.[26] The magnitude of the worsened job market opportunities for less skilled young men and rise in inequality were sufficiently large to suggest that they could have played a major role in the increase in criminal activity.

Studies that have examined the relation between inequality and crime generally find that more inequality is associated with more crime (see the reviews by Chiricos, 1987; Freeman, 1983, 1994). Land et al. (1990) even report that homicide rates are correlated with measures of inequality across cities. Lee (1993) found a substantive positive relation between inequality and crime rates across SMSAs in 1970 and 1980. His estimated effect of inequality on crime suggests that the increased inequality in the 1980s induced a 10% increase in the UCR but this relation disappeared with the inclusion of area fixed effects. In the most extensive study to date, Gould et al. (1998) have found a strong link between the wages paid to low skill workers, measured in a variety of ways, and crime. Using a pooled cross-section time series design across counties and states, they report elasticities of property crime to the pay of low skilled workers ranging from -0.31 (retail income per retail worker) to -1.0 (mean wages of non-college men, inclusive of dummy variables for area and time.

Studies that focus on responses to legitimate earnings, or perceptions thereof, find that higher legal earnings reduce crime. In its 1980 crime module the NLSY asked respondents the proportion of their income that came from illegal activity. Holding fixed time worked at legitimate jobs, and the number of crimes committed, persons who report that much of their earnings were illegal should have relatively higher illegal hourly pay than legitimate pay than persons who made only a small proportion of their income from crime. They should thus be more deeply involved in crime, and all else the same, more likely to end up incarcerated in the future, as turns out to be case (Freeman, 1995; Fagan and Freeman,

[26] The expected value of crime is $(1 - p)W_c - pS - W$. Assume that W_c depends proportionately on the earnings of higher paid (H): $W_c = vH$, where $v < 1$; and that the sanction depends proportionately on the legal earnings of the criminal (uW). Then the expected value of crime is $(1 - p)vH - (pu + 1)W$. Since H is multiplied by a factor less than 1 while W is multiplied by a factor greater than 1, equal proportionate increases in H and W will reduce the present value of crime. Thus a rise in inequality with both H and W increasing would have to be relatively large to offset the bigger impact of changes in W than in H in this equation.

1997).[27] Grogger (1997) estimated an econometric model of the crime behavior of young men in the NLSY that suggests that youth participation in crime has an elasticity with respect to wages of 0.6–0.9. This is sufficiently high to suggest that much of the 1970–1980 rise in the arrest rates of youths can be attributed to the fall in their real wages. Using the NBER Inner City Youth Survey, Vicusi, 1986a,b found that perceptions of risk combined with earnings opportunities influenced the supply of young blacks to crime. With the same data set, Freeman (1987) reported a significant positive relation between criminal participation and whether individuals perceived that they could earn more on the street than in the job market.

In sum, while we need better information on illegal earnings to pin down the responsiveness of crime to the net return to crime, the information we do have suggests that the elasticity of the supply of offenses is reasonably high.

4.4. The effect of sanctions[28]

The extent to which sanctions deter crime is a major topic. The bulk of the research suggests that penalties work in the predicted direction. Beginning with Ehrlich (1973), many studies have related offenses across areas or time to arrests per offense as indicators of p in Eq. (2). These studies invariably find that the number of offenses is negatively related to arrests per offense. They suffer, however, from ratio bias due to the measurement error in crime rates; and simultaneity bias due to the potential feedback of the number of offenses on arrests per offense. Both of these problems are likely to create a negative relation between crimes per capita and arrests per crime.[29] Since police invariably make arrests, moreover, changes or differences in the number of police ought to affect crime similarly as arrests per crime. But most studies that relate the number of police per capita to the number of offenses per capita find little effect (see the reviews by Marvell and Moody, 1997; Cameron, 1998). Here too, the real relation – if any – may be distorted by measurement error (increased police may mean increased reporting of crime) and simultaneity (when crimes rise, citizens are likely to hire more police). Fisher and Nagin (1978) have stressed the econometric problems of identifying the supply of crime curve and the effects of sanctions in most 1970s empirical studies.

Despite the potentially great impact of measurement error on the relation between arrest rates and crime, only Levitt (1995) has tried to assess the magnitude of the bias. Using a panel of large US cities, he regressed the number of crimes of different types on arrests per crime using a difference format, in which he varied the length of the differences. Since

[27] Because the NLSY has never repeated the crime module, evidence on future crime behavior is limited to whether or not the respondent was interviewed in jail or prison.

[28] I have benefited from reading Daniel S. Nagin "Criminal Deterrence Research at the Outset of the Twenty-first Century" Crime and Justice, 1998.

[29] Random measurement error will produce a negative correlation between crimes and arrests per crime because the error will change crimes and 1/crimes in opposite directions. The simultaneity bias will also be negative since an exogenous increase in crime reduce arrests per crime but is unlikely to affect arrests, which may depend on a relatively fixed number of police.

longer run differences should be less affected by measurement error, a significant amount of measurement error should show up in a falling absolute value to the coefficients on arrests. Failing to find such a pattern, he concludes that "there is little evidence that the use of reported crime rates induces a substantial bias in the estimated effects of arrest rates" (pp. 14–15). If detailed geographic data were available from the victimization survey, we might be able to probe this issue further, using the victimization measure of crime by itself or as an instrumental variable to correct for measurement errors.

An alternative way to deal with the measurement problem is to measure sanctions relative to the total population rather than to crimes. Levitt (1997) examines the dependence of juvenile and adult crime rates not only on the numbers of juveniles or adults in custody per crime but on the number of juveniles or adults in custody per juvenile or adult. Replacing crimes with persons in the divisor of the sanction measure eliminates the ratio bias from having the crime rate on one side of the equation and its inverse on the other side. Using a pooled cross state time series data set, with dummy variables for year and state, and separate state-level trends, Levitt finds that delinquents in custody per juvenile and adults in prison per adult reduce the relevant crime rates, and that the difference between the sanctions given to youths and adults helps explain changes in the crimes committed by youths as they age and become adults. Crime rates rise less rapidly (or fall) with age in states which put relatively large numbers of adults in custody compared to youths in custody than in states which put fewer adults in custody relative to youths. Thus, differences in the extent of sanctions in the juvenile justice system relative to the adult justice system helps explain differences in the rate of youth crime relative to adult crime.

The main way of identifying the effect of sanctions on the supply of crime is to find factors that exogenously shift sanctions.

At one extreme are studies of crime rates in the wake of strikes by police or other sharp declines in the possibility of being caught for criminal activity, such as riots in cities or in the case of one Danish study (Andenaes), the arrest of the Copenhagan police force by the Nazis. These studies show that huge drops in the number of police are associated with large increases in crime (University of Maryland, Department of Criminology and Criminal Justice, 1997, Fig. 8.1). For instance, bank robberies and burglaries zoomed in Montreal when that city suffered a police strike in 1979 (Clark, 1969). It is reassuring to know that sanctions work in the extremum, but the behavior identified in these studies is presumably far from the responses of potential criminals to more modest policy-relevant changes in sanctions.

Police crackdowns of various sorts, which raise the probability of apprehension for particular crimes, offers another potential way to identify the effects of sanctions on crime.[30] Sherman's (1990) review concluded that the increased police effort had an initial deterrent effect which declined over time, as the temporary nature of the crackdowns

[30] If the police decision to crack down on particular crimes is motivated by the likelihood that cracking down on that crime will have an especially large effect on crime, one cannot generalize the effects to other crimes.

became clearer to potential offenders. While it is possible that crackdowns on one crime have a displacement effect on others – leading criminals to shift from say drug sales to robbery, it is also possible that some crackdowns reduce crime more generally. In fact, studies that try to measure the possible sanction-induced displacement of crime geographically or to some other crimes invariably find that displacement effects are modest (Clarke and Cornish, 1985; Hesseling, 1995; Levitt, 1995), and in some cases that it is positive (Sampson and Cohen, 1988).

Marvell and Moody (1996) and Levitt (1996) have used different identification strategies to try to determine the effect of increased policing in reducing crime. Marvell and Moody exploit the time sequencing of the link between the number of police and crime (it is difficult to increase the police ranks rapidly in response to crime) and find a significant inverse relation: more police reduces crime. Levitt uses the fact that around election years, cities hire more police, to measure the exogenous change in policing and finds that the number of sworn officers instrumented on elections reduces most categories of crime. Both Marvell and Moody (1994) and Levitt (1995) have also examined the sanction of increased incarceration on crime and also obtain significant effects for sanctions, again using different identification strategies. Here, Levitt exploits the fact that overcrowding of prisons forced some states to let some prisoners out early, while Marvell and Moody exploit the fact that increases in crime do not show up quickly in increased prison populations.

A very different way of testing the deterrent effect of sanctions is to examine links between how individuals perceive the risk of being sanctioned and their criminal behavior. One set of studies has found that self-reported criminality is lower when individuals perceive a greater risk from crime (see the review by Nagin, 1998, pp. 62–71). For example, on the Boston Youth Survey, youths who do not commit crimes report a much higher probability that they will suffer from crimes than other youths. But cross-section contrasts do not show how the effect of changing sanctions influence the decision of any youth. Scenario-based studies provide a way to address this problem. These studies present individuals with carefully described situations and then ask them how they would behave and how they perceive the risk of sanctions in that situation. By artfully varying circumstances among randomly selected respondents, one can make reasonable deductions about the relation between perceived sanctions and responses. The main finding is that perceived risk is associated with smaller illegal activity (Nagin, 1998).

But perhaps the strongest support for the notion that perceived sanctions affect behavior occurs every April 15, when citizens fill in their tax forms. Compliance rates are high for wage and salary earnings where the IRS receives W2 forms) but not for cash income from the "grey" economy (Kagan, 1989).

Yet another way to examine the deterrence of sanctions is to contrast the future crime behavior of young persons who are differentially sanctioned for initial offenses. Three studies that have followed the careers of serious juvenile offenders report that the more serious the penalties imposed on the juveniles, the less likely were they to be apprehended from crimes in ensuing years (Murray and Cox; Empey and Lubeck; Empey and Erickson,

cited by Wilson, 1998), though whether this caused them to deter from crimes or simply made them more careful criminals was never established (Wilson, 1998).

In short, as far as we can tell, sanctions work, though the estimated magnitude of the sanctions effect varies across studies, possibly reflecting differences in the situations where sanctions are applied.

4.5. Social interactions and the geographic concentration of crime

Crime is highly concentrated in certain geographic areas and among certain types of people, and rises and falls over time in waves. In 1995, for instance, the FBI crime index per hundred thousand persons varied among metropolitan areas from 12,319 for Miami, Florida to 2196 for Wheeling, West Virginia. Similarly, within cities, crime is concentrated in a limited number of areas or precincts. It is difficult to account for the concentration of crime across areas or over time in terms of standard demographic variables or measures of incentives. These variables do not differ enough across areas to explain more than 30% or so of the geographic variation in crime (Glaeser et al., 1995).

Social interaction models that posit that individual behavior depends not only on the incentives facing the individual but also on the behavior of the individuals' peers or neighbors offer one promising way to explain the concentration of crime by area and over time. Given the same expected return from crime, you may be more likely to commit crime if your peers commit crime than if they do not commit crimes. Your decision, in turn, affects their behavior. As a result, social interaction models build in a "behavioral multiplier" that can blow up elasticities of individual responses to explain the excessive variation in crime rates across areas or time.

Glaeser et al. (1995) have shown that a relatively simple interaction model fits the geographic variation in crime rates reasonably well across cities and among precincts in NYC as well. Empirically, they show that the sample variance in crime rates (corrected for observable differences among areas) far exceeds the variance one would expect if decisions to commit crimes were independent. They develop a one parameter interaction model that produces a covariance in decisions and fits the geographic data for serious crimes. Estimating the same model for murder and rape, suicides, deaths from cancer, among other outcomes, they find little evidence for social interactions: the sample variance for these variables are reasonably well explained by a standard Poisson model.

Sampson et al. (1997) examine the ability of a social interactions model to explain variation in crime rates across areas in a different way. Interviewing nearly 8800 residents in 343 neighborhoods, they asked residents whether in their neighborhood people "can be trusted... share the same values ... get along with one another" and whether neighbors can be counted on to intervene when children are acting up. They use the responses to create an index of "collective efficacy" – the informal social controls that operate through interactions of neighbors – and find that this index helped explain a large proportion of the variation of perceived and actual crime across neighborhoods. Consistent with their finding, an earlier study of crimes among Baltimore blocks found that membership in volun-

tary organizations are associated with less violent crime block by block (Taylor et al., 1984).

Still, the evidence in neither of these studies is decisive. Glaeser et al. (1995) do not prove that the excess variation in crime rates is due to interactions; they interpret the excess variance through a social interaction lens.. Sampson et al. (1997) do not prove that the causality runs from collective efficacy to crime. Perhaps some other factor creates differences in crime across neighborhoods which itself may create the attitudes that underlie collective efficacy.

But there is complementary ethnographic evidence on the role of youth gangs in crime that lends support to a social interaction interpretation of the crime data. Gangs are an important social institution in the US. The 1995 National Youth Gang Survey reported that over 665,000 young Americans were in gangs (Moore, 1996). Much illegal work is organized within ethnic gangs that combine economic and cultural interests, often in very narrow geographic areas. In Boston, for instance, virtually all youth gangs are found in an area of 1.7 square miles, about 4% of the cities area.(Kennedy et al., 1996). The Rochester Youth Study found that gang members commit a disproportionate share of serious crime and that youths commit twice as many crimes when they are members than when they are not members (Thornberry and Christenson, 1984).

Ethnographers have documented how gang members remain longer in the gang in the 1990s than in earlier years, assuming leadership roles and manipulating the gang for their own economic advantage through perpetuation of gang culture and ideology (Moore, 1996). Chin and Fagan (1994) describe the complex economic relationship between street gangs and adult social and economic institutions in three Chinatown neighborhoods in New York City. The adult groups, descendants of the tongs that were the shadow governments in Chinatown a century ago, are involved in both legal social and business activities *and* a variety of illegal businesses that employ street gangs. The gangs guard territories and act as surrogates in violently resolving conflicts and rivalries between the adult groups. Chin (in press) concludes that the gangs prosper economically while functionally maintaining the cultural and economic hegemony of these ambiguous adult leadership groups. Moreover, the gangs are involved in a variety of income-producing activities, especially commercial extortion, that are shielded from legal pressures by cultural processes that tolerate and integrate their activities into the social fabric of everyday life in Chinatown. Taylor (1990), describing drug gangs in Detroit, and Padilla (1992) also talk about the use of money rather than violence as social control within African American and Latino drug selling gangs if a worker steps out of line, he simply is cut off from the business, a punishment more salient than threats to physical safety. Drug selling groups function as economic units with management structures oriented toward the maintenance of profitability and efficiency.

Finally, we can infer from the behavior of parents, who often move to suburbs or take other actions to prevent their children from interacting with youth gangs or juvenile delinquents, that social interactions matter a lot.

5. Does crime pay? criminal earnings and risk

The economic model suggests that, as long as individuals on the margin of crime are not risk-loving, crime should pay for those who choose it in the sense that (a) the earnings from successful crimes should exceed those from legitimate work; and (b) the discounted present value of crime, taking account of the risk of arrest and incarceration should exceed the discounted present value of legitimate work; while the discounted values adjusted for risk should be equal on the margin. By putting the crime decision into an expected utility framework, the model directs attention at the risk attitudes of persons on the margin of crime.

Since criminals are disproportionately less educated young men from troubled homes and disadvantaged minority backgrounds, they have low legitimate earnings prospects. Whether these youths make more from crime on an hourly, annual, or lifetime basis than they could or do make from legitimate work is difficult to determine, largely because information on criminal earnings are scattered and poorly measured, but also because their legal work record is often intermittent as well. Most data on criminal earnings comes from self-reports, whose accuracy is questionable. Most crime is self-employment, creating problems of valuations of non-cash exchanges, discounts in fencing stolen goods, net and gross incomes from drug sales, and so on. Some studies, like the NLSY, ask respondents only for the proportion of their income from crime, presumably on the notion that they could not accurately estimate actual earnings. Some studies of drug dealer, by contrast, ask for rather detailed information on criminal earnings and costs (MacCoun and Reuter, 1992; Fagan, 1993). The hours spent on crime are, if anything, even harder to pin down than the hours self-employed persons work at legitimate jobs. Subject to data problems, almost all analyses conclude that crime pays a higher hourly rate than legitimate work but that the work from crime is sufficiently intermittent and risky that annual crime incomes may be lower than the annual income the criminal could get from legal work. The combination of crime and legal work potentially provides higher annual income than either activity by itself for those who engage in crime.

The 1980 NBER survey of young black men in three cities (Freeman and Holzer, 1986; Vicusi, 1986b) found that annual crime incomes were $1607 in 1980 dollars. But because of the skew in crime incomes, crime income was a substantial income supplement for many youths.[31] The 1989 Boston Youth Survey found self-reported annual earnings that ranged from $752 for infrequent offenders to $5376 for youths committing crime at least once a week, with an average of $1607 (Freeman, 1991). Hourly rates varied from $9.75 for frequent offenders to $88 for infrequent offenders, suggesting a diminishing return from criminal activity. Average hourly wages from crime were $19. All these estimates exceed the average legal wage of $7.50 that these young men reported, and their potential after tax take home pay of $5.60 per hour. Grogger estimates illegal incomes from the NLSY by multiplying respondents' reports of the fraction of their income they attributed

[31] Thompson and Cataldo (1986) question the veridicality of self-reports in their criticism of Vicusi's (1986a) analysis.

to crime by their total income and obtains an average annual crime income in 1979 of $1187.

The Reuter et al. (1990, p. viii) survey of convicted drug dealers in Washington DC showed that "drug dealing is "much more profitable on an hourly basis than are legitimate jobs available to the same persons". The dealers reported net (mean) monthly income of $1799 from drugs and $215 from other crimes, which projects to an annual crime income of $25,000, and an implied hourly rate of $30 (see also MacCoun and Reuter, 1992).[1] These figures compare with mean legal wages of $1046 per month, or median legal monthly earnings of $715 for the 75% who reported such income. Drug incomes also exceeded legal (work) incomes by a wide margin in Fagan's study of drug users and dealers in two northern Manhattan neighborhoods in New York City (Fagan, 1992, 1993). As in the Washington DC sample of male dealers many drug sellers combined legal and illegal work in these two neighborhoods. Hagedorn (1994) finds that gang members in Milwaukee had a wide range of drug incomes. One in five (20.7%) earned the equivalent of $7–12 per hour, and one in four (28.7%) reported drug incomes in the range of $13–25 per hour, or $2000–4000 per month. A few (three of the 73 sellers) reported "crazy money" (more than $10,000 per month) at some time in their drug selling careers. Mean monthly drug sale income was $2400, or about $15 per hour, compared to legal monthly incomes of $677.[2]

In contrast to these studies, Wilson and Abrahamse (1992) estimated that criminals earn less per hour than other workers. They used Victimization Survey data on average losses by victims to estimate the earnings from crime among prison inmates in three states to estimate hourly or yearly wages. Summing across eight crime categories, they reported annualized crime incomes of $2368 (in 1988 dollars) for burglars and thieves with mid-level offending rates. For high-rate burglars and thieves, crime incomes were $5711. Only for high rate offenders did crime incomes exceed work incomes.

Studies that ask young persons whether they can make more money by legal or illegal means support the notion that crime pays a higher wage than legitimate earnings. In 1980 the NBER Inner City Youth Survey asked youths in Boston, Chicago, and Philadelphia whether they thought they could make more "on the street" than in a legitimate job. It also asked them about their perceptions of the availability of criminal opportunities. The 1989 Boston Youth Survey, conducted at the peak of the booming "Massachusetts Miracle" job market, asked the same questions. Between these dates, the proportion of youths who reported that they could earn more on the street went up, from 31% in the three cities and 41% in Boston in 1980 to 63% in Boston in 1989. Similarly, the proportion who said they had "chances to make illegal income several times a day" roughly doubles over the period, to reach nearly 50% in 1989 (Freeman, 1992). Huff (1996) reports a reservation wage of $30 per hour to abandon illegal work, indicating that inner city youths see a large premium to illegal work.

The risk of penalties and the extent of penalties also enter Eq. (2). Not only are crime returns foregone if the criminal is incarcerated, but opportunities for legal earnings also are lost. Moreover, if incarcerated, earnings upon release are lower, either because the ex-

offenders work less or have lower pay (Freeman, 1992; Kling, 1998). Depending on the community, there also may be social costs from punishment through stigma and expulsion from socially rewarding networks. Reuter et al. (1990) provide the only detailed analysis of whether, adjusted for risk, crime pays off on a lifetime basis for criminals. Examining the expected lifetime income of drug dealers in Washington, DC, they find that drug dealers spend roughly 1 in 3 years in prison, but that these men earn enough in the years they are not incarcerated to justify their choice of crime, even with a discount for risk aversion.

Risk aside, we can ask whether the expected value of crime increased or decreased during the period of falling real wages for less skilled workers. As arrest rates and the chance of incarceration rose during the period, it is not a priori obvious what happened to the expected return to crime. Freeman (1991) uses changes in imprisonment rates (Langan, 1991) to estimate that the lifetime earnings from crime fell by roughly 11% due to the increased chance of incarceration. This falls short of the 25–30% drop in real earnings for high school dropouts from legitimate work.

But none of these calculations take account of the non-monetary costs of punishment, such as harsh conditions, physical and sexual victimization, and social stigma upon release. If incarceration carries with it substantial non-pecuniary costs, these increased costs could change the present value calculus. Ethnographers, however, report that as the number of persons incarcerated has risen, the social stigma from incarceration has weakened, discounting punishment costs for young men in the population groups most likely to be incarcerated (Anderson, 1990).

In sum, with the exception of Wilson and Abrahamse (1992), all studies conclude that crime pays at least on an hourly basis for those who commit crime.

5.1. Do incentives explain the age and sex pattern?

As noted at the outset, there is a distinct age and gender pattern to criminal activities. Individuals start committing crimes when they are teenagers, concentrate on criminal activity then "mature out of crime". Fig. 3 shows this pattern in terms of the relative number of arrests in various age groups. It records the ratio of the proportion of arrests in a given age group to the proportion of the population in that age group: a number equal to 1 means that the arrest rate for the age group is at the average for all age groups; a number greater than 1 means that the age group has a higher arrest rate, and conversely for a number less than 1. The relative arrest rate rises for teenagers, peaks for persons aged 16–18, then declines modestly with age.

There are several questions that we can ask about the age pattern in criminal activity.

Is the decline in involvement in crime due largely to declining participation in crime or to reduced offenses per criminal? Studies of the career patterns of criminals show that the age pattern largely reflects changes in participation in crime, and that as a result adult careers in crime average 5–10 years (Blumstein et al., 1986, p. 5). An important determinant of the extent of criminal activity for career criminals is the age at which they commenced crime.

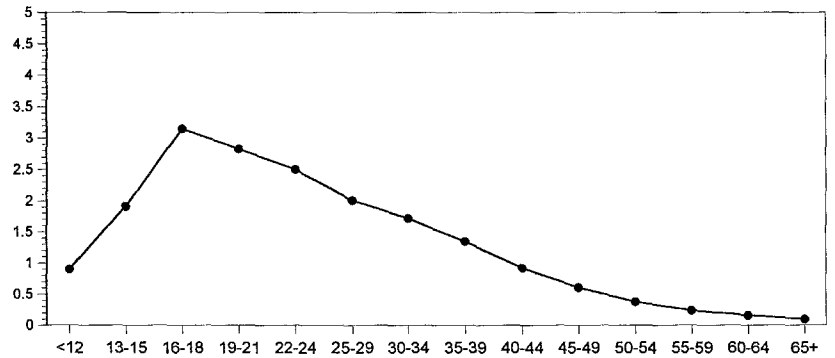

Fig. 3. Arrest rates by age relative to national arrest rates, 1995. *Source*: Maguire and Pastore (1997, Table 4.4).

Is the decline in criminal activity with age the result of biological aging or does it represent economic responsiveness to alternative incentives? Grogger (1997) and Levitt, 1997 make the case that at least some of the reduction in crime with age reflects responsiveness. Grogger (1997, Table 9) notes that the pattern of rapidly rising wages in the early years of work, coupled with his estimated elasticity of criminal participation to age, can explain a good part of the fall in crime among men from age 17–18 to 22–23. Levitt (1997) notes that many youths forego crime when they reach the age at which they are subject to the more severe sanctions of the criminal justice system compared to the juvenile justice system, and that the differential change in sanctions accounts for some of the variation in the age pattern of crime across states.

But the gender variation in crime is even greater than the age variation. No economist has tried to explain the greater participation of men than women in crime in terms of incentives. Since women are paid less than men in the legal market and participate less in work, it would be hard to make a simple opportunity cost of time argument why women do not engage in crime, though perhaps something could be made on the basis of the time intensity of child-bearing and rearing.

5.2. Future legitimate economic outcomes

As the number of men involved in crime has risen, attention has shifted to the possible long term effects of criminal activity and criminal sanctions on labor market outcomes. To what extent, if at all, does having a criminal record or being sanctioned for crimes committed affect economic outcomes years later?

There are two reasons for expecting the legitimate employment or earnings of persons who engage in crime to fall over time. On the demand side, many employers eschew hiring persons with criminal records (Finn and Fontaine, 1985). While employers often do not check references or whether or not an employee fills out accurately questions on incarceration, local employers often know which youths have been in trouble with the law and

have gone to prison. On the supply side, individuals who are sent to prison may increase their criminal human capital (Myers, 1983) while their legitimate work skills depreciate.

Freeman's studies of the effects of criminal activity on the labor market outcomes for youths in the NLSY, NBER Inner City Survey, and Boston Youth Survey found that incarceration was significantly linked to lower future employment and weeks worked, though they do not tell us whether the link is due to the sentencing or to the fact that only youths deeply involved in crime are incarcerated. In the NLSY young men who were incarcerated worked around 12 weeks less per year as other young men over an ensuing seven year period, giving a 25% lower rate of work activity. In the NBER Inner City Survey, weeks worked dropped sharply for the same men after incarceration compared to their weeks worked before incarceration. In these data sets other lesser brushes with the law – arrest, probation – had little effect on employment and earnings. One reason for the huge incarceration effect in the NLSY is that persons incarcerated have a high probability of engaging in crime again and being re-incarcerated and thus not able to work even if they wanted to do so. But even among non-institutionalized young men, those who have been to jail/prison have lower employment rates than others and a lower rate of employment than they had before going to jail or prison (Fagan and Freeman, 1997).

Other studies, using different data sets tell somewhat different stories. Bushway's (1996) analysis of the National Youth Survey[32] found adverse effects from being arrested on both weeks worked and weekly earnings. Within three years of an arrest, respondents who were arrested worked seven weeks less, and earned $92 per week less, than would otherwise be expected without an arrest (Bushway, 1996, p. 35). Grogger (1995) merged longitudinal arrest records from the California correctional system with unemployment insurance earnings records to examine the effects of arrests and sanctions on male employment and earnings. Men who were arrested, convicted, or sent to jail or prison had lower earnings and employment than others, but these relations diminished greatly with the addition of individual fixed effects, implying that arrests reduce future legal wages more in the short-term than in the long run. In the fixed effect model, the adverse impact of jail and prison on employment falls overt time but the adverse impact on earnings was stable over a six quarter period. Workers who went to prison had about a 20% lower earnings than others, while those who went to jail experienced about a 15% lower earnings (Table III compared to Table I means). Using the NLSY, Grogger, 1995 attributed about one-third of black–white differences in non-employment to the effect of arrests on future employment. Waldfogel (1992) finds a large effect of incarceration on earnings and employment; while Nagin and Waldfogel (1995) find a positive effect of conviction on employment in a sample of British youths. Kling (1998) links information on defendents in federal courts to unemployment insurance records in California to contrast employment and earnings for a three year period before and after time served in prison. In a sample where only a third of the population is employed in a quarter, he finds that imprisonment of various lengths has only a modest depressent effect on employment of at most 0.03 points

[32] This is a longitudinal study with a representative sample of 1725 adolescents who were 11–17 years of age in 1976 (Elliott et al., 1989).

while having a much larger effect on earnings in a quarter, ranging from 23 to 31%. But since the UI does not include hours worked, it is possible that the large earnings effect may reflect in part changes in hours worked.

The negative earnings effect is more pronounced among white collar criminals, who earn 10–30% less 5–8 years after release than those convicted but not incarcerated. And there is evidence that conviction affects legitimate earnings as well. Lott (1992b) finds that conviction for embezzlement and larceny reduces the future legitimate incomes by about 40%, while Lott (1993a) shows even greater drops in legitimate income, presumably due to reduced time in legitimate work, for persons convicted of drug dealing.

Studies that link involvlement with the criminal justice system to future outcomes suffer from one potential omitted variable problem. Personal characteristics unobserved in the data may affect both sentencing and future labor market performance. Judges may, for instance, give probation to one young person and a prison sentence to another because the youths differ in unobserved ways that will affect job market success. Kling deals with this problem by exploiting the fact that different judges have different sentencing strategies. Since cases are randomly assigend to judges, judges can be used as an instrumental variable for sentences. A "harsh" judge will give a tougher sentence than a "soft" judge to otherwise similar criminal defendants. This provides the exogenous variation in sentencing needed to identify the causal effect of sentences. His results, while often imprecise, show larger earnings than employment effects from incarceration.

In short, involvement with the criminal justice system affects future labor market outcomes. Incarceration is negatively correlated with future outcomes while the correlation between arrest and conviction and ensuing work activity is generally more moderate. The question remains open, however, about the causal mechanisms, if any, that underlie the links. Moreover, the effects probably vary among groups and over time and across prison experiences. As more and more men are sent to jail or prison – recall that the Justice Department estimates that 1 in 9 American men will spend some time incarcerated – any stigma attached to incarceration in the job market may fall. The adverse relation between incarceration and labor outcomes may also have a strong age component, being larger among younger men and smaller among older men in the declining part of the age–crime curve. Finally, as noted earlier, at least some well-constructed studies (Saylor and Gaes, 1992) find that prisoners who receive job training or who work in prison have better employment experiences after release than others.

6. Crime prevention activities

Since crime hurts victims physically and/or financially, the state and individuals spend considerable resources trying to prevent crime. Optimization of individual or social output requires that we pursue these activities only up to the point where the marginal value of reduction in crime equals the marginal cost of the specified crime prevention activity. If the technology of crime prevention was well-known, if all actors in the criminal justice

system were efficient optimizers, and if there were no externalities from individual crime prevention activities, we might conclude that society has the amount of crime we "want". None of these "ifs" appear to be correct. There are substantial debates over modes of crime prevention and innovations in technology and policing; over whether sanctions are more or less effective than social programs, and on the relation between individual efforts to reduce crime and public efforts.

6.1. Specific crime prevention programs

Various jurisdictions and groups in the US have sought to reduce the rate of crime through diverse innovative programs, ranging from trying to frighten youths from engaging in crime to providing recreational activities to counseling parents of juvenile delinquents. Many of these programs contain an evaluation component, though the evaluation is often of a weak scientific sort (i.e., without random assignment or a well-specified control group, without sufficient sample size to detect modest effects with any confidence, or without serious consideration of attrition of the treatment/control sample). Still, there have been enough reasonable evaluation studies to allow researchers to undertake meta analyses of the effects of programs in some areas, and enough high quality evaluations of particular programs to support conclusions at least about those programs. Meta analyses of juvenile delinquency programs (Lipsey, 1992) and various rehabilitation programs (Andrews et al., 1990) find that the typical program has modest crime-reducing effects – effect sizes (the ratio of the difference in outcomes between the treatment group and the control group relative to the standard deviation in the outcome in the sample) on the order of 0.20 (two-tenths of a standard deviation). This falls in the range of reviews of studies of social interventions of various forms, that has shifted the view of many social scientists from the 1970s view that "nothing works" to the current belief that "most things work a bit". (Lipsey and Wilson, 1993).

In 1996–1997 the University of Maryland Department of Criminology and Criminal Justice conducted the most comprehensive review of crime prevention programs, including summaries of several meta-statistical analyses, for the US Department of Justice. The Maryland review covered some 500 plus programs, ranging from school programs to family interventions to job training to policing strategies. It scored studies by their "scientific rigor" and tried to assess "what works, what doesn't, what's promising". Overall, the review found that most (though not all) inexpensive short programs are ineffective in reducing crime. This includes such well-publicized programs as Scared Straight (taking young at-risk youth to prisons, to see what awaits them if they commit crimes), correctional boot camps, police visits to homes where there is domestic violence, random patrols and rapid response by police to 999 calls, Neighborhood Watch programs, and Midnight Basketball, among others. At the same time, the review reported favorably on some longer run and potentially expensive programs, ranging from intensive residential training programs for at-risk youth to long-term frequent home visitation to at-risk youths and their parents, intensive supervision of probated or paroled criminals, additional police

patrols at hot spots of crime. They also found that some less expensive programs, such as Big Brother/Sister mentoring programs among others, are also promising in the sense that initial evaluations suggest that they reduce crime, at least in the short run.

Neither the meta-statistical analyzes nor the Maryland review were designed to compare the effectiveness of programs that operate on the incentive variables that economists stress as opposed to the attitudinal/background variables that other disciplines stress. This makes it is difficult to use the evaluation evidence to assess the contribution of economic incentives in crime. Some programs based on economic/sanction factors that enter Eq. (2) seem to work – some prison-based vocational education programs (Lattimore et al. 1989) and prison industry (Saylor and Gaes, 1992), the Job Corps intensive residential training programs, highly intensely supervised probation or parole programs, police strategies focused on crime hot spots. In addition, providing cash incentives for high risk youths to graduate high school also seems effective (Greenwood et al., 1996). But other equally sensible and seemingly well-designed programs seem not work – giving released prisoners unemployment benefits to tide them over until they find a job (Berk et al., 1980); in-prison training plus job placement assistance, participation in academic and vocational programs in prison (Adams et al., 1994). Exemplifying the wide range of results for programs that might expected to affect the economic calculus similarly, Lipsey's meta-analysis of the effectiveness of different treatments for juvenile delinquents shows that employment programs were most effective, while vocational programs were least effective. Perhaps the safest conclusion is that programs based on influencing incentives are not discernibly more or less effective than programs based on influencing attitudes or social conditions.

But social decisions about crime prevention programs should depend not only on their effectiveness but on their costs. Here, incentive-based programs have an advantage, since incentives can operate rapidly and can be relatively inexpensive whereas early social interventions take a long time to bear fruition and are often very costly. Greenwood et al. (1994) have simulated the reductions in crime and costs of four types of interventions: training for parents with young children who are aggressive in school; home visits by child care professionals followed by day care programs; monitoring and supervising delinquent high school age youth; and offer four years of cash and other incentives to induce disadvantaged youths to graduate high school. Their finding is that graduation incentives had by far the highest cost effectiveness in part because the rewards come quickly. Whether the Greenwood et al. assessment that incentives are more cost-effective than other policies holds up to further analysis or not, it moves discussion in the right direction: toward contrasting the efficacy per dollar spent on the relevant alternatives, rather than studying a single program in isolation.

6.2. Measuring the benefits from crime reduction

A complete benefit–cost analysis of the resources spent to prevent crime requires one other hard-to-determine statistic: the marginal dollar value of the reduction in crime due to any policy. This statistic is hard to determine because the value consists not only of reduced

pecuniary losses but also, and arguably more importantly, of the reduced non-pecuniary loss from being victimized.

Estimates of the average cost of crime, much less of the marginal cost, are difficult to make. The National Crime Victimization Survey estimates the direct monetary losses of crimes, by asking victims to estimate losses from theft or damage, medical expenses, and pay loss due to injury. The 1992 estimate was that the average burglary cost $834, the average auto theft, $3990, the average robbery $555, and so on (Klaus, 1994). The average crime was estimated to cost victims 3.4 days of working time. The total economic loss to victims of crime, including medical costs, and lost work time was estimated to be $532 per crime or 17.6 billion dollars for all reported crimes in that year. This is just 0.3% of GDP in that year.

But these figures do not cover the non-pecuniary costs of crime in the form of the misery created for victims. Some criminologists have estimated a more inclusive cost of crime, based on jury evaluation of non-pecuniary costs (Cohen, 1988) and medical evaluations of injuries, including psychological problems (Miller et al., 1993). Some estimates include the lost legitimate earnings of incarcerated criminals, which may affect the well-being of spouses or children – 56% of male prisoners have children under the age of 18 (Bureau of Justice Statistics, 1991, p. 10). Others exclude earnings, on the argument that the criminal consumes most of those earnings (Levitt, 1995). None include the suffering of the families of criminals. For all their problems, these estimates are undoubtedly closer to the truth than figures limited to the money stolen. They exceed reported monetary losses by massive amounts. For example, the estimated average pain and suffering and cost of risk of death created by a robbery is approximately eleven times the direct monetary loss (Cohen, 1988, Table 3). Estimates of the cost of pain, suffering, and economic loss for the average crime are on the order of $2300 (DiIulio and Piehl, 1991) to $3000 (Levitt, 1995).[33] These costs underlie the case for allocating considerable resources to crime control activities, including prison or alternative sentencing, and for any social programs that can prevent crime.

The one crime prevention program that analysts put to a benefit–cost test is incarceration. The skyrocketing prison and jail population, with its accompanying rising costs, has generated debate over whether "prison pays". The answer depends in part on the number of crimes that the incarcerated criminal would commit if he were free, and on the response of others on the margin of crime to the incarceration. Using an entire distribution of crimes per criminal, DiIulio and Piehl (1991) estimate that the benefit–cost ratio for imprisonment exceeds one for the median number of crimes per criminal, but falls below one for those in the lower quartile of the distribution of crimes. Given the uncertainty in the estimates, this suggests that prison just pays on the margin. Using regression based estimates of the effect of incarceration on crimes, Marvell (1994) reaches a similar conclusion that prison populations also just pay off at the margin. Neither of these studies take account of the utility victims and the public may get from seeing criminals receive their "just reward", which would inflate the benefits. In any case, the high costs of crime and of incarceration suggest that if prison pays on the margin, so too would even modestly effective alternative senten-

[33] Levitt reports $45,000 as the estimated cost per criminal and estimates that criminals commit 15 crimes per year, for the $3000 estimate that I use.

cing procedures (house confinement, electronic surveillance, parole, etc.; see Clear and Braga (1995)) or jobs/social programs for crime-prone groups.

6.3. Individual efforts to prevent crime

Individuals seek to protect themselves from crime not only through collective action organized through the state-run criminal justice system, but also through group action organized through private channels and through individual action. Individuals form neighborhood watch groups; hire private guards; exit crime-intense environments; buy alarms and protective equipment; keep attack dogs and guns. While we lack good survey data on the magnitude or efficacy of all of these various responses, much less the degree to which they substitute or complement one another, the scattered knowledge that we do have suggests that individual responses to the threat of crime are sizeable.

One major response is to leave crime-prone areas. Cullen and Levitt (1996) have used a pooled cross-city time series data set to examine how the population of cities changes with rising crime rates, conditional on other factors, such as the SMSA unemployment rate. In a variety of data sets, using ordinary least squares and instrumental variables regressions,[34] they found that increases in crime rates have a substantial and highly significant adverse effect on the city population: a 1% increase in the crime rate induces a 1–2% decline in city population. The effect is larger for families with children and persons in higher income groups. Their finding that people move from high crime areas is consistent with earlier criminology research (Sampson and Wooldredge, 1986; Smith and Jarjoura, 1988)

Many individuals respond to the threat of crime to their household by buying locks or alarms or other forms of protection. These forms of protection can have negative or positive spillovers for the neighbors of the individual. On the negative side, if my door is locked or my windows have protective bars, or my apartment building well-lit with a private guard, the prospective burglar may go to your place, instead. This is a form of displacement of crime, from those with greater private protection to those with less private protection. On the positive side, if my protective measures reduce the overall return to crime, my actions will help deter crime in general. The Lojack system for recovering stolen cars studied by Ayres and Levitt (1996) provides a striking example of individual measures that have a beneficial effect on others. The Lojack firm places a secret radio transmitter in a car, which enables the police to track the stolen vehicle, but which are not discoverable by car thieves. Ninety-five percent of cars with Lojack are recovered. This reduces the profitability of auto thefts in general, and thus should reduce the number of auto thefts. Ayres and Levitt (1996) use a cross-city before-after research design to assess the effects of Lojack and find that cities that introduce Lojack experience a drop in car thefts. Since the potential thief does not know whether any given car has the system (though he may surmise that more expensive cars are more likely to have it), the deterrent

[34] Worried that the crime rate may depend on population, they instrumented the change in crime with the change in prison commitments per crime. The instrumental variable analysis works because commitments are negatively related to the crime rate and positively related to the change in population.

effect operates market wide. Lojack is a privately created crime reduction system which requires police cooperation and thus exemplifies the complementarity between some public and private activities in the fight against crime.

Philipson and Posner (1996) use data from an insurance company on burglar alarms to examine the effect of the rate of burglary in a state on the purchase of alarms and also find a positive relation between the crime and individual protective action. In an earlier study using a sample of Washington, DC, households, Clotfelter (1978) examined the effect of the rate of robbery and burglary on other forms of private protective measures, such as installing locks or burglar alarms, putting bars on windows, staying at home for fear of crime in the neighborhood, and so on. Eight of nine protective measures were significantly positively related to the burglary/robbery rate in the area, implying that the higher the crime rate, the more protective measures citizens took. Neither of these studies have the data needed to determine whether the protective measures worked, at least in the sense of producing lower chances of robbery/burglary for families that took them than for unprotected families. If the measures reduced crime overall in a neighborhood, their estimates of citizen response to crime would be biased downward, since are not "corrected" for the crime-reducing impact of the protective measures.

As more private sector resources have gone to crime protection activities, and the number of private guards and detectives risen relative to police officers, the question naturally arises as to the extent to which private protective activity public activity are substitutes. Philipson and Posner (1996) find some evidence in their state by year data set that the proportion of homes with burglar alarms drops with improved public sector anti-crime activities, in the form of criminal case filings. Also using cross state data, Clotfelter (1977) found a fairly high but imprecisely estimated elasticity of substitution with respect to the relative price of the two forms of protection against crime and found that states with greater employment in wholesaling and finance tended to hire more private guards. Bartel (1975) found little evidence of substitution between police and private guards hired by firms. As the Lojack example indicates, there are situations in which public and private efforts to reduce crime are likely to be complementary as well as substitutable.

6.4. Partial privatization of criminal justice activities?

To what extent, if at all, might crime be better controlled through privatization of some criminal justice activities than through the public sector criminal justice system?

To what extent, if at all, should the criminal justice system target more resources to the compensation of victims of crime?

Privatization of criminal justice activities (like the death penalty) is highly contentious, with ideological overtones, but it is also an area where empirical evidence can help resolve disagreements. In the absence of random assignment controlled experiments of private versus public crime prevention programs, our main source of information are case studies of private sector initiatives. Benson (1998) provides a wide-ranging review of the role of the private sector in criminal justice which includes: the growing number of private

prisons; San Francisco's long standing use of "Private Special Police" to patrol neighborhoods; police outsourcing of some services; local government contracting police services from private firms; Federal Bureau of Prisons contracting all of its halfway houses to the private sector; university use of private campus policing, company preferences for resolving some criminal acts by employees; as well as diverse forms of mediation, liaisons between the police and private security forces. Reynolds (1994) presents evidence that the use of private bail agencies and bounty hunters and bail enforcement agents has been extremely successful and contrasts the minute fugitive rate for the private bail system with the high rate of failure of state run pretrial release of non-violent prisoners. Whatever one's views of where the public/private divide should be in criminal justice activities, these studies make it clear that there is much action on the private side that merits analytic attention.

In *To Serve and Protect*, Benson (1998) goes further and argues that additional privatization of criminal justice activity would help reduce crime, particularly if it created greater incentives for victims and others to play a more active role in crime prevention. Much of the argument is based on the economic incentive model, but the analysis is consistent with "community policing" strategies that seek to involve private citizens in crime prevention activities derived from a social interaction view of the determinants of crime. Benson also argues that the criminal justice system should expend greater resources in giving restitution to the victims of crime. This is an area in which the US has a highly variable set of policies. At one extreme are the limited penalties for illegal firing of worker for union activity. At the other is the possibility of huge economic payments through court suits over discrimination or harassment. The O.J. Simpson trials gave a contrasting picture of the use of the criminal justice system and of the private court system as modes of penalization and giving restitution to victims. Benson notes the greater use of fines, much of which are paid to victims of crime, in several foreign countries, such as France, and suggests that this may be a more cost-effective way of sanctioning criminals while using the money to give more to victims. Current prison employment programs give only a modest sums of the earnings of offenders to victims.

7. Conclusion: how big is the economics contribution?

As noted at the outset, research on crime is an area dominated by non-economists, some of whom are attuned to incentive-response issues and others of whom stress very different factors, such as family background and criminogenic traits. When Becker (1968) and Ehrlich (1973) first pushed economic analysis into the area of crime, criminologists did not greet economists with open arms. The incentive-based model of crime embodied in Eq. (2) left out too much for some tastes. Thirty odd years later, economists still stand out as "new kids" on the block but there is a concordance of views about the importance, and limitations, of individual incentive based models. It is heartening for an economist to see the great stress ethnographers put on economic rewards in the behavior of youth gangs and

the way young at-risk youths view working legally versus working illegally as options that fit the basic economic calculus. It must be heartening for the non-economists to see that economic researchers have come to stress social interactions and other non-market factors in crime, as well. My (biased economists') assessment is that economics has made a major positive contribution to our knowledge of crime, and that economic ideas, and professional economists will play a larger role in research on crime in the future.

But it would be wrong to claim that we (or others working in the crime area) have cracked the big question that has made crime such a hot issue in the past two decades – why crime rose so rapidly in the 1960s and 1970s; continued at high levels despite mass incarceration; and then began to fall sharply in the 1990s in the UCR data or earlier, using victimization reports. We can tell a plausible broad brush story about the massive rise in crime – sanctions weakened in the 1970s, the economic returns to crime rose as the earnings of less skilled workers fell sharply and as demand for drugs grew, but this explanation requires a reasonably high aggregate elasticity of supply of young persons to crime, possibly due to social interactions, for which we have only limited estimates that need not convince the skeptical. We can also tell a (more complicated) story about the 1990s drop in crime, in terms of the possible non-linear effects of a tight labor market, increases in apprehension rates, and incapacitation finally putting so many criminals in jail/prison to cut into the crime rate. But just as we have not managed to give a compelling explanation of such important economic phenomenon as the post-1973 or thereabouts fall in productivity nor the 1980–1990s rise in inequality nor the improvement in female earnings relative to male earnings, it is hard to see us nailing this social change down quickly, either. Economic analysis of crime has succeeded, but there is still a lot more to do and learn.

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