Economics and Crime in the States

ZSOLT BECSI

The author is a senior economist in the regional section of the Atlanta Fed's research department. He thanks Lucy Ackert, Roberto Chang, and Tom Cunningham for insightful comments and Amanda Swift and Victoria McKenney-Johnson for research assistance.

N POLL AFTER POLL, CRIME IS THE NUMBER ONE PUBLIC WORRY. CRIME ALSO EXACTS TREMENDOUS COSTS NOT FACTORED INTO OFFICIAL MEASURES OF WELL-BEING, AND IT IS A FAVORITE SUBJECT OF CAMPAIGN PROMISES BY POLITICIANS. IN ADDITION, CRIME RESPONDS TO ECONOMIC CONDITIONS AND INCENTIVES, SOMETHING ECONOMISTS HAVE KNOWN AT LEAST SINCE GARY BECKER'S (1968) PATH-BREAKING WORK ON THE ECONOMICS OF CRIME. DESPITE THE SUBSTANTIAL WORK IN THE AREA, PARTIC-ULARLY IN THE 1970S AND EARLY 1980S, THE PUBLIC SEEMS LARGELY UNAWARE OF THE ECONOMICS VIEW OF CRIME AND ITS IMPLICATIONS. A CYNICAL VIEW WOULD POINT OUT THAT FAMILIARIZING THE PUBLIC WITH THE RESEARCH FINDINGS WOULD GIVE PEOPLE THE INFORMATION TO DISTINGUISH BETWEEN POLIT-ICAL PROMISES ABOUT CRIME CONTROL THAT ARE MERELY WISHFUL THINKING AND PROMISES THAT MIGHT HAVE MERIT.

This article will first introduce the economics and crime literature by describing a very simple crime model.¹ Models for the economics of crime are easily described in a supply-and-demand framework in which criminals supply crime, the public at large demands protection from crime, and the government provides public protection. The model can be used to show how crime responds to a variety of demographic and economic factors and what results to expect from public policy proposals. Then the article introduces crime data by outlining broad trends of various crime categories in the United States and discussing potential problems associated with the data.

A large section of the article describes broad regional differences and trends in the patterns of crime and their underlying economic determinants using state data from 1971 to 1994. Specifically, the discussion looks at the determinants of total crime and the main categories of crime (property and violent crime) and their most visible and best-measured subcategories (auto theft and murder). It may be surprising that all these categories can be interpreted in an economic framework. While property crimes might be thought of as most responsive to economic conditions, many violent crimes are committed as by-products to crimes for economic gain and thus are also explainable with economics. The description compares individual states' experiences over the years from 1971 to 1994 with the 1990–94 portion of the period used to illustrate recent changes. The article presents state and regional rankings for various quality-of-life indicators as well as a discussion of simple correlations of these variables with crime data. Quality of life is a reflection of various demographic and economic variables such as unemployment rates, expenditures on police protection and police employment, welfare and education, the state population share of prisoners, and population density.²

Finally, the data undergo a more in-depth treatment using a panel regression approach that estimates the effects of demographic and economic variables on crime for all states over time. These regressions mirror some of the results found by others but also serve to highlight some serious issues that have been vexing the empirical literature. Generally, the demographic and economic variables explain crime rather well, and estimates for the most part conform with the economic model of crime. One important exception is that police variables are positively associated with crime or are insignificant, a finding that is common in the empirical literature. This result can be easily explained by the fact that estimates capture the response of public crimereduction efforts in response to increases in crime rather than the independent effect of crime reduction efforts on crime. The concluding section highlights the findings by drawing a few policy implications with the Southeast as an example.

The Supply and Demand of Crime

A s with all economic models, the economic model of crime assumes actors who try to make rational economic choices. The three sets of actors usually considered are the criminals, noncriminal households and legitimate businesses, and the government. In the simplest possible framework, criminals determine the supply of crime, the rest of society determines the demand for crime (protection), and the government affects both (directly on demand and indirectly through supply). This section briefly discusses how the interaction of all the actors determines the equilibrium rate of crime and how crime responds to different policies.³

The supply of crime is modeled as a choice between legitimate activities and work on the one hand and criminal activities on the other. The choice depends on the net payoff to crime, which is the payoff of the criminal activity itself (or loot) above all other costs associated with the crime. These costs include the forgone wages from legitimate activities, the direct costs of the crime (such as cost of supplies and so on), and the expected future penalties from the crime (including fines, incarceration, and other sanctions). The supply of crime is positively related to the net payoff to criminal activities, meaning that criminals will increase their activities when the net payoff rises (see Chart 1). The supply curve shifts to the right when the crime supplied by criminals for a given net return rises or when the return for a given level of activity falls. Examples of conditions that might cause a rightward shift of the supply curve include demographics (a higher proportion of youth),

fewer employment opportunities at a given wage, and reductions in imprisonment. Education and welfare might also be thought to increase the opportunity cost of committing crime by increasing legitimate earnings.

Though at first the concept of "demand for crime" may sound like an oxymoron, it can be easily explained in terms of two elements. First, there is the direct Criminals determine the supply of crime, the rest of society determines the demand for crime (protection), and the government affects both (directly on demand and indirectly through supply).

demand for (the spoils of) crime, whereby the quantity demanded falls as the loot falls, just like any other market good except that the market in this case is part of the shadow economy. Second, there is an indirect demand for crime, which is an inverse demand for protection and insurance and is also negatively related to the payoff of criminal activities. This negative relationship arises because as crime rises individuals step up private efforts at protection (ranging from locking their doors to hiring security personnel and so on), which increase the direct cost of criminal activity and therefore reduce the payoff to crime. The demand curve shifts to the left for any change to household conditions that decreases the payoff to crime for a given rate of crime. Examples include reductions in material well-being or economic growth or an increase in private vigilance.

So far, these ingredients form a market model of crime without a government. The intersection of demand and supply determines the laissez-faire equilibrium rate

- Several excellent surveys that capture different aspects of the economics and crime literature are referred to throughout the article. For starters, the reader might consider the articles contained in the Winter 1996 Journal of Economic Perspectives: DiJulio (1996), Freeman (1996), and Ehrlich (1996).
- 2. Other variables were considered. However, only limited data are available aggregated to the state level with sufficient time variation.
- 3. This is a very simple model along the lines of Ehrlich (1996) and Hellman and Alper (1990). A more in-depth survey of the theoretical literature can be found in, for instance, Eide, Aasness, and Skjerpen (1994).





of crime and the equilibrium return to crime, denoted point L in Chart 1, a simple graph of demand and supply curves. The laissez-faire crime rate is zero in only the most unusual of circumstances, requiring a high demand for and a low supply of protection and the willingness to pay for it. Note also that even a heinous crime such as murder, when there may be no associated material gains, can have a positive level of activity even though the equilibrium payoff may be negative. For such a crime, the intersection of demand and supply may occur in the lower right-hand quadrant rather than the usual upper right-hand quadrant. Also, the laissez-faire equilibrium will not be optimal from a social welfare perspective. For one thing, crime produces negative spillovers to other parts of the economy that are not reflected in its price and hence will be overproduced. Thus, the laissez-faire equilibrium crime rate will be greater than the socially optimal rate.⁴ However, a move toward the socially optimal level of crime requires either some sort of legal or social economywide self-discipline or some sort of market intervention.

The final actor is the government. The government is assumed to be moving the equilibrium toward a (lower) crime rate that has higher social welfare. Economists assume that governments attempt to equate the marginal cost of crime to the marginal social benefit of spending additional moneys on crime prevention for all categories of crime. By this principle, effort and dollars should be targeted to activities most likely to produce results. However, the government does not operate in isolation but under bureaucratic and political constraints that can distort its effectiveness but are not usually considered in simple models. Government anticrime actions can be seen as the public component of the demand curve. The public demand for crime is also negatively sloped because as crime increases the public will respond by stepping up efforts to battle crime, ultimately making crime more costly to the criminal. In particular, the expected future cost of crime (being caught) increases so that the net return to crime falls. Thus, there is an inverse relationship between the net return to crime and the crime rate from the public demand side.

The overall demand curve for crime adds public demand to the private demand. The total demand curve lies below the private demand curve because the combined public and private efforts at crime avoidance mean that there is less crime for a given payoff to crime than if the public acted alone.⁵ An exogenous increase in the expected future costs to criminals of public sanctions will shift the total demand curve to the left, as, for example, when tougher laws or harsher sentencing arrangements are enacted.

The equilibrium crime rate (and net return from crime) is determined by the intersection of the demand and supply for crime. This is point E in Chart 1, which is to the left of point L. Exogenous shocks will move the equilibrium, with the strength of the effect determined by the elasticity of supply-and-demand curves. Simply put, the curves tend to be more elastic or flatter as more substitution opportunities occur.⁶ The above-mentioned examples of leftward demand shifts (due to falling average incomes or increased vigilance) and supply shifts (because of lower unemployment rates and increased education and welfare) all imply lower equilibrium crime rates. However, the response may be smaller than expected. Consider, for instance, an exogenous increase in conviction rates. Because incarcerating criminals reduces the supply of crime, equilibrium crime will fall. However, convicted criminals will be replaced by new criminals, depending in part on the strength of the deterrence effect of convictions. If the deterrence effect is weak and individuals can easily substitute into the criminal activity, it is possible that crime might not fall significantly. In other words, the more elastic the supply curve, the smaller the response of crime to a given shift in the supply curve, with no change in crime for a perfectly flat supply curve. Thus, analysis of how crime equilibria respond to policy changes must consider the shapes of the supply-and-demand curves, which may differ among crime categories.

Finally, to foreshadow an issue that is important in empirical crime analyses, while it is clear that public efforts to combat crime should reduce the crime rate, this correlation is not always clear. The difficulty is that correlations sometimes fail to distinguish between exogenous shocks and endogenous comovements. For example, more effective police efforts should to some extent reduce crime rates. Thus one would see a negative correlation between crime and police efforts. However, not all police actions are exogenous—that is, independent from crime (or predetermined). Much police activity is in response to perceived changes in criminal activity. Thus, if crime increases for a reason completely unrelated to the crime itself, police activity will increase, too, and the crime and police efforts will be positively related even though exogenous increases in police efforts reduce crime. In empirical work the problem is compounded if many shocks occur at the same time and one does not control for all of the shocks. Then it is possible to estimate correlations that are driven by shocks other than the one being studied. Ideally, to see the effect of police efforts on crime, one would like to tie down the private demand curve and the supply curve for crime so that the only thing moving when police effort changes is the public demand curve for crime. However, in reality there are little data on private efforts at crime control, so the private demand curve is not pinned down and estimated correlation will pick up private and public demand shocks.

Aggregate Trends and Data Problems

F reeman (1996) estimates that the cost of crime in the United States may have been around 4 percent of gross domestic product (GDP) in the early 1990s. He finds that about half of this cost is direct loss from crime (including direct and indirect monetary and nonmonetary losses). The second half is from resources devoted to private and public crime-control activities that could have been put to other uses had there been no crime. To put the cost-of-crime number into perspective, 4 percent of GDP is a greater share than is typically spent on motor vehicles and parts or on clothing and shoes. Thus, without crime, society could afford to have at least twice as much clothing or cars as it does and could feel safer.

One problem with the cost-of-crime estimate is that, strictly speaking, it pertains only to the 1990s and says little about how crime has evolved over time. Occasional press updates on crime trends are not always helpful because they may report information out of context. To understand movements of crime over time, it is helpful to look at crime statistics from the Federal Bureau of Investigation's (FBI's) Uniform Crime Reporting (UCR) program data that have been collected since the 1930s. The FBI collects data on seven index crimes, which can be divided into two major categories—namely, violent crimes and property crimes. Violent crimes are further divided into murder and nonnegligent manslaughter, forcible rape, robbery, and aggravated assault.⁷ The category of property crimes contains burglary, larceny-theft, and motor vehicle theft (arson was added in 1978 but will not be considered here). The data are voluntarily provided to the FBI by state or local law enforcement agencies and are measured as a rate per 100,000 residents to adjust for population changes. Chart 2 graphs the overall crime index and its two main categories from 1971 to 1996.

As the chart indicates, overall crime saw dramatic growth (of roughly 50 percent) during the 1970s, peaking in 1980. Since then, overall crime has oscillated within a

broad band. Property crime, which accounts for the biggest part of overall crime, has had a similar pattern over this period. However, violent crimes continued to rise over the whole sample period, with a peak in 1990. While all crime rates have fallen off in the 1990s, such movements are not unprecedented, as the experience in the early 1980s shows.

Within the proper-

One problem with the cost-of-crime estimate is that, strictly speaking, it pertains only to the 1990s and says little about how crime has evolved over time.

ty crime and violent crime categories, developments of the components are shown in Charts 3 and 4. Larceny, by far the largest component of property crime, increased until 1980 and has been fairly steady for the rest of the sample period, making its biggest gains during the 1970s. By contrast, burglary, the second-largest component, has followed a relatively steady downward trend since 1980. However, the smaller auto theft component skyrocketed in the late 1980s and has been falling during the 1990s. For violent crime, the dominant category is aggravated assault, which saw a steady upward trend until the early 1990s and has seen a slight weakening since. Murder, a very visible component, has oscillated within a fairly well-defined range without any clear longterm pattern, although the most recent rates appear at the lower end of their range.

To gauge the relative cost to society, one can rank the different categories according to average cost per

^{4.} However, even the socially optimal crime rate may not be zero, for achieving it would involve costs that society may not want or cannot afford to pay.

^{5.} Public and private efforts may be substitutes and could crowd one another out. For example, if public protection were perfect, then one would not need to install alarms or lock doors, while with private neighborhood watches the necessity for police efforts is reduced.

^{6.} Thus, if crime is narrowly defined or the geographic area is small, elasticities will be larger.

^{7.} See the data appendix, which defines all variables with citations of data sources.

CHART 2 Overall Crime Index



reported crime. Cohen (1988) and Miller, Cohen, and Rossman (1993) provide estimates of the monetary costs of crime (medical bills, property loss, and lost productivity) and, on the basis of jury awards, the quality-of-life reductions caused by pain and suffering. They estimate that the 1992 dollar cost for the average crime was \$17,000 for murder, \$1,800 for assault, \$2,900 for robbery, \$1,200 for burglary, \$200 for larceny, and \$4,000 for auto theft. Estimates of quality-of-life costs were \$2.7 million for murder, \$10,200 for assault, \$14,900 for robbery, \$400 for burglary, and \$0 for larceny or for auto theft.⁸ The estimates give some idea about the relative values associated with the trends in the different crime rate indexes. Thus, while auto theft and murder are the smallest subcategories in terms of crimes per 100,000 individuals, in value terms they are considerably larger. Similarly, although property crimes make up the bulk of the overall crime rate, in terms of quality-of-life costs violent crimes carry much more weight.

The above charts graph those categories most responsive to economic variables, thus not breaking out forcible rape, which is included in the index for all violent crimes. While it would seem that property crime components should be most responsive to economic incentives, it is a misconception that violent crimes are crimes of passion that are impervious to economic factors. Violent crimes are also committed for economic gain, sometimes directly and sometimes as by-products of activities committed for economic gain. Thus, all of the included index crimes are to a greater or lesser extent understandable in the terms of the simple economic model and can be related to some economic variables of interest.

Before analyzing the data, one should note that there are potentially severe data measurement problems with crime data that must be considered when making inferences. As DiIulio (1996) explains, the data problems arise from two sources. First, there is the problem of underreporting by victims. Generally, the problems arise because reporting crimes can be costly to the victims in terms of time, aggravation, and so on. Thus, crime reported to police agencies will be less than the true amount of crimes committed. Second, there is the problem of reporting by local and state law enforcement agencies, which has several aspects. Uniform Crime Reporting data capture only voluntary reports. The fact that the number of agency volunteers has risen over time suggests possible undercounting early in the sample because of underrepresentation. There is also the issue of hierarchical reporting by the FBI, which counts only the most serious crime when several crimes are committed together. Thus, less serious crimes will tend to be undercounted. Finally, there is the issue of undercounting by some local and state departments in order to show that crime has fallen, which could be a temptation around election times. While there have been increasing efforts to improve the quality of the data, particularly in recent times, measurement problems in earlier data will taint any inferences drawn from longer time series.9

One can see how severe the measurement problem is by examining the results of a study published in 1995 (Department of Justice 1995) that extensively surveyed crime victimization in 1993. The study found that, of the total crimes committed in the United States, at least twothirds were not reported. Generally, 42 percent of violent

CHART 4 Violent Crime Index



Source: See data appendix.

5,500 700 Crime Rates per 100,000 Inhabitants 4,500 Property Crime 600 Auto Theft Rate 3,500 500 Larceny 2,500 Auto Theft 400 1,500 Burglary 500 300 1971 1975 1980 1985 1990 1995



Source: See data appendix.

crimes were reported, compared with only a third of all property crimes. Victims were more likely to report incidents to the police if an injury resulted, forcible entry occurred, or the property loss was high. The two subcategories of murder and auto theft have lesser data measurement problems. For one, murders are generally well reported through the media and documented by funeral home records, and the role of motor vehicle insurance implies that auto thefts will also be well documented. Because of the better documentation for these categories, this study highlights these two series as opposed to the other subcategories.

- 8. The numbers are taken from Levitt (1996, table 7), which combines numbers from both studies.
- 9. Dilulio (1996) also compares Uniform Crime Reporting data with other sources of crime data such as the Department of Justice's National Crime Victimization Survey. While this survey may not suffer from the problems of the Uniform Crime Reporting, it has other problems. Note also that prior to the 1980s the two series had different time trends, but now the trends are very similar.

					Crir	ne Ranking	gs: 1971	-94							Cri	me Rankir	ngs: 1990	0–94			
Region	State	Total Crimeª	Rank	Property Crime ^a	Rank	Violent Crimeª	Rank	Auto Theftª	Rank	Murder ^a	Rank	Total Crimeª	Rank	Property Crime ^a	Rank	Violent Crimeª	Rank	Auto Theft ^a	Rank	Murder ^a	Rank
New England	CT	92.2	27	95.3	28	65.1	23	115.0	41	50.4	15	88.4	23	91.6	28	67.4	22	109.7	40	61.1	22
	MA	97.5	32	97.7	32	94.2	35	202.0	50	41.5	13	88.3	22	86.3	19	101.5	38	131.6	46	40.8	13
	ME	68.4	8	73.2	9	28.9	5	37.1	5	27.9	6	61.6	7	68.2	7	17.9	4	24.2	4	19.7	3
	NH	63.4	7	68.4	7	21.6	2	45.6	13	26.1	4	55.9	4	61.8	6	17.0	3	33.5	9	22.3	5
	RI	97.4	31	101.6	34	62.1	22	160.8	49	39.7	11	83.4	20	87.6	21	55.7	17	115.6	43	42.7	15
	VT	71.5	11	77.5	13	22.3	3	38.5	7	27.8	5	67.0	8	74.8	9	15.2	2	23.4	3	23.7	6
Mideast	DE	105.1	36	107.2	38	84.7	30	82.7	31	63.4	21	91.4	26	91.3	27	89.6	32	59.1	22	52.5	18
	MD	108.4	38	104.4	36	141.8	47	105.5	38	113.2	35	108.1	40	104.8	37	130.0	44	115.1	42	127.1	45
	NJ	97.0	30	97.6	31	91.5	34	133.6	46	64.2	22	89.9	25	90.6	24	85.0	30	128.4	45	55.8	20
	NY	110.1	39	103.1	35	168.9	50	146.0	47	128.3	43	102.9	36	96.0	30	148.4	49	143.3	49	140.9	49
	PA	60.6	6	60.6	6	61.4	20	75.6	25	66.1	24	60.1	6	60.4	5	58.1	19	74.5	30	68.1	26
Great Lakes	IL	103.0	35	99.5	33	132.1	46	116.1	42	110.3	34	103.0	37	98.6	31	132.3	46	96.5	38	119.5	42
	IN	81.7	21	84.1	20	61.5	21	76.3	26	75.6	27	82.4	18	84.6	17	67.5	23	70.6	27	79.2	29
	MI	116.9	44	116.2	41	122.6	44	130.0	45	117.8	39	101.4	34	100.7	34	105.8	42	104.6	39	108.0	35
	OH	86.5	23	87.9	23	75.1	27	82.1	29	74.3	26	83.2	19	85.2	18	69.7	25	73.8	28	67.7	25
	WI	76.1	13	81.3	17	32.8	7	52.6	18	36.6	9	75.0	11	80.8	13	36.5	9	63.8	24	48.2	17
Plains	IA	72.9	12	77.5	12	34.1	9	37.6	6	23.1	2	69.7	9	74.1	8	41.1	13	27.8	7	20.3	4
	KS	88.6	24	91.9	26	60.9	19	50.8	16	59.6	20	91.6	27	95.7	29	64.6	21	52.9	18	62.0	23
	MN	80.3	19	84.9	21	42.2	11	62.7	22	28.5	7	79.2	16	84.5	16	44.5	14	55.3	19	33.3	9
	ND	59.2	5	59.6	5	58.0	17	34.6	4	139.7	47	76.9	15	80.0	11	55.9	18	50.4	16	140.9	48
	ND	49.0	2	53.7	2	10.8	1	26.6	2	13.7	1	50.2	2	56.3	2	10.4	1	22.6	2	12.0	1
	NE	71.2	9	74.6	10	43.4	13	44.7	12	36.8	10	76.7	13	81.0	14	48.1	15	42.0	13	36.8	11
	SD	51.3	3	54.3	3	26.9	4	25.1	1	23.1	3	53.4	3	57.5	3	26.4	6	17.9	1	19.1	2
Southeast	AL AR FL GA KY LA MS NC SC SC TN VA WV	77.4 71.5 143.4 96.9 98.4 91.4 82.0 93.9 79.5 78.1 42.3	15 10 50 29 4 33 25 22 28 18 17 1	76.2 72.1 141.8 97.3 96.3 90.9 81.7 91.1 78.9 80.6 43.9	$ \begin{array}{r} 11\\ 8\\ 49\\ 30\\ 4\\ 29\\ 24\\ 19\\ 25\\ 14\\ 15\\ 1\\ \end{array} $	$\begin{array}{r} 86.9\\ 66.7\\ 156.4\\ 94.9\\ 54.4\\ 116.5\\ 94.8\\ 85.7\\ 116.7\\ 84.4\\ 58.5\\ 29.0\\ \end{array}$	33 24 49 38 16 42 37 31 43 29 18 6	55.2 39.9 106.9 80.9 46.0 81.1 85.6 42.3 56.2 82.6 50.2 31.6	20 9 39 27 14 28 33 10 21 30 15 3	$\begin{array}{c} 133.6\\ 103.6\\ 130.7\\ 146.0\\ 92.9\\ 164.3\\ 104.3\\ 113.9\\ 127.2\\ 114.0\\ 97.1\\ 65.5 \end{array}$	45 32 44 30 50 33 36 42 37 31 23	$\begin{array}{r} 89.7\\ 86.5\\ 150.0\\ 112.8\\ 58.8\\ 117.0\\ 92.3\\ 100.9\\ 106.4\\ 91.9\\ 76.1\\ 45.5\end{array}$	24 21 50 44 5 47 29 33 39 28 12 1	87.5 87.8 148.2 115.2 58.4 114.8 91.1 102.7 102.3 90.8 80.2 48.3	20 22 50 46 45 26 36 35 25 12 1	$\begin{array}{c} 104.7\\78.0\\161.6\\97.6\\61.2\\131.6\\100.0\\88.9\\133.6\\98.6\\49.3\\26.9\end{array}$	41 28 50 35 20 45 37 31 47 36 16 7	55.4 50.9 135.5 95.7 34.1 96.4 84.5 57.9 92.7 48.8 26.6	20 17 47 36 10 37 33 14 21 35 15 6	$\begin{array}{c} 122.4\\ 115.8\\ 98.5\\ 121.1\\ 69.5\\ 195.5\\ 109.9\\ 116.9\\ 112.3\\ 109.3\\ 93.5\\ 65.0\\ \end{array}$	44 39 33 43 27 50 37 41 38 36 32 24
Southwest	AZ	140.0	49	144.7	50	101.2	40	105.5	37	92.4	29	133.7	49	139.9	49	92.1	34	143.0	48	91.2	31
	NM	114.4	40	114.5	40	112.8	41	69.7	23	117.9	40	114.2	45	113.6	43	117.9	43	63.2	23	100.9	34
	OK	91.6	26	94.0	27	71.7	25	87.7	34	87.9	28	97.7	31	100.0	33	82.1	29	83.5	32	79.1	28
	TX	115.5	41	118.0	42	95.3	39	112.3	40	149.8	49	123.7	48	126.6	48	104.5	40	125.6	44	137.9	47
Rocky Mountains	CO	121.5	46	125.8	46	86.5	32	92.4	36	70.3	25	102.4	35	106.7	39	73.9	27	70.2	26	58.6	21
	ID	76.4	14	80.6	16	41.7	10	39.0	8	40.7	12	71.5	10	76.5	10	38.2	10	28.1	8	30.9	7
	MT	81.2	20	87.1	22	33.2	8	52.4	17	44.6	14	80.2	17	89.0	23	22.2	5	38.8	11	35.5	10
	UT	98.8	34	105.3	37	45.2	14	55.2	19	36.0	8	97.3	30	106.0	38	39.6	11	40.2	12	31.9	8
	WY	77.9	16	81.6	18	47.0	15	42.8	11	58.3	18	76.7	14	82.2	15	40.2	12	24.6	5	39.4	12
Far West	AK	106.7	37	108.2	39	94.3	36	119.9	44	117.6	38	98.3	32	99.5	32	89.8	33	82.3	31	79.9	30
	CA	130.3	47	128.6	47	142.9	48	151.2	48	123.7	41	115.8	46	111.5	41	144.1	48	162.2	50	132.4	46
	HI	115.6	42	124.4	45	43.1	12	91.0	35	58.9	19	110.6	42	122.0	47	35.2	8	66.8	25	41.8	14
	NV	134.2	48	135.2	48	125.4	45	116.8	43	139.7	46	111.5	43	112.6	42	104.2	39	110.0	41	116.0	40
	OR	118.0	45	122.3	44	83.2	28	84.1	32	54.0	17	103.9	38	109.3	40	68.7	24	88.3	34	47.9	16
	WA	116.7	43	122.0	43	72.7	26	73.9	24	53.8	16	108.7	41	114.6	44	69.7	26	74.0	29	52.9	19

^aPercentage deviation relative to the nation

Source: See data appendix.

TABLE 1 State Differences in Crime Rates with Rankings

TABLE 2 Average Regional Differences in Crime Rankings

			1971–9	4		Comparison of 1990 with Full Sample						
Region	Total Crime	Property Crime	Violent Crime	Auto Theft	Murder	Total Crime	Property Crime	Violent Crime	Auto Theft	Murder		
New England	19	21	15	28	9	-5	-6	-1	-3	2		
Mideast	30	29	36	37	29	-3	-5	-1	0	3		
Great Lakes	27	27	29	32	27	-3	-4	0	-1	3		
Plains	11	11	11	9	13	2	1	2	2	1		
Southeast	21	19	31	21	38	7	8	2	4	-1		
Southwest	39	40	36	34	37	4	4	0	3	-2		
Rocky Mountains	26	28	16	18	15	-5	-3	-3	-6	-4		
Far West	44	44	33	38	30	-3	-3	-3	-3	-2		

Source: See data appendix.

These points serve as a reminder that any inferences from Uniform Crime Reporting data are inferences about reported crime and not necessarily about true crime, unless it can be shown that there exists some sort of stable relationship between the two. However, Grove, Hughes, and Geerken conclude that for crimes in which both citizens and police agree that a "serious violation of the law" has occurred, such as motor vehicle theft, robbery, burglary, and homicide, Uniform Crime Reporting crime statistics are "reasonably good approximations of the true crime rates" (1985, 489). For the less clear-cut crimes of aggravated assault and rape, they conclude that the evidence that Uniform Crime Reporting data accurately represent serious crime is somewhat weaker, and the larceny rates may overstate the actual crime rate.

A Regional Comparison of Crime and Its Determinants

This section looks at the cross section of states and the cross section's movements across time for the major crime categories. In particular, overall crime and its two major categories, property and violent crime, are examined. Because of the measurement problems discussed above, the discussion also focuses on subcategories that arguably have a smaller data measurement problem: auto theft and murder. For information about the time variation across states without going into the details of year-to-year differences, the study compares the 1990s with averages that span the whole sample. The discussion also looks at the link of the different crime categories with potential explanatory variables. After a brief summary of these quality-of-life variables, simple correlations are discussed.

Table 1 gives a picture of how crime has varied across states for the period 1971 through 1994. The table shows the percentage deviation by state relative to the nation averaged over the full sample period.¹⁰ To make comparisons easier, states' relative crime rates over the sample period are also ranked, with states with the lowest crime rates receiving the highest ranking. Also, states are grouped into eight standard regions defined by the Bureau of Economic Analysis. Finally, to give a rough idea of how the cross section has recently evolved, percentage deviations and rankings for the states are presented for the first half of the 1990s. As an example to help interpret this data, Florida on average had a murder rate that was 30.7 percent above the nation's for the period from 1971 to 1994, earning it a ranking of 44. However, for the first half of the 1990s Florida's murder rate was 1.5 percent below the nation's, and its rank climbed to 33.

To help identify regional characteristics, Table 2 provides unweighted averages of the rankings of all the states in each region for the complete sample period. The table also gives changes in the regional rankings when comparing the first half of the 1990s with the complete sample period. Because unweighted averages give disproportionate weight to small states, use of unweighted averages is meant only to identify patterns in the data, not to summarize the experiences of whole regions. With this in mind, the Plains states tended to have the lowest crime rates across all categories, and Rocky

^{10.} Because of the measurement problems with crime data, one can never be sure that these differences are not an artifact of reporting bias. Ehrlich (1996) suggests that reporting bias may be proportional to crimes reported, but this idea seems untestable.

1971–94									
Region	Density	15-24- Year Olds	Unemploy- ment Rate	Per Capita Personal Income	Public Welfare	Primary and Secondary Education	Convicts	Police Employment	Police Expenditures
New England	35	30	21	14	12	26	40	26	34
Mideast	46	21	27	14	23	21	20	11	17
Great Lakes	37	28	34	20	17	26	27	25	22
Plains	13	28	10	31	25	20	37	41	42
Southeast	29	21	29	38	31	34	15	31	28
Southwest	14	31	28	35	34	25	16	17	21
Rocky Mountains	7	25	17	31	37	12	36	23	20
Far West	19	24	38	10	24	30	20	17	11

.

· Oring a Mariahl

			Cor	mparison of 199	0 with Full Sa	mple			
Region	Density	15-24- Year Olds	Unemploy- ment Rate	Per Capita Personal Income	Public Welfare	Primary and Secondary Education	Convicts	Police Employment	Police Expenditures
New England	0	-6	11	-2	-2	-3	-5	-2	0
Mideast	0	12	1	-4	4	3	-2	0	2
Great Lakes	0	-6	-7	1	2	-2	-2	3	-2
Plains	-1	0	1	1	1	3	2	-2	-2
Southeast	0	8	0	-2	-4	-3	4	-2	2
Southwest	1	0	3	4	-5	-4	-2	-3	-5
Rocky Mountains	0	-15	-1	3	2	5	-1	3	0
Far West	1	-2	-7	2	6	2	1	5	1

Source: See data appendix.

Mountain states had moderately higher crime rates by comparison. On the other hand, states in the Far West had the highest overall and property crime rates while the Southwest and Mideast had relatively high crime rates across all categories.

During the 1990s crime increased dramatically in the Southeast as measured by the overall crime index and the property crime index. The region also saw a slight increase in violent crime from already high levels. Only murders declined slightly from generally high levels. The Southwest also saw important worsening in crime although not as severe as in the Southeast. Violent crime in the region remained unchanged at relatively high rates. All other regions experienced a reduction in overall crime rates. For the Rocky Mountain states and the states in the Far West, this reduction was balanced equally among property crime and violent crime. For the Northeast, Mideast, and Great Lakes regions the reduction in overall crime came mainly from lower property crime, but these regions also saw worsening relative murder rates. Finally, the Plains states saw a marginal worsening from comparatively low rates overall.

Next, the study turns to variables that may help explain crime variation across states. First, two demographic variables are considered—population density and the population share of the young. Population density is thought to be associated with crime primarily because crime is considered an urban phenomenon. Because much crime is committed by young (male) adults, the youth of the population should also be an important explanatory variable. As Freeman notes, the "demographics of the criminal population show that those who commit crimes consist disproportionately of persons with low legitimate earnings prospects-the young, the less educated, persons with low test scores, and so on" (1996, 33). Thus, the analysis looks at the share of the population of fifteen- to twenty-four-yearolds, which is the age group with the highest arrest rates (Marvell and Moody 1991).

Next, economic conditions are captured by two variables, the unemployment rate and per capita personal income. Both of these variables are fairly popular measures in crime analyses (Chiricos 1987; Hsieh and Pugh 1993). The unemployment rate measures reduced legitimate earnings opportunities that are particularly important for the population segment most at risk for engaging in criminal activities. In other words, increases of the unemployment rate imply diminished legitimate earnings expectations and so capture an increase in the net return from crime. By contrast, average personal income can be interpreted as a measure of general material well-being and thus of the potential loot from crime. The average is not really a measure of legitimate earnings for criminals because they tend to be at the lower end of the income distribution.¹¹

Finally, five public policy variables are considered, with expenditure variables measured as a share of personal income. The first two variables, welfare expenditures and expenditures on primary and secondary education, measure positive disincentives to crime. Welfare expenditures arguably might be thought of as reducing the pain from unemployment and thus reducing

the net return of crime. Alternatively, it can be interpreted as a state's propensity to help disadvantaged population segments. Education expenditures also increase the opportunity costs of crime, first by keeping youths off the streets, so to speak, raising their earnings potential from future legitimate earnings, and giving them tools to evaluate the costs of crime realistically. Fi-

The unemployment rate measures reduced legitimate earnings opportunities that are particularly important for the population segment most at risk for engaging in criminal activities.

nally, three variables are used to measure public disincentives to crime. The first is the state population share of prisoners or convicts, which can be thought of as a summary indicator of the penalties of being caught and the expected cost of crime. Police employment (as a share of state population) and public expenditures on police and protection each measure public efforts to reduce crime and raise the expected cost to criminals.¹²

State percentage deviations and rankings of these explanatory variables for the 1990–94 period are depicted in the table provided in the appendix.¹³ Table 3 summarizes these data with regional rankings over the full 1971–94 sample period and compares regional rankings for the first half of the 1990s with the full sample period. Some of the regions can be roughly characterized as follows: States in the Northeast had high incomes and welfare expenditures but low prison population and police expenditures. The Far West also tended to have high incomes but relatively high unemployment rates, moderately low education expenditures, and high prison population and police expenditures and employment. The

^{11.} A measure of legitimate earnings for criminals would be the median wage, which tends to be lower than the average but could not be obtained for this study.

^{12.} Per capita police expenditures and police employment were qualitatively very similar.

^{13.} See the data appendix, which defines all variables and cites all data sources.

TABLE 4 Simple Correlations of Crime Variables and Explanatory Variables (Percent)

		1	1971–94	4			1990–94								
Variables	Total Crime	Property Crime	Violent Crime	Auto Theft	Murder	Tota Crime	Property e Crime	Violent Crime	Auto Theft	Murder					
Population Density	13.8	10.9	23.6	65.4	-8.4	6.	5 1.5	22.7	52.5	-1.2					
15-24-Year-Olds	-18.8	-18.1	-16.1	-21.8	13.9	-14.8	3 –14.1	-12.9	-35.3	17.9					
Unemployment Rate	24.4	20.1	39.3	30.1	47.9	15.	7 8.3	38.0	41.0	43.1					
Per Capita Personal Income	40.6	41.5	23.3	61.2	-13.9	13.) 11.4	15.2	47.9	-14.5					
Public Welfare	-15.8	-17.8	-1.6	31.0	-16.7	-33.4	4 –37.4	-9.8	1.9	-5.8					
Primary and Secondary Education	-16.7	-14.0	-25.3	-19.6	-23.3	-29.2	1 –25.7	-33.4	-32.6	-24.7					
Convicts	49.3	43.2	66.4	22.7	80.5	58.	9 52.2	66.4	48.2	67.5					
Police Employment	66.4	62.5	66.7	68.6	35.6	55.3	3 51.0	57.6	62.8	33.8					
Police Expenditures	72.0	69.3	65.0	55.1	42.3	70.	67.7	59.0	59.6	38.6					

Source: See data appendix.

Southeast and Southwest generally had lower incomes, low welfare expenditures, and large prison populations, with the Southwest distinguishing itself by high police expenditures and employment and the Southeast by the lowest expenditures on education. A comparison of the 1990s with the overall sample period reveals that the Southeast and Southwest increased expenditures on welfare and education and increased relative police employment, with the Southeast experiencing rising personal incomes and the Southwest seeing income reductions. At the same time, the Southeast increased its prison population and police expenditures, and the Southwest did the opposite.

Finally, Table 4 ties the variation in crime rates to the set of explanatory variables. The table reports simple correlations of dependent crime variables with potential explanatory variables; that is, each correlation is considered in isolation from other variables, and no effort is made to control for the effects of other explanatory variables. Generally, the findings are that density, age, and personal income are positively correlated with all crimes except murder, for which the correlations with density tend to be relatively weak. Unemployment, the prisoner population share, and both police variables are all positively correlated with all index crime categories. Finally, education and welfare tend to be negatively correlated with all crime categories except that the welfare correlation is positive with auto theft and close to zero for violent crime. Qualitatively, the correlations for the 1990s are much the same as for the overall sample period. The exceptions are that incomes are negatively correlated with murder (but the correlation is small) and that welfare is negatively correlated with violent crime (again, the correlation is small).

Almost all the correlations are consistent with intuition. The demographic variables reinforce the view that crime is committed by youths in urban areas. Correlations of crime with variables for economic conditions support the idea that crime responds positively to the net benefit of crime through unemployment (which measures a reduction in legitimate earnings expectations) and personal income (which measures an increase in the material reward to some crimes). A case can also be made that the crime correlations with welfare and education indicate that these variables can also reduce the net benefit of crime. Even the positive correlations of the police variables and the prisoner share of the population can be explained as a reaction of public efforts to reduce crime rather than as capturing the independent effects of police and imprisonment on crime. This simultaneity bias arises because the public responds to crime and crime responds to public efforts, and simple correlations make no distinction between the two.

However, while the tables are helpful in introducing regional differences and the correlation analysis is suggestive, there are several reasons to view the correlation analysis with skepticism. First, while aggregation across all years might eliminate a great deal of noise in the data, it is also possible that much valuable information is lost and the correlations are purely a result of the time aggregation. Second, there is no way to tell which, if any, of the correlations are statistically significant. Thus, it is possible that the small correlations are statistically different from zero and the large correlations are statistically insignificant. Third, each correlation is treated in isolation without controlling for the effects of other variables.¹⁴ Partial correlations, or correlations that take into account other variables, might be considerably different. All these reasons argue for a multivariate approach that takes time variation into account.

Regression Analysis and Survey of Empirical Studies

This section presents the results of panel regressions that relate the various index crimes to the explanatory variables introduced in the last section. Alternative approaches, such as an aggregate time series analysis (along the lines of the data presented in the previous section) or a simple time-aggregated cross-regression approach (using Table 5 and the appendix table) could have been pursued. However, in either case aggregation of the data might create biases that can easily be prevented through an analysis of panel data.

A panel regression is simply a regression with crosssectional data that varies over time. The dependent variable (crime) is regressed against all explanatory variables for all states and all years. It is assumed that the coefficients for the explanatory variables are equal for all states, and state-specific variation is allowed through the use of dummy variables.¹⁵ Specifically, the equation to be estimated is of the following form:¹⁶

$$lnY(it) = a(i) + a * T + b1 * lnX1(it) + b2 * lnX2(it) + \dots + E(it),$$

where *i* denotes states and *t* denotes years; *Y* is the crime index variable; *X*1, *X*2, and so on are the explanatory variables discussed in the last section; *T* is a trend; and *E* is the error term. As in the tables, all variables are defined as ratios of the state variables relative to the corresponding U.S. aggregate for each year, or, for example, Y(it) = y(it)/y(USt). Also, the data used in the

regressions have been transformed using a logarithmic transformation because doing so reduces the influence of outliers and allows a simple elasticity interpretation. That is, one can explain the estimated coefficients, b1, b2, and so on, as the percentage change of Y that is associated with a 1 percent change of any particular explanatory variable.

Table 5 presents the results of the regression for the various crimes, including standard errors and significance values. The regressions have been estimated using White's (1980) formula for correcting for the possibility that the variances of the error term change over the

sample. All public expenditure and police variables and the prison population have been lagged one period in order to get an exogenous representation; however, the results do not change much when these variables are not lagged.¹⁷ Also, the estimation results from the initial specification are recorded in the first column for each crime. Overall, the results are intuitive, in some ways

Generally, density, age, and personal income are positively correlated with all crimes except murder, for which the correlations with density tend to be relatively weak.

more so than the correlation analysis of the last section, but there are also a few surprises. Not surprisingly, property crimes do a better job of conforming with an economic interpretation than do violent crimes and murder and, because property crimes are the largest component of overall crimes, so does the overall crime index.

In particular, population density is generally insignificant and only significant for auto theft, where it has a positive sign, and for murder, where it has a negative sign.

- 14. A related point, already hinted at in discussing the police correlations, is that the correlations capture equilibrium comovements and fail to distinguish between exogenous police effort changes and endogenous responses. As the next section makes clear, this problem is only partially solved in a regression framework because, for one thing, there is no way of controlling for all variables that create demand and supply shifts. In particular, there are no (readily available) data on private protection efforts, and thus demand shocks cannot be tied down.
- 15. The econometric model used is commonly known as the fixed-effect model and is fairly standard in the recent crime literature that deals with multiple time series (see, for instance, Marvell and Moody 1996 and Levitt 1997). One virtue of this model is that the state dummies (or fixed-effect adjustments) help reduce biases that arise because potentially important variables may have been omitted that explain cross-state variation.
- 16. While earlier discussion of correlations indicates that dividing the sample into smaller time frames such as decades might be interesting, subsample estimates were generally very imprecise and so are not reported. Also, regional dummies were not included, although earlier discussion focused on regional differences, mainly to simplify comparison across states.
- 17. Using lagged variables is perhaps the simplest way of dealing with the simultaneity biases inherent in empirical crime analysis. One problem with this method is that it may not adequately represent dynamic interrelations in the data and in particular may miss serial correlation effects. Other methods are more structural and require identifying assumptions derived from theory to get at the issue. For instance, Levitt (1997) uses an instrumental variable approach to account for simultaneity biases arising with police variables.

TABLE 5 Panel Regression Results^a

Variables	Total Crime	Property Crime	Violent Crime	Auto Theft	Murder
Population Density Coefficient estimate Standard error p-value	0.018 -0.038 0.64	0.009 0.038 0.81	0.079 0.068 0.238	0.632 0.098 0	-0.245 0.094 0.01
15-19-Year-Olds Coefficient estimate Standard error p–value	0.64 -0.07 0	0.696 0.07 0	0.275 0.119 0.02	0.522 0.222 0.019	-0.751 0.171 0
20-24-Year-Olds Coefficient estimate Standard error p-value	0.183 -0.069 0.008	0.114 0.071 0.105	0.57 0.12 0	1.378 0.184 0	0.682 0.21 0.001
Unemployment Coefficient estimate Standard error p-value	0.121 -0.017 0	0.134 0.018 0	-0.048 0.027 0.078	0.152 0.032 0	-0.08 0.037 0.028
Personal income Coefficient estimate Standard error p-value	0.371 -0.076 0	0.397 0.077 0	0.269 0.131 0.04	0.559 0.164 0	0.222 0.208 0.285
Welfare Coefficient estimate Standard error p-value	-0.003 -0.017 0.874	0.0004 0.018 0.98	0.013 0.027 0.62	-0.064 0.039 0.097	-0.105 0.047 0.024
Primary and Secondary Education Coefficient estimate Standard error p-value	0.016 -0.028 0.57	0.017 0.029 0.55	-0.024 0.044 0.58	-0.021 0.056 0.7	-0.017 0.074 0.82
Convicts Coefficient estimate Standard error p-value	-0.087 -0.015 0	-0.091 0.015 0	-0.046 0.022 0.03	-0.198 0.032 0	-0.063 0.034 0.065
Police Convicts ^b Coefficient estimate Standard error p-value	-1.35 0.825 0.103	-1.475 0.884 0.095	-0.95 0.6 0.113	-0.316 0.433 0.466	0.94 0.757 0.211
Residual Convicts ^c Coefficient estimate Standard error p-value	-0.087 -0.015 0	-0.091 0.015 0	-0.046 0.022 0.03	-0.198 0.032 0	-0.063 0.034 0.065
Police Expenditures Coefficient estimate Standard error p-value	0.076 0.123 0.024 0.031 0.001 0	0.08 0.132 0.025 0.033 0.001 0	0.069 0.1 0.033 0.036 0.037 0.004	0.022 0.026 0.025 0.03 0.39 0.39	-0.006 -0.044 0.031 0.039 0.83 0.26
Police Employment Coefficient estimate Standard error p-value	0.126 0 0.083 0 0.128 0	0.138 0 0.088 0 0.118 0	0.09 0 0.06 0 0.132 0	0.012 0 0.043 0 0.78 0	-0.1 0 0.06 0 0.18 0

^a The initial specification is in the first column of figures for a category, and the alternative specification is in the second column.
 ^b Prison population explained by police expenditures and employment
 ^c Prison population unaccounted for

Source: See data appendix.

All estimated elasticities are less than one, and for the most part, they are small. Specifically, a 10 percent increase of relative state population density is associated with a 6.3 percent increase in relative auto theft but a 2.45 percent reduction in murder rates. These figures suggest that auto theft is an urban phenomenon but, surprisingly, that murder is not.¹⁸ The share of twenty- to twenty-four-year-olds is always estimated with a positive sign and, except for property crime, is highly significant. Similarly, the share of fifteen- to nineteen-year-olds is always significant at the 98 percent level and positive except for murder. Thus, the estimates reaffirm the notion that crime is associated with youth.¹⁹ However, only for auto theft is the elasticity larger than one, meaning that a baby boom, for example, will have disproportionately large effects for this crime category.²⁰

Overall, the estimated effects of the indicators of economic conditions are consistent with the simple economic model of crime, while for the most part education and welfare expenditures are statistically insignificant. The unemployment rate, which is a proxy for the opportunity cost of legitimate work, is generally significant. It is positive for overall crime, property crime, and auto theft but negative for violent crime and murder, perhaps indicating a sort of envy effect on those left out of the legitimate work market.²¹ What works consistently for all types of crime (and is consistent with most studies-for example, Eide, Aasness, and Skjerpen 1994) is per capita personal income, which has a positive sign in all the regressions and is significant except for crimes of murder, for which one would expect material gain to be a lesser issue than for other crimes. Public expenditures on primary and secondary education are always insignificant, with a negative sign for most categories of crime except property crime and overall crime. On the other hand, welfare expenditures are weakly significant for auto theft and strongly significant for murder, both with a negative sign, suggesting that welfare spending may play a role in alleviating some crimes.²²

Finally, the evidence on imprisonment rates strongly suggests that punishment works to reduce crime, with the coefficient on the population share of prisoners always negative and strongly significant except for murder, for which it is weakly significant. Thus, a 10 percent increase

in the prison population is estimated to be associated with a 0.5 percent to 1.9 percent reduction in crimes.²³ However, the estimated coefficients on the two police variables are mostly positive (except for murder) and, with a few exceptions, insignificant. There are several possible explanations for this finding. One is that police employment or expenditures may not really matter for crime.²⁴

The United States in the 1990s has seen a dramatic fall in crime in almost all categories. However, not all regions have benefited equally.

Alternatively, it might be that the regressions do not capture the exogenous component of police efforts very well and mostly capture the endogenous response of police activity to changes in crime. In other words, the regression might not be controlling for simultaneity bias

- 20. The regressions could be used to explain crime variation by states. One simple way is to insert the numbers from the tables of explanatory variables into the regression and calculate predicted crime rates. Thus, for instance, Florida's crime rates in the 1990s are driven by a very high population density and low welfare expenditures.
- 21. Chiricos (1987) and Eide, Aasness, and Skjerpen (1994) survey the mixed evidence on the relationship between unemployment and crime. Chiricos concludes that on balance the evidence favors a positive relationship that frequently is significant. Hsieh and Pugh (1993), in their metanalysis of the literature on poverty, income inequality, and violent crime, conclude that the evidence indicates that resource deprivation is an important determinant of violent crime.
- 22. The results on education and welfare are consistent with studies that use more aggregated data, as in Levitt (1997). However, Zhang (1997) finds a significantly negative relationship to property crime for different welfare measures using 1987 state data. Using a more disaggregated approach, Witte and Tauchen's (1994) study suggests that parochial school education has a significantly negative effect as opposed to other forms of primary and secondary education.
- 23. This estimate is close to those by Marvell and Moody (1994) and Spelman (1994).
- 24. Marvell and Moody (1996) find in a survey of thirty-six studies of the police and crime relationship that there is little evidence of a negative relationship, leading some researchers to dismiss police activity as a source of crime reduction. They argue that overall the studies pay insufficient attention to correcting for simultaneity bias.

^{18.} Partly, this result may be due to the fact that the data were aggregated to the state level. At a more disaggregated level, density usually is positive and significant (Eide, Aasness, and Skjerpen 1994).

^{19.} In their surveys Eide, Aasness, and Skjerpen remark that crime is usually positively related to the share of young people but that "considering that most crimes are committed by young people, one would have expected strong results" (1994, 163). They suggest insufficient variability in the data and that "young people are perhaps not different, just poorer" (163) as possible explanations. Marvell and Moody find that only a small share of the ninety studies they reviewed find a significant relationship with the age structure and conclude that crime "forecasts based on demographic trends are not likely to be help-ful" (1991, 237).

(something that is corroborated by the fact that longer lags produced "better" results for the police variables). It also may be that, since imprisonments are one output of police activities, the coefficient on the share of prisoners already captures the effect of police efforts on crime. If so, this fact would explain why the police variables are largely insignificant in a regression in which both prison and police variables are used as explanatory variables.

To shed more light on these explanations, imprisonment rates were regressed on both police variables. From this regression two variables were extracted: the part explained by the police variables and the residual that

The results suggest that adding to the police force or increasing police expenditures will reduce crime only insofar as doing so leads to higher rates of conviction and imprisonment.

was unexplained, which can be thought of as a measure of the exogenous imprisonment rate. These two variables were substituted into the regression in place of the original imprisonment variable. The results of this regression appear in Table 5 in the second column for each dependent variable; the estimates for all other variables were exactly the same as before so that only differences in

the estimates are recorded. The exogenous conviction rate (not explained by police variables) is still negative and strongly significant. In fact, the coefficient estimates for the residual are identical to the original conviction rate estimates, reflecting the fact that the police variables did not significantly explain conviction rates in the first place. However, the coefficient on the imprisonment rate due to police efforts is large and negative (except for murder) and can generously be seen as weakly significant. Thus, police efforts can be interpreted as reducing crime through conviction. Interestingly, with this new specification, the coefficient for police employment turns to zero, suggesting that the numbers on police forces affect crime only inasmuch as they affect imprisonment rates. Finally, police expenditures again tend to have a positive coefficient.

In sum, the results of exploratory regressions suggest that crime does fit the economic model, particularly property crime. Generally, the age, unemployment, per capita incomes, and imprisonment rate variables were highly significant and usually of the expected sign (positive for age and income and negative for prisoners) and density was largely insignificant. The exception was that unemployment is positively related to property crimes and negatively related to violent crimes, a result that is consistent with the mixed results reported in the crime literature. The public expenditures analyzed here give a mixed picture. Primary and secondary education expenditures were usually insignificant, the same as when a more inclusive measure of education that included postsecondary expenditures was used. Interestingly, welfare expenditures are found to be significant for auto theft and murder, two of the crime variables that suffer least from measurement error. Studies by Zhang (1997) and Witte and Tauchen (1994) suggest that looking at components of the welfare and education measures might produce stronger results. Finally, police expenditures were usually positive and sometimes highly significant, and police employment had an effect only through imprisonment rates. On balance, the police results suggest that simultaneity bias still persists and that stronger empirical measures are warranted (Marvell and Moody 1994; Levitt 1997).

Conclusion

The United States in the 1990s has seen a dramatic fall in crime in almost all categories. However, not all regions have benefited equally; in fact some areas have seen no improvement. In particular, states in the Southeast have seen dramatic worsening in crime rates relative to other regions. The empirical analysis suggests that for some states increased crime is related to rapid growth in personal incomes, making property crime more lucrative. For other states, high crime rates reflect relatively high unemployment rates and low expected earnings from legitimate work for some population segments. Also, demographic factors may have been at work, with a comparative rise in the share of fifteen- to twenty-four-year-olds, the population share associated most closely with arrest rates.

The empirical analysis suggests several policy conclusions. Analysis of the effects of unemployment on crime indicates that unemployment insurance that alleviates the costs of unemployment might have some effects in ameliorating crime. Other social policies might also be helpful. For instance, the analysis shows that increases in welfare expenditures are associated with reduced auto theft and murder rates. Beyond these types of policies, there is strong empirical support that increases in imprisonment rates will significantly reduce crime. However, for the Southeast, increases in conviction rates may not have offset the crime-increasing effects of welfare reductions combined with other demographic and economic changes. Finally, the results reported here suggest that adding to the police force or increasing police expenditures will reduce crime only insofar as doing so leads to higher rates of conviction and imprisonment. It should be noted, however, that the methods used may have been too weak to capture other effects of police efforts on crime.

A P P E N D I X

Data Definitions and Sources

The data used in this article are annual state-level data for the United States for the years from 1971 to 1994 and until 1996 for the crime data.

Variables

Crime rate: Computed as number of crimes per 100,000 inhabitants (see Special Data Concerns). Data source: FBI (1960–96).

Burglary: "[I]includes any unlawful entry to commit a felony or a theft and includes attempted burglary and burglary followed by larceny." Definition source: Bureau of the Census (1997, 197). Data source: FBI (1960–96).

Larceny: "[I]ncludes theft of property or articles of value without use of force and violence or fraud and excludes embezzlement, 'con games,' forgery, etc." Definition source: Bureau of the Census (1997, 197–98). Data source: FBI (1960–96).

Auto theft: "[I]ncludes all cases where vehicles are driven away and abandoned, but excludes vehicles taken for temporary use and returned by the taker." Definition source: Bureau of the Census (1997, 198). Data source: FBI (1960–96).

Property crime: Includes burglary, larceny, and auto theft. Data source: FBI (1960–96).

Aggravated assault: "[I]ncludes assault with intent to kill." Definition Source: Bureau of the Census (1997, 197). Data source: FBI (1960–96).

Murder and nonnegligent manslaughter: "[B]ased on police investigations, as opposed to the determination of a medical examiner or judicial body, includes willful felonious homicides, and excludes attempts and assaults to kill, suicides, accidental deaths, justifiable homicides, and deaths caused by negligence." Definition source: Bureau of the Census (1997, 197). Data source: FBI (1960–96).

Violent crime: Includes murder, forcible rape, robbery, and aggravated assault. Data source: FBI (1960–96).

Overall crime index: Includes violent and property crime. Data source: FBI (1960–96).

Population: Civilian noninstitutional population, sixteen years or older. Data source: Department of Labor (1970–95).

Population density: Population of state/land area (in square miles) of state or thousands of people per square mile. Data source: Rand McNally (1995).

Population of youth: Youth between the ages of fifteen and nineteen and between twenty and twenty-four as a percentage of total state population. Data source: Bureau of the Census (1998).

Personal Income: Nominal, annual, by state. Data source: DRI/McGraw-Hill.

Unemployment rate: Seasonally unadjusted, by state. Data source: Department of Labor (1970–95).

Police protection employment: Includes all activities concerned with the enforcement of law and order, including "police training academies, coroners, medical examiners, forensic services and crime labs, temporary 'lockups,' police communications and radios services, buildings or other facilities used exclusively for police purposes (including rentals), criminal justice planning, and payments for transporting criminals." Definition source: Bureau of the Census (1992). The employment data reported for police protection employees represent full-time equivalent employment. Data source: Bureau of the Census (1958–95).

Police protection expenditure: All amounts of money paid out by the government for the "preservation of law and order and traffic safety. Includes police patrols and communications, crime prevention activities, detention and custody of persons awaiting trial, traffic safety, and vehicular inspection." Definition source: Bureau of the Census (1996, A-7). Data source: Bureau of the Census (1958–96).

Prison population (convicts): Adult prisoners in state prisons/state population. Data source: Department of Justice (1957–72; 1973–96).

Public welfare expenditure: Includes "support of and assistance to needy persons contingent upon their need. [It] excludes pensions to former employees and other benefits not contingent on need. Expenditures under this heading include: cash assistance paid directly to needy persons under the categorical programs (Old Age Assistance, Aid to Families with Dependent Children, Aid to the Blind, and Aid to the Disabled) and under any other welfare programs; vendor payments made directly to private purveyors for medical care, burials, and other commodities and services provided under welfare programs." Definition source: Bureau of the Census (1996, A-8). Data source: Bureau of the Census (1958–96).

Region	State	Population Density ^a	Rank	15-24- Year-Oldsª	Rank	Unemploy- ment Rate ^a	Rank	Per Capita Personal Incomeª	Rank	Welfareª	Rank	Primary and Secondary Education ^a	Rank	Convicts ^a	Rank	Police Employ- mentª	Rank	Police Expen- dituresª	Rank
New England	CT MA ME NH RI VT	934.8 1,066.2 55.3 172.6 1,318.1 85.5	47 48 15 33 49 21	107.0 100.5 98.8 102.6 101.0 96.6	6 24 34 17 23 39	95.0 110.6 107.1 95.7 119.4 85.8	24 43 39 27 47 15	135.1 118.0 106.0 108.5 101.3 93.1	1 4 11 8 17 29	94.3 129.1 150.5 105.1 125.4 118.7	24 3 2 18 6 9	102.2 86.9 128.4 90.7 106.2 131.5	27 44 6 42 20 4	$ \begin{array}{r} 115.3 \\ 51.1 \\ 38.5 \\ 46.8 \\ 85.1 \\ 64.9 \\ \end{array} $	13 42 47 46 25 38	99.3 103.3 83.4 95.0 105.3 76.4	18 12 37 24 9 46	79.4 86.0 66.6 77.9 96.7 72.7	36 26 47 38 15 42
Mideast	DE	494.5	44	91.5	47	82.6	13	105.7	12	68.8	46	97.3	35	180.0	1	101.6	13	96.6	16
	MD	691.3	46	99.8	28	86.9	17	100.2	19	74.4	41	91.7	41	125.5	10	107.7	7	93.3	20
	NJ	1,455.6	50	86.6	50	104.2	36	129.0	2	85.6	32	116.4	9	92.4	23	137.7	1	99.3	12
	NY	529.9	45	105.9	10	108.6	42	119.4	3	160.9	1	114.3	11	105.4	19	133.2	2	126.1	5
	PA	370.5	42	99.0	32	101.1	33	102.1	16	109.6	15	102.1	28	65.0	37	83.9	36	72.7	43
Great Lakes	IL	289.3	40	107.2	5	104.2	35	108.1	9	81.1	35	83.8	47	85.3	24	122.4	3	101.5	11
	IN	218.3	35	99.1	31	86.3	16	91.5	31	95.2	23	105.7	22	77.3	29	82.2	39	67.0	46
	MI	230.5	37	105.1	11	117.9	46	98.8	21	106.6	16	110.8	13	125.3	11	82.9	38	99.2	13
	OH	372.1	43	100.0	26	96.1	29	94.6	24	112.8	12	99.7	31	107.2	17	85.3	34	91.8	21
	WI	127.3	27	99.0	33	74.9	9	94.6	23	115.6	11	116.5	8	53.6	41	94.0	27	109.2	10
Plains	IA KS MN ND ND SD	69.6 42.7 78.1 76.9 12.8 29.0 13.1	18 11 20 19 4 9 5	106.2 108.8 96.9 92.8 98.4 101.7 95.7	8 48 46 35 22 41	65.1 72.5 74.5 114.9 65.7 41.2 54.3	4 7 8 45 5 1 2	90.0 95.2 101.2 69.9 83.3 94.6 86.4	33 22 18 50 39 25 37	96.3 67.1 125.7 102.6 110.5 81.6 78.7	22 47 5 19 13 34 38	110.8 105.5 106.2 106.9 106.1 98.0 98.6	14 23 19 17 21 34 32	50.8 74.2 26.6 111.5 24.4 49.5 65.0	43 32 49 16 50 44 36	78.9 97.7 74.4 84.3 73.4 86.2 77.4	43 21 47 35 48 32 45	77.3 83.1 84.6 75.7 59.3 71.1 62.9	39 32 29 40 49 44 48
Southeast	AL AR FL GA KY LA MS NC SC TN VA WV	$\begin{array}{c} 113.2\\ 63.9\\ 345.9\\ 161.8\\ 131.4\\ 133.0\\ 104.7\\ 194.7\\ 164.8\\ 169.3\\ 223.0\\ 104.0\\ \end{array}$	26 16 41 30 28 29 24 34 31 32 36 23	115.1 97.4 95.9 99.2 89.3 94.1 91.5 101.9 97.5 106.2 104.5 100.2	2 37 40 30 49 44 48 21 36 9 13 25	$\begin{array}{c} 107.1\\ 101.6\\ 107.2\\ 87.1\\ 97.0\\ 113.7\\ 90.3\\ 76.6\\ 95.2\\ 88.1\\ 80.8\\ 152.2 \end{array}$	40 34 41 18 30 44 20 10 26 19 12 50	81.6 76.0 99.6 92.2 80.8 78.9 94.0 88.7 80.9 87.4 104.2 77.0	41 49 20 30 44 45 26 34 43 35 14 48	$\begin{array}{r} 86.3\\ 105.6\\ 66.5\\ 88.2\\ 123.1\\ 117.0\\ 77.1\\ 80.8\\ 100.7\\ 90.6\\ 58.4\\ 129.0\\ \end{array}$	31 17 48 30 7 10 39 36 20 28 49 4	91.8 101.2 86.1 101.6 105.2 107.4 84.9 98.2 106.7 82.5 92.8 134.5	40 30 45 29 24 16 46 33 18 48 38 3	$\begin{array}{c} 132.5\\ 105.8\\ 115.0\\ 121.3\\ 84.2\\ 154.7\\ 97.4\\ 93.8\\ 160.6\\ 75.4\\ 105.2\\ 29.2 \end{array}$	8 18 14 12 26 3 21 22 2 31 20 48	89.9 79.0 120.6 98.9 71.1 100.4 100.7 94.4 91.7 89.7 88.1 58.3	29 42 5 20 49 15 14 26 28 30 31 50	84.4 68.8 126.1 87.6 73.2 119.5 81.8 88.5 83.7 78.8 84.6 51.5	30 45 6 25 41 8 35 24 31 37 28 50
Southwest	AZ	47.6	14	102.2	18	96.0	28	87.4	36	91.2	27	96.0	37	133.7	7	106.0	8	132.0	2
	NM	18.1	8	93.3	45	105.8	38	77.4	46	96.7	21	118.5	7	66.2	35	103.9	11	127.7	4
	OK	64.7	17	95.6	42	92.2	21	81.5	42	92.5	26	102.7	26	142.6	6	96.8	23	83.0	33
	TX	93.8	22	101.9	20	104.8	37	90.9	32	74.2	42	109.9	15	127.3	9	100.2	16	90.2	23
Rocky Mountair	n CO	46.5	13	109.3	3	78.1	11	102.5	15	70.3	44	92.6	39	81.0	27	97.7	22	96.5	17
	ID	18.0	7	100.0	27	93.1	23	83.4	38	70.6	43	102.8	25	68.2	34	94.4	25	91.6	22
	MT	7.9	3	102.6	16	95.0	25	81.8	40	94.2	25	130.2	5	58.3	40	85.8	33	82.7	34
	UT	30.9	10	106.6	7	67.1	6	77.4	47	79.5	37	113.9	12	47.1	45	77.7	44	93.7	18
	WY	6.6	2	123.0	1	83.7	14	93.8	27	69.6	45	144.3	2	75.9	30	121.8	4	116.2	9
Far West	AK	1.4	1	102.0	19	123.4	49	110.5	6	121.2	8	165.4	1	152.4	4	99.6	17	144.8	1
	CA	273.2	39	103.2	14	123.3	48	107.0	10	109.7	14	87.9	43	112.0	15	99.3	19	127.8	3
	HI	247.4	38	95.1	43	63.0	3	112.1	5	77.0	40	82.2	49	79.4	28	104.3	10	93.3	19
	NV	16.9	6	105.0	12	93.0	22	109.0	7	49.2	50	77.0	50	143.1	5	120.1	6	123.4	7
	OR	42.9	12	99.5	29	97.1	31	93.1	28	82.3	33	114.5	10	70.3	33	80.6	40	98.3	14
	WA	107.1	25	102.8	15	99.7	32	104.6	13	90.6	29	96.4	36	58.6	39	79.1	41	85.2	27

APPENDIX

(CONTINUED)

^aPercentage deviation relative to the nation

Source: See data appendix

Primary and secondary education expenditures: Public elementary (primary) and secondary education expenditure by the schools themselves (and not state governments on the schools) in thousands of dollars. Includes "payments for instructional, support services, and other activities of local public schools for kindergarten through high school programs . . . the operation of public schools, construction of school buildings, purchase and operation of school buses, and other services ancillary to the provision of public schools." Definition source: Bureau of the Census (1996, A-3) (see Special Data Concerns). Data source: Department of Education (1964–78; 1978–83; 1984–95).

Special Data Concerns

Primary and Secondary Education Expenditures. No data were available for any states for the years 1982 and 1983. In order not to lose all information in these years in the panel analysis of the data, these observations have been estimated for each state in the following ways. For 1982, a weighted average was estimated using the formula $(2/3) \times (1981 \text{ observation}) + (1/3) \times (1984 \text{ observation})$. The 1983 value was estimated using the weighted average $(1/3) \times (1981 \text{ observation}) + (2/3) \times (1984 \text{ observation})$. The following list gives the names of the states and how estimates were found for the missing years:

<u>State</u>	<u>Year</u>	<u>Formula</u>
AK, GA, IL	1979	average of 1978 and 1980
NJ	1975	average of 1974 and 1976
WI	1978	$(2/3) \times (1977 \text{ observation})$ + $(1/3) \times (1980 \text{ observation})$
WI	1979	$(1/3) \times (1977 \text{ observation})$ + $(2/3) \times (1980 \text{ observation})$

Crime Rate Variables. The following states did not have complete data for some years, and therefore those crime counts have been estimated by the FBI.

<u>State</u>	Years
KS	1993, 1994
KY	1988
МТ	1994
IL	1993, 1994

Illinois data from 1975–84 contain the "Chicago adjustment." Forcible rape data were estimated for Illinois for 1985–94 (forcible rape is included in the violent crime data).

REFERENCES

BECKER, GARY S. 1968. "Crime and Punishment: An Economic Approach." *Journal of Political Economy* 73 (March/April): 169–217.

CHIRICOS, THEODORE G. 1987. "Rates of Crime and Unemployment: An Analysis of Aggregate Research Evidence." *Social Problems* 34:187–212.

COHEN, MARK. 1988. "Pain, Suffering, and Jury Awards: A Study of the Cost of Crime to Victims." *Law and Society Review* 22:537–55.

DIJULIO, JOHN J., JR. 1996. "Help Wanted: Economists, Crime, and Public Policy." *Journal of Economic Perspectives* 10 (Winter): 3–24.

EHRLICH, ISAAC. 1996. "Crime, Punishment, and the Market for Offenses." *Journal of Economic Perspectives* 10 (Winter): 43–67.

EIDE, ERLING, JORGEN AASNESS, AND TERJE SKJERPEN. 1994. Economics of Crime: Deterrence and the Rational Offender: Oxford: North-Holland.

FEDERAL BUREAU OF INVESTIGATION. 1960–96. *State Crime Data*, *1960–96*. FBI Uniform Crime Reporting Program Data. Available online at <http://www.ojp.usdoj.gov/bjs/datast. htm> [February 24, 1998].

FREEMAN, RICHARD B. 1996. "Why Do So Many Young American Men Commit Crimes and What Might We Do About It?" *Journal of Economic Perspectives* 10 (Winter): 25–42.

GROVE, WALTER R., MICHAEL HUGHES, AND MICHAEL GEERKEN. 1985. "Are Uniform Crime Reports a Valid Indicator of Index Crimes? An Affirmative Answer with Minor Qualifications." *Criminology* 23:451–501.

HELLMAN, DARYL A., AND NEIL O. ALPER. 1990. *Economics of Crime: Theory and Practice.* 2d ed. Needham Heights, Mass.: Simon and Schuster, Ginn Press.

HSIEH, CHING-CHI, AND M.D. PUGH. 1993. "Poverty, Income Inequality, and Violent Crime: A Meta-Analysis of Recent Aggregate Data Studies." *Criminal Justice Review* 18:182–202.

LEVITT, STEVEN D. 1996. "The Effect of Prison Population Size on Crime Rates: Evidence from Prison Crowding Litigation." *Quarterly Journal of Economics* 111 (May): 319–51.

———. 1997. "Using Electoral Cycles in Police Hiring to Estimate the Effect of Police on Crime." *American Economic Review* 87 (June): 270–90.

MARVELL, THOMAS B., AND CARLISLE E. MOODY. 1991. "Age Structure and Crime Rates." *Journal of Quantitative Criminology* 7, no. 3:237–73.

——. 1996. "Police Levels, Crime Rates, and Specification Problems." *Criminology* 34 (November): 609–46. MILLER, TED, MARK COHEN, AND SHELLI ROSSMAN. 1993. "Victim Costs of Violent Crimes and Resulting Injuries." *Health Affairs* 12:186–97.

RAND MCNALLY. 1995. Road Atlas: United States, Canada, Mexico.

SPELMAN, WILLIAM. 1994. Criminal Incapacitation. New York: Plenum Press.

U.S. BUREAU OF THE CENSUS. 1958–95. State Distribution of Public Employment. Washington, D.C.: GPO.

——. 1958–96. *Government Finances*. Washington, D.C.: GPO.

———. 1997. *Statistical Abstract of the United States*. Washington, D.C.: GPO.

——. 1998. Population Estimates Program. Washington, D.C.: GPO.

U.S. DEPARTMENT OF EDUCATION. 1964–78. *Statistics of Public Schools*. Washington, D.C.: GPO.

———. 1978–83. Statistics of Public Schools: Revenues and Expenditures for Public Elementary and Secondary Education. Washington, D.C.: GPO.

——. 1984–95. *Estimates of School Statistics*. Washington, D.C.: GPO.

U.S. DEPARTMENT OF JUSTICE. Bureau of Justice Statistics. 1973–96. *Prisoners in State and Federal Institutions*. Washington D.C.: GPO.

——. 1995. Criminal Victimization, 1993. Washington, D.C.: GPO, May.

———. Federal Bureau of Prisons. 1957–72. *National Prisoner Statistics*. Washington, D.C.: GPO.

U.S. DEPARTMENT OF LABOR. Bureau of Labor Statistics. 1970–95. *CPS Household Survey: Unadjusted Unemployment Rate*. Washington, D.C.: GPO.

WHITE, HALBERT. 1980. "A Heteroskedasticity-Consistent Covariance Matrix Estimator and a Direct Test for Heteroskedasticity." *Econometrica* 48:817–38.

WITTE, ANN DRYDEN, AND HELEN TAUCHEN. 1994. "Work and Crime: An Exploration Using Panel Data." National Bureau of Economic Research Working Paper 4794, July.

ZHANG, JUNSEN. 1997. "The Effect of Welfare Programs on Criminal Behavior: A Theoretical and Empirical Analysis." *Economic Inquiry* 35 (January): 120–37.