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CHAPTER I

While different fields call for different levels of research, it is worth noting that research commands only a small fraction of 1 percent of the total expenditure for crime control. There is probably no subject of comparable concern to which the Nation is devoting so many resources and so much effort with so little knowledge of what it is doing.

President's Commission on Law Enforcement and Administration of Justice, The Challenge of Crime in a Free Society, p. 273.

CHAPTER I

INTRODUCTION

Economics may be referred to as the study of sacrifice and choice. Beginning with the premise that productive resources are scarce relative to the wants of society, recognition of the need for sacrifice is made explicit through the use of a "guns or butter" curve or its contemporary version, "missiles or margarine." It follows that employment of resources to produce more of one good requires the sacrifice of alternative goods, which could otherwise have been produced. The application of economics to a broad range of situations is permeated with recognition of the sacrifice involved in alternative courses of action.

The preponderant interest of economics has been the market sector wherein choice is explicit in transactions involving individuals, households, and firms, and wherein it is assumed that all parties are motivated by "self-interest" and act "rationally." Although these terms may be defined somewhat differently for different purposes, self-interest is considered the motivation, and rational behavior, the process involved in market decisions. Market transactions that take place generate objective data that are used to analyze behavior and efficiency. The explicit values and quantities generated by market transactions facilitate economic investigations and help explain the emphasis that economists give to the private sector. This paper is

concerned with an extension of the principles derived from analysis of market activity.

A. Extensions of Economic Analysis

Although economics has always been concerned with the public sector and nonmarket activities, the tools of economic analysis developed in the market sector have not been easily applied to nonmarket activity and the public sector. However, coincident with growth in the relative share of total resources devoted to the public sector has been increased economic attention to nonmarket decisions and the output of social goods. The results of economic analysis in the public sector are hampered by the lack of objective data; therefore these results may be less definitive when compared to the analysis of market activity. Nonetheless, studies dealing with highways, water projects, defense, and education, have provided information and a viewpoint that strongly encourage recognition in decision making.

In the past decade there has developed within economics a number of specialized divisions, each of which applies economic analysis to areas that previously had been largely exempt from the economic approach. The economics of health, education, poverty, discrimination, and urban transportation are representative of the specialized extension of economic analysis.[1]

This paper is concerned with one of the most recent extensions of economic analysis; namely, crime and law enforcement activity. This extension could appear to be a case of economic imperialism into fields

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[1] An examination of current literature illustrates this. For examples refer to: American Economic Association, Journal of Economic Literature, 9 (June, 1971), pp. 678-83.

preempted by sociology, criminology, and psychology; however, a case can be made on behalf of an economic approach to criminal activity and law enforcement.

B. Relation of Economics to Crime

Crime has an impact on the lives of all people in the United States largely as a result of the costs it imposes in the form of lost or physically damaged lives, suffering, fear, and loss of property, as well as the private and public costs involved in avoiding and preventing crime. Though a broad conceptual framework for the study of these costs was developed in the 1930's, relatively little attention has been devoted to an explicit recognition or accounting of these costs until quite recently.[2]

As concern with crime rapidly increased in the 1960's, a new impetus was given to varied approaches to crime and its attendant costs. The best current estimate of the economic impact of crime and related expenditures is that of the President's Commission on Law Enforcement and Administration of Justice. The President's Commission estimated costs totalling nearly $21 billion for 1965.[3] The components of this estimate are shown in Table 1.

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[2]U.S., National Commission on Law Observance and Enforcement, Report on the Cost of Crime, No. 3 (Washington, D.C.: Government Printing Office, 1931). This is one of a series of reports by the body known popularly as the Wickersham Commission.

[3]U.S., President's Commission on Law Enforcement and Administration of Justice, Crime and Its Impact--An Assessment, "Task Force on Assessment," (Washington, D.C.: Government Printing Office, 1967), pp. 42-59. This Commission is hereinafter referred to as the President's Commission.

A much larger cost figure of $51.1 billion for 1970 was publicized recently in several magazines. See "Crime Expense Now Up to 51 Billions a Year," U.S. News and World Report, October 26, 1970, pp. 30-34.

TABLE 1

ECONOMIC COSTS OF CRIME AND RELATED ACTIVITY IN 1965
(Millions of Dollars)

Type of Cost	Estimated Cost	
Crimes against Persons		$ 815.
Homicide	$ 750.	
Assault and other	65.	
Crimes against Property		3,932.
Unreported commercial theft	$1,400.	
Index property crimes	600.	
Embezzlement	200.	
Fraud	1,350.	
Forgery and other	82.	
Arson and vandalism	300.	
Other Crimes		2,036.
Driving under influence	$1,816.	
Tax fraud	100.	
Abortion	120.	
Illegal Goods and Services		8,075.
Narcotics	$ 350.	
Loansharking	350.	
Prostitution	225.	
Alcohol	150.	
Gambling	7,000.	
Public Law Enforcement and Criminal Justice		4,212.
Police	$2,792.	
Corrections	1,034.	
Prosecution and defense	125.	
Courts	261.	
Private Costs Related to Crime		1,910.
Crime prevention services	$1,350.	
Crime prevention equipment	200.	
Insurance	300.	
Counsel, bail, and witness expense	60.	
TOTAL		$20,980.

Source: President's Commission on Law Enforcement and Administration of Justice, Crime and Its Impact--An Assessment, p. 44.

The crime costs indicated in Table 1 are of three types: direct costs of victims, public costs associated with the criminal justice system, and private expenditures that are closely related to crime. A problem may exist in that these estimates may not represent the true costs or net damages to society. For example, theft could be considered as an involuntary transfer, and the value of goods or money stolen may overestimate what economists consider as the true cost of theft. Conceptually, economists might consider the opportunity costs of thieves' labor and capital as the true costs of theft. A large overstatement may exist in the estimate of illegal goods and services as the estimate takes no account of the utility received by the buyer. The voluntary nature of these so-called victimless crimes may lead an economist to conclude that there are no true costs involved with the illegal goods and services category beyond the external disutilities of third parties, such as families of gamblers, the clergy, and so on. These factors which suggest an overstatement on the part of the President's Commission would ideally have to be balanced against the inability to estimate the costs of fear, suffering, and changed modes of behavior in attempts to measure the true costs of crime on American society.

Using the estimates of the President's Commission, which are nonetheless the best estimates available, it appears that crime and related activities account for approximately 4 percent of national income. Thus it appears that the magnitude of costs warrants the increased economic attention to crime.

The nature of criminal activity itself should be of interest to the economist. All individuals are faced daily with choices requiring

decisions among alternative courses of action. Although nearly all economic analysis of choice has been concerned with decision making involved in legal activities, there is little reason to presume that most illegal activity is not similarly a matter of choice where comparable criteria are used. Some evidence of the economic motivation for criminal activity is offered by the fact that about 90 percent of all crimes are economic or property crimes. No act is innately illegal. In fact, the existence of laws defining socially undesirable or illegal activity rests upon a presumption of man's ability to exercise his own free will. Note the position of several prominent consultants in the law enforcement field.

> This is not to say that all the acts of man are free, but that in order to satisfy some desire, very often man can choose between this alternative and that. If such were not so, commands, prohibitions, rewards, and punishments would be in vain. If such were not so, law, and law enforcement would be, indeed, cruel, or inane.[4]

Holding a person responsible for his unlawful acts is based upon the presumption that the person was aware of the nature of the act and knowingly chose to commit a crime. Since economics has been actively concerned with choice in lawful activities, application of analysis of choice to unlawful activities may provide a fruitful approach for an understanding of crime not provided by the more traditional viewpoints.

In a much broader sense, society makes a choice as to how much crime will exist through its determination of what is to be considered illegal and how much resources will be devoted to law enforcement and

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[4] A. C. Germann, Frank D. Day, and Robert R. J. Gallanti Introduction to Law Enforcement (Springfield, Ill.: Charles C. Thomas Publishers, 1966), pp. 13-14.

the administration of justice. As is true for the individual, society faces a set of possible actions, each of which leads to specific consequences. By its establishment of laws and law enforcement policy, society determines the level of crime that exists though the range of choices may involve sacrifices felt to be unacceptable or limited, and none may be considered ideal.[5]

Although economists have not feared to explore new areas, this extension of economic investigation has been by invitation. The Institute for Defense Analyses, the President's Commission on Law Enforcement and Administration of Justice, and several leaders in the crime field have given a clear invitation that an economic approach to crime is desired as part of the quest for a better understanding of criminal activity and law enforcement. In the words of the President's Commission:

> The causes of crime, then, are numerous and mysterious and intertwined. Even to begin to understand them, one must gather statistics about the amounts and trends of crime, estimate the costs of crime, study the conditions of life where crime thrives, identify criminals and victims of crime, and survey the public's attitudes toward crime. No one way of describing crime describes it well enough.[6]

Several leading criminologists, including Leslie T. Wilkins, are critical of the present lack of definitive terminology and measurement in the area of crime and law enforcement policy. If rational decisions are to be made in regard to priorities, more

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[5]Kenneth J. Arrow, "Alternative Approaches to the Theory of Choice in Risk-Taking Situations," Econometrica, 19 (1951), p. 404.

[6]U.S., President's Commission on Law Enforcement and Administration of Justice, The Challenge of Crime in a Free Society (Washington, D.C.: Government Printing Office, 1967), p. 18.

information is required as to the costs and benefits of alternative actions in order that the dramatic event not become the determinant of social action.

> The importance of the idea of cost in relation to social benefit is not due to the value of money, but only to the fact that the concept of cost is the one thing which unites the whole of the social system of a country or organization...Money, or the idea of money, flows through all the affairs of government and management, and the tracing of the system which it sustains provides a ready-made and powerful tool for rational thought and social action.[7]

Admittedly the extension of the boundaries of economics to include crime and law enforcement may be considered a questionable exercise. However, the ultimate worth of an economic investigation relates to its ability to explain. "A hypothesis is important if it 'explains' much by little, that is, if it abstracts the common and crucial elements from the mass of complex and detailed circumstances surrounding the phenomena to be explained and permits valid predictions on the basis of them alone."[8] It is on this basis that the validity of an economic approach will ultimately be judged.

C. Organization of the Paper

It is desirable to limit and to state specifically the subject of this paper. For the purposes of this paper, crime consists of that variety of human acts which are violations of the criminal law. There are over 2800 Federal crimes and an even larger number of State and

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[7] Leslie T. Wilkins, "Crime Prevention and Costs in National Planning: A Discussion of Concepts and Issues," International Review of Criminal Policy, No. 25, United Nations (1967), p. 25.

[8] Milton Friedman, "The Methodology of Positive Economics," in Essays in Positive Economics (Chicago: University of Chicago Press, 1953), p. 14.

local crimes. Some of these involve bodily harm, some loss of property, some morals or public order, some government revenues, some the creation of hazardous conditions, some the regulation of the economy.[9]

It is not feasible to attempt an examination of all the crimes which have been defined. Rather, this paper examines primarily those crimes that concern Americans most by affecting their personal safety and security of property. For this purpose the most convenient grouping of crimes are the seven offenses identified by the Federal Bureau of Investigation as the "Index" offenses. These are:

1. Criminal Homicide or Murder--murder and nonnegligent manslaughter: all willful felonious homicides as distinguished from deaths due to negligence.

2. Forcible Rape--rape by force including attempts and assault to rape; excludes statutory rape.

3. Robbery--stealing or taking things of value from another by force of violence or putting in fear, with or without use of a weapon.

4. Aggravated Assault--assault with intent to kill or inflict severe bodily injury by shooting, cutting, stabbing, maiming, etc.,; excludes simple assault, assault and battery, and fighting.

5. Burglary--breaking or entering, or any unlawful entry with intent to commit a felony or theft.

6. Larceny--theft (except auto theft), (a) of $50 or more in value; (b) of less than $50 in value. Thefts of bicycles, auto accessories, shoplifting, pocket-picking, or any stealing of property from its lawful owner without force, violence, or fraud.

7. Auto Theft--stealing or driving away a motor vehicle.[10]

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[9]President's Commission, Crime and Its Impact-An Assessment, p. 14.

[10]U.S., Department of Justice, Federal Bureau of Investigation, Uniform Crime Reports-1970 (Washington, D.C.: Government Printing Office, 1971), p. 61.

The Index Offenses are generally considered felonies (except larceny under $50), although several states define a felony somewhat differently. These seven offenses appear to be the most representative of what the public considers serious crimes, and when compared with other offenses better data are available for these seven. For these reasons the attention of this paper is restricted primarily to the Index offenses.[11]

The purpose of this paper is to examine the criminal activity and law enforcement from an economic point of view. The central hypothesis is that criminal activity in the aggregate can be depicted through the economist's analysis of choice. A model will be developed that depicts crime as a function of the expected gains from crime and the expected costs as determined by law enforcement policy. The model is primarily concerned with what may be considered a supply of crime and will be formulated along the lines of the pioineering work by Gary S. Becker in 1968.[12] The model will be tested by using available data for 48 states on the costs of committing an offense for each of the Index offenses to determine if there exists a verifiable relation between these costs and the level of offenses. In addition, an attempt will be made to measure the elasticity of the supply of offenses with respect to the costs to offenders. This will be followed by a more

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[11]Oddly enough the most costly crime is shown to be "illegal goods and services" in Table 1. It is not emphasized in this paper for the following reasons: (a) the data are extremely poor, (b) the cost estimate does not represent a true cost to society, (c) the popular conception of the "crime problem" is approximated by the Index offenses, and (d) involvement of organized crime requires a somewhat different approach.

[12]Gary S. Becker, "Crime and Punishment: An Economic Approach," Journal of Political Economy, 76 (March-April, 1968), pp. 169-217.

intensive application of the model to seventeen cities in the state of Oklahoma using a somewhat different set of variables. In this pursuit, an effort will be made to appraise the value of this approach for policymaking purposes by projecting crime and introducing the role of the costs of crime.

The organization of the paper is as follows: Chapter II presents a review of the different approaches to crime causation and an examination of the economic approaches which have been recently undertaken. Chapter III develops a model of criminal activity and law enforcement policy by using the analysis of choice and the concepts of social costs and benefits. Chapter IV tests the model by using data on crime, convictions, and punishments for the Index offenses with forty-eight states as observations. In this chapter an attempt is made to determine the elasticity of the supply of various offenses with respect to the costs of committing an offense. Chapter V applies the model more intensively to a sample of Oklahoma cities in an effort to determine the effects of changes in clearance rates, expenditures, and population on the level of offenses in these cities. This examination involves a crime projection and extends well beyond anything else of this nature relating to the state of Oklahoma. Finally, Chapter VI draws conclusions and examines the implications of this economic investigation of criminal activity and law enforcement.

CHAPTER II

There is no crime of which I do not deem myself capable.

Johann Wolfgang Goethe

CHAPTER II

REVIEW OF APPROACHES TO THE STUDY OF CRIME

A survey of the literature on crime reveals a dominance of sociology and psychology. The first part of this chapter traces the development of theories of crime causation that attempt to answer the question: why does crime occur? This survey is representative rather than exhaustive as it summarizes the primary types of theories that have achieved broad-based support. The second major portion of the chapter examines several economic approaches that have been used in the study of crime and law enforcement.

It is the purpose of this examination to provide a background relating to the available approaches to crime and law enforcement and identify some of the considerations involved in an economic approach. This base will be useful in establishing the model in the chapter that follows.

A. Conventional Theories of Criminal Behavior

1. Classical

Cesare Becarria (1738-1794), Jeremy Bentham (1748-1832), and Sir Samuel Romilly (1757-1818) were children of the Enlightenment wherein nationalism became embedded in the social and political philosophy. One area which was singled out for reform was the criminal jurisprudence and penal system. The French publicist Montesquieu condemned the arbitrary retributive nature of the French penal code when he urged that reforms

be instituted in order that punishments be based on the crime rather than on retribution or social retaliation. Montesquieu's Persian Letters and The Spirit of the Laws attracted the attention of Becarria who in 1764 published Crimes and Punishments, which soon became the most influential piece in eighteenth century law reform.

Jeremy Bentham was influenced by John Locke, Montesquieu, and Becarria as he developed Becarria's position to its highest level. The Whig lawyer Romilly supported Bentham's reform plans in Parliament and played an important role in gaining many legal reforms that led away from superstition and revenge to a system based on responsibility. The movement, which was later to become known as the classical or deterrent school, is best represented by an examination of the ideas of Bentham.[1]

Jeremy Bentham was a humanitarian who devoted his life to the removal of pain. He felt that human nature was conditioned by two ultimate forces: pain and pleasure. "The principle of utility recognizes this subjection, and assumes it for the foundation of that system, the object of which is to rear the fabric of felicity by the hands of reason and of law."[2] Man's only motives are desire for pleasure and avoidance of pain, and "The business of government is to promote the happiness of society, by punishing and rewarding."[3] Motives are not in

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[1]The best single work on development of the classical school is: Coleman Phillopson, Three Criminal Law Reformers: Becarria, Bentham, Romilly (London: Dent, 1923).

[2]Jeremy Bentham, The Principles of Morals and Legislation (New York: Hafner Publishing Co., 1948, original 1789), pp. 1 - 2.

[3]Ibid., p. 70. One may also follow the Bentham position in his later simplified work, Theory of Legislation (London: Kegan Paul, Trench, Trubner and Co., 1904, original 1802).

themselves good or bad and any analysis of motives dependent upon their goodness or badness is subject to difficulty and imprecision. The purpose of the law should be to increase the happiness of society by excluding those things that subtract from happiness, such as mischief.

> But all punishment is mischief: all punishment in itself is evil. Upon the principle of utility, if it ought at all to be admitted, it ought only to be admitted in as far as it promises to exclude some greater evil.[4]

To this end, punishment should be in accord with the following rules:

1. The punishment must not be less than that necessary to outlive the profit of the offense and should be greater for larger offenses.
2. The punishment should discourage larger offenses and multiple offenses by finely dividing offenses and restraining the offender.
3. Punishment should not exceed that necessary for conformance and should be in accord with different sensibilities of offenders.
4. Punishment should be inversely related to the degree of uncertainty of punishment and should be greater for habitual and more distant (time) offenses.
5. The amount of punishment should be related to its effectiveness (quality); this is especially the case when a moral lesson is involved.

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[4]Bentham, The Principles of Morals and Legislation, p. 170.

6. In cases where punishment is unprofitable as for unintentional acts, or in cases where intricacy of the punishment becomes burdensome, these rules should be modified.[5]

The classical position was considered humanitarian in its day as it provided a definite and uniform scheme encouraging no more punishment than that necessary to prevent occurrence of crime. The purpose of punishment was deterrence rather than an emotional penalty based on revenge. It was assumed that significant numbers of potential offenders would contemplate the punishment and on this basis decide against commission of the offense; consequently, when an offense was committed, there would be encouragement to commit a less serious crime.

The classical approach became firmly entrenched in the criminal law system of the United States and has retained that position even though it has faced severe criticism. Critics of the classical position argue that the threat of punishment fails to deter crime except for those people who are mature, intelligent, self-controlled, and under no extraordinary pressures. Rising crime rates at times of more police and increasing punishments, evidence of pickpockets at the gallows, and concern over the relation between the deterrent approach and rehabilitation have added to the impetus for different explanations of crime.[6]

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[5] Ibid., pp. 179-87.

[6] The divergent positions are evident in: U.S., Report of the Task Force on Law and Law Enforcement to the National Commission on the Causes and Prevention of Violence, Law and Order Reconsidered (Washington, D.C.: Government Printing Office, 1969), pp. 5-8.

Andrew S. Watson, "A Critique of the Legal Approach to Crime and Correction," Law and Contemporary Problems, 23 (Autumn, 1958), pp. 618-21.

2. Biological and Psychological

Although it is often useful to separate biological explanations from those of a psychological orientation, for present purposes they will be treated together. Within this broad category there exists substantial variation in their explanation of crime causation as each investigation tends to emphasize the importance of factors associated with the specialty of the investigator. For example, there are (a) the organicists emphasizing anatomy, physiology, and pathology, (b) psychoanalysts stressing the concepts of Freud, intrapsychic dynamics and mental distortions, and (c) physicians using theory and clinical experiences of both a psychological and psychiatric nature.[7]

Cesare Lombroso (1835-1909) played the major role in early development of biological theories and emergence of what became known as the positive school.[8] William H. Sheldon carried this type of explanation to its highest level.[9] According to this position, one can be born criminal since atavistic or biological differences in makeup determine or motivate criminal acts. However, biological and anthropological models generally have attracted bitter opposition. The popularity of the biological interpretation with its dependence upon anatomical or physiological difference began to wane in the twentieth

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[7]Thomas J. Meyers, "The Riddle of Legal Insanity," Journal of Criminal Law, 44 (1953), pp. 330-33.

[8]Cesare Lombroso, Crime, Its Causes and Remedies (Boston: Little, Brown, and Co., 1911). The positivist position is that crime is a social, biological, or natural phenomenon that is best understood by study of individuals as a means of identifying the causes of crime.

[9]William H. Sheldon, Varieties of Delinquent Youth: An Introduction to Constitutional Psychiatry (New York: Harper, 1949).

century as it was supplanted by the emergence of Freud's efforts, which emphasized the psyche.

Sigmund Freud (1856-1939) stimulated these new developments through his efforts aimed at an understanding of psychodynamics. The neurotic may be so overcome by his unconscious as to be unable to act deliberately; or the aim of self-punishment may encourage the commission of crime.[10] Modern proponents of this approach usually begin with criticism of the classical deterrent approach imbedded in the legal structure.

> It is a well-known fact that relatively few offenders are caught, and most of those arrested are released. But society makes a fetish of wreaking "punishment," as it is called, on an occasional captured and convicted one. This is supposed to "control crime" by deterrence. The more valid and obvious conclusion--that getting caught is thus made the unthinkable thing--is overlooked by all but the offenders.[11]

It is held that regardless of any physical disorder the psyche or mind is responsible for the lack of conformance to the legal order. Psychopathic disorder, degeneration, emotional disturbance, etc., are considered determinants of crime. Numerous investigations have been undertaken to identify an invisible characteristic of the mind. Such approaches may be highly particularized or eclectic in orientation.[12]

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[10]Paul Roazen, Freud: Political and Social Thought (New York: Alfred A. Knopf, 1968), pp. 139-47.

[11]Karl Menninger, The Crime of Punishment (New York: Viking Press, 1968), p. viii.

[12]For an example of a highly eclectic approach involving over 400 factors of various types see: Sheldon and Eleanor Glueck, Unraveling Juvenile Delinquency (New York: Commonwealth Fund, 1950).

Verification of biological and psychological explanations usually proceed along lines that seek to identify factors in groups of offenders as compared to nonoffenders. However, the results tend to demonstrate that offenders differ as much from one another as they do from nonoffenders. This has encouraged studies which attempt to differentiate thieves from non-criminals, rapists from non-criminals, and so on. However, efforts aimed at establishing individualized tendencies toward criminality do not appear to have provided satisfactory results.

> ...the individualized approach has failed to establish standards of psychiatric or social normality and of non-criminality, so that one cannot determine from these studies what differences or what degrees of variation distinguish the delinquent from the nonoffender. Where etiological significance is imputed to a neurotic trait, a psychopathic trend, or some emotional deviation, it is generally impossible to determine to what extent, if at all, this quality in the offender can be distinguished from the qualities in other individuals who do not commit crimes.[13]

Lombroso, Ferri, and Freud, each modified their own position several times, and adherents of the biological-psychological approach have expressed displeasure with their own investigations. One outcome has been the development of multifactor approaches, even though the result may be the sacrifice of a true theory.[14] It will be worthwhile to examine two popular theories of criminal behavior that command large numbers of advocates in sociological studies of crime.

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[13] Paul W. Tappan, Crime, Justice, and Correction (New York: McGraw-Hill Book Co., 1960), p. 77.

[14] Stephen Schafer, Theories in Criminology (New York: Random House, 1969), pp. 220-21.

3. Differential Association

There are many theories of crime causation that are concerned with broad aspects of culture and society. Usually the theory is derived abstractly, is eclectic, and attempts in some sense to place the blame for crime on the culture. In 1939 the late Professor E. H. Sutherland set forth the theory of "differential association," which is presently a very popular representative of this group.

This approach denies that individuals are born criminal or that traits lead to crime, rather it supports the theory that situations lead to crime. Clinical methods are considered inappropriate for the study of crime, and the biologist and psychologist are assumed to lack the proper background for the study of crime. In Sutherland's theory, it is held that crime is learned in an ordinary learning situation.

In its modern version, "...the conditions which are said to cause crime should always be present when crime is present, and they should always be absent when crime is absent."[15] Sutherland and Cressey find fault with theories that are operative at the time of the crime occurrence and refer to such explanations as situational or mechanistic. Instead, they provide a theory that is concerned with processes taking place over a considerable time period prior to the criminal act itself. They also propose that criminal behavior is learned through a process of communication within intimate personal groups. Attitudes toward violation of the law, as well as criminal

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[15]Edwin H. Sutherland and Donald R. Cressey, Principles of Criminology, 5th ed. (Chicago: J. B. Lippincott Co., 1955), p. 74. Donald Cressey played a role in later development of the differential association explanation and has continued to promote the position since the death of Professor Sutherland.

techniques, are acquired in an ordinary learning situation in which the frequency, duration, priority, and intensity vary.[16]

Substantial crime reduction can come about only through prevention as punishment and treatment are expected to have little effect, and it is likely that changes in social organization offer the only hope for significant reductions in crime rates.[17]

Although the theory continues to enjoy broad support, it has not been subjected to extensive verification largely because of the inability to make its concepts (duration, priority, intensity) operational. The empirical results which are available at present appear indeterminate.[18] Another major shortcoming of this proposition lies in its failure to reveal why some individuals who are exposed to evil ways accept and transmit them while others do not; that is, the contagious nature of association is not identifiable.[19]

4. Anomie

Another explanation of crime causation in the United States relates crime to the gap between aspirations and opportunities. Though Cesare Beccaria and Friedrich Engels had cited this factor earlier, Emilie Durkheim (1858-1917) developed and popularized the explanation. In more recent times, Robert K. Merton continued the development of this approach to its highest stage of development.

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[16] Ibid., pp. 77-80. The term "differential" in this theory refers to the ratio of associations with criminal to anticriminal patterns of behavior.

[17] Ibid., pp. 600-07.

[18] Don C. Gibbons, "Observations on the Study of Crime Causation," American Journal of Sociology, 77 (September, 1971), pp. 263-64.

[19] Tappan, p. 180.

According to the modern version, the social structure exerts pressure to achieve desired social rewards through acceptable means. But some lack the opportunity necessary for successful achievement.

> It is only when a system of cultural values extols, virtually above all else, certain common symbols of success for the population at large while its social structure rigorously restricts or completely eliminates access to approved modes of acquiring these symbols for a considerable part of the same population, that anti-social behavior ensues on a considerable scale...The American stress on pecuniary success and ambitiousness for all thus invites exaggerated anxieties, hostilities, neuroses, and antisocial behavior.[20]

As social isolation of mass urban society reduces the control of social norms, some individuals attempt to achieve rewards along a normless path and crime is the result. There are varieties of the anomie approach as Cohen's "delinquent subculture," Ohlin's "theory of differential opportunity systems," and Reckless' "categoric risk."

However, the approach offers little systematic or operational content useable for explanation of crime causation. There is a clear possibility of associating normlessness with crime, a tautology that does little to further understanding of crime. Although it is certain that people of all countries experience frustrations in their attempts to achieve goals, most investigations aimed at verifying this theory proceed as if American crime can be explained by this approach as though the theory is novel to the American scene.[21]

B. Economic Approaches to the Study of Crime

It has long been recognized that economic conditions were

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[20] Robert K. Merton, "Social Structure and Anomie," American Sociological Review, 3 (October, 1938), p. 680.

[21] Schafer, pp. 248-51.

related to unlawful activity. Xenophon, Plato, Aristotle, Horace, and Sir Thomas More, all of whom commented on the observed relationship between poverty and criminal activity were early in this observation. Today few if any writers neglect the role of income level in criminality. Nonetheless, not until quite recently was economic analysis applied directly in a precise and organized manner to criminal decision making and the effects of law enforcement activity.

There are three types of approaches used in the economic study of crime: (a) aggregate models which find fault in the economic system itself, (b) public finance models that examine the results of law enforcement activity, and (c) crime output models that treat the criminal as a producer and government as determining the demand. Though the approaches blend together to various degrees, each is treated separately below.

1. Aggregate Models

The first strictly economic examination of the relation between economic conditions and crime began as an offshoot of the work of Friedrich Engels and Karl Marx.

Marx stressed that all social phenomena were the result of economic conditions, and that crime was one of the social ills associated with destruction of the workmen's vitality, freedom, and independence.[22] Engels was more specific in identification of the relation between crime and the economic system. Speaking of the vast pools of unemployed, Engels noted a sevenfold increase in criminal trials in England and Wales between 1805 and 1842, which he felt was an indication of the

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[22] Karl Marx, Capital, Vol. II (New York: International Publishers, 1949, original edition 1847), Chapter 15.

degree of economic demoralization.

> If the demoralization of the worker passes beyond a certain point then it is just as natural that he will turn into a criminal--as inevitably as water turns into steam at boiling point. Owing to the brutal and demoralizing way in which he is treated by the bourgeoisie the worker loses all will of his own and, like water, he is forced to follow blindly the laws of nature.[23]

Crime was a natural outcome of the economic system that itself steals from the worker. Violence was viewed as a frank and undisguised retaliation for the theft from the working class by the bourgeoisie.[24]

William A. Bonger applied the Marxian scheme to crime in a more detailed fashion in an attack on the economic system. Crime was viewed as the direct outgrowth of the capitalist economic system that stresses egoism as it promotes the conditions of unemployment and limited opportunity that Bonger felt were correlates with capitalism.[25] Though Bonger explicitly noted that the opportunity costs of crime were less for the lower income classes, such were considered as demoralizing influences that weakened social instincts. Bonger was intent on depicting crime as a fault of the economic system so did not pursue this avenue for economic analysis.

The first highly explicit model relating crime to economic variables was to appear in the 1960s in several pieces by Belton M. Fleisher.[26]

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[23] Friedrich Engels, The Condition of the Working Class in England (New York: The Macmillan Co., 1958, original edition 1845), pp. 145-46.

[24] Ibid., p. 242.

[25] William A. Bonger, Criminality and Economic Conditions (Boston: Little, Brown, and Co., 1916), pp. 377-82.

[26] Belton M. Fleisher, "The Effect of Income on Juvenile Delinquency," Journal of Political Economy, 71 (December, 1963), pp. 543-55. Also, "The Effect of Income on Delinquency," American Economic Review, 56 (March, 1966), pp. 118-37.

He assumed that the choice between legal and illegal alternatives is decided on the basis of relative costs and benefits in a rational manner according to some taste function. The consummation of Fleisher's work was the Economics of Delinquency, which is a good representative of the methodology used in aggregate approaches.

Fleisher suggests that the decisions of young people in regard to crime can be examined through an application of supply and demand.

> The economist sees delinquency as the result of two interacting forces: the tendency or propensity of people to commit delinquent acts on the one hand, and the number and value of opportunities for the commission of such acts, on the other. Using the language of labor-supply analysis, we may say that a causal relationship between economic and other characteristics of persons and their tendencies to commit delinquent acts--other things remaining unchanged--represents supply of delinquency or delinquents. Alternatively, it represents the demand for engaging in delinquent acts. I have chosen to call this relationship the demand relationship, meaning that the demand for engaging in delinquent acts is a function of tastes for delinquency and of legitimate alternatives to criminal behavior.[27]

Fleisher goes on to discuss the supply of delinquency as a function of opportunities available. These opportunities depend upon available booty, protection of potential victims, and a variety of economic and social characteristics of the environment. However, protection appears to be related to both demand and supply, as these have been defined, and a similar problem may exist with other economic variables. For example, low income is a demand factor in Fleisher's analysis while income dispersion is supposed to reflect a supply factor.

The gains from crime may bring either financial gain or psychic pleasure: however, Fleisher notes that 90 percent of crime of the young

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[27] Belton M. Fleisher, The Economics of Delinquency (Chicago: Quadrangle Books, 1966), p. 23.

are property crimes where booty is involved. Costs consist of the direct costs or sacrifice of income and reduction of expected lifetime earnings due to apprehension as well as the stigma of a criminal record. Tastes are considered "attitude toward crime."

In examining these relations using both time series and cross-sectional regression analysis, Fleisher uses Chicago and Cook County, 101 cities with population of 25,000 or over, a comparison of three large cities (Chicago, Boston, and Cincinnati), each with the other, and England and Wales.

The level and distribution of income is treated as the primary causal factor with unemployment the secondary factor. Tastes are represented by the surrogate variables: (a) separated or divorced females, (b) mobility of population, (c) percent of nonwhite population, (d) proportion of home ownership, (e) median school years per adult, and (f) a dummy variable for north-south differences.

Using both the time series and the cross-sectional analyses to isolate the effects of each variable, Fleisher concludes that

> (1) A 1 percent rise in income may well cause a 2.5 percent decline in delinquency; a 10 percent rise in family income in highly delinquent areas may result in a 15 percent reduction in juvenile arrest while effects due to reduced unemployment are relatively lower;[28] and
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> (2) A $500 increase in income would result in a reduced arrest rate of 5.2 per 1,000 population,

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[28]Fleisher, American Economic Review, pp. 134-35.

> and a 1 percent reduction in unemployment will result in a .15 percent reduction in the delinquency rate.[29]

This approach has been criticized on several grounds. One criticism is that the results are too dependent on taste variables to exercise a relationship between income and crime.[30] Other criticisms relate to the inability to separate demand and supply factors, failure to hypothesize relationships among variables, lack of a firm theoretical basis in choice of tastes, questionable assumptions, and narrowness.[31] Nonetheless, this general type of approach continues to be pursued by individuals from economics, sociology, and political science.

Much of the empirical work involving crime production models becomes involved in examinations of taste variables leading to a similarity with aggregate models. It is questionable if studies that concentrate on tastes are suitable for law enforcement policy matters.

2. Public Finance Models

One approach of economics to the problem of crime and law enforcement has been concerned with the effects of public expenditure. An examination of this literature reveals management studies, studies

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[29] Fleisher, The Economics of Delinquency, p. 117.

[30] John C. Weicher, "The Effect of Income on Delinquency: Comment," American Economic Review, 60 (March, 1970), pp. 249-56.

[31] Geoffrey Millerson, "The Economics of Delinquency: Review," The British Journal of Criminology, 6 (October, 1966), pp. 443-44.

Austin T. Turk, "The Economics of Delinquency: Review," Journal of Criminal Law, Criminology, and Police Science, 58 (September, 1967), pp. 388-90.

concerned with determination of the level of expenditure, and studies concerned with police output.

Management studies were begun in the 1930s in a high crime era when it had become fashionable to study the effects of employing more police and applying different operational techniques. Most of these studies attempted to determine if police output could be measured and how police services might be best distributed. One may consider most of the early management studies as exclusively concerned with enhancing the quality and quantity of protection.[32] Recent work along these lines attempts to introduce more analytical techniques to improve resource allocation. Schumate and Crowther's paper represents a typical approach using queueing theory and probability. However, a recognized shortcoming of such approaches is absence of a successfully defined "success criteria."[33]

A variation is concerned with the matter of equity and efficiency in the distribution of police service, a development which is partly the result of questions raised by Musgrave.[34] Some of the interesting

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[32]Donald C. Stone, "Can Police Effectiveness Be Measured?", Public Management, 12 (September, 1930), pp. 465-71.

Clarence E. Ridley and Herbert E. Simon, "Measuring Police Activities," Public Management, 19 (May, 1937), pp. 134-39.

[33]Robert P. Shumate and Richard F. Crowther, "Quantitative Methods for Optimizing the Allocation of Police Resources," Journal of Criminal Law, Criminology, and Police Science, 57 (June, 1966), pp. 197-206.

[34]Carl Shoup, "Standards for Distributing a Free Governmental Service: Crime Prevention," Public Finance, 19 (December, 1964), pp. 383-92.

John G. Head, "Equity and Efficiency in Public Goods Supply," Public Finance, 25 (January, 1970), pp. 24-37.

aspects that are generated relate to the need to identify the role of equity or justice. Is the goal of law enforcement to be maximizing the capture of criminals, minimizing the crime level, or equalizing probabilities of victimization, and how does society determine its canons of equity with respect to victims and criminals?[35] Such thorny questions have been highlighted through the incursions of Professor Shoup and others into an examination of crime prevention as a social good.

Another group of studies is concerned with the determinants of expenditure level conditions under which law enforcement services are generated. Werner Z. Hirsch uses a cross-section analysis for a number of communities to conclude that since cost per capita showed no significant variation with size of police department, economies of scale were not present.[36] Questions were raised as to the appropriate measure of output, and alternative approaches have been sought. H. J. Schmandt and G. R. Stephens measure output as the number of functions in a police department in reaching the conclusion that economies of scale do exist.[37] One of the more recent investigations follows the method of Hirsch and obtains results that tend to reinforce the earlier conclusion that economies of scale do not exist in law enforcement.[38]

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[35]Lester C. Thurow, "Equity versus Efficiency in Law Enforcement," Public Policy, 18 (Summer, 1970), pp. 451-62.

[36]Werner Z. Hirsch, "Expenditure Implications of Metropolitan Growth and Consolidation," Review of Economics and Statistics, 41 (August, 1959), pp. 232-41.

[37]Henry J. Schmandt and G. Ross Stephens, "Measuring Municipal Output," National Tax Journal, 13 (December, 1960), pp. 369-75.

[38]L. R. Gabler, "Economies and Diseconomies of Scale in Urban Public Sectors," Land Economics, 45 (November, 1969), pp. 425-34.

Studies of this type devote considerable effort to developing measures of police output as they attempt to determine the cost conditions under which the output is generated. Extensions of the approach often become involved in determination of the specific level of output through an examination of expenditure. As an example, Roy W. Bahl uses data from 198 cities to identify nine significant variables that explain variations in per capita expenditures for police protection.[39]

The common element in the public finance approach to study of crime and law enforcement is attention to the quality and quantity of output for a given expenditure level and in some cases attention to the determination of the expenditure level itself. Such studies do not explicitly analyze criminal decisions and the effects of law enforcement on these decisions.

3. Crime Output Models

This approach to crime and law enforcement treats the criminal as a producer of crime, an output which imposes costs on society. The decision to produce is analyzed as a typical economic decision based on expected returns and costs. Costs of both crime and law enforcement become germane in analyzing the desired levels of law enforcement activity.

As far back as the 1930s, the costs of crime were conceptualized by the Wickersham Commission in an effort to develop some guidelines for policy-making purposes. However, for over thirty years

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[39]Roy W. Bahl, Metropolitan City Expenditures (Lexington, Ky.: University of Kentucky Press, 1969), pp. 67-69.

explicit concern over the economic impact of crime and law enforcement were negligible.

In the 1960s, J. P. Martin and J. Bradley initiated a study of crime costs in Great Britain.[40] Their purpose was to begin development of a foundation that would be useful in a more rational approach to policymaking. The developments in Britain appear to have begun with an intensive study of the costs of crime without firm commitment to a theoretical foundation. At the present time, major surveys of manpower allocation have been completed in an initial undertaking.[41] The British activities appear to be largely independent of American influence, and vice versa.

In 1967 Thomas C. Schelling developed a paper for the President's Commission analyzing underworld enterprises operating in the area of illegal goods and services.[42] Using the perspective of economics, the paper is concerned with characteristics of the market and functions of the firm as Schelling attempts to deal with matters of overhead costs, monopolistic pricing, internalization of costs, and governance of the market. Schelling identifies the conditions encouraging development of criminal enterprises and the advantages and disadvantages that such organizations generate to society. Although the model is concerned with

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[40] J. P. Martin and J. Bradley, "Design of a Study of the Cost of Crime," British Journal of Criminology (October, 1964), pp. 591-603.

[41] J. P. Martin and Gail Wilson, The Police: A Study in Manpower (London: Heinemann, 1969).

[42] Thomas C. Schelling, "Economic Analysis and Organized Crime," appendix D in; President's Commission on Law Enforcement and Administration of Justice, Organized Crime, "Task Force Report," (Washington, D.C.: Government Printing Office, 1967), pp. 114-26.

output, Schelling's model is conceptually oriented and deals primarily with criminal activity carried on by organizations (firms) rather than individuals; and the crimes are largely outside the Index offense category.

A similar application of economic analysis to narcotics distribution was pursued by Simon Rottenberg in early 1968.[43] Rottenberg examined quasimonopoly firms involved in distribution of a nominal product, heroin, and a service output, concealment. Profit maximization and cost minimization using marginal revenue and marginal cost are used to explain how the criminal enterprise decides upon its level of operations, with high profits being the result of cartellization and the high risk nature of the firm's activities.

Both Schelling and Rottenberg concentrate on the "victimless" type of criminal activity where a marketable good or service is involved as opposed to the more traditional criminal offenses of the Index offense category. Although others had used economic concepts and terminology, it was the appearance of the model of Gary S. Becker that marked the introduction of a detailed output model applicable to all forms of criminal activity.

In Professor Becker's definitive article, the objective of the criminal justice system is minimization of the total social loss from crime and the criminal justice system.[44] He first posits a model of

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[43]Simon Rottenberg, "The Clandestine Distribution of Heroin, Its Discovery and Suppression," Journal of Political Economy, 76 (January - February, 1968), pp. 78-90.

[44]Gary S. Becker, "Crime and Punishment: An Economic Approach," Journal of Political Economy, 76 (March - April, 1968), pp. 169-217.

criminal behavior wherein the level of crime is determined by the probability of conviction and the amount of punishment in a manner reminiscent of Jeremy Bentham.

Becker assumes the same motivations are involved as in legal activity. For each criminal offense, there is a supply function which relates the crime rate to the probability of conviction, punishment, and tastes or other variables, such as alternative sources of income. Offenses will be committed as long as the expected utility of the offense exceeds the expected utility from alternative uses of his resources. Since only a fraction of the offenders are punished, there is uncertainty and price discrimination.[45]

The probability of conviction and amount of punishment are two policy variables through which the level of each crime can be regulated. That the output of criminals generates harm or a direct social cost has long been recognized; however, the two policy variables themselves involve social costs that must be considered in enforcement. Considering the total social cost function as the sum of direct crime costs, apprehension costs, and punishment costs, Becker minimizes the cost function with respect to the two policy variables. The optimal conditions identify the marginal social cost and marginal social benefit of a change in either of the policy variables.

One virtue of Professor Becker's approach is its explicit identification of control variables in a complete model of the criminal justice system, a development which provides rigor and the opportunity for empirical investigation. Three of his students have carried on

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[45] Ibid., pp. 176-77.

separate investigations of the implications of the model. Arleen Smigel Leibowitz used a regression for 48 states and found evidence supporting Becker's hypothesis that criminal responses to changes in the probability of conviction were greater than responses to changes in punishments.[46] Ephraim Kleiman used data from Palestine to examine another matter raised by Becker, the rate of substitution between fines and prison sentences.[47] However, the most significant empirical work is currently being carried on by Dr. Isaac Ehrlich at the National Bureau of Economic Research.

Ehrlich applies a similar model to determine the deterrent effects of the probability of conviction and punishment then examines the components of tastes for crime.[48] An extension of the analysis attempts to determine the productivity of public expenditure on law enforcement. Despite the shortcomings of his data, the results thus far appear to be encouraging.

Although the approach developed by Professor Becker is of quite recent origin, it is recognized as the most sophisticated approach yet taken in an economic analysis of crime as it has generated

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[46] Arleen Smigel Leibowitz, "Does Crime Pay? An Economic Analysis," (unpublished M.A. thesis, Columbia University, 1965).

[47] Ephraim Kleiman, "The Choice Between Two Bads: Some Economic Aspects of Criminal Sentencing," (unpublished manuscript, Hebrew University, 1967).

[48] Issac Ehrlich, "Participation in Illegitimate Activities and the Effectiveness of Law Enforcement," National Bureau of Economic Research: 50th Annual Report (New York: NBER, 1970), pp. 76-77. Summaries of current efforts also appear in the 1969 and 1971 reports.

and will likely continue to generate further empirical investigations.[49] John R. Harris extends the approach by investigating the institutional framework as a policy variable.[50] William M. Landes has begun an extension of the analysis to the court and bail system.[51]

While still in a developmental stage, the output approach developments, largely inspired by Professor Becker's model, appear to be bridging the gap between theory of the offender and the allocation of law enforcement. The incorporation of the theory of the offender through a supply function with the social cost function provides the necessary link.

C. Model to Be Developed and Examined

The concern over crime in the United States and the increased willingness to extend economic analysis have resulted in expanded discussion in professional circles.[52] There is ample evidence that diversity will rule for some time before a synthesis begins to present

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[49]Several Ph.D. dissertations have already been completed. Also, similar types of investigations into deterrence and tastes is evidenced in the work of some sociologists. For example: Frank D. Bean and Robert G. Cushing, "Criminal Homicide, Punishment, and Deterrence: Methodological and Substantive Reconsiderations," Social Science Quarterly, 52 (September, 1971), pp. 277-89.

Jack P. Gibbs, "Crime, Punishment, and Deterrence," Social Science Quarterly, 48 (March, 1968), pp. 515-30.

[50]John R. Harris, "On the Economics of Law and Order," Journal of Political Economy, 78 (January-February, 1970), pp. 165-74.

[51]William M. Landes, "An Economic Analysis of the Courts," Journal of Law and Economics, 14 (April, 1971), pp. 61-107.

[52]Thomas C. Schelling, chairman, "Round Table on Allocation of Resources in Law Enforcement," American Economic Review: Papers and Proceedings, 59 (May, 1969), pp. 504-12.

a more united front.[53] One must begin to face this question: What does economics offer to the understanding of crime and law enforcement that isn't presently available through more traditional ways?

It is often expressed that criminals are a sick lot, or at least that "something" is wrong with them. One simply does not ordinarily assume criminal actions in regard to crime as normal. The examination of traditional theories of crime causation provides a glimpse at the current explanations, each of which appears to lead to a logical policy choice.

In the classical deterrent approach, which is imbedded in our legal system, the solution to crime problems is through changed levels of police or punishment of "law and order." The biological and psychological explanations lead to remedial measures, such as clinical treatment, psychotherapy, etc. Differential association and anomie would suggest modifications of the environment, including perhaps the

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[53] For examples of the diverse fronts in this development see: J. J. Tobias, "The Crime Industry," British Journal of Criminology, 8 (July, 1968), pp. 247-58.

Martin T. Katzman, "The Economics of Defense Against Crime," Land Economics, 44 (November, 1968), pp. 431-40.

Gordon Tullock, "An Economic Approach to Crime," Social Science Quarterly, 50 (June, 1969), pp. 59-71.

Lester C. Thurow and Carl Rappaport, "Law Enforcement and Cost-Benefit Analysis," Public Finance, 24 (Summer, 1969), pp. 48-64.

George J. Stigler, "The Optimum Enforcement of Laws," Journal of Political Economy, 78 (May-June, 1970), pp. 526-36.

Robert G. Hann, "Crime and Cost of Crime: An Economic Approach," (unpublished manuscript, University of Toronto, 1971).

R. A. Carr-Hill and N. H. Stern, "An Econometric Model of the Supply and Control of Recorded Offenses in England and Wales," (unpublished manuscript, Oxford University, 1971).

James Gunning, "The Economic Rationality of the Decision to Become A Burglar," (unpublished manuscript, Center for the Study of Public Choice, Virginia Polytechnic Institute).

Gregory Krohm, "Income Maximization Via Crimes Against Property," (unpublished manuscript, Center for the Study of Public Choice, Virginia Polytechnic Institute).

economic system itself. Individualized treatment within the correctional system as opposed to uniform punishment is strongly encouraged in most of the recent sociological theories.

Each specialized approach tends to exaggerate some influences and ignore others, while multicausal explanations may tend to lack the abstraction necessary for a more useful theory. There has thus far been little harmonization in the diverse viewpoints. Nonetheless, the law continues to fix responsibility on the individual as he is assumed culpable for his acts.

While all recognize that criminal activity and the criminal justice system are costly, little is known about the effects of increasing the availability of resources to combat crime. Certainly objective measures are desirable when there is increased employment of resources for any purpose; and an economic approach to crime and law enforcement promises a viewpoint that presents some questions that otherwise may not be made explicit.

The model to be developed and examined below is based upon that of Gary S. Becker. Although the supply of crime function in the approach resembles the classical deterrence position which has received sustained criticism, the model does relate closely to the present structure of the law and law enforcement policy. It does not examine the effects of changes in the criminal justice system. The model identifies the practical policy variables involved in current efforts to deal with the crime problem as a specific problem of the American society. The allowance for taste variables eliminates singularity and enables the model to be compatible with a number of special theories of the offender. The incorporation of the crime function with the

cost function provides a useful bridge for obtaining some guidance in the use of resources for the control of crime.

In these times of increased crime costs, no one way of examining crime can be considered sufficient. The rules-of-thumb approach of law enforcement may be appreciably improved if the tradeoffs involved in decision making are more clearly identified. It is hoped that the following analysis will make possible a better identification of the questions that are intricately involved in use of law enforcement resources.

CHAPTER III

Economics is all about how people make choices. Sociology is all about why people don't have any choices to make.

James S. Duesenberry

If there is any common denominator for the minds of criminals, it is their inability to face reality squarely and their ability to rationalize. The feeling that "in some magical way, I'll get away with it; I won't get caught this time," pervades their thinking. But, perhaps this is not so unrealistic, after all, when one realizes that only one-fourth of major crimes reported to the police are followed by convictions.

Manfred S. Guttmacher

CHAPTER III

THE BASIC MODEL

The model that follows has been developed to provide a means for analyzing the effects of criminal activity and the actions aimed at restricting criminal activity. The model identifies the optimum level of crime, along with the crime restricting activity, as that which minimizes the total social costs of crime, the expenditures on criminal justice, and private expenditures for protection from criminal activity. The model is a crime output model since criminal activity is viewed as producing an output that imposes costs on members of society who, on the whole, are unwilling to bear this expense. In the model, government expenditures for law enforcement and punishment, in addition to private expenditures for protection from crime, determine the level of crime that is allowed to exist.

The model is developed in terms of one specific type of crime and initially abstracts from consideration those private actions that might be used to restrict criminal activity. It is assumed throughout that there are no changes in laws defining either criminal activity or offender attitudes toward obedience to the law. This initial development at times follows closely the theoretical framework of Gary S. Becker's sophisticated model.[1]

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[1] Becker, Journal of Political Economy, 76, pp. 169-84.

Following this initial development, a departure is made by introducing the private actions of individuals who intend to reduce their own vulnerability to crime incidence through the expenditure of resources for this purpose.

In the model to follow, the level of crime is determined by the returns and costs as viewed by the potential offender. Law enforcement is viewed from the economic perspective of costs and benefits. On this basis, it may be concluded that the approach is economic in nature.

A. Supply of Crime

Basically, differences in individual tastes and preferences distinguish the criminal from the noncriminal. A potential criminal will commit an illegal act if the expected gains from the act exceed the expected costs resulting from the activity. It is therefore hypothesized that the potential criminal wants to maximize his utility from criminal activity in a manner described in the concept of the economic man used in analyzing the decisions that are made in legal activity.

Then the supply function for crime may be written as

$$C = C\ (p, s, u) \qquad (1)$$

when C is the number of crimes of a particular type; when p is the probability of conviction for each offense; when s is the sentence or punishment if convicted; and when u is a taste or stochastic variable representing all other influences such as law-abidingness, income from

legal activity, and so on.[2]

In Chapter II several theories of criminal behavior were examined. Because of its generality the supply of crime function as illustrated may be compatible with many (or all) of these theories. Advocacy of the classical deterrence, biological, psychological, differential association, or anomic approach, is not of any question in this supply of crime function. It should be noted, however, that the classical deterrent approach emphasizes the effects of p and s on crime, while the remaining explanations highlight factors which this model includes in tastes for crime.

Though compatibility with diverse theories of criminal behavior is expected in the development of this paper, tastes are assumed to be fixed by invoking the condition ceteris paribus, which thereby provides an opportunity to examine individually the effects of changes in these two components of costs to an offender.

Economics explains behavior in decision making on the basis of returns, costs, and tastes. To the potential criminal both p and s represent exogenous costs of committing a crime. Thus, one anticipates an inverse relationship between the crime level and the two exogenous variables so that

$$\frac{\partial C}{\partial p} < 0, \quad \frac{\partial C}{\partial s} < 0. \qquad (2)$$

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[2] Legal punishment for Index offenses is predominately a prison sentence. Occasionally, a characteristic of the offender, such as his age, results in probation rather than prison. In this paper s should be thought of as a prison term.

In his article, Professor Becker devotes considerable attention to fines and the substitution of fines for prison. As fines are seldom the form of punishment for Index offenses, this form of punishment and substitution is largely ignored in this paper.

An individual offender may not expect to be caught and punished; however, he is aware of this risk. Perhaps master offenders generally avoid getting caught, and it is only the unsophisticated who are detected and punished. Though such a disparity as this may occur, the relation depicts average behavior--as is the case with much economic analysis--and may therefore be explanatory of criminal activity in general.

Law enforcement officials through their general attitude that certainty is a more important deterrent than severity, would infer that the partial elasticity of the supply of offenses is greater for changes in p than for changes in s. As these elasticities are examined in greater detail later (p. 54), a complete examination of this opinion is not made at this point. However, it may be noted that this attitude infers that

$$-\frac{p}{C}\frac{\partial C}{\partial p} > -\frac{s}{C}\frac{\partial C}{\partial s}. \qquad (3)$$

Hence, a given percentage increase in p has a greater negative effect on the crime level than a similar increase in s.

Since a substantial part of the cost of punishment to the offender is the stigma of conviction and going to prison--and this is largely independent of the prison term--a significant part of the punishment cost to the offender may be fixed independently of a variable cost, the length of time in prison. Also there is evidence that beyond some attainable limit $\frac{\partial C}{\partial s} = 0$.[3]

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[3] As the discussion is in terms of values of s external to the individual offender, the deterrent effect is considered in the criminologist's category of "general prevention." For examples of the different dimensions of deterrence, refer to the following:

Roger Hood and Richard Sparks, Key Issues in Criminology (New York: World University Library, 1970), pp. 172-75.

For punishment to reflect a positive marginal cost to him, the potential criminal must believe the authorities are both willing and able to impose the punishment on him as a result of a criminal act. That is, the threat of punishment must have both applicability and credibility.[4] As the potential offender likely has an imperfect knowledge of p and s, it is the perceived values of these variables that are relevant. This suggests that policies leading to an exaggerated perception of p or s may reduce the crime level as long as credibility exists. It is possible that a campaign in the media creating the impression that offenders are caught and convicted with more relative frequency than is actually the case would reduce the offense level significantly even though actual levels of p and s are completely unchanged. If overstatement would have a similar effect over long periods of time may be an entirely different matter.

Since some guilty escape conviction and punishment is meted out only to those convicted of a crime, not to all who commit a crime, there is uncertainty and price discrimination in the cost of committing criminal acts.

As the gains from a criminal act are subject to uncertainty, there is reason to examine the criminal's attitude toward uncertainty itself. Assuming the offender maximizes utility (U) which is a function of his net income from criminal activity (W_c), then his expected utility (ExU) can be depicted as a relation of criminal income,

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[4] Franklin E. Zimring, Perspectives on Deterrence, Public Health Service Publication No. 2050 (Washington, D.C.: Government Printing Office, 1971), pp. 65-68.

the probability of conviction (p), and costs of punishment to him (s), as

$$ExU = pU\ (W_c - s) + (1 - p)\ U(W_c). \qquad (4)$$

Since punishment is a cost to the offender, $s > 0$. Differentiating (4) with respect to p, s, and W_c yields

$$\frac{\partial ExU}{\partial p} = U(W_c - s) - U(W_c) < 0$$

$$\frac{\partial ExU}{\partial s} = -pU'\ (W_c - s) < 0 \qquad (4a)$$

and

$$\frac{\partial ExU}{\partial W_c} = pU'\ (W_c - s) = (1 - p)\ U'(W_c) > 0.$$

An increase in p or s reduces expected utility and the tendency for an offender to commit offenses, while an increase in W_c has the effect of increasing the utility from offenses and the tendency for offenses to occur. The widely held opinion of law enforcement officials that criminals are more deterred by increases in p than by increases in s would infer than an increase in p offset by a compensating (equal percent) decrease in s would not change the expected income from an offense but would reduce utility expected from offenses. This position would mean that criminals tend to be risk preferrers.[5]

This matter can be shown as follows. Using the elasticity expressions involving expected utility yields

$$\frac{-\ p}{ExU}\frac{\partial ExU}{\partial p} = \frac{p}{ExU}\left[-U(W_c - s) + U(W_c)\right] \quad \gtrless \quad \frac{-s}{ExU}\frac{\partial ExU}{\partial s} = \frac{s}{ExU}\ p\ U'\ (W_c - s). \qquad (4b)$$

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[5]Becker, pp. 177-78.

This becomes

$$\frac{U(Wc) - U(Wc-s)}{s} \gtreqless U'(Wc - s). \qquad (4c)$$

The term on the left of (4c) denotes the average change in utility between (Wc) and (Wc-s), the right hand term is the marginal utility at (Wc - s). Risk preference is expressed by $U'' > 0$, as there is increasing marginal utility of income as income increases. Persons who exhibit risk preference will, when given a choice between a sure income and fair odds for a higher income, choose the chance for the higher income as the extra dollars of income are valued more highly than the dollars of the certain but lower income. $U'' > 0$ infers increasing marginal utility of income, a condition associated with risk preference.[6]

It is expected that the responses of criminals to changes in p and s will vary widely for different types of crime and may also vary widely among individuals as each contemplates the same crime. For example, the person committing the so-called "crime of passion" may show less response to changes in costs to the offender than if he were committing the other crimes.[7]

Why might certain types of crime take place with little response to the costs involved or increases in those costs? The stochastic

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[6]The matter of choice under conditions of uncertainty is examined extensively in:
Milton Friedman and L. J. Savage, "The Utility Analysis of Choices Involving Risk," Journal of Political Economy, 56 (August, 1948), pp. 279-304.

[7]Of the Index offenses, "crimes of passion" are considered to be murder, rape, and aggravated assault.

term (u) in equation (1) may represent intense feelings that reduce sensitivity to the values of p or s for these offenses. In some cases u may represent significant variables, such as educational attainment, unemployment, income level, etc., which may be specified and examined empirically.[8]

B. Restricting Crime through Public Action

Since public authorities have control over the values of p and s, the expected gains from crime are determined by public policy. The punishment (s) can be set precisely by the legislature of a state, though interaction of prosecutor, judge, jury, and parole boards are often important.[9] In thinking of the substantive content of s in this paper, it is worthwhile to consider s as the time a potential offender anticipates he will have to serve in prison if he is convicted. This period will reflect the determination of sentence by the entire criminal justice system.

Determination of the probability of conviction is less certain. Increasing the resources of law enforcement, primarily police manpower, will undoubtedly, raise p, but by how much? Actually, p could be raised to near unity by having a policeman on every block, a policy that would likely result in dramatically lower crime levels.

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[8]Much of the research in crime causation by sociologists and criminologists emphasizes such variables as do the studies by Fleisher noted in Chapter II. Since these aggregates are not directly a part of the law enforcement system and can be changed only quite slowly with imprecise results, they are not analyzed in this chapter.

[9]For a particular offense, there is usually a significant difference between the formal sentence and actual time served. It is the time an offender expects to serve that is considered relevant in the model.

With p and s raised to sufficient levels the supply of crime could be restricted to very low levels. This procedure is not followed and may not be feasible when there is an examination of the costs of law enforcement. The resources necessary for a virtually crimeless society may exceed society's valuation of this near crime-free state. An explicit understanding of this matter is facilitated by an examination of the various costs associated with public crime restricting action as well as the resultant harm of crime itself.

C. Costs of Crime and Law Enforcement

The basic reason for declaring certain acts illegal is that the act imposes costs on an unwilling victim in a manner that serves no useful purpose for society.[10] Death, injury, and defensive acts, such as changed modes of life, fear, and loss or destruction of property, are the victim or direct costs, V, of crime. These costs to the victim are a direct function of the supply of crimes so that:

$$V = V(C), \text{ with } \frac{\partial V}{\partial C} > 0. \qquad (5)$$

It is presently impossible to quantify the costs of fear and of most defensive actions. Loss or damage to property is more easily calculable and damages due to injury or death have been calculated for other purposes. Added complexity is introduced by the effect that fear may have on retail establishments, restaurants, and theaters in high crime areas. Though the business itself may face an element of

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[10] Almost any definition of crime is vulnerable to criticism. The statement used above is sufficient for the purposes at hand. As a beginning for the interested person refer to the following: Henry M. Hart, Jr., "The Aims of the Criminal Law," Law and Contemporary Problems, 23 (Summer, 1958), pp. 401-41.

victim costs as defined above, there are additional costs associated with loss of revenue and earnings. Analytical convenience is served by considering V as inclusive of all these crime costs, whether or not measurable, with private protective expenditures not included at this point in the development.

There is not reason to presume that the costs to the victim must in some way be related to the gains to the offender. The offender may treat the victim costs partly or wholly as an externality. The failure of the market mechanism to internalize the negative externalities (diseconomies) may provide a reason for existence of public action to restrict crime. Also private expenditures for protection may benefit others who do not support the protective activity.[11]

When a crime is committed, the victim sustains a loss while the offender gains. For some crimes, such as those involving property, the direct costs to the victim may be partly or totally offset by the gains to the offender. Even in this case, however, there is a loss to society equal to the real input of the offender in the form of labor and capital. For this reason, as well as for the social undesirability of crime itself, the gains to the offender (in this paper) are ignored when determining the optimum level of enforcement.

Although victim costs, V, may be reduced to a very low level by raising p to near unity and imposing a more severe punishment, s, this may not be feasible because of the increased costs of a higher p and s. The costs of conviction first involve apprehension so that law

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[11] Often the victim plays some role in his victimization from crime. Keys left in the ignition of an auto, unlocked doors, and other forms of carelessness are examples. Some aspects of these relationships will be examined later in part F of this chapter.

enforcement, or police activity, is important in determining p. If R represents the level of use of law enforcement resources, then

$$p = p\ (R), \text{ with } \frac{\partial C}{\partial R} < 0. \qquad (6)$$

If P represents the cost of law enforcement resources, primarily police, then

$$P = P\ (R), \text{ with } \frac{\partial P}{\partial R} > 0. \qquad (7)$$

For reasons that are apparent as illustrated, it is necessary to assume equations (6) and (7) with each possessing an inverse.[12]

If tastes are held constant, the direct costs of crime may be written as

$$V = V_1\ (p, s) = V_2(R, s) = V_3\ (P, s), \qquad (8)$$

with the restriction that each function possesses an inverse.

Since most of the expenditures for law enforcement are for personnel, increased law enforcement is effected primarily through an increased number of policemen, though expenditures for prosecution and courts may be included.[13]

Costs of punishment represent a somewhat more complex variable because they involve the costs to those convicted and incarcerated, to their families, and to the state; however, there are possible benefits to others in the form of reduced crime levels. To insure comparability,

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[12] The inverse of each function will be needed for equation (18) below. Letting θ denote the inverse of (6) and ϕ the inverse of (7), then $R = \theta'\ (p)$,and,$R = \phi'\ (P)$.

[13] $\frac{\partial V}{\partial R} < 0$,and, $\frac{\partial V}{\partial P} < 0$. If there are decreasing returns to law enforcement resources, $\frac{\partial^2 V}{\partial P^2} < 0$, when the cost of an additional unit of law enforcement resources is constant or rising.

the relevant costs and benefits necessarily must be expressed as monetary values. In addition to psychic losses and social stigma that may reduce future earnings, those convicted face losses of income, consumption, and freedom for themselves and their families. Each component may differ considerably for different individuals even for the same crime. In the following, W represents the costs of imprisonment to the offender and his family. W consists largely of lost wages and consumption.

Imprisonment involves a cost of punishment which the state must bear. Facilities, guards, food, and clothing, which must be included in social costs, are obvious costs to the state. However, imprisonment may reduce social costs somewhat because of the benefits accruing from imprisonment since those who are incarcerated will be unable to commit crimes during the prison term, and if prisons successfuly rehabilitate inmates, future crime levels could be reduced. Let K represent the cost of imprisonment to the state, net of the crime reducing effects of incarceration. Depending on the relative magnitude of these crime reducing effects, K may be a positive or negative value. As the severity of punishments increases by increasing the length of imprisonment, s, costs of punishment to both the state and the offender rise.[14] Letting S represent punishment costs to society,

$$S = W + K. \qquad (9)$$

The relationship between law enforcement resources and punishment costs remains to be identified. As the probability of conviction

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[14]Becker (pp. 179-180) considers the total social costs of fines as near zero when costs of collection are ignored. As the Index offenses are almost exempt from the use of fines as punishment, this consideration does not apply to the present discussion.

is increased by the employment of more resources for law enforcement, prison population rises and leads to an increase in punishment costs. Therefore, there is a direct relation between employment of law enforcement personnel and punishment costs.[15] Recalling the relationship between law enforcement expenditures (P) and the probability of conviction (p), punishment costs to society may be written thus:

$$S = S\ (P,\ s). \qquad (10)$$

The total or social costs of crime, L, may be represented as follows:

$$L = V_2 + P + S = V_2\ (R,\ s) + P\ (R) + S\left[P\ (R),\ s\right]. \qquad (11)$$

With these relations and costs in mind, it is possible to begin identification of the optimum levels of enforcement and punishment.

D. Identifying the Social Optimum

From an economic point of view, the optimal level of enforcement and punishment is that which minimizes the social or total costs that are due to victim costs, law enforcement costs, and punishment costs. Minimizing equation (11) for law enforcement resources and punishment,

$$\frac{\partial L}{\partial R} = \frac{\partial V_2}{\partial R} + \frac{\partial P}{\partial R} + \frac{\partial S}{\partial R} = 0 \qquad (12)$$

and

$$\frac{\partial L}{\partial s} = \frac{\partial V_2}{\partial s} + \frac{\partial S}{\partial s} = 0. \qquad (12\ \text{continued})$$

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[15] A case can be made that the severity of punishment has some effect on the probability of conviction. For example, a judge or jury may be somewhat reluctant in reaching a judgment of guilty if this means the imposition of a more severe punishment. No such effect is assumed here because of the uncertainty of the relationship.

Since $\frac{\partial L}{\partial R}$ and $\frac{\partial L}{\partial s}$ are both equal to zero,

$$\frac{\partial V_2}{\partial R} = -\frac{\partial P}{\partial R} - \frac{\partial S}{\partial R}$$

and (13)

$$\frac{\partial V_2}{\partial s} = -\frac{\partial S}{\partial s}.$$

The first equation of (13) indicates that at the optimum level of enforcement, the marginal reduction in victim costs will equal the marginal cost of law enforcement and the extra cost of imprisonment resulting from law enforcement resources.[16] The second equation of this pair indicates that at the optimum punishment level, the marginal reduction in victim costs due to increased punishment equals the marginal cost of the increased punishment. To be certain that (13) represent minima, it would be necessary to specify the signs of the second derivatives.

Though the results of equations (13) are obvious, it is useful to specify a more transparent approach. Using equations (8), (7), and (10), the social cost function can be rewritten in this manner:

$$L = V_2 (R, s) + P (R) + S (P, s). \qquad (14)$$

Although it has been treated as a length of time of imprisonment, s may be transformed into a social cost measure. Let s' be defined as the social costs of punishment consisting of costs of imprisonment to the state, money costs of punishment to the offender, (inclusive of the loss to others such as to his family), minus any

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[16] The last term, $\frac{-\partial S}{\partial R}$, represents the effect of a change in p on S noted on p. 50.

gain to society, such as through crime reduction. Following Becker's approach quite closely and using b as a coefficient that transforms s into s',

$$s' = bs, \tag{15}$$

with b as a constant representative of the form of punishment.

Ignoring collection costs associated with fines, $b \approx 0$ for fines as gains to others is approximately equal to the cost to the offender. For imprisonment, probation, and parole, $b > 1$ as the costs imposed on the offender are not recovered by others.[17]

The transformation of s into social costs s' permits a reformulation of the total social cost function (equation 14). As bs represents the social cost of punishment and pC represents the number of persons subject to this punishment, social costs of punishment are as follows:

$$S = b\ s\ p\ C. \tag{16}$$

The total social cost function can now be rewritten in this way:

$$L = V_2\ (R,\ s) + P\ (R) + b\ s\ p\ C. \tag{17}$$

When p and s are considered decision variables, the first order optimality conditions are

$$\frac{\partial L}{\partial p} = \frac{\partial V_2}{\partial R}\frac{\partial R}{\partial p} + \frac{\partial P}{\partial R}\frac{\partial R}{\partial p} + bsC + bsp\frac{\partial C}{\partial p} = 0$$

and

$$\frac{\partial L}{\partial s} = \frac{\partial V_2}{\partial s} + bpC + bsp\frac{\partial C}{\partial s} = 0. \tag{18}$$

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[17] This immediate section follows Becker (pp. 180-182) closely. However, Becker does not appear to consider the crime reducing effects of s. These effects could result in a value of b less than unity for punishments other than fines.

LIST OF SYMBOLS

C - number of crimes of a particular type.

p - probability of conviction for each offense.

s - sentence or punishment when convicted.

u - taste or stochastic variable, representing all other influences.

V - victim or direct costs or crime, loss of property, injury, death, and changed modes of life.

R - law enforcement resources, primarily police.

P - cost of law enforcement resources, primarily police.

W - costs of imprisonment to the offender and his family, largely loss of wages and consumption.

K - cost of imprisonment to the state net of crime reducing effects of incarceration, consists primarily of guards, sustenance of prisoners, and prisons.

S - punishment costs to society, social costs of punishment to state.

L - total or social costs of crime to society.

s' - money costs of punishment to the offender, inclusive of loss to others minus any gain to society as through crime reduction.

b - a coefficient that transforms punishment (s) into money costs (s'), representative of the form of punishment.

ε_p - elasticity of supply of crime with respect to probability (p).

ε_s - elasticity of supply of crime with respect to punishment (s).

E. Elasticity of Supply of Crime to p and s

Much of the effect of changes in costs of criminal activity relate directly to responses of offenders to p and s. This response is analogous to elasticity of supply in economic theory. Deriving a measure of the elasticity of supply is facilitated by using the elasticity concepts:[18]

$$\varepsilon_p = - \frac{p}{C} \frac{\partial C}{\partial p}$$

and (19)

$$\varepsilon_s = - \frac{s}{C} \frac{\partial C}{\partial s} .$$

Rearranging equation (18) slightly and using the elasticity concept yields

$$\frac{\partial R}{\partial p} \frac{\partial V_2}{\partial R} + \frac{\partial P}{\partial R} \frac{\partial R}{\partial p} = - bsC \left[1 + \frac{p}{C} \frac{\partial C}{\partial p} \right] = - bsC \ (1 - \varepsilon_p)$$

and (20)

$$\frac{\partial V_2}{\partial s} = -bpC \left[1 + \frac{s}{C} \frac{\partial C}{\partial s} \right] = -bpC \ (1 - \varepsilon_s).$$

Although the elasticity of the supply of crime to p and s is conveniently identified in equation (20), several of the terms lack specific counterparts in the terminology of economic theory. This shortcoming[19] can be remedied by using equations (5), (7), and (16) to obtain

$$L = V(C) + P(R) + bspC, \qquad (21)$$

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[18] Becker, p. 182.

[19] This approach has been suggested by J.F. Giertz in a study supported by the Law Enforcement Assistance Administration. Please refer to:

J.F. Giertz, "An Economic Analysis of the Distribution of Patrol Forces," NI 69-080 (Springfield, Va.: National Technical Information Services, 1970), or, "An Economic Approach to the Allocation of Police Resources," (unpublished Ph.D. dissertation, Northwestern University, 1970).

which is similar to equation (17). This expression can be minimized for law enforcement resources (R) and punishment (s) to yield the more easily interpreted result

$$\frac{\partial L}{\partial R} = \frac{\partial V}{\partial C}\frac{\partial C}{\partial R} + \frac{\partial P}{\partial R} + bsC\frac{\partial p}{\partial R} + bsp\frac{\partial C}{\partial R} = 0$$

and

$$\frac{\partial L}{\partial s} = \frac{\partial V}{\partial C}\frac{\partial C}{\partial s} + bpC + bsp\frac{\partial C}{\partial s} = 0. \qquad (22)$$

The following list is useful in interpreting the results shown in equation (22): (assuming an increase in law enforcement resources or police and increased punishments respectively).

$\frac{\partial L}{\partial R}$ = marginal benefit of increased police, reduction in social loss.

$\frac{\partial V}{\partial C}$ = marginal reduction in direct crime costs as a result of crime reduction, marginal victim costs.

$\frac{\partial C}{\partial R}$ = marginal effect of additional police on crime, marginal product of police in terms of crime.

$\frac{\partial P}{\partial R}$ = marginal cost of police.

$bsC\frac{\partial p}{\partial R}$ = increased punishment costs due to probability increasing effects of additional police.

$bsp\frac{\partial C}{\partial R}$ = decrease in punishment costs due to crime decreasing effects of increased police.

$\frac{\partial L}{\partial s}$ = marginal benefit of increased punishment, reduction in social loss.

$\frac{\partial C}{\partial s}$ = marginal reduction in number of crimes due to increased punishment, marginal product of punishment in terms of crime.

bpC = form of punishment times number of punishments administered.

$bsp\frac{\partial C}{\partial s}$ = decrease in punishment costs due to crime decreasing effects of increased punishment.

In the examination that follows (Chapters IV and V) several of the relations identified above will be examined in more detail. One very important set of relations is the elasticity of the supply of a particular crime to changes in p or s, the relations identified as ε_p and ε_s in equation (20). The generalization that certainty is a more important deterrent than severity implies that the value of ε_p is greater than that of ε_s and that criminals are risk preferrers. Also, as Becker demonstrates, optimal public policy will require that enforcement and punishment be in a region where crime does not pay and where it is highly likely that both ε_p and ε_s are less than unity.[20]

In addition, public demands that something (more police and/or stiffer punishments) be done about the crime problem have resulted in new Federal programs aimed at reducing crime. These expenditures of resources can be rationally applied only when knowledge of police effects on costs are known, that is, when there is some knowledge of the relations identified on page 55. Do more police have a significant marginal effect on crime ($\partial C/\partial R$) and does this effect have an appreciable impact on direct crime costs ($\partial V/\partial C$) that will be justified by the costs of the additional police? Underlying this relation, however, is the effect of more police on p and the elasticity of the supply of crimes with respect to p, or ε_p.

Similar matters are of concern when changes in punishments are considered. If much of the cost of imprisonment is fixed irrespective of the length of the term, this assumes the marginal effect of greater punishment ($\partial C/\partial s$) to be small. Once more it becomes necessary to

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[20] Becker, pp. 182-83.

examine an elasticity, in this case ε_s.

Before beginning an examination which attempts to approximate these relations it is worthwhile to introduce the general effect of private anti-crime efforts.

F. Private Expenditures and Defensive Actions

As developed to this point, the model takes no account of private expenditures and defensive actions which may be undertaken to avoid victimization. In this section, activities of a private nature are introduced into the model.

Individuals (or businesses) may expend sums for private police services, watchdogs, locks, alarms, weapons, lighting, and security devices. Such actions make the commission of crime more costly to the offender in two ways. First, the chance of a successful crime is reduced somewhat as the probability of conviction is increased since private police, lights, and alarms increase the chances that law enforcement personnel will be able to apprehend and convict. Private police (security services or watchmen) may detect or detain offenders, provide information, or otherwise generate evidence that can be used by the authorities to obtain a conviction.[21] Lighting, watchdogs, and alarms may have the effect of increasing criminal exposure so as to cause similar results.

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[21] Traditionally, it is assumed that private police play a minor role in the United States. However, the following statement questions this popular belief.

"The security industry itself claims that two out of every three law enforcement officers in the nation are actually on private payrolls."

"Creeping Capitalism," Forbes, September, 1970, p. 22.

One difficulty in interpreting this statement is concerned with those private police duties not directly related to crime control such as answering telephones, watching for fires, courtesy services, etc.

For convenience this aspect of privately obtained protective goods and services that provides some effect on the probability of conviction is referred to as the "apprehension-related" effect.

If private protection goods and services are represented by A and expenditures on them by E, then

$$E = E\ (A), \text{ with } \frac{\partial E}{\partial A} > 0.^{22} \qquad (23)$$

Since the employment of these private resources affects the probability of conviction it becomes necessary to rewrite equation (6) as

$$p = p\ \ (R, E), \frac{\partial p}{\partial E} > 0. \qquad (24)$$

The second way in which private expenditures have an effect on crime is by increasing the resistance of potential victims or targets. This effect increases the cost of committing an offense in several ways. First, the criminal must determine the vulnerability of the target through some form of search and this is itself a costly activity. Second, the increased resistance of some potential targets will at times cause the criminal to choose a different victim, a decision that involves a shifting of resources and introduces an additional cost element to the offender. Finally, if the decision is made to victimize a target with some added element of private protection more of the criminal's resources must be used to overcome the now more resistant target. This general effect of private protective expenditures will

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[22] It is assumed in this section that private expenditures, E, do not depend upon R and s. Though this may not appear accurate for extreme levels of $\bar{R}$ and s, for moderate and generally prevailing levels this assumption appears reasonable. Also, it is assumed that public expenditures are not determined by any awareness of E.

be referred to as a "target-hardening" effect.

When the target-hardening effects of private protective expenditures are introduced equation (1) may be rewritten

$$C = f(p, s, E) = g(R, s, E). \qquad (25)$$

In addition to private expenditures that have an effect on p as well as a direct effect on C (other than through p), individuals might spend money for goods or services that affect their vulnerability to crime without any effect on p. Such items are assumed to impact on the amount of crime exclusively and the relation between E and p of equation (24) would be negligible or zero. It is likely that many private activities and expenditures have effects that are exclusively of a target-hardening type.

In addition to activities involving the use of money there are many actions which a person might undertake that do not involve direct outlays yet have effects similar to those goods and services costing money. Staying off streets at night, avoiding high risk neighborhoods, keeping valuables hidden, and time devoted to securing doors and windows are examples. Although there is no known way to measure the cost of these sacrifices, they may be assumed measurable and included in E.

It may be noted that expenditures of individuals are usually intended to have target-hardening effects and any apprehension-related effects are incidental. For example, people with alarms or watchdogs usually hope that the sound of the alarm will scare the offender away. The use of locks, lights, and visible security personnel will likely have this effect exclusively. However, business expenditures for two-way mirrors and cameras (that are operative) would likely have both effects. And it is quite certain that business alarm systems (such as

ADT) that are silent but connected directly to police stations are intended as apprehension-related expenditures.[23]

In identifying the optimal allocation of law enforcement resources of both a public and private nature it is first necessary to rewrite victim costs of equation (8) as

$$V = V_1 (p, s, E) = V_2 (R, s, E) = V_3 (P, s, E) \tag{26}$$

and punishment costs of equation (10) as

$$S = S (P, s, E). \tag{27}$$

Defining the total social loss function of equation (11) to include private actions provides

$$L = V + P + S + E = V_2 (R, s, E) + P(R) + S(P, s, E) + E. \tag{28}$$

Minimizing the social loss function for both public and private resources results in

$$\frac{\partial L}{\partial R} = \frac{\partial V_2}{\partial R} + \frac{\partial P}{\partial R} + \frac{\partial S}{\partial P}\frac{\partial P}{\partial R} + 0 = 0$$

$$\frac{\partial L}{\partial s} = \frac{\partial V_2}{\partial s} + 0 + \frac{\partial S}{\partial s} + 0 = 0 \tag{29}$$

and

$$\frac{\partial L}{\partial A} = \frac{\partial V_2}{\partial E}\frac{dE}{dA} + \frac{\partial S}{\partial E}\frac{dE}{dA} + \frac{dE}{dA} = 0.$$

Rearranging the last part of equation (29) provides

$$\frac{dE}{dA} = -\frac{dE}{dA}\left[\frac{\partial V_2}{\partial E} + \frac{\partial S}{\partial E}\right]. \tag{30}$$

This indicates that the optimal allocation of private resources results when the marginal cost of private protection $\left(\frac{dE}{dA}\right)$ is equal to

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[23]Nonetheless, even when the device itself fails to scare the offender away as it aids apprehension, this is usually a consequence of failure of target-hardening. Most businesses display signs indicating that a silent alarm system is in use, the clear intent of the sign is target-hardening.

the marginal benefits which consist of reductions in victim costs net of increased punishment costs.[24] But private parties would be very unlikely to consider increased punishment costs in protection decisions. This isolated factor would suggest that there would be overallocation of private protection. However, other opposite effects would likely exist.

If, as is highly likely, private parties consider only their own victim costs there will likely be an underallocation of private protection. The implications of equations (24), (25), and (26) are that apprehension-related private protection resources affect the probability of conviction and therefore the general crime level and society's victim costs. These apprehension-related effects exceed the benefits impacting upon the parties expending sums for protection. Would the parties incurring expenditures take into account all of the reduction in victim costs or only the expected reduction in their own victim costs? If the latter case holds, private protection produces a positive externality and there will be underallocation of private resources.

On the basis of this discussion it would appear that private resources will be allocated at optimum levels only when these resources have effects that are exclusively of a target-hardening type. Whether this is the nature of most private protection is an empirical matter beyond the scope of this paper. Casual observation suggests that

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[24] When there are apprehension-related effects of private resources, $\frac{\partial S}{\partial E} > 0$. Thus for increased A, victim costs fall but punishment costs rise, hence marginal benefits, the right hand side of equation (30), reflects the net effects of decreased victim costs and increased punishment costs.

most private protection is intended as primarily of the target-hardening type.

Based on the above it appears that private resources will be underallocated when they have an apprehension-related effect. However, there was some offset identified in equation (30). Private parties would not likely consider the impact on punishment costs that private acts (apprehension-related) have. This factor alone would tend to lead to overallocation and could offset some of the tendency for underallocation noted above.

Further complications are involved when a relation between public and private activities exists. If private expenditures affect p and hence C, would not public authorities consider private protection activities as parameters in their decisions? And would not private actions be dependent upon public activities? Though these relations were assumed nonexistent earlier (footnote 22), interrelations between private and public expenditures would introduce new problems requiring examination in studies that attempt to fully integrate private protection.

Experience shows that there are usually some localized neighborhood effects that differ somewhat from those identified earlier. Nearly always these are regarded as beneficial effects conferred on those located proximate to the purchaser of private protection.[25] Since it may be assumed that the purchaser fails to take these benefits to his neighbors into account this suggests underprovision as a result.

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[25]When retribution provides satisfaction to the individual spending money for private resources these statements may require modification.

However, a new problem arises when there is a change in crime incidence, a problem of a distributive nature is introduced. It is likely that private protection does benefit the immediate neighborhood but largely at the expense of other areas that will now be victimized. This introduces another complexity.

It may be that private expenditures have an effect only on crime incidence with little or no effect on the amount of crime. For example, individual X may use lights, locks, and private security services to reduce his own victimization from crime. These may reduce his victimization, however, instead of X being victimized Y becomes victimized.

The experience of Chicago in this matter may be relevant to the point being made. Chicago began a battle against alley crime by spending $20 million for lighting alleys in 1969-70. A police survey indicated a thirty percent decrease in after-dark alley crime, but after-dark street crime rose thirty-three percent.[26]

An attempt to minimize the social loss from crime and crime prevention should include attention to private actions to be complete. Nonetheless, the introduction of private actions introduce a number of problems which may lead to imprecise results in the model. It is likely that this is the reason the private sector is so often ignored in economic studies of crime and law enforcement. However, by the introduction of private actions into the model as in this section, it is possible to gain some insight into the matter.

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[26]Raymond A. Joseph, "Let There Be Light: Then Crime Will Fall--If It Doesn't Go Up," Wall Street Journal, January 6, 1970, p. 1.

CHAPTER IV

Economics, unlike the law, is quantitative.

Paul A. Samuelson

CHAPTER IV

IDENTIFICATION OF A SUPPLY OF CRIME FUNCTION

The model developed in Chapter III illustrates the relation between the supply of offenses of a particular type and the expected costs of committing an offense; the probability of conviction (p), and the punishment (s). Based upon the data gathered from forty-eight states, the discussion in this chapter provides estimates of these relationships for the seven Index offenses.

Before journeying far into an empirical investigation of crime, law enforcement, and punishment, it becomes apparent that even the best available sources of data do not provide the desired measures. In many cases, the needed data have been collected only infrequently or not at all. The approach followed in this chapter is highly dependent upon the available measures of p and s. There is clear evidence to support the prediction that within the next several years, much better data, which will enhance the testability of economic models of crime and law enforcement, will be available.[1] At that time, the tentative results of this chapter may require modification.

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[1] Significant contributions are expected from recently established organizations charged with the responsibility to collect such data; namely, the Law Enforcement Assistance Administration (National Institute of Law Enforcement and Criminal Justice Statistics Division), National Council on Crime and Delinquency, and the various state law enforcement planning commissions.

A. Relevant Criminal Justice System

The model in Chapter III identifies two strategic independent variables, p and s, that affect the cost to an offender committing a crime. Identification of values for these variables presupposes a specific jurisdiction in which these values are determined through a criminal justice system involving the processes of apprehension, prosecution, conviction, sentencing, and parole.

The American criminal justice system was not created with a specific design in mind at any one particular time. From the philosophic base that a person may be punished for violation of a law only after proof has been demonstrated through an impartial and deliberative process, layers of institutions and procedures have accumulated. Some were inspired by principles; others resulted from expediency or imitation. The American criminal justice system represents America's own novel adaptation of English common law to the American scene with emphasis on local community determination. As a result, each local community and state has its own criminal justice system; and there is a Federal system as well.[2]

Figure 1 provides a general overview of the criminal justice system in the United States. Generally speaking, the criminal justice system consists of three separately organized yet interdependent divisions: police, courts, and corrections. Identification of a supply of crime as developed in Chapter III requires information

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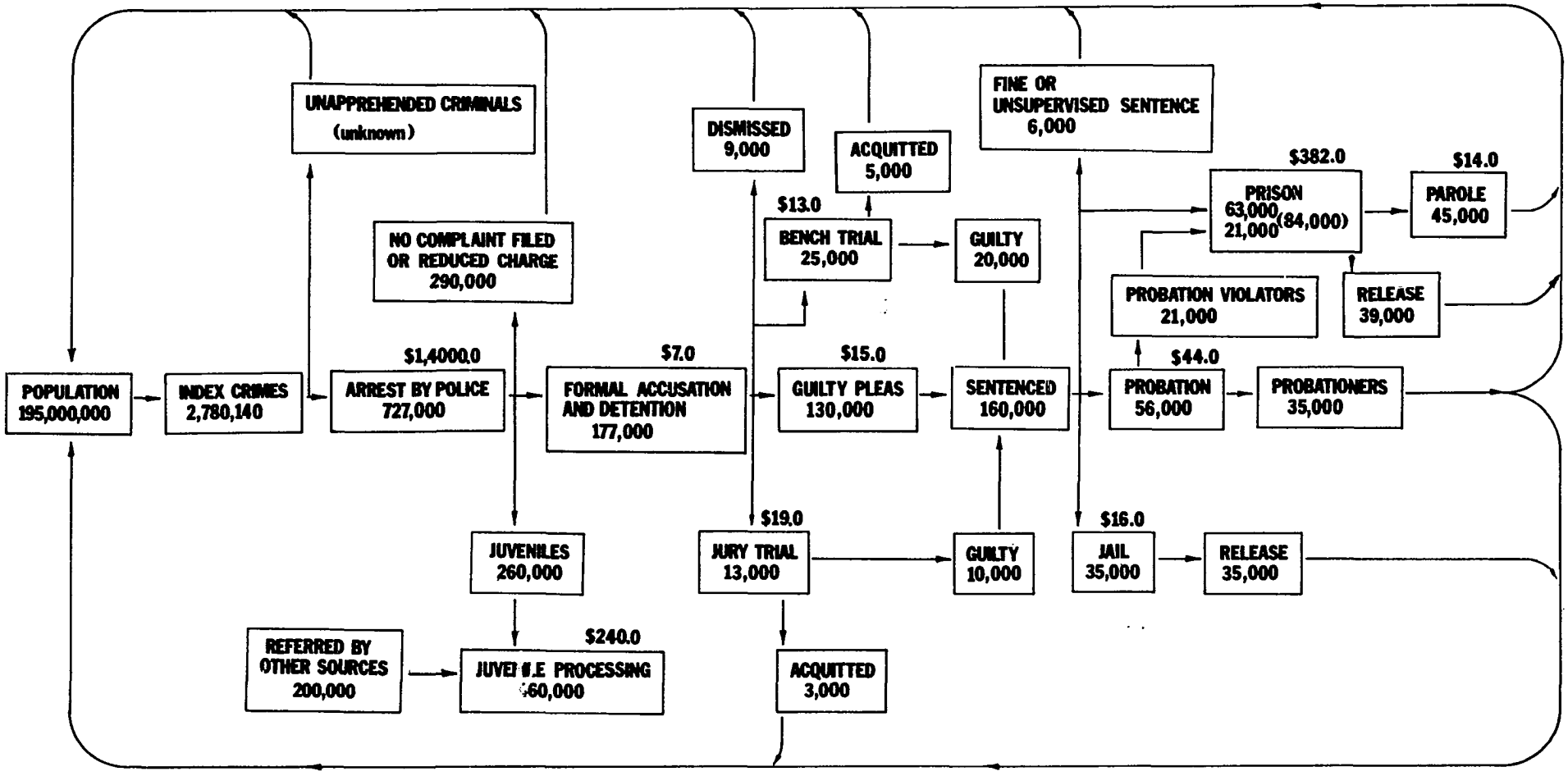
[2]U.S., President's Commission on Law Enforcement and Administration of Justice, The Challenge of Crime in a Free Society, pp. 7-12.

FLOW MODEL OF UNITED STATES CRIMIAL JUSTICE SYSTEM
FOR INDEX OFFENSES DEPICTING FLOW OF INDIVIDUALS
AND DIRECT OPERATING COSTS IN 1965

(Costs in Millions)



Source: Institute for Defense Analyses, Science and Technology, pp.60-61

regarding the values of p and s; and it is here that the first difficulty arises in applying the analysis to a part of the criminal justice system.

The value of the probability of conviction is determined largely by municipalities through their determination of the level of expenditures for law enforcement or police.[3] Determination of the punishment results from an interplay of forces involving prosecution, courts, and correctional organizations with jurisdictional areas that are usually different from those of the police. Thus, one is faced with a situation wherein p and s are determined for different areas of jurisdiction. For this reason, an investigation using p and s is most feasible when using states for observations. Though they may somewhat limit specific application of the theory to the data, there is logical justification for the using of states as they possess identifiable political and institutional uniformity.[4]

Although the model is compatible with all kinds of crime--violent crime, property crime, organized crime, white collar crime, and tax evasion--lack of data prevents an empirical investigation into all types of crime. Acceptable statistics are available for only the seven offenses identified by the Federal Bureau of Investigation as representative of serious crimes, commonly referred to as the Index offenses.

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[3]One harsh way to put this is as follows: "In 1969 the Seattle City Council voted to permit 21 murders, 104 rapes, 962 robberies, 417 assaults, as well as various numbers of lesser crimes, in the first half of 1970."

Douglass C. North and Roger Leroy Miller, The Economics of Public Issues (New York: Harper and Row, 1971), p. 114.

[4]Thomas R. Dye, Politics, Economics and the Public: Policy Out-Comes in the States (Chicago: Rand McNally, 1966), pp. 11-14.

The Index offenses are:

1. Criminal Homicide or Murder--murder and nonnegligent manslaughter: all willful felonious homicides as distinguished from deaths due to negligence. Excludes attempts to kill, assaults to kill, suicides, accidental deaths, or justifiable homicides.

2. Forcible Rape--rape by force, assault to rape, and attempted rape. Excludes statutory offenses (no force used--victim under age of consent).

3. Robbery--stealing or taking things from another by force or violence or by putting in fear, such as strong-arm robbery, stickups, armed robbery, assault to rob, and attempts to rob.

4. Aggravated Assault--assault with intent to kill or for the purpose of inflicting severe bodily injury by shooting, cutting, stabbing, maiming, poisoning, scalding; or by the use of acids, explosives, or other means. Excludes simple assault, assault and battery, fighting, etc.

5. Burglary or Breaking or Entering--burglary, housebreaking, safecracking, or any breaking or unlawful entry of a structure with the intent to commit a felony or a theft. Includes attempts.

6. Larceny or Theft (except auto theft)--(a) of $50 or more in value; (b) of less than $50 in value. Thefts of bicycles, automobile accessories, shoplifting, pocket-picking, or any stealing of property or article of value that is not taken by force and violence or by fraud. Excludes embezzlement, "con" games, forgery, worthless checks, etc.

7. Auto Theft--stealing or driving away and abandoning a motor vehicle. Excludes taking for temporary or unauthorized use by those having lawful access to the vehicle.[5]

Variations among states in definitions of each crime introduce an obstacle that is largely removed by use of this standardized set of definitions used for reporting crime to the FBI. These seven, known as the Index Offenses, are interpreted as the "Crime Index," much like a cost-of-living index used for price changes.

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[5]U.S., Department of Justice, Federal Bureau of Investigation, Uniform Crime Reports--1970 (Washington, D.C.: Government Printing Office, 1971), p. 61. Hereinafter referred to as Uniform Crime Reports.

B. Use of Available State Data to Derive a Supply of Crime Function

In the supply of crime function developed in Chapter III, the dependent variable is the number of crimes of a particular type (C). In the United States the systematic collection of crime statistics has been vested primarily in the FBI. For each year since 1930 the FBI has published the Uniform Crime Reports which present summaries of crime data that have been voluntarily submitted by police departments, sheriff offices, and states. As of 1971 approximately 9200 different jurisdictions covering 91 percent of the population were represented in the Uniform Crime Report. This source and figures provided by the Federal Bureau of Prisons are used to generate values for the variables that are necessary for the examination of this chapter. Due to the lack of standard data for this type of examination, some discussion of the data is desirable.

1. Dependent Variable: Crime--C

The Uniform Crime Reports represent the best available source of information on the dependent variable, C. Nonetheless, there are several problems. In 1958, significant revisions were made in the method of reporting. Increased efforts were made to assure accuracy, thus providing reliable comparisons for only the post-1958 period. To establish acceptable uniformity, offenses are defined broadly enough so that crimes committed under varying statutes of the several states will be included in the same category, while violations of federal law per se

are excluded.[6]

The major deficiency of the data is that only those crimes reported to the police are included. A recent study by the National Opinion Research Center (NORC) of the University of Chicago for the President's Commission on Law Enforcement and Administration of Justice verified the expectation of substantial underreporting to police.[7] Table 2 provides an estimate of the degree of underreporting in different parts of the United States.

Table 3 provides an indication of the possible level of underreporting for the nation as a whole. Auto theft appears to be overreported while all other crimes on which NORC obtained significant information appear to be very much underreported.[8] Especially worthy of note is the evidence that forcible rape appears to occur at more than three and one-half times the reported rate; burglary, three times; aggravated assault and larceny ($50 and over), more than double. Total Index offenses appear to be about double those reported in the Uniform Crime Reports.

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[6] Federal offenses overlapping into state jurisdictions are reported as state offenses. U.S., Staff Report to the National Commission on the Causes and Prevention of Violence, Crimes of Violence, Vol. II. Donald J. Mulvihill and Melvin M. Tumin, Directors (Washington, D.C.: Government Printing Office, 1969), pp. 14-16.

[7] National Opinion Research Center, Criminal Victimization in the United States: A Report of a National Survey, Field Surveys II, Directed by Phillip H. Ennis (Washington, D.C.: Government Printing Office, 1967).

Comparability is facilitated by using offenses per 100,000 population.

[8] There are three reasons for overreporting of auto theft: (1) auto theft insurance policies require notification of police, (2) the likelihood of police finding and identifying the auto is relatively high, and, (3) some reported thefts are cases of misplacing the auto or unauthorized use by a family member, not related to the police after the initial report of auto theft.

TABLE 2

REGIONAL DIFFERENCES IN REPORTING OF INDEX CRIMES AND NORC ESTIMATES OF INDEX CRIMES: 1965-66[a]
(Rate per 100,000 Population)

Crime	Northeast		North Central		South		West	
	NORC Estimate	Uniform Crime Report	NORC Estimate	Uniform Crime Report	NORC Estimate	Uniform Crime Report	NORC Estimate	Uniform Crime Report
Homicide[b]	...	3.4	...	3.5	10	7.7	...	3.9
Forcible Rape	25	7.9	42	10.5	48	10.2	57	16.3
Robbery	139	44.5	85	76.2	48	44.0	133	76.2
Aggravated Assault	164	76.9	233	82.3	173	134.9	361	109.6
Burglary	746	486.5	987	505.8	866	544.6	1,348	894.8
Larceny ($50 and over)	480	365.0	594	319.0	596	305.9	855	573.1
Auto Theft	278	263.2	170	234.7	96	178.7	380	341.2
Total	1,832	1,247.4	2,111	1,232.0	1,837.0	1,236.0	3,134	2,015.1
	(N = 7,911)		(N = 9,411)		(N = 10,398)		(N = 5,266)	

[a] Uniform Crime Report figures are for 1965, NORC estimates for 1965-66.

[b] The NORC homicide sample is too small to be statistically useful for three regions.

Source: National Opinion Research Center, Criminal Victimization in the United States, p. 21.

TABLE 3

ESTIMATED UNDERREPORTING OF INDEX OFFENSES
IN THE UNITED STATES: 1965-66

Crime	NORC Estimated Rate per 100,000 Population (N = 32,966) (1)	Uniform Crime Report Estimated Rate per 100,000 Population: 1965 (2)	λ Uniform Crime Report Rate As Percent of NORC Rate (3)
Homicide	(3.0)[a]	5.1	..
Forcible Rape	42.5	11.6	0.27
Robbery	94.0	61.4	0.65
Aggravated Assault	218.3	106.6	0.49
Burglary	949.1	296.6	0.31
Larceny ($50 and over)	606.5	267.4	0.44
Auto Theft	206.2	226.0	1.10
Total	2,119.6	974.7	0.46

[a]The single homicide in the sample is too small to be statistically useful.

Source: National Opinion Research Center, Criminal Victimization in the United States, p. 8.

There are many reasons for underreporting by victims: a negative view of police effectiveness; lack of time or apathy; feelings that the crime was not a police matter; embarrassment; fear of harm to the offender; and fear of reprisal.[9] The police themselves may be a cause of underreporting as they inadvertently fail to record reports of crime or intentionally underreport to minimize the evidence of crime in their jurisdiction.[10] Systematic underreporting also gives an impression of increased police effectiveness through a higher clearance rate, hence underreporting by police may be self-serving.

The ratio λ in column (3) of Table 3 can be used to adjust the Uniform Crime Reports estimates to eliminate the effects of underreporting. This will not be done when examining state data in this chapter as values for λ are not available by state as of this time. The underreporting factor ($1/\lambda$) may be useful later when examining aggregate crime.

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[9] Ibid., p. 44.

[10] Until 1950, Chicago, with half the population of New York City, reported several times as many robberies as did New York. In 1960 New York discontinued its practice of allowing precincts to handle complaints directly, as a result of the installation of a central reporting system. In the first year of operation of the system, robberies rose 400 percent and burglaries 1300 percent, with both surpassing the number of robberies and burglaries in Chicago! In 1960, Chicago installed a central complaint system of its own and thereafter robberies in Chicago again exceeded those in New York.

Fortunately, the staff of the Uniform Crime Reports uses a careful system of checks to identify units reporting on a different basis from that of previous years and restricts trends to agencies that have had comparable records and reporting practices.

U.S., President's Commission on Law Enforcement and Administration of Justice, Crime and Its Impact--An Assessment, "Task Force on Assessment," (Washington, D.C.: Government Printing Office, 1967), pp. 22 - 23.

As the units of observation are states of differing populations, uniformity in the dependent variable is obtained by dividing the offenses in each state by a population factor to yield offenses per 100,000 population, popularly referred to as the crime rate. C in the regressions refers to this measure.

2. Independent Variable: Probability of Conviction--p

One cost of committing an offense is the probability of conviction (p), a cost that is not directly available. Both the FBI and police authorities emphasize a rate referred to as the clearance rate. A crime is "cleared" when police have identified an offender with sufficient evidence to put him in custody and prefer charges, or when some unusual element precludes formal charges against the accused.[11] Although the clearance rate may bear a relationship with p in the model, this relationship is not known and the clearance rate is not available by state. (Out of necessity, however, the clearance rate is used in the examination of the following chapter.)

As a result the decision was made to compute a value for p using two sources. The FBI Uniform Crime Reports provides data for each year on the number of crimes per state by type of offense. Until recently the Bureau of Prisons provided data on prisoners received from court by state prisons by type of offense for forty-eight states.[12] Recent data on admissions are only available for 1960, 1964, and 1970.

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[11] Uniform Crime Reports--1970, p. 30.

[12] The Law Enforcement Assistance Administration (LEAA) has recently taken over the program and is presently revitalizing the program of prisoner statistics. Data for 1970 was received late and was not as complete as for the years 1960 and 1964. For this reason 1970 is treated in a somewhat limited fashion as compared to 1960 and 1964.

As a result the examination using states will be restricted to those three years.[13]

Using the number of admissions to state prison by crime per state divided by the number of these crimes (C) in the state, a value of p for each state can be conveniently calculated. Though it is expected that the values of p so computed may appear strikingly low for several offenses, the calculated values of p are the best available measure of p.[14]

It is expected that the reliability of the calculated values of p are weakest for forcible rape. For obscure reasons the Federal Bureau of Prisons does not report a separate figure for forcible rape; rather this offense is included in the more general category, "sex offenses."[15]

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[13]U.S., Department of Justice, Federal Bureau of Prisons, National Prisoner Statistics: Characteristics of State Prisoners, 1960 (Washington, D.C.: Government Printing Office, 1965).

_____, National Prisoner Statistics: State Prisoners: Admissions and Releases, 1964 (Washington, D.C.: Government Printing Office, 1967).

_____, National Prisoner Statistics: State Prisoners: Admissions and Releases, 1970 (Washington, D.C.: Government Printing Office, 1972).

Hereinafter these are referred to as National Prisoner Statistics. Data for Alaska and New Jersey are not reported.

[14]The denominator, C, presents two problems. First, there is measurement error in C as the NORC survey demonstrates. This error is not random but consists of systematic understatement of the true value of C for all crimes except auto theft. Nonetheless, as long as the discussion proceeds in terms of "known" crimes, it is not expected that this factor will be unduly troublesome.

Second, the dependent variable is the crime rate per 100,000 while the denominator of p is the number of crimes. Thus, the dependent variable and p are not completely independent and some bias is anticipated.

[15]Sex offenses include forcible rape, statutory rape, indecent assault, carnal abuse, sodomy, adultery, cohabitation, incest, indecent liberties, indecent exposure, lewdness (male), peeping Tom, seduction, soliciting (male), commercialized vice, pandering, obscenity, and pornography. National Prisoner Statistics: 1960, p. 8.

Although breakdowns of more specific offenses within this category are not available by state, forcible rape comprises more than eighty-five percent of all admissions to state prison for sex offenses and this measure is therefore used as a representation for forcible rape convictions.

Comparison of the average calculated value for p by offense with a figure calculated from the Uniform Crime Reports is presented in Table 4. The values calculated for this paper using National Prisoner Statistics are generally lower than those derived from the Uniform Crime Reports.[16] The values calculated for this paper are substantially lower for robbery, aggravated assault, burglary, larceny, and auto theft. Several reasons for these disparities are evident: (1) police reporting of court action is questionable as most police departments do not systematically record final disposition of cases, and, (2) the clearance rates, from which the FBI estimates are calculated, are often inflated. These would suggest that the FBI figures are inaccurate and would overstate the value of p.

It is possible to provide some support for the values of p calculated from Bureau of Prisons data in several ways. First, the President's Commission independently calculated an "overall" value of p, basically an average value of p for all offenses. Using comprehensive court records and offense data the President's Commission estimated an average value for p of between 2.5 and 5.0 percent in 1965.[17] The

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[16]The values that can be calculated from the Uniform Crime Reports are based on a sample of cities over 25,000 population.

[17]U.S., President's Commission on Law Enforcement and Administration of Justice, Science and Technology, "Task Force on Science and Technology," (Washington, D.C.: Government Printing Office, 1967), p. 55.

TABLE 4

COMPARISON OF CALCULATED PROBABILITY
WITH FBI ESTIMATE BY OFFENSE: 1960, 1964, AND 1970

	1960		1964		1970	
Crime	Calculated	FBI Est.	Calculated	FBI Est.	Calculated	FBI Est.
Homicide	0.42	0.58	0.45	0.42	0.38	0.35
Forcible Rape	0.38	0.38	0.28	0.21	0.11	0.16
Robbery	0.13	0.25	0.11	0.15	0.07	0.07
Aggravated Assault	0.08	0.27	0.04	0.26	0.02	0.17
Burglary	0.03	0.13	0.03	0.07	0.01	0.04
Larceny	0.03	0.11	0.02	0.06	0.006	0.06
Auto Theft	0.02	0.14	0.01	0.06	0.004	0.03

Sources: Federal Bureau of Prisons, National Prisoner Statistics: 1960, p. 41.

Federal Bureau of Prisons, National Prisoner Statistics: 1964, p. 17.

Federal Bureau of Prisons, National Prisoner Statistics: 1970, pp. 47-81.

Federal Bureau of Investigation, Uniform Crime Reports-1960, pp. 85-86.

Federal Bureau of Investigation, Uniform Crime Reports-1964, p. 101.

Federal Bureau of Investigation, Uniform Crime Reports-1970, p. 115.

(weighted) average for p using Bureau of Prisons data and FBI offense figures is 2.8 percent for 1960 and 2.0 percent in 1964. These appear much closer to the President's Commission figures than do FBI probability (weighted) averages of over 10 percent for these two years. The figures of the President's Commission are considered the most authoritative in the field.

Secondly, the FBI figure is a probability of conviction that does not take account of the punishment. Many times the charge is reduced or the penalty is not prison but probation. A reference to Figure 1 will verify the many alternatives. For the past few years the FBI has provided a breakdown of case disposition from a sample of large cities. Table 5 provides a summary of this information for 1970. It may be noted that estimates of p taken from this information for 1970 are significantly lower than were those of 1960 and 1964.

Comparison of these FBI estimates and the calculated values for aggravated assault, burglary, larceny, and auto theft shows substantial differences (Table 4). However, these are the offenses for which suspended sentences, probation, and (although infrequently) fines are more likely. In addition, in the case of auto theft many offenses (about half) of all auto thefts are committed by juveniles, and juveniles are far less likely to be sent to prison for this offense.

For these reasons and due to the fact that there is no other source for values of p for states, calculated values of p using Bureau of Prisons data are used in the examination.

In the calculation of p in this paper there was no way to take multiple crimes into account, one admission to prison may clear several crimes. As there is not reason to assume this factor differs among

TABLE 5

CLEARANCES, ARRESTS, AND GUILTY PER 100 CRIMES, BY TYPE OF CRIME: 1970[a]

Crime	Cleared	Arrests	Guilty As Charged	Guilty of Lesser Offense	Total Guilty
Homicide	85.6	102.0	25.9	9.0	34.9
Forcible Rape	56.2	51.3	10.4	5.3	15.7
Robbery	27.7	32.1	5.7	1.6	7.3
Aggravated Assault	66.3	49.6	12.7	4.7	17.4
Burglary	18.6	16.0	2.6	0.9	3.5
Larceny	17.4	18.2	5.6	0.4	6.0
Auto Theft	16.5	16.3	2.3	0.6	2.9
Total Index Offenses	19.8	19.2	4.8	0.8	5.6

[a]Based on a sample of 2221 cities with total population of 59,532,000.

Source: Federal Bureau of Investigation, Uniform Crime Reports-1970, p. 115.

states it need not introduce any complication.

As long as the cost of committing an offense is considered as the chance of going to prison, the calculated values of p are appropriate. In this framework, police harassment, jail, trials, suspended sentences, and probation are part of the disutilities of the trade currently not quantifiable.[18] It is assumed that these do not differ substantially from state to state.

3. Independent Variable: Punishment--s

The second component of cost to the offender, punishment (s), is the prison term an offender receives if caught and convicted. Table 6 provides an indication of the sentences received for the Index offenses; however, there is often a substantial disparity between the sentence and the time actually served.

It can be safely assumed that the expected cost of punishment is accurately reflected by the time a convicted offender actually expects that he will be required to serve. The best information on this cost is the term presently being served for the same offense in the state before being released.

The Bureau of Prisons has published by state for 1960, 1964, and 1970 the median time served before (first) release for each offense. This has been chosen as the best estimate of s by reason of its relation to the actual punishment.[19] The contrast between sentences and actual

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[18]Jails typically contain misdemeanants and those awaiting trial.

[19]Values for sentences are reported for the same states as the information on admissions. However, median time served is not reported for those offenses in a state where less than ten were released. Data for 1970 were presented in somewhat different form, for this reason they are not included in Tables 6 and 7.

TABLE 6

MEDIAN SENTENCE BY TYPE SENTENCE AND
MEDIAN TIME SERVED BEFORE FIRST RELEASE,
BY OFFENSE: 1960
(IN MONTHS)

Crime	Median of Definite Sentence	Median of Maximum of Indeterminate Sentence	Median Time Served by First Release in 1960
Homicide	235.1	188.0	52.0
Forcible Rape	70.8	146.9	30.0
Robbery	97.6	166.0	33.9
Aggravated Assault	34.2	79.2	19.5
Burglary	43.1	100.5	20.4
Larceny	29.9	68.1	16.7
Auto Theft	32.1	89.8	18.9
All Offenses	77.5	119.8	27.3

Source: Federal Bureau of Prisons, National Prisoner Statistics: 1960, pp. 25, 69.

times served before release may be noted through comparisons used in Table 6. Similar comparisons are not directly available for the year 1970.

An additional advantage of using the actual time served is that while sentences are determined by a number of courts in a state and these sentences may vary widely among different jurisdictions, paroles account for nearly two-thirds of all releases.[20] Paroles are typically granted by a single agency in a state, thus introducing an element of uniformity in the measure of punishment in the state.

Table 7 provides an indication of differences in punishments for different crimes among states and the median (of the median) for all states in two of the years under examination.

4. Expected Values vs. True Values of p and s

To this point the discussion has centered on identification of reliable estimates of the true values of p and s. The model assumes that it is the offender's "impression," and not necessarily the true values of p and s that matters. As evidenced by the paucity of published information of these measures of costs to the offender, it is highly doubtful if even law enforcement personnel in a state are aware of these values for their own jurisdiction.[21] Can one assume potential

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[20] Federal Bureau of Prisons, National Prisoner Statistics: 1960, p. 1, and National Prisoner Statistics: 1964, p. 4.

[21] One reason for not increasing information on these values is that they appear substantially lower than popular impressions. Wider dissemination of the chances of a successful criminal act (except homicide and rape) could encourage criminal acts.

Leonard Goodman, Trudy Miller, and Paul Deforest, A Study of the Deterrent Value of Crime Prevention Measures as Perceived by Criminal Offenders (Washington, D.C.: Bureau for Social Science Research, 1966), pp. B 1-22.

TABLE 7

RANGE AND MEDIAN OF MEDIAN TIME SERVED
BY FIRST RELEASE BY OFFENSE FOR STATES: 1960 AND 1964[a]
(IN MONTHS)

Crime	1960		1964	
	Range[b]	Median of All States	Range[b]	Median of All States
Homicide	23.1 - 180	52.0	15.9 - 180	48.5
Forcible Rape	11.3 - 57.0	30.0	11.1 - 180	31.4
Robbery	17.9 - 68.4	33.9	7.2 - 180	36.1
Aggravated Assault	8.4 - 37.3	19.5	8.2 - 32.7	21.3
Burglary	10.7 - 32.3	20.4	10.0 - 42.0	20.1
Larceny	5.1 - 25.8	16.7	7.4 - 28.0	16.5
Auto Theft	7.5 - 30.4	18.9	6.7 - 37.4	17.9
Average		27.3		27.4

[a]Medians for states are provided only where the number of releases is ten or more.

[b]Medians greater than 180 months are reported as 180 months.

Source: Federal Bureau of Prisons, National Prisoner Statistics: 1960, p. 69 and National Prisoner Statistics: 1964, p. 52.

offenders have knowledge of these costs?

There is reason to assume that in general those engaging in criminal acts are much more knowledgeable than the general public as to the chances of conviction and punishment. In nearly all forms of behavior participants are more aware of the consequences than non-participants.

In a survey of new inmates at the Lorton Reformatory in Virginia, a number of interesting points in this regard were brought into light. Although nearly all inmates indicated that they were not impressed with new techniques of police or numbers of police, seventy-seven percent had at times thought of committing a crime but decided against it largely out of fear of apprehension or prison. Ninety-four percent of the inmates knew the maximum sentence and eighty-one percent the minimum for the offense for which they had been committed. Fifty-seven percent of the inmates knew the maximum sentence for burglary (versus seven percent for the control group) and seventy-four percent of the inmates knew the maximum sentence for auto theft (versus twenty-four percent for the control group): these two being the most common crimes for inmates at Lorton.

Though it is not necessary for offenders to know the true value of the two components of cost, their perception does appear to bear a relation with the true values. As it is difficult to determine the perceived values in any case, the actual values of the variables must be used in any empirical work.

C. Regression Results

Economic theory does not suggest a specific functional form for regression purposes. In this investigation the two basic models are

used. The first is a multiple linear regression model using the values of the variables as calculated by simple arithmetic operations which have been described. The second model is the Cobb-Douglas type, a simple exponential form of a multiplicative model.

1. Multiple Linear Model

Multiple linear regression was used to determine how the crime level (C) for each offense responded to changes in the probability of conviction (p) and punishment (s). A least-squares multiple linear regression program of the form

$$C = a + B_1 p + B_2 s + u \qquad (1)$$

was applied to the data described earlier in this chapter.[22] The resulting summary statistics for 1960, 1964, and 1970 appear in Tables 8, 9, and 10 respectively. Significance at the 0.05 or 0.01 level is indicated by * and ** respectively.

As was expected, the parameter estimates for probability, which may be interpreted as partial derivatives, are negative for all seven Index offenses for each of the three years. The parameter estimates for punishment are negative for all three years for homicide, forcible rape, and robbery. The coefficients are negative in two of the three years for aggravated assault and burglary, negative in 1964 alone for larceny, and positive in all three years for auto theft. In all cases the absolute value of the coefficient for probability is much greater than

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[22]The specific program used was the IBM System/360 Scientific Subroutine Program Version III for multiple linear regression.

TABLE 8

REGRESSION RESULTS: 1960

Crime and Variable		Mean	Standard Deviation	(Intercept) Regression Coefficient	Computed t	Multiple Correlation Coefficient	Coefficient of Determination	Standard Error of Estimate	F-value for Analysis of Variance
Homicide									
N=39	C	5.7179	3.5546	(10.10287)					
	p	0.4236	0.1306	- 5.3519	1.28	0.404	0.164	3.34	3.52
	s	62.9128	35.1813	- 0.0337*	2.17				
Forcible Rape									
N=42	C	7.5119	3.7378	(12.31177)					
	p	0.3775	0.2536	- 8.8350**	3.96	0.549	0.302	3.20	8.43
	s	29.0690	9.9985	- 0.0504	0.89				
Robbery									
N=43	C	38.3627	28.9750	(84.80873)					
	p	0.1258	0.0567	- 263.2688**	3.72	0.511	0.261	25.53	7.05
	s	12.0532	12.0532	- 0.3891	1.17				
Aggravated Assault									
N=41	C	58.7195	42.2600	(63.98930)					
	p	0.0822	0.1594	- 88.5168*	2.01	0.341	0.116	40.76	2.50
	s	20.1975	7.1255	0.0993	0.10				
Burglary									
N=48	C	412.9192	175.3752	(587.38403)					
	p	0.0332	0.0169	-4,784.7773**	3.13	0.450	0.203	160.06	5.71
	s	19.3166	5.5083	- 0.8055	0.17				
Larceny									
N=44	C	241.2832	102.4515	(278.52612)					
	p	0.305	0.0240	-1,553.7588*	2.25	0.378	0.143	97.14	3.42
	s	16.6477	4.9251	0.6103	0.18				
Auto Theft									
N=30	C	169.6763	69.9333	(158.47983)					
	p	0.0177	0.0157	-1,886.9668**	2.50	0.513	0.264	62.19	4.83
	s	17.6333	5.8194	2.5279	1.24				

TABLE 9

REGRESSION RESULTS: 1964

Crime and Variable		Mean	Standard Deviation	(Intercept) Regression Coefficient	Computed t	Multiple Correlation Coefficient	Coefficient of Determination	Standard Error of Estimate	F-value for Analysis of Variance
Homicide									
N=37	C	5.0351	2.7428	(8.87412)					
	p	0.4541	0.1082	- 7.0785	1.63	0.289	0.083	2.70	1.55
	s	68.4648	55.4351	- 0.0091	1.08				
Forcible Rape									
N=47	C	9.2681	3.9734	(13.74455)					
	p	0.2827	0.1995	- 12.9410**	5.39	0.631	0.398	3.15	14.56
	s	36.2595	31.9606	- 0.0243	1.51				
Robbery									
N=44	C	42.4113	33.4538	(88.48712)					
	p	0.1117	0.0602	- 325.2266**	4.30	0.560	0.313	28.39	9.35
	s	44.4113	38.2478	- 0.2178*	1.83				
Aggravated Assault									
N=41	C	83.5560	46.0093	(114.64116)					
	p	0.0409	0.0575	- 365.5979**	2.76	0.416	0.173	42.93	3.97
	s	21.1682	7.4008	- 0.7614	0.74				
Burglary									
N=48	C	519.2778	204.4494	(664.27759)					
	p	0.0258	0.0140	-7,156.1172**	3.46	0.517	0.267	178.90	8.19
	s	19.5062	5.8890	2.0393	0.42				
Larceny									
N=44	C	343.5877	153.5367	(452.22583)					
	p	0.0187	0.0136	-4,924.6953**	2.75	0.420	0.177	142.68	4.40
	s	16.2318	5.3388	- 1.0069	0.22				
Auto Theft									
N=34	C	214.2521	87.0032	(251.63846)					
	p	0.0124	0.0102	-4,186.4375**	3.08	0.513	0.264	77.04	5.55
	s	17.5323	7.7641	0.8328	0.47				

TABLE 10

REGRESSION RESULTS: 1970

Crime and Variable		Mean	Standard Deviation	(Intercept) Regression Coefficient	Computed t	Multiple Correlation Coefficient	Coefficient of Determination	Standard Error of Estimate	F-value for Analysis of Variance
Homicide									
N=33	C	6.4909	3.8385	(12.48936)					
	p	0.3806	0.1224	- 10.4678*	2.11	0.504	0.254	3.42	5.12
	s	48.2121	37.8003	- 0.0418**	2.60				
Forcible Rape									
N=33	C	15.3394	7.2949	(24.53290)					
	p	0.1087	0.0809	- 56.6762**	4.07	0.605	0.366	6.00	8.64
	s	36.8182	29.6431	- 0.0825*	2.17				
Robbery									
N=33	C	96.9059	98.9167	(189.48749)					
	p	0.0647	0.0533	- 991.0107**	3.20	0.507	0.257	88.05	5.19
	s	35.4849	28.3175	- 0.8011	1.38				
Aggravated Assault									
N=33	C	124.2120	63.1959	(162.23665)					
	p	0.0218	0.0136	- 1,103.6846	1.25	0.234	0.055	63.45	0.87
	s	22.4545	16.5361	- 0.6222	0.86				
Burglary									
N=33	C	908.9653	367.9424	(1,268.79150)					
	p	0.0104	0.0071	-31,873.9805**	3.97	0.602	0.362	303.49	8.52
	s	19.5454	10.2411	-1.4464	0.26				
Larceny									
N=33	C	777.0288	309.1184	(896.49878)					
	p	0.0059	0.0048	-23,383.2461*	2.07	0.381	0.146	295.13	2.55
	s	17.7879	14.0239	1.0865	0.28				
Auto Theft									
N=33	C	360.4409	211.1077	(366.55469)					
	p	0.0043	0.0060	- 9,286.4883	1.52	0.304	0.092	207.74	1.52
	s	19.4242	15.5444	1.7603	0.74				

the coefficient for punishment.[23] Before attaching much importance to these coefficients it is necessary to examine the significance of the estimates.

The use of computed values for Student's t allows statements on the significance of the parameter estimates.[24] The following listing indicates the cases where the significance level exceeds 0.85.

		1960	1964	1970
Homicide	p	---	.90	.95
	s	.95	---	.99
Forcible Rape	p	.99	.99	.99
	s	---	.90	.95
Robbery	p	.99	.99	.99
	s	.85	.95	.90
Aggravated Assault	p	.95	.99	.85
	s	---	---	---
Burglary	p	.99	.99	.99
	s	---	---	---
Larceny	p	.95	.99	.95
	s	---	---	---
Auto Theft	p	.99	.99	.90
	s	.85	---	---

At the 5 percent level punishment is significant in only four cases out of twenty-one and does not appear to be continuously significant

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[23] At this point interpretation of the coefficient is somewhat confusing and may not be very useful. For example, in 1964 the coefficient for homicide in p is -7.0785. This means, ceteris paribus, a one unit increase in p will result in a predicted decrease in C of 7.0785 per 100,000 population. The coefficient on s of -0.0091 may be interpreted to mean that the model predicts a 0.0091 decline in C when s is increased by one month. But, p has a range of only 0 to 1 and cannot (in nearly all cases) be increased by 1. Interpretation may be aided if changes in p of .1 are considered, this change would lead to a predicted change in C of .70785. The second set of regressions which develop elasticities will remedy this problem of interpretation.

[24] $t = \frac{b_j}{s_{b_j}}$

for any individual offense for the years studied. This result, which is not totally unsuspected, should suggest caution when examining the proposals that increased prison terms be used as a means of reducing crime. At best the deterrent value of punishment appears minimal and is statistically insignificant at the conventional level of significance for most cases.

Quite a different picture emerges when viewing the coefficient for p. In all but four of the twenty-one cases the coefficient is significant at the 5 percent level.[25] As expected, identifying a relation between probability and offense level is weakest for homicide, the offense criminologists consider least rational due to its association with passion. For unknown reasons the relation between probability and offense levels for aggravated assault and auto theft are not significant for 1970.[26]

However, the coefficient for forcible rape, robbery, and burglary is always significant at 1 percent and for larceny it is always significant at 5 percent or less. This suggests that this model identifies probability as an explanatory factor for these particular offenses.

Although this approach allows for statements regarding the relation between certainty (p), severity (s), and offenses (C), how much

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[25]The exceptions are homicide in 1960 and 1964, aggravated assault in 1970, and auto theft in 1970.

[26]Data on auto theft and aggravated assault are more questionable than for the other offenses. This is due to the number of juveniles involved, alternative punishments used such as probation, and in the case of auto theft the fact that it becomes a Federal crime if the stolen auto crosses a state line.

In addition, the data for 1970 are less complete and less detailed than for 1960 and 1964. For these reasons 1970 is examined less intently in this chapter.

of the variance in offense rates is "explained" by the two independent variables? The fraction of the variance in offense rates explained by the two explanatory variables is summarized by the values for the coefficient of determination (R^2) as shown in the listing below (partial correlation coefficients appear in parentheses).

		1960		1964		1970	
Homicide	(p)	.16	(-.23)	.08	(-.23)	.25	(-.29)
	(s)		(-.35)		(-.11)		(-.38)
Forcible Rape	(p)	.30	(-.54)	.40	(-.61)	.37	(-.52)
	(s)		(.15)		(-.02)		(-.12)
Robbery	(p)	.26	(-.49)	.31	(-.51)	.26	(-.46)
	(s)		(-.07)		(-.07)		(-.05)
Aggravated Assault	(p)	.12	(-.34)	.17	(-.40)	.06	(-.18)
	(s)		(.15)		(.09)		(-.08)
Burglary	(p)	.20	(-.45)	.27	(-.51)	.36	(-.60)
	(s)		(.17)		(.27)		(.16)
Larceny	(p)	.14	(-.38)	.18	(-.42)	.15	(-.38)
	(s)		(.19)		(.16)		(.15)
Auto Theft	(p)	.26	(-.47)	.26	(-.51)	.09	(-.21)
	(s)		(.31)		(.19)		(.15)

These relatively modest R^2 values were not unexpected. This is especially the case when realizing that most of the explanation is from a single independent variable, probability. The computed F value may be used to evaluate the regression equations as a whole, this examination would parallel earlier discussion quite closely.[27] Likewise, the

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[27] If high R^2s are desired all that is required is the addition of independent variables representing taste variables such as: income, unemployment level, percent nonwhite population, population mobility, educational levels, etc. The inclusion of these taste variables, however, destroys the identification of control variables within a complete model as was explained earlier.

Critical values for F are approximately 3.3 at 5 percent and 5.3 at 1 percent (for 2 and N-3 degrees of freedom). F0.05 (2.45) and F0.01 (2. 45).

standard error of the estimate may be used to obtain an impression of the amount of slippage that exists in the ability of the regressions to account for variations in offense levels. As what may be a more fruitful form of examination remains to be examined it is not necessary to elaborate any further on the statistics for the initial regression.

2. Cobb-Douglas Form

In an attempt to render the results of this investigation in a form more useful for evaluation and policy purposes, the decision was made to derive parameter estimates using a different functional form. The exponential form of a multiplicative form known as the Cobb-Douglas model was used. This simple linear model was chosen by virtue of its simplicity, popularity among economists, the fact that the coefficients generated provide convenient estimates of constant elasticity directly, and the recognition that economic theory does not suggest any alternative form for this type of study.

Due to problems in obtaining data for 1970, regressions using natural logs were run on the 1960 and 1964 data only. The results of the multiple linear regression model of the form

$$\ln C = \ln a + B_1 \ln p + B_2 \ln s + \ln u \qquad (2)$$

appear in Tables 11 and 12. In this form the parameter estimates indicate the percentage change in offense rate expected as a result of a one percent change in the independent variable, p or s.

The parameter estimates for p are always negative with absolute values ranging between 0.16 and 0.997 which represent an inelastic response to changes in p for all offenses. This leads to the suggestion that while the supply of offenses responds to changes in p, the supply of offenses is not highly responsive. The parameter estimate for s is

TABLE 11

ELASTICITY ESTIMATES: 1960

Crime and Variable		Mean	Standard Deviation	(Intercept) Regression Coefficient	Computed t	Multiple Correlation Coefficient	Coefficient of Determination	Standard Error of Estimate	F-value for Analysis of Variance
Homicide									
N=39	C	1.5022	0.7721	(3.99021)					
	p	-0.9062	0.3164	-0.7262 *	2.11	0.536	0.288	0.6695	7.27
	s	4.0263	0.4668	-0.4470 **	3.35				
Forcible Rape									
N=42	C	1.8919	0.5196	(1.26739)					
	p	-1.1677	0.6225	-0.5002 **	4.19	0.603	0.364	0.4250	11.14
	s	3.3103	0.3558	0.0121	0.06				
Robbery									
N=43	C	3.4214	0.6760	(2.12002)					
	p	-2.1794	0.4782	-0.7750 **	4.04	0.540	0.292	0.5829	8.24
	s	3.4820	0.3181	-0.1113	0.39				
Aggravated Assault									
N=41	C	3.7589	0.8752	(2.86556)					
	p	-3.0851	0.9492	-0.7100 **	5.83	0.728	0.530	0.6156	21.42
	s	2.9447	0.3577	0.3305	1.45				
Burglary									
N=48	C	5.9428	0.4011	(4.70770)					
	p	-3.5430	0.5549	-0.3237 **	2.98	0.459	0.210	0.3643	5.99
	s	2.9210	0.2871	0.0302	0.14				
Larceny									
N=44	C	5.4017	0.4176	(4.91884)					
	p	-3.7748	0.7967	-0.2489 **	2.89	0.423	0.179	0.3875	4.48
	s	2.7632	0.3323	-0.1653	0.80				
Auto Theft									
N=30	C	5.0614	0.3804	(4.11069)					
	p	-4.3982	0.9325	-0.1988 **	2.74	0.497	0.247	0.3421	4.42
	s	2.8127	0.3533	0.0271	0.14				

TABLE 12

ELASTICITY ESTIMATES: 1964

Crime and Variable		Mean	Standard Deviation	(Intercept) Regression Coefficient	Computed t	Multiple Correlation Coefficient	Coefficient of Determination	Standard Error of Estimate	F-value for Analysis of Variance
Homicide									
N=37	C	1.4484	0.6199	(1.10433)					
	p	-0.8160	0.2323	-0.9000*	2.01	0.325	0.106	0.6032	2.01
	s	3.9923	0.6428	-0.0978	0.60				
Forcible Rape									
N=47	C	2.1263	0.4754	(1.78761)					
	p	-1.4454	0.5864	-0.6327**	6.72	0.720	0.519	0.3371	23.73
	s	3.4205	0.5102	-0.1684	1.56				
Robbery									
N=44	C	3.4904	0.7344	(2.13137)					
	p	-2.3260	0.5240	-0.9965**	5.32	0.646	0.417	0.5742	14.67
	s	3.6143	0.5498	-0.2653	1.49				
Aggravated Assault									
N=41	C	4.2432	0.6616	(2.73514)					
	p	-3.6066	0.8088	-0.5436**	4.22	0.620	0.385	0.5325	11.87
	s	2.9922	0.3570	-0.1513	0.52				
Burglary									
N=48	C	6.1801	0.3845	(4.88074)					
	p	-3.8345	0.6577	-0.2899**	3.38	0.521	0.272	0.3353	8.40
	s	2.9295	0.2882	0.0641	0.33				
Larceny									
N=44	C	5.7533	0.4186	(4.99136)					
	p	-4.3747	1.0697	-0.1595**	2.73	0.414	0.171	0.3903	4.23
	s	2.7321	0.3408	0.0236	0.13				
Auto Theft									
N=34	C	5.2933	0.3886	(4.32455)					
	p	-4.8620	1.1731	-0.2147**	4.56	0.639	0.408	0.3084	10.69
	s	2.7259	0.6389	-0.0276	0.32				

always less than that of the corresponding estimate for p (in absolute value), and in six cases the parameter estimate for punishment is positive.

Before attaching too much importance to the elasticity estimates it is necessary to examine the significance levels of the estimates. Again, the 0.05 and 0.01 significance levels are indicated by * and ** respectively in Tables 11 and 12. The following listing provides a summary of the level of significance for the seven offenses in 1960 and 1964, for those cases where the significance level exceeds 0.85.

		1960	1964
Homicide	p	.95	.95
	s	.99	---
Forcible Rape	p	.99	.99
	s	---	.90
Robbery	p	.99	.99
	s	---	.90
Aggravated Assault	p	.99	.99
	s	.90	---
Burglary	p	.99	.99
	s	---	---
Larceny	p	.99	.99
	s	---	---
Auto Theft	p	.99	.99
	s	---	---

Probability is always significant at the 5 percent level for homicide and at the 1 percent level for the remaining six offenses. Much less certain results appear for punishment. In one of the years punishment is significant for homicide at 1 percent, and in one of the years punishment is significant at 10 percent for forcible rape, robbery, and aggravated assault. Again, these results appear to be in line with a priori expectations regarding the relative roles played by certainty and

severity. Certainty always appears to be a significant determinant of the crime level while severity is much less significant, at the conventional levels of significance. It is possible to say that the probability of conviction is a determinant of the crime level for each of the seven Index offenses (at the 0.05 level).

It is again worthwhile to examine the percent of the variation in offense levels explained by this pair of variables. The listing below indicates values of R^2 for each regression with partial correlation coefficients in parentheses.

		1960		1964	
Homicide	p	.29	(-.26)	.11	(-.31)
	s		(-.45)		(-.01)
Forcible Rape	p	.36	(-.60)	.52	(-.70)
	s		(.28)		(.16)
Robbery	p	.29	(-.54)	.42	(-.62)
	s		(.06)		(.12)
Aggravated Assault	p	.53	(-.71)	.39	(-.62)
	s		(.33)		(.31)
Burglary	p	.21	(-.46)	.27	(-.52)
	s		(.23)		(.30)
Larceny	p	.18	(-.41)	.17	(-.41)
	s		(.11)		(.14)
Auto Theft	p	.25	(-.50)	.41	(-.64)
	s		(.19)		(.11)

The R^2s are with two very minor exceptions greater than was the case for the first model used.[28] Again, most of the explained variation in the crime level is due to the single explanatory variable, probability.

One of the goals of this section is to predict the impact of

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[28]The exceptions are auto theft in 1960 (a 1 percent difference) and larceny in 1964 (again a 1 percent difference).

changing levels of law enforcement on the crime level. For this purpose it is desirable to construct a confidence interval for probability. Using the standard error for the coefficient for probability at a 95 percent confidence interval it is possible to establish the estimated percentage change in C for a one percent change in p. Only 1964 is examined for this purpose and the liberty of some rounding facilitates the use of these estimates in later discussion. In each case the interval represents the percent change in the offense level expected when p changes by one percent. These estimates are shown in Table 13.

The confidence interval is quite wide for homicide and may not be useful for serious discussion of the expected change in the homicide level due to a change in the value of p. However, in order to maintain the completeness of the discussion the examination will continue to be in terms of all seven Index offenses.

It is questionable if law enforcement authorities are in a position to attempt an increase in p as exacting as one percent, this is a very small change that would, from a practical viewpoint, very unlikely be a policy target.

It is possible that added manpower, equipment, and support could be used to attempt to achieve something in the order of a ten percent increase in p. How many additional convictions would be necessary to result in a ten percent increase in p and how much would the crime level be affected? Table 14 provides some tentative answers to these questions. In 1964 the average population per state was used to estimate offenses, convictions, change in convictions per ten percent change in p, and the resultant (anticipated) change in number of offenses for a typical

TABLE 13

ESTIMATED EFFECT OF A ONE PERCENT CHANGE IN PROBABILITY ON THE OFFENSE LEVEL, BY OFFENSE, AT 95 PERCENT CONFIDENCE IN 1964

Offense	Regression Coefficient	Standard Error of Regression Coefficient	Percent Change in C
Homicide	-0.90	0.45	0.01 to -1.81
Forcible Rape	-0.63	0.09	-0.45 to -0.81
Robbery	-1.00	0.19	-0.62 to -1.38
Aggravated Assault	-0.54	0.13	-0.28 to -0.80
Burglary	-0.29	0.09	-0.11 to -0.47
Larceny	-0.16	0.06	-0.04 to -0.28
Auto Theft	-0.22	0.05	-0.12 to -0.32

TABLE 14

ESTIMATED EFFECT ON NUMBER OF OFFENSES OF A TEN PERCENT CHANGE IN PROBABILITY OF CONVICTION FOR AN AVERAGE STATE, BY OFFENSE: 1964[a]

Offense	Convictions	Offenses	Additional Convictions Required (for 10% change)	Original Offense Rate	Range of Expected Change in Rate (95%)	Range of Expected Change in Number of Offenses[b]	Best Estimate
Homicide	79	185	8	4.400	0.00	0	
					-0.80	- 32	- 16
Forcible Rape	72	412	7	9.227	-0.42	- 17	
					-0.75	- 30	- 24
Robbery	163	2,199	16	39.58	-2.45	- 98	
					-5.46	-218	- 158
Aggravated Assault	81	3,684	8	76.49	-2.14	- 86	
					-6.12	-245	- 166
Burglary	414	22,090	41	519.3	-5.71	-229	
					-24.41	-976	- 602
Larceny	172	14,120	17	339.4	-1.36	- 54	
					-9.50	-380	- 217
Auto Theft	65	9,120	7	200.9	-2.41	- 96	
					-6.43	-257	- 177

Notes:

[a] Convictions, offenses, and the original offense rates are averages. The population of an average state is taken as 4 million.

[b] The expected change in offense rate was multiplied by a factor of 40 to obtain these figures.

state.[29] These estimates are depicted both as intervals using the confidence intervals of Table 13 and as specific estimates using the regression coefficients directly.

This procedure suggests that for an average state a ten percent increase in the probability of conviction will reduce the number of offenses by anywhere from 16 to 602 depending upon the particular offense, and that the required number of new convictions requisite for a ten percent increase in p is from 7 to 41. As was noted earlier, it may not be possible to indicate anything with satisfactory confidence regarding homicide, however, the estimates for the other six offenses are deserving of attention. The reduction in number of offenses provides an estimate of the benefit of a ten percent increase in probability of conviction. It remains to determine the economic benefit of this reduction and the increased costs associated with the increased probability. The final section of this chapter deals with the cost of increasing the number of convictions. At this point several points regarding the costs of the offenses can be recalled.

Ideally the cost of each crime would include measures of:

1. Victimization Costs--reduced earnings, loss of property, medical expenditures, and other direct losses associated with being a crime victim.

2. Fear of Victimization--restricted personal activity, reduced business activity, and changes in behavior caused by fear of crime.

3. Private Protection Costs--cost of alarms, locks, reinforcements, watchdogs, safes, watchmen, and the like as well as insurance costs net of payments received.

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[29]The average state had a population of approximately 4 million in 1964, thus the number of offenses per state averaged 40 times the offense rate.

4. Psychic Costs of Victims--injury, terror, and other discomfort suffered by being victimized.

5. Cost of Publicly Provided Services Associated with Prevention, Detection, Conviction, and Treatment of Offenders.

6. Other Consequential Costs--alienation, surveillance, bribery, and criminalization costs generated by criminal activity.

It is not possible at the present time to obtain information on most of these costs of crime. Some data are available for victimization costs, private protection costs, and the cost of publicly provided services. These are indicated in Table 1 (page 4) and will be referred to again later.

It is somewhat easier to obtain costs of convictions, the other side of the matter of equating the marginal cost and benefit of law enforcement. Attention will now be devoted to this matter.

D. Costs of Crime

The use of economic analysis in determination of rational law enforcement policy requires some knowledge of the costs of crime and law enforcement. The only comprehensive attempt to study the cost of crime was that of the Wickersham Commission in 1931.[30] However, by using some of the available cost estimates generated by the Institute for Defense Analyses in a study prepared for the President's Commission on Law Enforcement and Administration of Justice, it is possible to generate several tentative magnitudes.

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[30] U.S., National Commission on Law Observance and Enforcement, Report on the Cost of Crime, No. 3 (Washington, D.C.: Government Printing Office, 1931).

The regression coefficients for the Index offenses enable prediction of the effect of a change in p or s on the number of offenses. At the present time, though little is known as to how much a given percentage increase in p or s would add to law enforcement costs, it is possible to approximate the increased public costs of increasing the number of convictions by one.

Several strong assumptions are required. First it is necessary to assume that the public sector is operating at the most efficient level, no rearrangement of resources between p and s could reduce crime, and the present levels of p and s are being achieved in the most efficient manner. The Institute for Defense Analyses provided tentative cost figures for the Index offenses by establishing a generalized criminal justice system through the following process:

1. Aggregating related stages of criminal processing.

2. Determining the probability that an arrested person is routed through each part of the system.

3. Imputing to each person routed through the system costs of processing at each stage.

4. Using available data to determine consequences of an additional arrest on costs.

5. Allocating the direct cost of processing on the basis of time at each stage and time unit costs.[31]

Table 15 indicates the percentage distribution of criminal justice expenditures for each of the Index offenses as estimated by the Institute.

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[31] Science and Technology, pp. 56-57. Data on probability of passing through each stage were based on a sample of state court reports from California, police costs were based on data from the International Association of Chiefs of Police, court costs were based on Washington, D.C. figures, and corrections costs were based on the Corrections Task Force work.

TABLE 15

PERCENTAGE DISTRIBUTION OF CRIMINAL JUSTICE EXPENDITURES IN THE UNITED STATES, BY OFFENSE: 1965

Offense	Percent of Total Cost Devoted to: Police Cost	Juvenile Processing Cost	Court Cost	Corrections Cost	Total Cost in Millions of Dollars
Murder	10	1	8	81	48.
Forcible Rape	39	14	5	42	29.
Robbery	42	12	4	42	140.
Aggravated Assault	54	8	4	34	190.
Burglary	72	11	1	16	820.
Larceny ($50. and over)	76	8	1	15	500.
Auto Theft	67	21	1	11	370.
Average for All Offenses	51.4	10.7	3.4	34.4	

Source: Institute for Defense Analyses, Science and Technology, p. 62.

Though the result of several arbitrary assumptions, these are the best available figures.[32] The estimates of Table 15 were used to allocate total criminal justice expenditures among the Index offenses.

The results of this allocation in terms of actual dollar costs appear in Table 16. In terms of severity the FBI considers murder the most serious crime and rape the second most serious. Nonetheless, on the basis of allocated criminal justice expenditures these are the least costly crimes due to the fewness of these crimes in comparison to the other offenses.

It is possible to use prisoner data to determine the criminal justice expenditures per conviction. There are several adjustments that must be made before a law enforcement cost per conviction can be obtained. First, since the prisoner data includes only adults, juvenile processing costs were omitted from the calculations. Second, because prisoner figures are for adults, each cost component was reduced by the percent of total arrests accounted for by juveniles (persons 11-17).[33] Third, prisoner data excludes Alaska and New Jersey while the cost figures are for all fifty states. Admissions to state prison were increased by a factor based on the percent of United States population living in these

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[32]Time was used as the basis for most of the allocations of costs. In several cases the estimates are quite subjective. For example, the International Association of Chiefs of Police estimated that twenty-five percent of total patrol time and one-hundred percent of detective time was devoted to the Index offenses.

[33]Percentages used were taken from: The Challenge of Crime, p. 56.

The percentage of all offense arrests accounted for by juveniles were: murder 8.4, forcible rape 19.8, robbery 28.0, aggravated assault 14.2, burglary 47.7, larceny 49.2, and auto theft 61.4.

TABLE 16

ESTIMATED CRIMINAL JUSTICE EXPENDITURES
BY OFFENSE: 1965
(Millions of Dollars)

Offense	Police Cost	Juvenile Processing Cost	Court Cost	Corrections Cost	Total Cost in Millions of Dollars
Murder	4.8	0.48	3.84	38.88	48.
Forcible Rape	11.3	4.06	1.45	12.18	29.
Robbery	58.8	16.80	5.60	58.50	140.
Aggravated Assault	102.6	15.20	7.60	64.60	190.
Burglary	590.4	90.20	8.20	131.20	820.
Larceny ($50. and over)	380.0	40.00	5.00	75.00	500.
Auto Theft	247.9	77.70	3.70	40.70	370.
Total	1,395.8	244.44	35.39	421.36	2,097.

Source: Computed from, Institute for Defense Analyses, Science and Technology, p. 62.

two states.[34]

After these adjustments, a tentative figure for average police, court, and correctional costs per conviction can be calculated by dividing expenditures for each of these functions by admissions to state prison in 1964. Results before these adjustments and calculations appear in Table 17, results after the adjustments appear in Table 18. Certainly these results provide surprising relationships. Though murder and forcible rape are considered the most serious crimes in terms of subjective measures of severity as well as victim costs measured in economic terms, police costs per conviction are lowest for these two crimes and total criminal justice expenditures are well below those for the less serious crimes of aggravated assault, burglary, larceny, and auto theft! Is there basis for an explanation of these relations or do they represent the results of too many tenuous propositions?

There are many barriers in the way of simple explanations. The President's Commission avoids the seemingly contradictory figures indicated in Table 18 by failing to report police, court, and corrections costs on a "per conviction" basis. Rather, total criminal justice system costs "per crime" are reported. The reported figures are as in Table 19 which is presented for purposes of facilitating comparisons.

When costs are reported on a per crime basis the criminal justice expenditures for each type offense appear very much in line with the severity of each offense as judged subjectively or as measured in economic terms. However, because the probability of conviction is very low police costs per conviction is very high for aggravated assault,

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[34]As 3.6 percent of the population lived in Alaska and New Jersey, reported admissions were increased by a factor of 1.0373.

TABLE 17

AVERAGE LAW ENFORCEMENT COSTS PER CONVICTION
BY OFFENSE: 1965
(Unadjusted Dollars)

Offense	Police Cost	Court Cost	Corrections Cost	Total Cost
Murder	1,213.	970.	9,826.	12,009.
Forcible Rape	3,084.	395.	3,322.	6,801.
Robbery	7,167.	680.	7,167.	15,014.
Aggravated Assault	25,079.	1,858.	15,790.	42,727.
Burglary	28,540.	396.	6,342.	35,278.
Larceny ($50. and over)	44,330.	583.	8,749.	53,662.
Auto Theft	75,304.	1,123.	12,363.	88,790.

Source: Federal Bureau of Prisons, National Prisoner Statistics: 1964, p. 17, and computations from Table 16.

TABLE 18

AVERAGE LAW ENFORCEMENT COSTS PER CONVICTION
BY OFFENSE: 1965
(Adjusted Dollars)

Offense	Police Cost	Court Cost	Corrections Cost	Total Cost
Murder	1,111.	889.	9,000.	11,000.
Forcible Rape	2,474.	317.	2,664.	5,455.
Robbery	5,160.	491.	5,160.	10,812.
Aggravated Assault	21,560.	1,594.	13,548.	36,661.
Burglary	14,926.	207.	3,317.	18,450.
Larceny ($50. and over)	22,520.	296.	4,445.	27,261.
Auto Theft	29,067.	434.	4,772.	34,273.

Sources: Computations from Tables 16 and 17 involving juvenile crime data from;President's Commission, The Challenge of Crime, p. 56.

TABLE 19

CRIMINAL JUSTICE EXPENDITURES
PER OFFENSE: 1965
(Dollars)

Offense	System Costs Per Offense
Murder	4,900.
Forcible Rape	1,300.
Robbery	1,200.
Aggravated Assault	920.
Burglary	700.
Larceny ($50. and over)	660.
Auto Theft	760.
Average for All Index Offenses	750.

Source: Institute for Defense Analyses, Science and Technology, p. 63.

auto theft, larceny, and burglary. It is possible to verify these somewhat alarming figures through use of President's Commission data.[35]

If the figures of Table 19 are multiplied by the reciprocal of the probability of conviction for each offense (Table 4) the resultant figure should approximate the cost per conviction, after one adjustment. Since the costs of Table 19 are for adult offenders, a reduction was made for crimes committed by juvenile offenders. The results appear in Table 20. A very high degree of similarity exists as there is less than five percent difference for all offenses except auto theft. The following caveat appears appropriate; the data upon which these estimates are based are not highly reliable but they are the best available. The only other estimates of costs per conviction in an economic study are quite compatible.[36]

Using the information on the number of additional convictions required for a ten percent increase in the probability of conviction from Table 14 and the costs per conviction of Table 20 the following emerge as estimates of the costs of this increase in enforcement (with some averaging of figures).

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[35]For convenience the original method of computation is referred to as Method A and the second method is Method B.

[36]Morgan Reynolds derived the following conviction costs for property crimes; burglary $21,700, robbery $7,800, and larceny $31,000. His figures likely overstate the true cost as no adjustment was made for juveniles and the absence of Alaska and New Jersey from the data base.

Morgan O. Reynolds, "Crimes for Profit: Economics of Theft," (unpublished Ph.D. dissertation, University of Wisconsin, 1971), pp. 159-61.

TABLE 20

COMPARISON OF SYSTEM COSTS PER CONVICTION
FOR INDEX OFFENSES IN 1965

	Method B				Method A
Offense	System Costs per Offense	Reciprocal of Probability		System Costs per Conviction	System Costs per Conviction
Homicide	$4,900.	2.35	(.916)[a]	$10,548.	$11,000.
Forcible Rape	1,300.	5.73	(.802)	5,974.	5,455.
Robbery	1,200.	13.53	(.720)	11,690.	10,812.
Aggravated Assault	920.	45.45	(.858)	35,876.	36,661.
Burglary	700.	53.39	(.523)	19,546.	18,450.
Larceny	660.	82.37	(.508)	27,617.	27,261.
Auto Theft	760.	140.45	(.386)	41,202.	34,273.

[a]The figures in parentheses indicate the percent of offenses committed by adults.

Offense	AC (= MC)	X	Number	=	Cost Increase
Homicide	$11,000.		8		$ 88,000.
Forcible Rape	5,500.		7		38,500.
Robbery	11,000.		16		176,000.
Aggravated Assault	36,000.		8		288,000.
Burglary	19,000.		41		779,000.
Larceny	27,500.		17		467,500.
Auto Theft	37,000.		7		259,000.

Using the estimates of the reduced number of offenses as a result of a ten percent increase in probability from Table 14, it is possible to state tentatively how much is being paid (or must be paid) to prevent each additional offense, a figure analogous to the average cost and marginal cost of preventing an offense.[37] These costs are as indicated below.

Offense	Average Cost of Preventing One Offense
Homicide	$5,500.
Forcible Rape	1,604.
Robbery	1,114.
Aggravated Assault	1,735.
Burglary	1,294.
Larceny	2,154.
Auto Theft	1,463.

It is surprising that the range is narrow, from $1,114. to $2,154. for the offenses, when homicide is excluded. Is the reduction

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[37]The figure for homicide should be interpreted only with considerable caution, it is not possible to estimate the effects of changes in p for this particular offense with acceptable confidence.

in crime costs (a marginal benefit) less than, greater than, or equal to these amounts? Unfortunately the reductions in these costs are presently impossible to determine due to their diverse nature and the absence of a market mechanism through which they can be measured.[38] There are estimates of the direct (or victim) costs of each offense, however, these are not adequate. Is there an alternative source of information or a different procedure which may be pursued?

At the present time there does not appear to be an explicit or indirect way to measure total costs of criminal activity on American society. Measures of costs presently available are limited to the victim costs and protection expenditures including law enforcement. In the final chapter of this paper some tentative conclusions are drawn on the basis of the results of this chapter, however, the lack of comprehensive figures on costs precludes direct comparisons of marginal cost and marginal benefit at this time.

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[38] By referring back to page 100 it is possible to appreciate the difficulty involved in obtaining even tentative estimates for these magnitudes.

CHAPTER V

AN APPLICATION OF THE MODEL TO OKLAHOMA

Oklahoma has no central repository of crime information. The only reliable source of information regarding the nature and extent of crime is found in the Uniform Crime Reports of the Federal Bureau of Investigation. While this supplies worthwhile information, it still falls short of providing the information needed for statistical analysis fundamental to criminal justice planning.

Oklahoma Crime Commission,
Annual Report: 1970, p. 11.

CHAPTER V

AN APPLICATION OF THE MODEL TO OKLAHOMA

The results of Chapter IV tend to substantiate the usefulness of an explanation of the supply of crime as a function of costs and returns which are determined by law enforcement authorities. Though it might appear logical to continue with an examination of interstate differences in costs of committing an offense and differences in law enforcement resources, the decision was made to extend the analysis by examining the economics of crime and law enforcement in a single state, Oklahoma.

There are several reasons for this decision. First, there have been several studies of interstate variations in the costs of committing a crime using various economic and demographic variables as cost measures. Fleisher conducted the first economic investigation in this area. Ehrlich has been actively engaged in empirical work at the National Bureau of Economic Research following the lines of the Becker model. In addition, several dissertations relating crime to economic magnitudes have been completed. Most of these studies relate the cost of committing crime to unemployment rates, area wealth, nonwhites as a percent of total population, and other aggregate measures.[1]

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[1] A brief review of the studies of this type was presented in Chapter II (pp. 23-26 and pp. 33-34). It appears that investigations along these lines invariably become involved in dissection of the tastes for crime, a process which leads to a similarity with sociological investigations.

As the aggregates in these models are not subject to variation due to law enforcement policy (and may not be capable of significant change as a result of any policy) and decision making in law enforcement is not centralized within individual states, interest was directed toward examination of a dimension associated with a policy making unit.

A second reason for the decision to examine the economics of crime and law enforcement in the State of Oklahoma is related to the present paucity of research in the area. There has been no economic analysis of crime or law enforcement of any kind for the State of Oklahoma. For this reason it was felt that a void could be partially filled and a substantive contribution made through an extension using Oklahoma as the unit under examination.[2]

Because law enforcement in Oklahoma has been under local control, crime and law enforcement have not been the subject of much statewide research. As a result, data are quite limited. Only through cooperation received from the FBI, Office of the State Auditor, and the Oklahoma State Crime Commission was it possible to generate data sufficient for this chapter.

With the development of state-wide planning it is expected that in the next several years more useable data will become available for analysis as law enforcement decisions become less of a local function. At that time examinations as this one may be substantially facilitated.

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[2]Due to the availability of good data, California and especially the city of Los Angeles have been the subject of several economic investigations. In contrast, data on crime and law enforcement in Oklahoma are very limited and difficult to obtain. Some data used in this chapter are not used by, or even available to, law enforcement groups within the state even though there is a planning organization with responsibilities in this area.

A. Law Enforcement in Oklahoma

At the present time, law enforcement in Oklahoma is primarily the responsibility of municipalities and counties though several state agencies are available to provide services that aid the local units of law enforcement in their activities. A basic understanding of these relations may be established by briefly examining the existing system of law enforcement in Oklahoma.

Each of Oklahoma's seventy-seven counties has a sheriff who is elected to a two-year term and is responsible for maintaining the county jail, processing civil and criminal cases, and the general law enforcement in the county. The sheriff appoints his deputies and staff subject only to budget limitations. The sheriff's office is concerned primarily with law enforcement in rural areas.

The charters and ordinances of municipalities determine the system of law enforcement in Oklahoma cities. The size of police forces in Oklahoma ranges from 1 to 581 officers with departmental expenditures ranging from about $20,000 to over $4½ million.[3] Very small towns often have no police personnel, and thus are dependent upon the county sheriff for law enforcement.

The primary role of the State in law enforcement is of a supportive nature. Oklahoma does not have a state police. The Department of Public Safety has responsibility for enforcement of state laws regarding the operation of motor vehicles on all roads in the state highway system. A division of the department, the Oklahoma Highway

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[3]Oklahoma Crime Commission, "Results of Questionnaires Sent to Police Departments," 1969.

Patrol, has primary responsibility for regulation of motor vehicle operation. Although the Highway Patrol does have general police powers, it has never acted as a state police. The only involvement of the Highway Patrol with crime (as depicted by the Index offenses) relates to patrol cooperation in setting up roadblocks, aiding in manhunts, acting as a clearing agency for the state radio network, serving criminal warrants, and regulating waterways in the state.

The Oklahoma Bureau of Investigation, a division of the Governor's office, was created to assist other law enforcement agencies carry out their duties. The Bureau provides scientific laboratory services and identification files as an aid to local law enforcement in the state. In addition the Bureau provides instruction, aids in detection and apprehension when called upon to do so by local police, acts as the state input center for the National Crime Information Center (NCIC), and publishes bulletins containing items that may be of interest to local law enforcement agencies.[4]

In 1968 the Congress of the United States passed the Omnibus Crime Control and Safe Streets Act. This act established the Law Enforcement Assistance Administration (LEAA) which provides funds to states in an effort to: (1) encourage comprehensive plans in the area of law enforcement, (2) improve and strengthen law enforcement, and (3) encourage research and development of new methods for the prevention and reduction of crime and apprehension of criminals. Principal assistance is provided via LEAA block grants of two types: (1) "planning"

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[4]This introductory section is drawn primarily from: Oklahoma Crime Commission, Comprehensive Law Enforcement Action Plan: 1972 (Oklahoma City: Oklahoma Crime Commission, 1972), pp. A12-17.

grants providing ninety percent of the costs of maintaining state planning agencies, and (2) "action" grants providing seventy-five percent of the funds necessary to carry out criminal justice programs contained in annual plans submitted by the state planning agencies.[5]

On January 13, 1968, Governor Dewey F. Bartlett created the Oklahoma Crime Commission by executive order. The Commission acts as the state planning agency in Oklahoma in response to the requirement of the Omnibus Crime Act. For planning purposes the state was divided into fourteen regional planning districts. Each region employs a coordinator who secures information concerning needs, problems, and priorities from local law enforcement and criminal justice agencies. This information is used for development of projects and programs aimed at improving law enforcement in the state.[6] The Oklahoma Crime Commission has primary responsibility for formulating and submitting annual plans and administering the program in the State of Oklahoma.

Although the introduction to this section asserts that Oklahoma law enforcement is a local responsibility under local control, there is increasing evidence that Federal encouragement through LEAA funds and the establishment of the Oklahoma Crime Commission are leading toward a change in the nature of law enforcement administration. Coordination, more centralized decisions, and broader administrative control can be

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[5]The Omnibus Crime Act represents a major effort at the block grant system. For a critical appraisal of the results of the first years of this effort refer to: U.S., Congress, House Committee on Government Operations, Block Grant Programs of the Law Enforcement Assistance Administration, Twelfth Report, 92nd Congress, 2nd session, 1972, pp. 3-4 and 6-12.

[6]Oklahoma Crime Commission, Annual Report: 1970 (Oklahoma City: Oklahoma Crime Commission, 1971), p. 7.

expected in the future. If such centralization does take place studies as this one will be very useful.

B. Measuring Crime and Law Enforcement in Oklahoma

As the President's Commission noted and as the Oklahoma Crime Commission indicated in the prefatory statement to this chapter, data on crime and law enforcement are not readily available beyond that found in the Uniform Crime Reports. In the State of Oklahoma the lack of data useful for an analysis of law enforcement from economic or other perspectives has been a long recognized fact.

Data on crime, the amount of crime in the state, and where it is; was not collected in any organized fashion by the state from statehood until 1972. Due to LEAA influence in 1970 a statute was sought by the Governor and obtained from the Oklahoma Legislature establishing a law requiring that reports be prepared by all law enforcement jurisdictions in the state and submitted to a central repository, the Oklahoma State Bureau of Investigation. While this appears to be an encouraging development, it may be noted that no provision was made for enforcement of this requirement.[7] Thus far the results have been mixed.

1. Dependent Variable: City Offense Rate

An examination of crime data within the state must resort to the FBI Uniform Crime Reports which provide summary data for the state. Of a total of seventy-seven sheriffs offices and seventy-three police departments in cities of 2,500 or more population, in 1969 about 45 law enforcement agencies covering nearly ninety percent of the total popula-

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[7] Ibid., pp. 11-12.

tion in the state voluntarily reported known Index Offenses to the FBI.[8] Unfortunately the published figures on crime in Oklahoma are summarized to such an extent so as to be of quite limited usefulness for an analysis of crime within the state. However, through cooperation received from the FBI Uniform Crime Reporting Section, original record cards for the large cities in the state of Oklahoma for the years 1960 through 1970 were made available for this study.

Although somewhat incomplete, the number of Index offenses and clearances for the seventeen largest Oklahoma cities were made available for the eleven year period. The cities in this sample contain forty-seven percent of the state population. Specific cities for which this information was obtained are:

1. Ada
2. Altus
3. Ardmore
4. Bartlesville
5. Duncan
6. Enid
7. Lawton
8. McAlester
9. Midwest City
10. Muskogee
11. Norman
12. Oklahoma City
13. Okmulgee
14. Ponca City
15. Shawnee
16. Stillwater
17. Tulsa

Index offenses for each city were made comparable by computing the number of offenses of each type per 1,000,000 population for each year.[9] Computed crime rates are subject to the same bias and inaccuracies of police reporting as noted earlier in Chapter IV. Regardless of this consideration these are the only feasible data as no alternative source exists.

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[8] Uniform Crime Report: 1969, p. 71.

[9] The results for the cities appear in Appendix A. As larceny is divided into two categories (less than $50 and $50 or greater) there are eight Index offenses rather than seven in this chapter. Also, the independent variable used was the offense rate per 1,000,000 population rather than the more customary offense rate per 100,000 population.

In this examination the dependent variable, the offense rate per 1,000,000 population by city and offense for 1960 through 1970, is a simple variation of the commonly accepted FBI measure of potential victimization. Due to the wide acceptance of this type measure, it would be difficult to justify using an alternative. However, it is possible to develop an alternative that would facilitate comparison of victimization rates among the cities. One such alternative is explained and depicted in Appendix B. In this, a base incidence for an offense is set equal to 1.0 for the average of all seventeen cities, and the offense rate for each city is related directly to this base.

2. Independent Variable: City Clearance Rate

Identification of the independent variables of the theoretical model, probability of conviction (p) and punishment (s), is rendered difficult by the absence of centralized collection of crime and law enforcement data. There have been two major studies of law enforcement in the State of Oklahoma, however, neither generated measures useable as independent variables approximating p or s since these studies were conducted for other purposes.

In 1954 the Oklahoma Crime Study Commission examined law enforcement conditions in the state.[10] This study was concerned almost exclusively with police employee characteristics, salaries, equipment, and departmental procedures. Only a small amount of attention was devoted to crime. The questions; where is the crime and what is the response of crime to law enforcement?; were not a concern of this commission.

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[10]Oklahoma Crime Study Commission, Municipal Law Enforcement in Oklahoma: A Survey and Evaluation, Gilbert Geis, director (Oklahoma City: Oklahoma Crime Study Commission, 1955).

The influence of LEAA led to a recent repetition and expansion of the Oklahoma Crime Study Commission survey. In 1969, the then newly created Oklahoma Crime Commission carried on a survey of police departments in all cities over 2,500 population and the seventy-seven county sheriff offices.[11] Although several abstract measures of law enforcement activity for cities could be derived from the study, these are available only for the single year 1969.[12] As is the case in the 1954 study, practically no attention was devoted to the collection of information on crime or the relation between crime and law enforcement activity. While generating far more data than was available previously, the Crime Commission emphasized qualitative and quantitative measures regarding personnel, facilities, and equipment. Although this type of inventory information is very useful in the quest for funds from the Federal government the useability of this information for the present analysis is quite limited.[13]

Concluding that data on independent variables representative of p for Oklahoma cities are not available from any centralized source, the following procedure was used to obtain related values for the model. Original record cards for the seventeen cities were obtained from the

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[11] Oklahoma Crime Commission, Local Law Enforcement in Oklahoma, Survey-study 69-2 (Oklahoma City: Oklahoma Crime Commission, 1969).

[12] Two potential variables generated were: (a) number of police personnel per thousand and (b) police cost per capita.

[13] In a personal discussion with John Robertson, Director of the Research and Statistics Division of the Oklahoma Crime Commission, a point emphasized by Mr. Robertson was that the Commission simply had no information on, "where the crime is in the State of Oklahoma," beyond the summary information of the Uniform Crime Reports.

FBI Uniform Crime Reporting Section. In reporting offenses annually to the FBI, each reporting agency is asked to report the number of crimes that have been cleared. In Chapter IV (p. 74) the distinction between the probability of conviction and the clearance rate was noted and explained. As police departments do not collect and record the court action necessary for identification of the number of convictions, it is not possible to obtain the true value of p from these records. Therefore, the decision was made to compute a clearance rate to be used as a proxy for the probability of conviction.

The seventeen city sample for an eleven year period would ideally generate 187 observations for each of eight offenses or a total of 1,496 observations.[14] As data for a few years for some cities were not available and in several cities there were occasionally no offenses of a certain type (and no clearances) the actual number of observations was somewhat less than 1,400.

3. Independent Variable: Punishment

As noted earlier, police departments in the state usually do not keep formal records on dispositions of criminal cases in their jurisdiction. Of the seventeen cities in the sample, Oklahoma City and Tulsa trace cases as follows: (1) offenses, (2) clearances, (3) number charged, (4) guilty as charged, and (5) guilty of lesser offense. However, even these two cities keep no record of punishments imposed. The remaining fifteen cities in the sample do not maintain records on

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[14] In the departmental reports to the FBI two types of larceny are included: (a) larceny less than $50, and (b) larceny of $50 or greater. This division explains the reason for examination of eight offenses rather than seven as was the case in Chapter IV. Calculated values for clearance rates appear in Appendix A.

disposition.

Court records in the state are also insufficient for any attempt to derive a punishment measure for the cities in the sample or for jurisdictions within which the cities are included.[15] The insufficient court records regarding punishment along with the discrepancy between the clearance rate and p eliminated the feasible use of punishment as an independent variable for the sample. In an effort to remedy this absence two additional independent variables were introduced.

4. Independent Variable: Police Expenditures Per Capita

To this point the paper has emphasized the relation between p and s and the offense rate. It is often assumed that there is a relation between expenditures for police and the offense rate although there does not appear to have been any attempts to measure this effect in the state. The Oklahoma Crime Commission did obtain expenditures for police departments in its 1969 survey, but these data are available only for the single year 1969.[16] As a consequence, in order for expenditures to be introduced into the analysis it was necessary to examine annual municipal expenditure reports for each of the seventeen cities for each of the eleven years under examination.[17]

Three figures for police expenditures are available: (1) wages and salaries, (2) operations and maintenance, and (3) capital

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[15] In discussion with the administrator of the Oklahoma State Supreme Court, the point was made that the courts of the state do not collect this "sociological" data at present.

[16] Local Law Enforcement in Oklahoma, pp. 10-14.

[17] Expenditures for the three most recent years were available in the State Auditor's Office. Expenditures for the previous years were available at the Oklahoma State Archives, a part of the Oklahoma State Library system.

improvements. For purposes of this analysis two separate figures were computed for each city on a per capita basis: (1) wages and salaries, and (2) the sum of the wages and salaries and the operations and maintenance budgets.[18] It was assumed a priori that there would be a negative relation between the expenditure variables and offense rates.

5. Independent Variable: Population

A final independent variable used is city population. Census figures for the seventeen cities were used for 1960 and 1970, population figures for the remaining years were individual year estimates that are available.[19]

Use of this variable introduces an aggregate variable into the analysis which is not a control or policy variable as there is no way of exercising control over population in a city. Recognition of this nature of the population variable becomes important in the analysis that follows. An additional cognizance of population is apparent in two of the forms used which exclude the two largest cities from the data. It was assumed that there would be a positive relation between population and the dependent variable.

C. Regression Results

Step-wise regression analysis was used for each offense individually for each of eight models. Four different sets of data were used, herein-

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[18] To the extent that the clearance rate is a function of expenditures on police there could be collinearity between two of the explanatory variables, a problem of multicollinearity. The relationship between expenditures and clearance is examined later in the chapter.

[19] The estimates were obtained from the Bureau of Business and Economic Research of the University of Oklahoma.

after referred to as the four forms. The first, form A, used data from all seventeen cities for the same year in the regressions. The second, form B, introduces the possibility that offense rates respond to changes in the independent variables only after a period of time--specifically, one year. Thus form B is the same as A except that the dependent variable is always lagged one year behind the respective independent variables. The third, form C-A, takes cognizance of the fact that Oklahoma City and Tulsa are substantially larger and qualitatively different from the remaining fifteen cities. This form is the same as A with the exception that it excludes the two largest cities from the set of observations. The fourth set, C-B, is identical with set B only with the exclusion of the two largest cities.

Since the state's two metropolitan centers differ in many ways from the other fifteen cities in the sample there are reasons to suspect significant differences may exist in results that exclude these two cities from the set of observations; hence, the two sets of models that exclude Oklahoma City and Tulsa from the data set. The mean values for all variables are displayed in Table 21 (pp. 135 and 136) while all original data are shown in Appendix A.

The following eight models were used for each of the sets of data (forms).

1. $Y = B_0 + B_1X_1 + B_{21}X_{21} + B_3X_3$
2. $Y = B_0 + B_1X_1 + B_{22}X_{22} + B_3X_3$
3. $Y = B_0 + B_1X_1 + B_{21}X_{21}$
4. $Y = B_0 + B_1X_1 + B_{22}X_{22}$
5. $Y = B_0 + B_1X_1$
6. $Y = B_0 + B_{21}X_{21}$

7. $Y = B_0 + B_{22}X_{22}$

8. $Y = B_0 + B_3X_3$

In the models the variables for each city are:

O = number of offenses.

P = population.

K = number of offenses cleared.

S = expenditures on police department wages and salaries.

M = expenditures on police department operations and maintenance.

$Y = (O/P)10^6$ = offense rate per 1,000,000 population.

$X_1 = K/O$ = clearance rate.

$X_{21} = S/P$ = per capita expenditures for police department wages and salaries.

$X_{22} = \frac{(S + M)}{P}$ = per capita expenditures for police department wages, salaries, operations, and maintenance.

X_3 = population.

Values for the eleven year period from 1960 through 1970 were used in the regressions.[20] The values for expenditures (X_{21} and X_{22}) and population (X_3) were the same for each individual city for all eight offenses for any particular year. Due to the problem of missing data for several cities in a few years (clearance and/or offense data was missing) it may be that the number of observations and corresponding figures for the variables differ somewhat: this does not provide any serious problem.

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[20] If all data were available for all cities in all years, for each form there would be a total of 187 observations. When K was not available or O was zero, the observation was dropped from the regression. As a result, the actual number of observations ranged from 110 to 181 for form A, 75 to 163 for B, 88 to 159 for C-A, and from 55 to 143 for C-B.

Since a total of 256 regressions were used in the four sets, discussion that follows refers to the summarized results of the regressions appearing on pages 137-168.

According to the theory developed in Chapter III, stated a priori expectations which were stated are that the coefficient (B_1) on X_1 is negative, reflecting an inverse relation between the clearance rate and the offense rate. In interpreting the coefficient on X_1 it must be remembered that B_1 can vary only between zero and one. Moving the decimal one place to the left aids in interpretation by indicating the suggested effect, ceteris paribus, of a 10 percent change in the clearance rate. Further, if an increase in police or their presence and support are a deterrent one would expect that coefficients (B_{21} and B_{22}) on X_{21} and X_{22} would also be negative. However, it is clearly possible that this deterrent effect is small while the effect of added police expenditures is increased reporting or official knowledge of offenses, an occurrence that others have observed in some law enforcement studies.[21] If this is the case the coefficients on X_{21} and X_{22} would be positive. The coefficient (B_3) on X_3 is expected to be positive, as greater population will likely be associated with higher offense levels.

For convenience in the discussion of the regression results which follows, the summarized regression results are collected in the Tables 22 through 29 on pages 137 to 168; which are all of the same standard form.

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[21] This is a case where the theory suggests one result yet the nature of available data suggests that opposite results may be observed. Alternative interpretations appear later, pp.169-70.

1. Homicide: Tables 22A to 22C-B

If homicide is truly a crime of passion, a priori expectations would suggest poor results in an examination using the eight models selected. The very low values for the coefficient of determination (R^2) confirms this expectations. For all the models, only the coefficients for expenditures per capita (B_{21} and B_{22}) are ever significant at the 1 percent level. Also, only models including an expenditure coefficient in forms A and B explain more than 10 percent of the variation in homicide rates. The coefficient on clearance (B_1) is positive, rather than negative as was expected, but is not significant at the 5 percent level. Population is not significant except for one limited case.

The fact that .13 is the highest R^2 gives adequate evidence that none of the models possesses sufficient explanatory power to be taken very seriously. Fortunately, these results are not very surprising.

2. Forcible Rape: Tables 23A to 23 C-B

The first two models of forms A and B explain about 28 percent of the variation in rapes per 1,000,000 population among cities, with the coefficients for both population and expenditures positive and significant at 1 percent. The coefficient on clearance is not significant (at 5 percent) though for forms A and B the coefficient is consistently negative as was expected.

That population by itself possesses the greatest explanatory power is evident from examination of model 8 of forms A and B. Removal of the two largest cities (as was done for models C-A and C-B) thus provides poorer overall results, because much of the population variation

is lost from the set of observations.[22]

The positive coefficients on expenditures (B_{21} and B_{22}) which are highly significant merit further interpretation. When offenses are known independent of expenditures it is expected that greater per capita expenditures (X_{21} and X_{22}) would lead to reduced offense rates in accordance with the theory of Chapter III. A different result may be witnessed when knowledge of offenses is related to expenditures. If additional police expenditures and more police personnel result in more discovery and reporting of offenses, for whatever reasons, then a positive relation between offenses and police expenditures may be expected. The consistently positive coefficients on B_{21} and B_{22} suggest more expenditures result in more reporting of crime. Or, it may be that more crime leads to increased police; a matter examined later.

Since forcible rape is often considered a crime of passion, the modest R^2 values for the best models and the insignificance of the coefficients on clearance are not discomfortingly low overall. Nonetheless, the fact that the coefficient on clearance is not significant is not inspiring of confidence in the theory as far as explanation of forcible rape is concerned.

3. Robbery: Tables 24 to 24 C-B

Robbery is an offense wherein the economic motive is clearly

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[22]Since the two largest cities also have greater per capita expenditures than most of the remaining cities in the sample, it may be suspected that removal of Oklahoma City and Tulsa would also remove most expenditure variation. However, there is not a substantial difference in per capita expenditures for the two largest cities versus the remaining fifteen, usually only a few dollars difference. A comparison of expenditures for forms A and B with forms C-A and C-B confirms this.

involved and thus, an economic explanation is expected to be more applicable than for the so-called crimes of passion; homicide, forcible rape, and assault.

Models 1 and 2 of forms A and B generate values for R^2 of .70 or more, when the two largest cities are excluded the results are appreciably less explanatory of the variation in robbery rates. The coefficient on clearance (B_1) is consistently negative for all models, though not significant unless population is excluded from the model. As was the case for forcible rape, a positive and usually highly significant coefficient is shown for police expenditures per capita.

It is worthwhile to note the importance of population (noting model 8 of forms A and B). Although the emphasis of this paper has been upon probability of conviction, a control variable which the clearance rate may approximate, the introduction of population into the models dominates in explaining variation in robbery rates. Again the removal of the two largest cities removes substantial population variation and the result is considerably lower R^2 values for forms C-A and C-B.

4. Aggravated Assault: Tables 25A to 25C-B

When all seventeen cities are included in the data set, poor results occur with low R^2s for all models and the coefficient on clearance having the correct sign but is not significant in any of the models. Population and expenditures are usually significant. However, the low R^2s for the best models of forms A and B raise doubts as to the usefulness of the models in explaining variations in assault rates.

Considerably improved results are experienced when Oklahoma City and Tulsa are removed from the set of observations. Both population and

expenditures are highly significant in two of the models, however, the sign of the coefficient on clearance becomes positive though it is not significant. As was the case earlier, population is the most explanatory of the independent variables.

5. Burglary: Tables 26A to 26 C-B

The first of the less serious property offenses to be considered, burglary, is best explained with a lag in the burglary rate for one year. Clearance, expenditures (B_{21} or B_{22}), and population coefficients are all significant at the 0.01 level. As was the case for earlier offenses, population is most explanatory. The clearance rate by itself gives evidence of explaining only about 4 percent of the variation which is not as strong an explanation as a priori expectations suggest. Nonetheless, burglary represents the first case (in the lagged version), where all three of the independent variables are highly significant (0.01 level).

While an R^2 of .64 is not unusually high compared to some models comprised of six to ten taste variables as general studies have used, as was the case in this study concerning robbery, it is possible to explain a majority of the observed differences in offense rates using a very few variables including two variables quite closely related to law enforcement policy.[23]

6. Larceny--$50. and Over: Tables 27A to 27C-B

An examination of the results for grand larceny shows that all

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[23]Some of the studies generating R^2s of .80 and above are referred to earlier in this paper (see pp. 23-26). It may be worthy of mention again that the taste data for similar studies using the Oklahoma cities are not regularly available.

variables are(highly)significant for all four forms. Clearance has the expected sign, and in conjunction with either expenditure variable appears capable of explaining a respectable proportion of the variation in offense rates per 1,000,000 population. It is of interest to note that the coefficient for clearance is quite large and is highly significant. While not conclusive, these results do lend empirical support regarding the impact of economic policy variables in determination of the level of this criminal activity.[24]

7. Larceny--Under $50.: Tables 28A to 28C-B

Although youth are usually involved in petty larceny and it may be expected that poorer results would be obtained in this case as compared to robbery, burglary, and grand larceny ($50. and over), the results are interestingly different from these expectations. While population is important and highly significant, the clearance rate is highly significant (0.01 level) for the comprehensive forms and expenditures are always significant. There is one surprise compared to the other offenses, the coefficients on expenditures are always negative for this offense.

This would lead to the suggestion that increased police expenditures result in less petty larceny. Why a significant negative relation exists for this offense while there is a significant positive relation for the other offenses, is a matter for conjecture at this point.

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[24]As this section provides an overview of the results, one apparently troublesome result, the positive coefficient on expenditures has not been adequately dealt with. This is explained more completely in a later section.

8. Auto Theft: Tables 29A to 29C-B

Auto theft represents the only case where the clearance rate can explain as much as 10 percent of the variation in offense rates when taken by itself as in the bivariate case (model 5 of forms A and B). All three variables are significant at 0.01 percent (forms A and B) and the signs of all coefficients are as has come to be expected from the investigation. The R^2 of approximately .70 for the complete data is relatively high with population again the most important factor.

Having depicted and briefly explained the results of 32 regressions on each offense it is helpful to indicate those results which appear to have value for interpretation and policy.

TABLE 21

MEAN VALUES OF VARIABLES BY OFFENSE AND FORM

Offense and Variable	Form of Model A	B	C-A	C-B
Homicide	(112)	(75)	(90)	(55)
Y	62.91	64.49	60.73	62.50
X_1	0.826	0.833	0.812	0.814
X_{21}	6.04	6.33	5.82	6.05
X_{22}	6.88	7.16	6.62	6.80
X_3	91,421.5	115,070.6	34,746.0	38,257.6
Forcible Rape	(110)	(76)	(88)	(56)
Y	115.88	123.92	97.27	103.37
X_1	0.613	0.602	0.640	0.625
X_{21}	6.10	6.33	5.90	6.06
X_{22}	6.91	7.14	6.65	6.78
X_3	94,231.2	116,911.9	36,970.1	42,128.1
Robbery	(167)	(142)	(145)	(122)
Y	310.68	306.84	205.20	197.50
X_1	0.423	0.426	0.439	0.445
X_{21}	6.05	6.21	5.91	6.07
X_{22}	6.91	7.10	6.75	6.93
X_3	70,520.6	74,422.2	32,171.5	33,129.7
Aggravated Assault	(171)	(148)	(149)	(128)
Y	688.21	643.05	616.28	588.17
X_1	0.763	0.757	0.785	0.782
X_{21}	6.08	6.29	5.95	6.17
X_{22}	6.94	7.18	6.80	7.03
X_3	69,308.7	72,169.9	31,810.3	32,461.1
Burglary	(181)	(163)	(159)	(143)
Y	5,509.62	5,219.03	4,755.14	4,469.08
X_1	0.262	0.262	0.270	0.270
X_{21}	5.98	6.12	5.84	5.98
X_{22}	6.83	6.70	6.67	6.84
X_3	67,037.3	68,136.4	31,583.0	32,028.7

TABLE 21 (Continued)

Offense and Variable	Form of Model A	B	C-A	C-B
Larceny--$50. and over	(181)	(163)	(159)	(143)
Y	4,457.16	4,011.34	4,291.02	3,837.92
X_1	0.164	0.160	0.169	0.166
X_{21}	5.98	6.12	5.84	5.98
X_{22}	6.83	7.00	6.67	6.84
X_3	67,037.3	68,136.4	31,583.0	32,028.7
Larceny--under $50.	(181)	(163)	(159)	(143)
Y	11,860.80	11,872.16	11,180.23	11,201.35
X_1	0.169	0.171	0.177	0.179
X_{21}	5.98	6.12	5.84	5.98
X_{22}	6.83	7.00	6.67	6.84
X_3	67,037.3	68,136.4	31,583.0	32,028.7
Auto Theft	(181)	(163)	(159)	(143)
Y	1,898.89	1,858.82	1,499.54	1,476.79
X_1	0.335	0.341	0.350	0.358
X_{21}	5.98	6.12	5.84	5.98
X_{22}	6.83	7.00	6.67	6.84
X_3	67,037.3	68,136.4	31,583.0	32,028.7

Notes:

Number of observations is shown in parentheses.
Sources of data cited in text of chapter.

TABLE 22A

HOMICIDE
FORM A

Model	Intercept B_0	Clearance B_1	Personnel Expenditures B_{21}	Departmental Expenditures B_{22}	Population B_3	Standard Error of Estimate	R	R^2
1	29.50	10.17 (2.03)	3.70** (10.43)		0.00003 (1.66)	27.117	0.342	0.12
2	28.39	10.20 (2.04)		3.42** (11.03)	0.00003 (1.56)	27.059	0.347	0.12
3	29.03	10.86 (2.03)	4.12** (10.43)			27.199	0.321	0.10
4	27.82	10.88 (2.04)		3.80** (11.03)		27.129	0.328	0.11
5	51.12	14.26 (3.33)				28.169	0.171	0.03
6	36.26		4.41** (10.43)			27.325	0.294	0.09
7	35.08			4.05** (11.03)		27.257	0.302	0.09
8	58.62				0.00005* (4.29)	28.050	0.194	0.04

N = 112

Notes:
F values shown in parentheses below coefficients.
* significant at the 0.05 level.
** significant at the 0.01 level.

TABLE 22B

HOMICIDE
FORM B

Model	Intercept B_0	Clearance B_1	Personnel Expenditures B_{21}	Departmental Expenditures B_{22}	Population B_3	Standard Error of Estimate	R	R^2
1	28.24	10.45 (1.31)	4.00** (8.56)		0.000020 (0.60)	27.458	0.358	0.13
2	26.92	10.62 (1.34)		3.73** (8.95)	0.000017 (0.47)	27.414	0.362	0.13
3	28.16	11.01 (1.31)	4.29** (8.56)			27.382	0.348	0.12
4	26.60	11.09 (1.34)		4.00 (0.31)		27.312	0.354	0.13
5	51.18	15.98 (2.66)				28.492	0.187	0.03
6	35.04		4.65** (8.56)			27.441	0.324	0.11
7	33.56			4.32** (8.95)		27.376	0.330	0.11
8	60.13				0.000038 (2.22)	28.573	0.172	0.03

N = 75

Notes:
F values shown in parentheses below coefficients.
* significant at the 0.05 level.
** significant at the 0.01 level.

TABLE 22C-A

HOMICIDE
FORM C-A

Model	Intercept B_0	Clearance B_1	Personnel Expenditures B_{21}	Departmental Expenditures B_{22}	Population B_3	Standard Error of Estimate	R	R^2
1	31.86	9.22 (1.28)	3.33** (4.39)		0.000058 (0.12)	28.723	0.250	0.06
2	29.18	9.10 (1.29)		3.22** (4.91)	0.000082 (0.23)	28.624	0.263	0.07
3	34.08	9.43 (1.28)	3.26* (4.39)			28.578	0.248	0.06
4	32.57	9.43 (1.29)		3.10** (4.91)		28.497	0.258	0.07
5	51.38	11.52 (1.88)				29.020	0.145	0.02
6	40.31		3.51* (4.39)			28.623	0.218	0.05
7	38.84			3.31* (4.91)		28.544	0.230	0.05
8	59.47				0.000036 (0.05)	29.321	0.023	0.001

N = 90

Notes:

F values shown in parentheses below coefficients.
* significant at the 0.05 level.
** significant at the 0.01 level.

TABLE 22C-B

HOMICIDE
FORM C-B

Model	Intercept B_0	Clearance B_1	Personnel Expenditures B_{21}	Departmental Expenditures B_{22}	Population B_3	Standard Error of Estimate	R	R^2
1	24.63	10.79 (0.94)	3.40 (1.49)		0.00022 (2.70)	29.639	0.303	0.09
2	21.12	10.62 (0.93)		3.44* (2.98)	0.00024 (1.75)	29.498	0.317	0.10
3	34.46	12.05 (1.19)	3.02 (2.70)			29.706	0.264	0.07
4	32.56	12.07 (1.20)		2.96 (2.98)		29.628	0.273	0.08
5	50.35	14.92 (1.84)				29.989	0.183	0.03
6	41.72		3.44 (2.70)			29.758	0.220	0.05
7	39.91			3.32 (2.98)		29.683	0.231	0.05
8	55.17				0.00019 (0.90)	30.250	0.129	0.02

N=55

Notes:

F values shown in parentheses below coefficients
* significant at the 0.05 level.
** significant at the 0.01 level.

TABLE 23-A

FORCIBLE RAPE
FORM A

Model	Intercept B_0	Clearance B_1	Personnel Expenditures B_{21}	Departmental Expenditures B_{22}	Population B_3	Standard Error of Estimate	R	R^2
1	8.31	..	12.57** (11.03)		0.0003** (28.43)	81.818	0.531	0.28
2	4.87	-3.39 (0.03)		12.02** (12.43)	0.0003** (28.43)	81.708	0.539	0.29
3	27.03	-20.97 (0.82)	16.66** (15.79)			89.866	0.366	0.13
4	20.51	-23.04 (1.01)		15.84** (17.98)		89.005	0.388	0.15
5	121.32	- 8.88 (0.13)				96.075	0.034	0.001
6	17.12		16.18** (15.79)			89.793	0.357	0.13
7	10.00			15.32** (17.98)		89.008	0.378	0.14
8	80.81				0.0004** (28.43)	85.532	0.457	0.21

N = 110

Notes:
F values shown in parentheses below coefficients.
* significant at the 0.05 level.
** significant at the 0.01 level.

TABLE 23B

FORCIBLE RAPE
FORM B

Model	Intercept B_0	Clearance B_1	Personnel Expenditures B_{21}	Departmental Expenditures B_{22}	Population B_3	Standard Error of Estimate	R	R^2
1	16.50	-17.77 (0.39)	13.92** (9.57)		0.00026** (16.29)	82.560	0.529	0.28
2	10.64	-18.38 (0.42)		13.41** (10.81)	0.00024** (16.29)	81.930	0.539	0.29
3	37.93	-38.23 (1.67)	17.21** (13.28)			87.933	0.414	0.17
4	27.82	-37.92 (1.69)		16.65** (15.65)		86.751	0.440	0.19
5	143.41	-32.40 (1.03)				95.273	0.117	0.01
6	16.93		16.89** (13.28)			88.322	0.390	0.15
7	6.81			16.40** (15.65)		87.156	0.418	0.18
8	87.06				0.00032** (16.29)	86.846	0.425	0.18

N = 76

Notes:
F values shown in parentheses below coefficients
* significant at the 0.05 level.
** significant at the 0.01 level.

TABLE 23C-A

FORCIBLE RAPE
FORM C-A

Model	Intercept B_0	Clearance B_1	Personnel Expenditures B_{21}	Departmental Expenditures B_{22}	Population B_3	Standard Error of Estimate	R	R^2
1	-51.13	8.09 (0.13)	12.62** (8.79)		0.00186** (9.02)	83.939	0.425	0.18
2	-65.82	5.85 (0.07)		13.02** (11.60)	0.00197** (9.02)	82.739	0.452	0.20
3	39.15	-4.95 (0.04)	10.39** (5.02)			89.063	0.236	0.06
4	33.67	-6.94 (0.08)		10.23** (6.01)		89.098	0.257	0.07
5	94.31	4.63 (0.04)				91.648	0.021	0.0004
6	37.00		10.22* (5.02)			89.103	0.235	0.06
7	30.82			9.99* (6.01)		88.622	0.256	0.07
8	39.03				0.00158** (9.021)	87.208	0.308	0.09

N = 88

Notes:

F values shown in parentheses below coefficients.
* significant at the 0.05 level.
** significant at the 0.01 level.

TABLE 23C-B

FORCIBLE RAPE
FORM C-B

Model	Intercept B_0	Clearance B_1	Personnel Expenditures B_{21}	Departmental Expenditures B_{22}	Population B_3	Standard Error of Estimate	R	R^2
1	- 59.20	- 5.44 (0.03)	15.03** (7.51)		0.00178* (4.17)	87.574	0.433	0.19
2	- 76.20	- 5.16 (0.03)		15.29** (4.87)	0.00188** (8.71)	86.202	0.461	0.21
3	48.54	-24.79 (0.57)	11.66* (3.99)			92.355	0.281	0.08
4	40.39	-25.38 (0.61)		11.67* (4.87)		91.630	0.305	0.09
5	114.88	-18.05 (0.29)				95.075	0.073	0.005
6	35.29		11.23 (3.99)			91.989	0.262	0.07
7	26.88			11.27* (4.87)		91.298	0.288	0.08
8	45.92				0.00136* (4.17)	91.849	0.268	0.07

N = 56

Notes:

F values shown in parentheses below coefficients.
* significant at the 0.05 level.
** significant at the 0.01 level.

TABLE 24A

ROBBERY
FORM A

Model	Intercept B_0	Clearance B_1	Personnel Expenditures B_{21}	Departmental Expenditures B_{22}	Population B_3	Standard Error of Estimate	R	R^2
1	- 1.11	- 62.71 (1.75)	22.61** (7.38)		0.003** (356.41)	199.640	0.837	0.70
2	7.75	- 61.23 (1.65)		18.32** (6.10)	0.003** (356.41)	200.449	0.835	0.70
3	94.10	-197.02** (5.92)	49.60** (11.72)			345.172	0.314	0.10
4	105.63	-195.67** (5.79)		41.65** (10.39)		346.612	0.302	0.09
5	380.62	-165.37* (3.92)				358.286	0.152	0.02
6	31.48		46.17** (11.72)			350.282	0.258	0.07
7	43.86			38.62** (10.39)		351.608	0.243	0.06
8	101.64				0.003** (356.41)	203.926	0.827	0.68

N = 167

Notes:

F values shown in parentheses below coefficients.
* significant at the 0.05 level.
** significant at the 0.01 level.

TABLE 24B

ROBBERY
FORM B

Model	Intercept B_0	Clearance B_1	Personnel Expenditures B_{21}	Departmental Expenditures B_{22}	Population B_3	Standard Error of Estimate	R	R^2
1	41.65	- 58.65 (1.55)	13.62* (3.01)		0.0028** (372.36)	180.653	0.858	0.74
2	49.19	- 58.06 (1.51)		10.76 (2.33)	0.0028** (372.36)	181.115	0.857	0.73
3	150.88	-200.47** (5.41)	38.83** (7.38)			334.674	0.293	0.09
4	158.61	-200.26** (5.37)		32.88** (6.59)		335.625	0.284	0.08
5	388.48	-191.86* (4.72)				343.013	0.181	0.03
6	72.52		37.72** (7.38)			339.904	0.224	0.05
7	80.66			31.86* (6.59)		340.820	0.212	0.05
8	95.71				0.0028** (372.36)	182.302	0.852	0.73

N = 142

Notes:

F values shown in parentheses below coefficients.
* significant at the 0.05 level.
** significant at the 0.01 level.

TABLE 24C-A

ROBBERY
FORM C-A

Model	Intercept B_0	Clearance B_1	Personnel Expenditures B_{21}	Departmental Expenditures B_{22}	Population B_3	Standard Error of Estimate	R	R^2
1	-188.50	-47.40 (1.31)	24.87** (10.55)		0.00831** (74.45)	172.807	0.627	0.39
2	-205.88	-47.84 (1.35)		23.30** (11.84)	0.00854** (74.45)	172.058	0.631	0.40
3	134.66	-75.25 (2.10)	17.52 (2.91)			217.292	0.185	0.03
4	150.56	-72.89 (1.96)		12.83 (1.91)		218.153	0.163	0.03
5	231.99	-61.02 (1.39)				219.274	0.098	0.01
6	112.99		15.60 (2.91)			218.127	0.141	0.02
7	129.71			11.18 (1.91)		218.881	0.115	0.01
8	- 53.32				0.00804** (74.45)	178.678	0.585	0.34

N = 145

Notes:
F values shown in parentheses below coefficients.
* significant at the 0.05 level.
** significant at the 0.01 level.

TABLE 24C-B

ROBBERY
FORM C-B

Model	Intercept B_0	Clearance B_1	Personnel Expenditures B_{21}	Departmental Expenditures B_{22}	Population B_3	Standard Error of Estimate	R	R^2
1	-107.23	-48.04 (1.46)	14.76** (4.40)		0.00714** (69.46)	151.009	0.630	0.40
2	-122.82	-48.08 (1.48)		14.45** (5.30)	0.00729** (69.46)	150.454	0.633	0.40
3	185.21	-76.00 (2.13)	7.60 (0.79)			191.273	0.155	0.02
4	199.92	-75.00 (2.13)		4.46 (0.34)		191.630	0.142	0.02
5	229.93	-72.96 (2.13)				191.104	0.132	0.02
6	156.79		6.71 (0.61)			192.303	0.071	0.005
7	172.05			3.67 (0.23)		192.607	0.044	0.002
8	- 34.31				0.0070** (69.46)	153.433	0.605	0.367

N = 122

Notes:
F values shown in parentheses below coefficients.
* significant at the 0.05 level.
** significant at the 0.01 level.

TABLE 25A

AGGRAVATED ASSAULT
FORM A

Model	Intercept B_0	Clearance B_1	Personnel Expenditures B_{21}	Departmental Expenditures B_{22}	Population B_3	Standard Error of Estimate	R	R^2
1	164.86	- 53.80 (0.13)	66.54** (6.21)		0.0023** (23.25)	683.774	0.391	0.15
2	200.43	- 55.04 (0.13)		52.97** (5.01)	0.0023** (23.25)	686.117	0.384	0.15
3	293.93	-158.46 (1.02)	84.73** (9.70)			718.153	0.233	0.05
4	333.85	-160.78 (1.04)		68.69** (8.13)		721.281	0.228	0.05
5	838.14	-196.57 (1.51)				735.235	0.094	0.01
6	159.36		87.03** (9.70)			718.192	0.233	0.05
7	196.64			70.79** (8.13)		721.373	0.214	0.05
8	510.57				0.0026** (23.25)	692.416	0.348	0.12

N = 171

Notes:
F values shown in parentheses below coefficients.
* significant at the 0.05 level.
** significant at the 0.01 level.

TABLE 25B

AGGRAVATED ASSAULT
FORM B

Model	Intercept B_0	Clearance B_1	Personnel Expenditures B_{21}	Departmental Expenditures B_{22}	Population B_3	Standard Error of Estimate	R	R^2
1	282.45	-86.63 (0.23)	41.50* (2.68)		0.00229** (24.61)	619.345	0.400	0.16
2	307.96	-88.77 (0.24)		32.88 (2.15)	0.00230** (24.61)	620.443	0.398	0.16
3	478.30	-26.06 (1.92)	57.53** (6.10)			658.068	0.215	0.05
4	506.04	-26.40 (1.96)		46.89* (4.34)		659.622	0.205	0.04
5	873.87	-30.50 (2.60)				665.655	0.132	0.02
6	254.13		61.81* (5.10)			660.132	0.184	0.03
7	278.42			50.76* (4.34)		661.784	0.170	0.03
8	464.69				0.00247** (24.61)	621.239	0.380	0.14

N = 148

Notes:
F values shown in parentheses below coefficients.
* significant at the 0.05 level.
** significant at the 0.01 level.

TABLE 25C-A

AGGRAVATED ASSAULT
FORM C-A

Model	Intercept B_0	Clearance B_1	Personnel Expenditures B_{21}	Departmental Expenditures B_{22}	Population B_3	Standard Error of Estimate	R	R^2
1	-769.77	15.54 (0.01)	86.65** (11.37)		0.02700** (63.53)	602.479	0.594	0.35
2	-842.31	20.70 (0.02)		82.18** (13.00)	0.02778** (63.53)	599.356	0.599	0.36
3	335.97	- 90.99 (0.30)	59.10* (3.71)			736.016	0.163	0.03
4	384.56	- 92.87 (0.31)		44.81 (2.74)		738.371	0.143	0.02
5	699.72	-106.35 (0.41)				742.442	0.053	0.003
6	259.55		59.95 (3.71)			734.270	0.157	0.03
7	306.40			45.59 (2.74)		736.646	0.135	0.02
8	-200.42				0.02567** (63.53)	621.256	0.549	0.30

N = 149.

Notes:
F values shown in parentheses below coefficients.
* significant at the 0.05 level.
** significant at the 0.01 level.

TABLE 25C-B

AGGRAVATED ASSAULT
FORM C-B

Model	Intercept B_0	Clearance B_1	Personnel Expenditures B_{21}	Departmental Expenditures B_{22}	Population B_3	Standard Error of Estimate	R	R^2
1	-639.75	43.68 (0.07)	61.01** (6.07)		0.02457** (62.97)	536.838	0.604	0.36
2	-721.20	52.17 (0.10)		61.10** (7.69)	0.02520** (62.97)	533.499	0.610	0.37
3	489.06	-133.86 (0.45)	29.80 (1.09)			666.638	0.110	0.01
4	524.69	-136.96 (0.74)		21.40 (0.47)		667.517	0.098	0.01
5	685.42	-150.02 (0.57)				666.550	0.067	0.004
6	374.15		31.47 (1.09)			665.177	0.093	0.01
7	407.07			22.91 (0.74)		666.107	0.076	0.01
8	-193.07				0.02345** (62.97)	545.505	0.577	0.33

N = 128

Notes:
F values shown in parentheses below coefficients.
* significant at the 0.05 level.
** significant at the 0.01 level.

TABLE 26A

BURGLARY
FORM A

Model	Intercept B_0	Clearance B_1	Personnel Expenditures B_{21}	Departmental Expenditures B_{22}	Population B_3	Standard Error of Estimate	R	R^2
1	1,672.22	-1,053.98 (1.81)	454.09** (36.98)		0.0209** (201.29)	1,916.89	0.784	0.61
2	1,826.76	-1,069.09 (1.81)		373.92** (31.15)	0.0210** (201.29)	1,942.66	0.777	0.60
3	2,312.59	-2,528.84** (5.11)	645.84** (36.79)			2,763.54	0.440	0.19
4	2,496.20	-2,567.92** (5.16)		539.96** (32.15)		2,793.38	0.420	0.18
5	6,142.17	-2,414.33 (3.86)				3,036.33	0.145	0.02
6	1,673.51		641.92** (36.79)			2,795.10	0.413	0.17
7	1,857.37			534.99** (32.15)		2,825.64	0.390	0.15
8	3,979.97				0.0228** (201.29)	2,105.50	0.728	0.53

N = 181

Notes:
F values shown in parentheses below coefficients.
* significant at the 0.05 level.
** significant at the 0.01 level.

TABLE 26B

BURGLARY
FORM B

Model	Intercept B_0	Clearance B_1	Personnel Expenditures B_{21}	Departmental Expenditures B_{22}	Population B_3	Standard Error of Estimate	R	R^2
1	2,132.35	-1,510.39** (4.11)	342.22** (23.14)		0.02037** (221.40)	1,729.044	0.801	0.64
2	2,221.97	-1,507.21** (4.02)		285.45** (20.14)	0.02048** (221.40)	1,743.840	0.797	0.64
3	2,759.38	-2,987.37** (7.14)	529.87** (25.11)			2,619.440	0.415	0.17
4	2,868.37	-2,994.65** (7.07)		448.32** (22.51)		2,638.476	0.400	0.16
5	6,005.13	-2,996.32* (6.22)				2,815.641	0.193	0.04
6	1,972.96		530.31** (25.11)			2,668.905	0.367	0.14
7	2,082.18			448.40** (25.51)		2,687.751	0.350	0.12
8	3,718.53				0.02202** (221.40)	1,861.904	0.761	0.58

N = 163

Notes:

F values shown in parentheses below coefficients.
* significant at the 0.05 level.
** significant at the 0.01 level.

TABLE 26C-A

BURGLARY
FORM C-A

Model	Intercept B_0	Clearance B_1	Personnel Expenditures B_{21}	Departmental Expenditures B_{22}	Population B_3	Standard Error of Estimate	R	R^2
1	- 101.16	- 709.41 (0.88)	483.74** (40.28)		0.07032** (38.28)	1,829.092	0.604	0.37
2	- 226.77	- 711.06 (0.88)		424.82** (39.26)	0.07406** (38.28)	1,833.870	0.601	0.36
3	2,597.46	-1,215.02 (1.93)	425.35** (22.83)			2,124.047	0.371	0.14
4	2,828.01	-1,219.78 (1.89)		338.13** (18.04)		2,153.203	0.337	0.11
5	5,028.54	-1,013.15 (1.18)				2,271.484	0.086	0.01
6	2,303.40		419.56** (22.83)			2,130.320	0.356	0.13
7	2,537.44			332.35** (18.04)		2,159.300	0.321	0.10
8	2,711.42				0.06471** (38.28)	2,044.341	0.443	0.20

N = 159

Notes:

F values shown in parentheses below coefficients.
* significant at the 0.05 level.
** significant at the 0.01 level.

TABLE 26C-B

BURGLARY
FORM C-B

Model	Intercept B_0	Clearance B_1	Personnel Expenditures B_{21}	Departmental Expenditures B_{22}	Population B_3	Standard Error of Estimate	R	R^2
1	608.75	-1,112.62 (2.32)	376.49** (26.41)		0.05958** (33.65)	1,666.647	0.576	0.33
2	436.86	-1,081.50 (2.20)		338.10** (26.87)	0.06286** (33.65)	1,665.086	0.577	0.33
3	3,016.51	-1,707.76* (4.24)	319.90** (14.24)			1,907.695	0.344	0.12
4	3,187.86	-1,698.89* (4.11)		254.61** (11.27)		1,927.050	0.317	0.10
5	4,904.94	-1,612.61 (3.44)				2,000.306	0.154	0.02
6	2,585.05		314.86** (14.24)			1,929.500	0.303	0.09
7	2,759.18			250.15** (11.27)		1,948.212	0.272	0.07
8	2,682.97				0.05577** (33.65)	1,819.143	0.439	0.19

N = 143

Notes:

F values shown in parentheses below coefficients.
* significant at the 0.05 level.
** significant at the 0.01 level.

TABLE 27A

LARCENY--$50 AND OVER
FORM A

Model	Intercept B_0	Clearance B_1	Personnel Expenditures B_{21}	Departmental Expenditures B_{22}	Population B_3	Standard Error of Estimate	R	R^2
1	943.28	-5,071.13** (14.33)	697.28** (44.88)		0.0026 (1.55)	2,720.92	0.526	0.28
2	1,339.36	-5,251.05** (14.78)		533.76** (36.91)	0.0029 (1.84)	2,783.65	0.492	0.24
3	1,007.86	-5,235.19** (14.33)	720.68** (47.88)			2,725.14	0.519	0.27
4	1,414.57	-5,440.35** (14.78)		576.21** (36.91)		2,790.22	0.484	0.24
5	5,393.21	-5,714.84** (13.52)				3,066.53	0.265	0.07
6	34.19		740.16** (47.88)			2,824.75	0.459	0.21
7	446.70			587.46** (36.91)		2,895.62	0.414	0.17
8	4,054.77				0.0060* (6.32)	3,125.49	0.185	0.03

N = 181

Notes:
F values shown in parentheses below coefficients.
* significant at the 0.05 level.
** significant at the 0.01 level.

TABLE 27B

LARCENY--$50 AND OVER
FORM B

Model	Intercept B_0	Clearance B_1	Personnel Expenditures B_{21}	Departmental Expenditures B_{22}	Population B_3	Standard Error of Estimate	R	R^2
1	1,825.07	-4,397.39** (13.13)	433.68** (24.29)		0.00342* (3.11)	2,384.241	0.461	0.21
2	2,119.72	-4,531.71** (13.66)		338.38** (18.29)	0.00363* (3.40)	2,417.960	0.436	0.19
3	1,913.96	-4,656.13** (13.13)	463.98** (24.29)			2,399.884	0.444	0.20
4	2,216.07	-4,815.34** (13.66)		366.42** (18.29)		2,436.027	0.415	0.17
5	4,818.72	-5,016.69** (13.65)				2,563.280	0.280	0.08
6	1,034.09		486.39** (24.29)			2,488.625	0.362	0.13
7	1,349.91			380.44** (18.29)		2,529.971	0.319	0.10
8	3,613.47				0.00584** (7.95)	2,606.246	0.217	0.05

N = 163

Notes:
F values shown in parentheses below coefficients.
* significant at the 0.05 level.
** significant at the 0.01 level.

TABLE 27C-A

LARCENY--$50 AND OVER
FORM C-A

Model	Intercept B_0	Clearance B_1	Personnel Expenditures B_{21}	Departmental Expenditures B_{22}	Population B_3	Standard Error of Estimate	R	R^2
1	-2,672.92	-3,041.10** (6.49)	754.57** (64.19)		0.09715** (43.57)	2,237.890	0.684	0.47
2	-2,683.46	-3,182.5** (6.87)		641.60** (56.31)	0.10230** (43.57)	2,276.344	0.670	0.45
3	1,108.45	-4,382.62** (9.52)	671.36** (34.59)			2,686.955	0.477	0.23
4	1,580.75	-4,550.05** (9.75)		521.39** (24.88)		2,755.587	0.433	0.19
5	5,020.67	-4,318.09** (7.53)				2,977.169	0.214	0.05
6	382.86		668.79** (34.59)			2,758.897	0.425	0.18
7	875.39			511.88** (24.88)		2,831.577	0.370	0.14
8	1,415.10				0.09106** (43.57)	2,696.448	0.466	0.22

N = 159

Notes:
F values shown in parentheses below coefficients.
* significant at the 0.05 level.
** significant at the 0.01 level.

TABLE 27C-B

LARCENY--$50 AND OVER
FORM C-B

Model	Intercept B_0	Clearance B_1	Personnel Expenditures B_{21}	Departmental Expenditures B_{22}	Population B_3	Standard Error of Estimate	R	R^2
1	-1,299.32	-2,409.06** (5.10)	475.45** (32.73)		0.08404** (50.76)	1,904.443	0.652	0.43
2	-1,352.27	-2,507.99** (5.45)		409.92** (29.57)	0.08754** (50.76)	1,919.864	0.645	0.42
3	2,113.85	-3,738.69** (8.54)	391.71** (14.89)			2,310.862	0.384	0.15
4	2,478.17	-3,857.72** (8.82)		292.48** (9.85)		2,346.979	0.347	0.12
5	4,469.28	-3,808.41** (8.05)				2,425.690	0.232	0.05
6	1,469.72		395.78** (14.89)			2,371.865	0.309	0.10
7	1,859.85			289.38** (9.85)		2,411.167	0.255	0.07
8	1,258.87				0.08052** (50.76)	2,138.540	0.514	0.27

N = 143

Notes:
F values shown in parentheses below coefficients.
* significant at the 0.05 level.
** significant at the 0.01 level.

TABLE 28A

LARCENY--UNDER $50
FORM A

Model	Intercept B_0	Clearance B_1	Personnel Expenditures B_{21}	Departmental Expenditures B_{22}	Population B_3	Standard Error of Estimate	R	R^2
1	14,369.01	-4,226.70** (5.11)	-570.40** (15.69)		0.02409** (51.81)	3,980.21	0.554	0.31
2	14,486.16	-4,164.89** (4.98)		-518.12** (16.76)	0.02410** (51.81)	3,970.73	0.557	0.31
3	14,976.32	-6,663.86** (10.97)	-332.85* (3.65)			4,582.37	0.277	0.08
4	15,118.03	-6,613.07** (10.97)		-313.38* (4.16)		4,547.86	0.282	0.08
5	13,052.16	-7,048.06** (10.97)				4,616.13	0.240	0.06
6	14,160.03		-384.74* (4.69)			4,694.43	0.160	0.03
7	14,329.00			-361.55* (5.34)		4,686.10	0.170	0.03
8	10,317.18				0.02300** (51.81)	4,187.83	0.474	0.23

N = 181

Notes:

F values shown in parentheses below coefficients.
* significant at the 0.05 level.
** significant at the 0.01 level.

TABLE 28B

LARCENY--UNDER $50
FORM B

Model	Intercept B_0	Clearance B_1	Personnel Expenditures B_{21}	Departmental Expenditures B_{22}	Population B_3	Standard Error of Estimate	R	R^2
1	15,187.35	-4,249.16** (4.94)	-686.83** (19.86)		0.02368** (43.86)	3,945.97	0.567	0.32
2	15,242.54	-4,220.22** (4.87)		-608.94** (19.95)	0.02362** (43.86)	3,945.78	0.567	0.32
3	15,794.60	-6,585.55** (9.80)	-457.31** (6.41)			4,547.76	0.306	0.09
4	15,862.21	-6,558.26** (9.80)		-410.46** (6.57)		4,545.58	0.308	0.10
5	13,049.09	-6,900.49** (9.80)				4,623.53	0.240	0.06
6	14,863.49		-488.69** (6.99)			4,662.10	0.204	0.04
7	14,951.81			-440.22** (7.22)		4,658.87	0.207	0.04
8	10,357.84				0.02222** (43.86)	4,221.73	0.463	0.21

N = 163

Notes:
F values shown in parentheses below coefficients.
* significant at the 0.05 level.
** significant at the 0.01 level.

TABLE 28C-A

LARCENY--UNDER $50
FORM C-A

Model	Intercept B_0	Clearance B_1	Personnel Expenditures B_{21}	Departmental Expenditures B_{22}	Population B_3	Standard Error of Estimate	R	R^2
1	10,167.60	-2,974.46* (2.93)	-521.92** (12.91)		0.14531** (65.37)	3,652.00	0.600	0.36
2	10,006.82	-3,033.09* (3.01)		-423.95** (10.78)	0.14199** (65.37)	3,674.28	0.593	0.35
3	15,735.31	-5,034.93** (6.30)	-626.90** (14.32)			4,270.80	0.345	0.12
4	15,904.00	-4,939.52** (6.10)		-576.81** (15.83)		4,254.83	0.355	0.13
5	12,214.71	-5,840.80** (8.00)				4,424.71	0.220	0.05
6	15,138.46		-677.36** (14.32)			4,342.25	0.289	0.08
7	15,339.60			-623.34** (. 15.83)		4,323.31	0.303	0.09
8	6,200.81				0.15766** (65.37)	3,811.39	0.542	0.29

N = 159

Notes:

F values shown in parentheses below coefficients.
* significant at the 0.05 level.
** significant at the 0.01 level.

TABLE 28C-B

LARCENY--UNDER $50
FORM C-B

Model	Intercept B_0	Clearance B_1	Personnel Expenditures B_{21}	Departmental Expenditures B_{22}	Population B_3	Standard Error of Estimate	R	R^2
1	11,214.46	-2,980.66 (2.66)	-629.99** (15.62)		0.13394** (51.73)	3,715.13	0.595	0.35
2	11,049.37	-3,053.68* (2.74)		-506.52** (12.38)	0.12991** (51.73)	3,753.39	0.584	0.34
3	16,596.72	-5,169.92** (6.31)	-747.09** (17.35)			4,251.99	0.385	0.15
4	16,692.86	-5,106.94** (6.62)		-669.69** (18.00)		4,245.41	0.388	0.15
5	12,233.31	-5,767.59** (7.11)				4,478.50	0.219	0.05
6	15,870.19		-780.27** (17.35)			4,341.29	0.331	0.11
7	15,995.14			-701.29** (18.00)		4,322.52	0.336	0.11
8	6,421.50				0.14924** (51.73)	3,926.02	0.518	0.27

N = 143

Notes:

F values shown in parentheses below coefficients.
* significant at the 0.05 level.
** significant at the 0.01 level.

TABLE 29A

AUTO THEFT
FORM A

Model	Intercept B_0	Clearance B_1	Personnel Expenditures B_{21}	Departmental Expenditures B_{22}	Population B_3	Standard Error of Estimate	R	R^2
1	1,064.00	- 949.89** (12.77)	68.86** (5.15)		0.0111** (355.76)	784.22	0.835	0.70
2	1,066.92	- 954.39** (12.77)		59.98** (5.02)	0.0111** (355.76)	784.50	0.834	0.70
3	1,489.76	-1,915.02** (19.50)	175.84** (12.67)			1,302.40	0.398	0.16
4	1,501.95	-1,928.09** (19.50)		152.78** (12.26)		1,303.81	0.395	0.16
5	2,513.72	-1,834.87** (19.50)				1,344.20	0.313	0.10
6	926.35		162.74** (9.72)			1,378.59	0.227	0.05
7	949.61			139.05** (9.09)		1,380.88	0.220	0.05
8	1,107.90				0.0118** (355.76)	818.97	0.816	0.67

N = 181

Notes:
F values shown in parentheses below coefficients.
* significant at the 0.05 level.
** significant at the 0.01 level.

TABLE 29B

AUTO THEFT
FORM B

Model	Intercept B_0	Clearance B_1	Personnel Expenditures B_{21}	Departmental Expenditures B_{22}	Population B_3	Standard Error of Estimate	R	R^2
1	1,200.58	- 805.56** (9.89)	35.24 (1.32)		0.01053** (319.15)	759.74	0.829	0.69
2	1,208.21	- 806.05** (9.89)		29.67 (1.19)	0.01538** (319.15)	760.05	0.829	0.69
3	1,636.37	-1,749.48** (17.70)	133.85** (7.22)			1,256.52	0.371	0.14
4	1,650.01	-1,755.08** (17.70)		115.44** (6.81)		1,258.06	0.369	0.14
5	2,450.79	-1,735.21** (17.70)				1,280.54	0.315	0.10
6	1,056.83		131.02* (6.23)			1,323.73	0.193	0.04
7	1,076.45			111.84* (5.76)		1,325.61	0.186	0.04
8	1,102.94				0.01109** (319.15)	781.21	0.815	0.67

N = 163

Notes:

F values shown in parentheses below coefficients.
* significant at the 0.05 level.
** significant at the 0.01 level.

TABLE 29C-A

AUTO THEFT
FORM C-A

Model	Intercept B_0	Clearance B_1	Personnel Expenditures B_{21}	Departmental Expenditures B_{22}	Population B_3	Standard Error of Estimate	R	R^2
1	516.72	- 739.65** (8.25)	63.66** (4.22)		0.02754** (56.11)	745.45	0.565	0.32
2	436.68	- 743.37** (8.25)		64.68** (5.59)	0.02823** (56.11)	742.28	0.570	0.33
3	1,633.68	-1,128.05** (16.47)	44.63 (1.60)			852.15	0.323	0.10
4	1,658.39	-1,128.49** (16.47)		35.41 (1.30)		852.97	0.320	0.10
5	1,883.16	-1,095.66** (16.47)				853.78	0.308	0.10
6	1,319.96		30.73 (0.69)			895.46	0.066	0.004
7	1,354.95			21.67 (0.45)		896.17	0.053	0.003
8	567.24				0.02952** (56.11)	770.29	0.513	0.26

N = 159

Notes:

F values shown in parentheses below coefficients.
* significant at the 0.05 level.
** significant at the 0.01 level.

TABLE 29C-B

AUTO THEFT
FORM C-B

Model	Intercept B_0	Clearance B_1	Personnel Expenditures B_{21}	Departmental Expenditures B_{22}	Population B_3	Standard Error of Estimate	R	R^2
1	511.32	-562.42** (4.93)	48.05 (2.29)		0.027448** (54.53)	728.90	0.561	0.32
2	425.99	-559.60** (4.93)		51.41 (3.31)	0.028086** (54.53)	726.29	0.565	0.32
3	1,683.85	-978.03** (12.23)	23.86 (0.43)			840.32	0.287	0.08
4	1,716.01	-976.92** (12.23)		16.12 (0.25)		840.86	0.285	0.08
5	1,823.38	-969.02** (12.23)				838.62	0.282	0.08
6	1,371.90		17.53 (0.22)			873.56	0.039	0.002
7	1,410.44			9.71 (0.80)		873.96	0.024	0.0005
8	548.86				0.028972** (54.53)	742.39	0.528	0.28

N = 143

Notes:

F values shown in parentheses below coefficients.
* significant at the 0.05 level.
** significant at the 0.01 level.

D. Significance of the Results

The coefficient on clearance is nearly always negative, though significant only for the property offenses. While not explanatory of as much of the variation in offense rates as had been hoped, the sign, the magnitude, and highly significant status of B_1 for the property offenses lend credence to hypotheses suggesting that there is a relation between the clearance rate and offense rates, especially for the property crime.

Comparing these results to those of Chapter IV, the clearance rate does not appear to be as useful in prediction as was the probability of conviction used in the earlier chapter. Perhaps the actual value of the clearance rate for a city for a given year does not affect the perceived value of p very strongly. That is, the perceived value of p may change only very slowly in response to apprehensions unless these are highly publicized. These matters require more examination, however, the evidence suggests that values for probability of conviction are preferred to clearance rates in research efforts as the former more nearly represents the relevant parameter in criminal decision making.

Expenditures for police personnel and police departments have basically equivalent relations to offense rates. Also these relations are usually highly significant for the offenses. The surprising evidence in regard to this relation is that the coefficients, with the exception of petty larceny, are usually positive. One possible interpretation is the apparently contradictory idea that hiring more police and spending more in the department results in more rather than less crime! After one spends time examining the origins of police data several alternative interpretations are suggested.

Many crimes are substantially underreported (see pp. 70-73).

It is likely that increased expenditures result in more discovery and reporting of offenses. This crime "visibility-increasing" effect of more police may appear to exceed the deterrent effect increased police likely have on offenses. The exception to this position would be petty larceny which is often committed by juveniles. Perhaps if juveniles are more highly responsive to additional police, it is possible to explain the negative coefficient on expenditures for this offense.

An alternative interpretation is to suggest that high crime rates lead to more police, that is; "crime causes police." If a community increases its police expenditures as a consequence of high crime rates a positive coefficient between the crime rate and per capita police expenditures would result. If this is the case, police expenditures would not truly represent an independent variable in the regression. This alternative interpretation could be rejected if it were possible to show that police expenditures were determined by forces independent of the offense level. An examination of per capita expenditures (Appendix A) suggests that within the eleven year period under examination, per capita expenditures do not demonstrate a relation in response to offense levels. Total expenditures for nearly all cities show a gradual year-by-year increase over the period, casually interpreted to be the consequence of increased tax revenues with negligible reallocation among different local government functions.

The positive relation between population and offense rates is not at all unexpected. The tendency, in the case of some offenses, for population to be far more closely related to the dependent variable than clearance or expenditures was not expected. As population is not determined by government policy this relation is not of policymaking value to

those concerned with law enforcement. The removal of the two largest cities from the data (forms C-A and C-B) appreciably reduces the worth of the results for homicide, forcible rape, robbery, burglary, and auto theft.

Models A and B for aggravated assault, larceny of $50. and over, and larceny--under $50.; show better results when the two largest cities are excluded. Explanations could be offered to the effect that the supply of these offenses is less elastic with respect to population and additional expenditures result in greater reporting as compared to the larger cities. Acceptance of such suggested interpretations would require more specific evidence than is currently available.

Earlier in this chapter (pp. 124-25), the possibility of a relation between expenditures and the clearance rate was mentioned. Multicollinearity between these two independent variables would lead to high standard errors and parameter estimates which are highly sensitive to changes in the model or data set. It is possible to examine the coefficients of correlation between B_1 and B_{21} or B_1 and B_{22} when these are the only two independent variables in the regression model (models 3 and 4).[25] This examination does not suggest that a significant relation exists, and if any does, it is weak.

A related problem that may be encountered is errors in the measurement of an independent variable specifically the clearance rate. This estimation problem may result in downward bias in the estimates.[26] Though there are techniques that might resolve this problem they are not

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[25] An examination of the correlation coefficients between these pairs show a range of -.08 to +.14 for the sixteen pairs of form A.

[26] J. Johnston, Econometric Methods (N.Y.: McGraw-Hill Inc., 1963), pp. 148-50.

highly satisfactory. The nature of the results does not suggest much gain would result from the application of such procedures.[27]

In this chapter an attempt was made to determine if it is possible by using a simple model with only a few variables to explain differences in offense rates. It was not intended that the model merely explain the variations as might be reflected by a high R^2. The purpose was to identify independent variables that can be controlled through law enforcement policy, in particular the clearance rate and police expenditures.

What can be concluded? Although the relation involving clearance is usually of the correct sign and often either highly significant or significant, it is not possible to explain very much of the offense rate differences by the clearance rate. The surprising result is that per capita expenditures appear to be positively related to offense levels and this relation (in nearly all cases) is significant or highly significant. These less than ideal results should perhaps be expected in cases as this where the data are far from excellent and no settled approaches exist.

E. Projecting Crime and the Cost of Crime in Oklahoma

No evidence was found of attempts to project future levels of crime, crime costs, and possible effects of differing applications of law enforcement on these costs. The recent implementation of statewide planning aimed at coordinated improvement of law enforcement has not

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[27] An additional change made in the program was the regressing of Y on X, reversing the dependent and independent variables of model 5. These results showed little relation.

entered this area although future requirements and costs would appear to represent a natural line of inquiry.[28]

An examination of the level of Index offenses for the past provides a means of initiating such projections. As offense data have been reported in compatible terms since 1958, it is best to restrict attention to the post-1958 period. Table 30 depicts Index offenses in Oklahoma for each year from 1958 through 1970. Future offense levels were projected for the ten year period 1971 through 1980 by a linear extrapolation of the 1958-70 offenses.[29] Table 31 presents the projected level of offenses by year through 1980.

A linear projection may appear to be a gross simplification of reality. Nonetheless, it is possible to estimate how well this method represents changes in offense levels. Table 32 provides a set of summary statistics that aid in interpretation of the usefulness of the projection.

All correlation coefficients exceed .85 with the exception of murder and forcible rape. The linear relationship appears to generate a quite good fit for the remaining five offenses. Of particular

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[28]No part of this analysis goes into the matter of reallocation of police resources among the cities. Nonetheless, increased Federal funding and the promotion of more centralized coordination may in the future lead to increased attention toward the allocation of police manpower among cities. Several studies have addressed themselves to this matter. Some of the effects of different goals and allocational patterns relating to police districts in Chicago, are presented in Appendix C.

[29]Projection of the elements of a criminal justice system was done by Blumstein and Larson for California as part of research done through the Institute for Defense Analyses. This represents the source of methodology for this section. Refer to: Alfred Blumstein and Richard Larson, "Models of a Total Criminal Justice System," Operations Research, 17 (March-April, 1969), pp. 199-215.

TABLE 30

INDEX OFFENSES IN THE STATE OF OKLAHOMA: 1958-70

Offense	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970
Murder	150	154	175	119	126	129	110	110	135	166	162	148	151
Forcible Rape	234	254	299	286	182	200	269	275	336	343	383	366	400
Robbery	645	564	936	804	958	981	1,038	942	999	961	1,221	1,248	1,378
Aggravated Assault	808	741	838	1,173	1,156	1,431	2,100	1,928	1,995	2,142	2,595	2,890	3,132
Burglary	9,668	9,008	12,495	11,951	11,929	12,659	14,047	13,089	14,278	14,844	17,368	17,657	20,303
Larceny--$50. and over	6,468	5,956	6,076	5,982	6,284	6,657	7,399	7,482	9,023	10,891	13,434	14,514	17,516
Auto Theft	3,256	3,181	4,642	4,430	4,826	4,706	4,881	4,717	4,768	4,691	5,343	6,197	7,049
Total Index Offenses	21,229	19,858	25,461	24,745	25,461	26,763	29,844	28,543	31,534	34,038	40,506	43,020	49,929

Source: Federal Bureau of Investigation, Uniform Crime Reports, 1958-70.

TABLE 31

PROJECTED INDEX OFFENSES IN OKLAHOMA: 1971-80

Offense	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Murder	143.6	144.0	144.3	144.7	145.0	145.4	145.7	146.1	146.4	146.8
Forcible Rape	389	402	415	429	442	456	469	483	496	509
Robbery	1,339	1,391	1,443	1,495	1,547	1,600	1,652	1,704	1,756	1,808
Aggravated Assault	3,179	3,381	3,584	3,786	3,988	4,190	4,392	4,594	4,797	4,999
Burglary	19,190	19,960	20,730	21,500	22,270	23,050	23,820	24,590	25,360	26,130
Larceny-- $50. and over	15,190	16,070	16,940	17,820	18,690	19,570	20,450	21,320	22,200	23,080
Auto Theft	6,411	6,638	6,865	7,092	7,319	7,546	7,773	8,000	8,227	8,454
Total Index of Offenses	45,842	47,986	50,121	52,267	54,041	56,557	58,702	60,837	62,982	65,127

Source: Computed from Table 30.

TABLE 32

STATISTICS OF LINEAR PROJECTION OF INDEX OFFENSES IN OKLAHOMA

Offense	Mean Offenses 1958-70	Standard Deviation	Constant (1958=0)	Linear Growth Coefficient	t Statistic of Linear Term	Standard Error or Estimate	Correlation Coefficient r	Coefficient of Determination r^2	Interval of Growth Coefficient at 95% Confidence
Murder	141	21	139	0.35	0.21	22	0.064	0.004	--
Forcible Rape	294	68	214	13.44	3.94	46	0.77	0.59	6 to 21
Robbery	975	226	663	52.04	6.74	104	0.90	0.81	35 to 69
Aggravated Assault	1,764	807	551	202.19	14.81	184	0.98	0.95	172 to 232
Burglary	13,792	3,185	9,165	771.18	6.39	1,108	0.94	0.89	590 to 952
Larceny-- $50. and over	9,054	3,843	3,793	876.59	6.42	1,843	0.88	0.79	576 to 1176
Auto Theft	4,822	1,021	3,460	227.03	5.75	533	0.87	0.75	140 to 314

Source: Computed from Table 30.

importance to law enforcement and criminal justice planning is the linear growth coefficient which represents the annual increment of offenses. With the exception of homicide, all the linear growth coefficients are significant at the 0.01 level.

These growth measures and the last column of Table 32 indicate that larcenies and burglaries are growing much more rapidly than any other offense in absolute terms. With 95 percent confidence one can state that the annual growth in larcenies is between 576 and 1176 per year while burglaries have a growth rate of between 590 and 952 per year.

If cost figures for individual offenses are used to measure the direct impact of these offenses it is possible to generate an estimate of the future costs crime will have on victims in the state. Appendix D provides an indication of these estimated magnitudes. When expected offense levels and costs are important in the determination of law enforcement policy it would appear cognizance of these measures is necessary for policy matters.

CHAPTER VI

Police departments are about the most poorly managed organizations in our society. No business - government or private - could survive very long without knowledge of the functions it performs.

John A. Webster, "Police Task and Time Study," Journal of Criminal Law and Police Science, 61 (March, 1970), p. 100.

Demands upon the public purse are made through arguments and demonstrations having little basis in fact. If the crime rate is high, it is contended that larger police quotas will lower it; if low then more police are needed to keep it low.

Bruce Smith, Police Systems in the United States, 2nd ed. rev. by Bruce Smith, Jr., p. 121.

CHAPTER VI

IMPLICATIONS AND CONCLUSIONS

A. Usefulness of an Economic Approach

Economic study emphasizes sacrifice and the need for choice. This study is a part of the recent trend in economics which attempts to apply the traditional tools of economics to an area of public activity previously exempt from economic analysis, criminal activity and law enforcement. In general terms, the goal of this study was to analyze crime using the traditional economic tool of analysis of choice to determine if there is an identifiable relation between changes in the cost of committing criminal acts and the level of criminal activity. Serious thought and theoretical reasoning provided a convincing basis for the belief that there is a definite inverse relation between changes in the costs of committing criminal acts and the number of criminal acts.

It is clear from numerous criminological studies that certain environmental conditions are conducive to the commission of offenses. However, it is not possible to accurately control social parameters. In an attempt to identify relations wherein a variable capable of control could be isolated, this study primarily emphasized a microeconomic orientation. Examination of the relation between costs of committing offenses and the number of offenses was attempted using two different

empirical bases; data using forty-eight states and data for seventeen Oklahoma cities. The results of the applications have been presented earlier. Of what value are these results?

In the examination involving forty-eight states the modest values for the coefficients of determination suggest that while it may not be possible to explain most of the variation in offense rates by the probability of conviction and punishment, in most cases these appear to be significant factors explaining variations in crime rates with the probability being more explanatory. Evidence has supported the view that the supply of offenses is inelastic with respect to probability and punishment and that there are significant differences in criminal response to these two measures of costs for different offenses.

The part of the study using the Oklahoma cities involving clearance rates, police expenditures per capita, and population suggested that the clearance rate, a proxy for the probability of conviction, often fails to be a significant factor determining the offense level. Population appeared to be most closely associated with the offense level. A surprising result was the often observed positive relation between police expenditures per capita and offense levels. The examination labored throughout under the disadvantage of potential inadequacy of the measurements of costs. As is the case for most newer areas of economic study it is assumed that in the next several years better data will become available that can be used to improve upon the results of this study.

Though numerous qualifications and problems have been cited throughout the text of this investigation, it remains evident that optimal policies aimed at controlling illegal activity are part of the

problem of attempting to achieve an optimum allocation of resources. In the private sector one may cite examples of this. For example, profit-seeking firms tolerate higher levels of shoplifting than would exist if they increased the number of clerks employed. Apparently the wages of extra clerks exceed the reduction in losses from shoplifting expected when more clerks are employed. Socially, people accept certain amounts of speeding, robbery, burglary, and auto theft rather than allow the law enforcement authorities carte blanche in their attempts to combat illegal activity. Yet public opinion polls in the late 1960s and early 1970s indicated that crime was consistently one of the major concerns of the public. Imperatives instructing the police to "wipe out" crime often appear to neglect the obvious tradeoffs that exist in law enforcement, as in all areas of public activity.

Perhaps the dimensions of the tradeoffs are not presently capable of measurement, though this study may have shed some light on such relations. The goal of law enforcement should be the point where marginal cost is equal to the marginal benefit if society is to achieve the level of enforcement it believes it can afford. The basic limitation of a study as this in contributing to the achievement of the ideal is the lack of meaningful measures of costs to the offenders and costs of the offenses themselves. Costs which the economist prefers are ideally generated through a market. The costs used in this examination may not meet this ideal. While it is not known how serious this defect is for research in the crime and law enforcement area, Buchanan offers some light on the difficulty. In referring to studies of crime and law enforcement he notes,

> ...any costs which the economist may objectify need bear little relation to those costs which serve as actual

> obstacles to decisions. Recognition of this fact need not destroy the usefulness of economic analysis. The costs that the economist quantifies may be directionally related to those costs that inhibit choice. In this case, changes in the level of objectified costs (for example, changes in the probabilities of conviction and in the severity of punishment) will produce effects on the number of offenses committed.[1]

At a minimum the increased attention of economics will lead to an elucidation of the tradeoffs that are already involved in law enforcement but are often neglected. It is hoped that this identification of alternatives and the need for choice will at some time aid in achieving a more efficient use of society's resources.

B. Policy Implications

This study does not provide any obvious precise policy suggestions though some general implications are generated. Chapter IV provides evidence of a significant relation between costs to offenders and offense levels. It is vital in policymaking that work be done which identifies the impact of more police and different techniques on offender costs, especially the probability of conviction. Very little is known about this relation, yet it is the justification used in seeking larger police budgets. Probably a considerable number of controlled experiments will be necessary for knowledge to be forthcoming on the issue.

Perhaps because of a sense of presumed vitalness of police activity very little experimentation has been done. Casual observation suggests that a substantial portion of law enforcement resources are used to deal with victimless crimes, especially drunkenness.

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[1] James M. Buchanan, Cost and Choice: An Inquiry into Economic Theory (Chicago: Markham Publishing Co., 1969), p. 93.

Table 33 illustrates this point. Index offenses comprise less than twenty percent of all arrests and there are more arrests for drunkenness alone than for all Index offenses combined. It is not known what loss of attention to Index offenses results from the diversion of police to less serious offenses, manpower studies may provide a basis for judgment in the matter.

When examining the costs of a conviction (pp. 104 to 10) it becomes apparent that the cost of a conviction is extremely high for several offenses. At present there is little or no evidence that law enforcement authorities pay attention to this cost in decisions as to the relative concentration of resources under their control.[2] Attention to the costs of conviction appears a necessary requisite for enlightened decisions in law enforcement.

Similarly, little evidence can be found that authorities even attempt to measure their own output or valuation of their impact in objective terms. The typical police department keeps track of its manpower, arrests, and budgetary information but it is the rare department that attempts to use this information for planning and improving upon its activity. Those records that are kept appear at times to be intentionally biased so as not to make the department look too bad.

The examination of crime in Oklahoma leads to the discovery that the typical police department fails to keep good records on criminal activity, police activity, and police influence. The influx of federal

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[2]As an example, the $29,067. estimate (p.108) for police costs per conviction for auto theft appears excessive. There may be much more promising ways of preventing this offense as, for example, the transmission lock. It is expected that in the future auto thefts will diminish not because of the police effort as much as due to the introduction of the transmission lock in the late 1960s.

TABLE 33

TOTAL ARRESTS IN THE UNITED STATES: 1970
(Excluding Traffic Offenses)

Offense	Number	Percent Of Total
Index Offenses		
Homicide	15,230	0.2
Forcible Rape	19,050	0.2
Robbery	98,210	1.2
Aggravated Assault	155,060	1.9
Burglary	358,100	4.4
Larceny	748,200	9.2
Auto Theft	153,300	1.9
Total Index Offenses	1,547,150	19.0
Non-Index Offenses		
Drunkenness	1,825,500	22.5
Disorderly Conduct	710,000	8.8
Driving under Influence	555,700	6.8
Narcotic Drug Laws	415,600	5.1
Other Assaults	348,900	4.3
Liquor Laws	309,000	3.8
Runaways	232,700	2.9
Vandalism	141,900	1.8
Curfew and Loitering	129,600	1.6
Weapons	120,400	1.5
Vagrancy	113,400	1.4
Fraud	104,600	1.3
Gambling	91,700	1.1
Suspicion	83,500	1.0
Offenses against Family	78,500	1.0
Stolen Property (receiving, possession, etc.)	74,000	0.9
Sex Offenses (excluding prostitution and rape)	59,700	0.7
Forgery and Counterfeiting	55,500	0.7
Prostitution and Commercialized Vice	51,700	0.6
All Other (nontraffic)	1,068,690	13.2
Total Non-Index Offenses	6,570,590	81.0
GRAND TOTAL	8,117,740	100.0

Source: Federal Bureau of Investigation, Uniform Crime Reports--1970, p. 119.

support through LEAA has resulted in the creation of a planning group which might soon remedy these deficiencies, the Oklahoma Crime Commission. At the present time the Commission is primarily concerned with procurement of Federal funds. Although the Commission has yet to complete a study on the influence of new monies being put into law enforcement on crime in Oklahoma there is hope that the prevailing attitude to the effect that additional expenditures will necessarily reduce offenses or have other desirable effects is changing.[3]

It appears possible to forecast offenses in Oklahoma with fair accuracy using a simple straightforward method though this is not presently being done for the State. Planning would seem to require such estimates for action. Logic suggests that the state planning agency would obtain data on the disposition of accused offenders after their initial arrest. Thus far, there has not been an integration of court and police records by anyone in the state. Contact with the court system demonstrates a similar failure to keep track of dispositions. And the same pattern is apparent with prison authorities, a general lack of coordination with other parts of the state criminal justice system. The Commission will likely play a major role in overcoming these problems in future years.

In attempting to use resources more effectively it is vital that critical relations in deterrence be identified and quantified.

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[3]Subsidizing college for police is taken as an obviously beneficial expenditure aimed at professionalizing the police force; hence, not requiring justification. The financing of a helicopter for combatting crime (not an eligible LEAA expenditure if used for traffic) is justified by using data from helicopter producers. Much money has gone into equipment for riots, radio hardware, and upgrading facilities, without critical appraisal of impact.

Authorities in the field must begin to generate better data in order that the phenomenon of crime can be better understood and dealt with. This study may provide some tentative results and a general approach that can be used. However, the truly valuable results await better data with which to work. Without better data, economic approaches to the study of crime and law enforcement remain "quite interesting" but tentative.

C. Concluding Observations

One often hears criticisms of academic studies of public policy problems to the effect that "academicians would rather be right than be helpful," as if these two goals are somehow mutually exclusive. This study was begun with anticipation that the results would be useable for decision-making and therefore helpful. A substantial number of interesting facts and impressions have emerged. Casting warnings aside for the moment, the following may be noted.

1. Crime costs exceed $21 billion per year by conservative estimates, and although this exceeds the cost of unemployment, little is known as to how to control crime.

2. Resources are being increasingly devoted to law enforcement with little concern as to how these resources will impact on crime, if at all.

3. While structural change in law enforcement is possible, little has been done to change the system of delivery in the past century.

4. Decisions in the field of law enforcement are made every day yet only a few of the most sophisticated departments are quantifying information for decision-making.

5. In studies as this some significant relations may be identified but truly valuable results await better data.

6. Oklahoma is not presently generating an understanding of crime in its borders, nor is there planning in the usual use of the term which relates planning to a goal measured in terms of offense levels.

7. The field of law enforcement possesses many characteristics of a closed fraternity and this may explain some of the lack of progress.

It is good to end on an optimistic note. With all of the problems and defects economic study confronts when moving into a new area, the increasing flow of literature on the economics of crime gives evidence of a committment to continued study. It seems inevitable that progress will be made in overcoming the difficulties. It is hoped that this study represents some small contribution in this progress.

APPENDICES

APPENDIX A

OKLAHOMA CRIME DATA

The following pages in this appendix contain the data used for the regressions in this chapter. All data are coded as indicated below. Where offenses (O) were zero or clearances (K) were unknown, the observations of all variable values were excluded from the regressions.

CITY CODE

1. Ada
2. Altus
3. Ardmore
4. Bartlesville
5. Duncan
6. Enid
7. Lawton
8. McAlester
9. Midwest City
10. Muskogee
11. Norman
12. Oklahoma City
13. Okmulgee
14. Ponca City
15. Shawnee
16. Stillwater
17. Tulsa

CRIME CODE

1. Homicide
2. Forcible Rape
3. Robbery
4. Aggravated Assault
5. Burglary
6. Larceny--$50. and over
7. Larceny--under $50.
8. Auto Theft

YEAR CODE

All observations are indicated by the last two digits for the year observed.

CODES			VARIABLES				
City Code (1-9)	Crime Code (10-19)	Year (20-29)	Population (30-39) P	Offenses (40-49) O	Clearances (50-59) K	Service Expenditures (60-69) S	Operations and Maintenance Expenditures (70-79) M

0 OR K = ZERO							
1	1	60.	14347.	0.	0.	71600.	10900.
1	1	61.	14356.	1.	0.	77031.	16240.
1	1	62.	14365.	1.	0.	76925.	15810.
1	1	63.	14489.	1.	1.	88100.	19200.
0 OR K = ZERO							
1	1	64.	14614.	0.	0.	92630.	18880.
1	1	65.	15112.	1.	1.	95120.	19580.
0 OR K = ZERO							
1	1	66.	15470.	0.	0.	98685.	18536.
0 OR K = ZERO							
1	1	67.	15829.	0.	0.	108770.	21156.
0 OR K = ZERO							
1	1	68.	15935.	0.	0.	108474.	20005.
1	1	69.	15397.	1.	1.	123800.	21400.
1	1	70.	14859.	1.	1.	148640.	24940.
0 OR K = ZERO							
1	2	60.	14347.	0.	0.	71600.	10900.
0 OR K = ZERO							
1	2	61.	14356.	0.	0.	77031.	16240.
0 OR K = ZERO							
1	2	62.	14365.	0.	0.	76925.	15810.
1	2	63.	14489.	2.	2.	88100.	19200.
0 OR K = ZERO							
1	2	64.	14614.	0.	0.	92630.	18880.
1	2	65.	15112.	6.	7.	95120.	19580.
1	2	66.	15470.	2.	2.	98685.	18536.
0 OR K = ZERO							
1	2	67.	15829.	0.	0.	108770.	21156.
0 OR K = ZERO							
1	2	68.	15935.	0.	0.	108474.	20005.
1	2	69.	15397.	1.	1.	123800.	21400.
1	2	70.	14859.	1.	1.	148640.	24940.
0 OR K = ZERO							
1	3	60.	14347.	0.	0.	71600.	10900.
1	3	61.	14356.	1.	0.	77031.	16240.
1	3	62.	14365.	1.	0.	76925.	15810.
1	3	63.	14489.	3.	3.	88100.	19200.
1	3	64.	14614.	1.	0.	92630.	18880.
1	3	65.	15112.	3.	2.	95120.	19580.
1	3	66.	15470.	4.	4.	98685.	18536.
1	3	67.	15829.	2.	1.	108770.	21156.
0 OR K = ZERO							
1	3	68.	15935.	0.	0.	108474.	20005.
1	3	69.	15397.	2.	2.	123800.	21400.
1	3	70.	14859.	5.	3.	148640.	24940.
1	4	60.	14347.	2.	0.	71600.	10900.
0 OR K = ZERO							
1	4	61.	14356.	0.	0.	77031.	16240.
1	4	62.	14365.	4.	0.	76925.	15810.
1	4	63.	14489.	13.	13.	88100.	19200.
1	4	64.	14614.	2.	2.	92630.	18880.
1	4	65.	15112.	15.	14.	95120.	19580.
1	4	66.	15470.	6.	6.	98685.	18536.
1	4	67.	15829.	6.	6.	108770.	21156.
1	4	68.	15935.	5.	5.	108474.	20005.
1	4	69.	15397.	4.	4.	123800.	21400.
1	4	70.	14859.	37.	32.	148640.	24940.
1	5	60.	14347.	29.	0.	71600.	10900.
1	5	61.	14356.	10.	0.	77031.	16240.

1	5	62.	14365.	20.	0.	76925.	15810.	
1	5	63.	14489.	42.	12.	88100.	19200.	
1	5	64.	14614.	26.	16.	92630.	18880.	
1	5	65.	15112.	35.	17.	95120.	19580.	
1	5	66.	15470.	38.	18.	98685.	18536.	
1	5	67.	15829.	34.	17.	108770.	21156.	
1	5	68.	15935.	107.	42.	108474.	20005.	
1	5	69.	15397.	78.	30.	123800.	21400.	
1	5	70.	14859.	104.	96.	148640.	24940.	
1	6	60.	14347.	6.	0.	71600.	10900.	
1	6	61.	14356.	2.	0.	77031.	16240.	
1	6	62.	14365.	17.	0.	76925.	15810.	
1	6	63.	14489.	53.	10.	88100.	19200.	
1	6	64.	14614.	53.	1.	92630.	18880.	
1	6	65.	15112.	91.	42.	95120.	19580.	
1	6	66.	15470.	98.	13.	98685.	18536.	
1	6	67.	15829.	98.	5.	108770.	21156.	
1	6	68.	15935.	100.	15.	108474.	20005.	
1	6	69.	15397.	117.	27.	123800.	21400.	
1	6	70.	14859.	167.	13.	148640.	24940.	
1	7	60.	14347.	131.	0.	71600.	10900.	
1	7	61.	14356.	75.	0.	77031.	16240.	
1	7	62.	14365.	265.	0.	76925.	15810.	
1	7	63.	14489.	141.	15.	88100.	19200.	
1	7	64.	14614.	204.	15.	92630.	18880.	
1	7	65.	15112.	189.	47.	95120.	19580.	
1	7	66.	15470.	168.	33.	98685.	18536.	
1	7	67.	15829.	218.	50.	108770.	21156.	
1	7	68.	15935.	159.	17.	108474.	20005.	
1	7	69.	15397.	103.	34.	123800.	21400.	
1	7	70.	14859.	113.	22.	148640.	24940.	
1	8	60.	14347.	6.	0.	71600.	10900.	
1	8	61.	14356.	9.	0.	77031.	16240.	
1	8	62.	14365.	27.	0.	76925.	15810.	
1	8	63.	14489.	16.	8.	88100.	19200.	
1	8	64.	14614.	16.	12.	92630.	18880.	
1	8	65.	15112.	25.	19.	95120.	19580.	
1	8	66.	15470.	25.	11.	98685.	18536.	
1	8	67.	15829.	9.	5.	108770.	21156.	
1	8	68.	15935.	27.	13.	108474.	20005.	
1	8	69.	15397.	26.	23.	123800.	21400.	
1	8	70.	14859.	43.	33.	148640.	24940.	
O OR K = ZERO 2	1	60.	21225.	0.	0.	78200.	4650.	
O OR K = ZERO 2	1	61.	21917.	0.	0.	78484.	6608.	
O OR K = ZERO 2	1	62.	22609.	0.	0.	84520.	9285.	
2	1	63.	23323.	1.	0.	89998.	9322.	
2	1	64.	24037.	1.	1.	102500.	9400.	
O OR K = ZERO 2	1	65.	24530.	0.	0.	98040.	11960.	
2	1	66.	23494.	1.	1.	101420.	16430.	
O OR K = ZERO 2	1	67.	22458.	0.	0.	113860.	19000.	
O OR K = ZERO 2	1	68.	25759.	0.	0.	117320.	21932.	
O OR K = ZERO 2	1	69.	24530.	0.	0.	134190.	22800.	
O OR K = ZERO 2	1	70.	23302.	0.	0.	140009.	33681.	

0 OR K_2 = ZERO	2	60.	21225.	0.	0.	78200.	4650.
0 OR K_2 = ZERO	2	61.	21917.	0.	0.	78484.	6608.
0 OR K_2 = ZERO	2	62.	22609.	0.	0.	84520.	9285.
K_2	2	63.	23323.	1.	0.	89998.	9322.
K_2	2	64.	24037.	1.	1.	102500.	9400.
0 OR K_2 = ZERO	2	65.	24530.	0.	0.	98040.	11960.
0 OR K_2 = ZERO	2	66.	23494.	0.	0.	101420.	16400.
0 OR K_2 = ZERO	2	67.	22458.	0.	0.	113860.	19000.
0 OR K_2 = ZERO	2	68.	25759.	0.	0.	117320.	21932.
0 OR K_2 = ZERO	2	69.	24530.	0.	0.	134190.	22800.
0 OR K_2 = ZERO	2	70.	23302.	0.	0.	140009.	33681.
0 OR K_2 = ZERO	3	60.	21225.	0.	0.	78200.	4650.
0 OR K_2 = ZERO	3	61.	21917.	0.	0.	78484.	6608.
K_2	3	62.	22609.	0.	0.	84520.	9285.
K_2	3	63.	23323.	1.	0.	89998.	9322.
0 OR K_2 = ZERO	3	64.	24037.	0.	0.	102500.	9400.
K_2	3	65.	24530.	4.	4.	98040.	11960.
K_2	3	66.	23494.	3.	1.	101420.	16400.
0 OR K_2 = ZERO	3	67.	22458.	0.	0.	113860.	19000.
K_2	3	68.	25759.	1.	0.	117320.	21932.
0 OR K_2 = ZERO	3	69.	24530.	0.	0.	134190.	22800.
0 OR K_2 = ZERO	3	70.	23302.	0.	0.	140009.	33681.
0 OR K_2 = ZERO	4	60.	21225.	0.	0.	78200.	4650.
0 OR K_2 = ZERO	4	61.	21917.	0.	0.	78484.	6608.
0 OR K_2 = ZERO	4	62.	22609.	0.	0.	84520.	9285.
K_2	4	63.	23323.	8.	0.	89998.	9322.
K_2	4	64.	24037.	42.	42.	102500.	9400.
K_2	4	65.	24530.	13.	8.	98040.	11960.
K_2	4	66.	23494.	18.	17.	101420.	16400.
K_2	4	67.	22458.	10.	10.	113860.	19000.
0 OR K_2 = ZERO	4	68.	25759.	0.	0.	117320.	21932.
K_2	4	69.	24530.	1.	1.	134190.	22800.
0 OR K_2 = ZERO	4	70.	23302.	0.	0.	140009.	33681.
0 OR K_2 = ZERO	5	60.	21225.	0.	0.	78200.	4650.
0 OR K_2 = ZERO	5	61.	21917.	0.	0.	78484.	6608.
0 OR K_2 = ZERO	5	62.	22609.	0.	0.	84520.	9285.
K_2	5	63.	23323.	58.	0.	89998.	9322.

2	5	64.	24037.	45.	45.	102500.	9400.
2	5	65.	24530.	36.	6.	98040.	11960.
2	5	66.	23494.	66.	40.	101420.	16400.
2	5	67.	22458.	51.	15.	113860.	19000.
2	5	68.	25759.	67.	42.	117320.	21932.
2	5	69.	24530.	131.	105.	134190.	22800.
O OR K = ZERO							
2	5	70.	23302.	0.	0.	140009.	33681.
O OR K = ZERO							
2	6	60.	21225.	0.	0.	78200.	4650.
O OR K = ZERO							
2	6	61.	21917.	0.	0.	78484.	6608.
O OR K = ZERO							
2	6	62.	22609.	0.	0.	84520.	9285.
2	6	63.	23323.	58.	0.	89998.	9322.
2	6	64.	24037.	48.	2.	102500.	9400.
2	6	65.	24530.	48.	0.	98040.	11960.
2	6	66.	23494.	53.	12.	101420.	16400.
2	6	67.	22458.	68.	10.	113860.	19000.
2	6	68.	25759.	92.	18.	117320.	21932.
2	6	69.	24530.	100.	26.	134190.	22800.
O OR K = ZERO							
2	6	70.	23302.	0.	0.	140009.	33681.
O OR K = ZERO							
2	7	60.	21225.	0.	0.	78200.	4650.
O OR K = ZERO							
2	7	61.	21917.	0.	0.	78484.	6608.
O OR K = ZERO							
2	7	62.	22609.	0.	0.	84520.	9285.
2	7	63.	23323.	127.	0.	89998.	9322.
2	7	64.	24037.	91.	19.	102500.	9400.
2	7	65.	24530.	89.	13.	98040.	11960.
2	7	66.	23494.	136.	42.	101420.	16400.
2	7	67.	22458.	139.	49.	113860.	19000.
2	7	68.	25759.	202.	78.	117320.	21932.
2	7	69.	24530.	277.	95.	134190.	22800.
O OR K = ZERO							
2	7	70.	23302.	0.	0.	140009.	33681.
O OR K = ZERO							
2	8	60.	21225.	0.	0.	78200.	4650.
O OR K = ZERO							
2	8	61.	21917.	0.	0.	78484.	6608.
O OR K = ZERO							
2	8	62.	22609.	0.	0.	84520.	9285.
2	8	63.	23323.	29.	0.	89998.	9322.
2	8	64.	24037.	19.	17.	102500.	9400.
2	8	65.	24530.	12.	10.	98040.	11960.
2	8	66.	23494.	19.	17.	101420.	16400.
2	8	67.	22458.	8.	6.	113860.	19000.
2	8	68.	25759.	9.	8.	117320.	21932.
2	8	69.	24530.	9.	8.	134190.	22800.
O OR K = ZERO							
2	8	70.	23302.	0.	0.	140009.	33681.
3	1	60.	20184.	1.	1.	103500.	8500.
3	1	61.	20546.	2.	0.	103000.	7500.
3	1	62.	20908.	1.	0.	105000.	5500.
3	1	63.	21333.	1.	0.	110000.	9500.
3	1	64.	21759.	1.	1.	118000.	12000.
O OR K = ZERO							
3	1	65.	21458.	0.	0.	127000.	10000.
O OR K = ZERO							

3	1	66.	21566.	0.	0.	140551.	19686.
3	1	67.	21674.	2.	2.	160129.	10778.
3	1	68.	22088.	2.	2.	179023.	10421.
3	1	69.	21484.	2.	2.	188260.	10000.
3	1	70.	20881.	2.	2.	213772.	12400.
3	2	60.	20184.	1.	0.	103500.	8500.
O OR K = ZERO							
3	2	61.	20546.	0.	0.	103000.	7500.
3	2	62.	20908.	1.	0.	105000.	5500.
O OR K = ZERO							
3	2	63.	21333.	0.	0.	110000.	9500.
O OR K = ZERO							
3	2	64.	21759.	0.	0.	118000.	12000.
O OR K = ZERO							
3	2	65.	21458.	0.	0.	127000.	10000.
O OR K = ZERO							
3	2	66.	21566.	0.	0.	140551.	19686.
3	2	67.	21674.	3.	2.	160129.	10778.
3	2	68.	22088.	4.	1.	179023.	10421.
3	2	69.	21484.	1.	1.	188260.	10000.
O OR K = ZERO							
3	2	70.	20881.	0.	0.	213772.	12400.
3	3	60.	20184.	7.	5.	103500.	8500.
3	3	61.	20546.	1.	0.	103000.	7500.
3	3	62.	20908.	7.	0.	105000.	5500.
3	3	63.	21333.	5.	0.	110000.	9500.
3	3	64.	21759.	3.	3.	118000.	12000.
O OR K = ZERO							
3	3	65.	21458.	0.	0.	127000.	10000.
O OR K = ZERO							
3	3	66.	21566.	0.	0.	140551.	19686.
3	3	67.	21674.	3.	2.	160129.	10778.
3	3	68.	22088.	7.	2.	179023.	10421.
3	3	69.	21484.	5.	1.	188260.	10000.
3	3	70.	20881.	12.	5.	213772.	12400.
3	4	60.	20184.	2.	6.	103500.	8500.
3	4	61.	20546.	11.	0.	103000.	7500.
3	4	62.	20908.	7.	0.	105000.	5500.
3	4	63.	21333.	12.	0.	110000.	9500.
3	4	64.	21759.	50.	44.	118000.	12000.
O OR K = ZERO							
3	4	65.	21458.	0.	0.	127000.	10000.
O OR K = ZERO							
3	4	66.	21566.	0.	0.	140551.	19686.
3	4	67.	21674.	14.	13.	160129.	10778.
3	4	68.	22088.	8.	8.	179023.	10421.
3	4	69.	21484.	12.	11.	188260.	10000.
3	4	70.	20881.	22.	18.	213772.	12400.
3	5	60.	20184.	90.	33.	103500.	8500.
3	5	61.	20546.	141.	0.	103000.	7500.
3	5	62.	20908.	168.	0.	105000.	5500.
3	5	63.	21333.	154.	0.	110000.	9500.
3	5	64.	21759.	172.	35.	118000.	12000.
O OR K = ZERO							
3	5	65.	21458.	0.	0.	127000.	10000.
O OR K = ZERO							
3	5	66.	21566.	0.	0.	140551.	19686.
3	5	67.	21674.	154.	41.	160129.	10778.
3	5	68.	22088.	150.	43.	179023.	10421.
3	5	69.	21484.	215.	55.	188260.	10000.
3	5	70.	20881.	225.	51.	213772.	12400.

3	6	60.	20184.	28.	11.	103500.	8500.
3	6	61.	20546.	32.	0.	103000.	7500.
3	6	62.	20908.	51.	0.	105000.	5500.
3	6	63.	21333.	42.	0.	110000.	9500.
3	6	64.	21759.	43.	5.	118000.	12000.
0 OR K = ZERO							
3	6	65.	21458.	0.	0.	127000.	10000.
0 OR K = ZERO							
3	6	66.	21566.	0.	0.	140551.	19686.
3	6	67.	21674.	79.	29.	160129.	10778.
3	6	68.	22088.	81.	20.	179023.	10421.
3	6	69.	21484.	223.	39.	188260.	10000.
3	6	70.	20881.	320.	48.	213772.	12400.
3	7	60.	20184.	167.	20.	103500.	8500.
3	7	61.	20546.	180.	0.	103000.	7500.
3	7	62.	20908.	272.	0.	105000.	5500.
3	7	63.	21333.	263.	0.	110000.	9500.
3	7	64.	21759.	172.	8.	118000.	12000.
0 OR K = ZERO							
3	7	65.	21458.	0.	0.	127000.	10000.
0 OR K = ZERO							
3	7	66.	21566.	0.	0.	140551.	19686.
3	7	67.	21674.	134.	54.	160129.	10778.
3	7	68.	22088.	243.	79.	179023.	10421.
3	7	69.	21484.	161.	38.	188260.	10000.
3	7	70.	20881.	175.	73.	213772.	12400.
3	8	60.	20184.	14.	6.	103500.	8500.
3	8	61.	20546.	35.	0.	103000.	7500.
3	8	62.	20908.	35.	0.	105000.	5500.
3	8	63.	21333.	28.	0.	110000.	9500.
3	8	64.	21759.	39.	9.	118000.	12000.
0 OR K = ZERO							
3	8	65.	21458.	0.	0.	127000.	10000.
0 OR K = ZERO							
3	8	66.	21566.	0.	0.	140551.	19686.
3	8	67.	21674.	28.	14.	160129.	10778.
3	8	68.	22088.	30.	7.	179023.	10421.
3	8	69.	21484.	29.	14.	188260.	10000.
3	8	70.	20881.	27.	9.	213772.	12400.
0 OR K = ZERO							
4	1	60.	27893.	0.	0.	132998.	25020.
4	1	61.	27733.	2.	2.	144776.	25740.
4	1	62.	27572.	3.	3.	149908.	24050.
0 OR K = ZERO							
4	1	63.	28854.	0.	0.	155573.	27050.
0 OR K = ZERO							
4	1	64.	30137.	0.	0.	172493.	11950.
0 OR K = ZERO							
4	1	65.	30773.	0.	0.	198431.	13050.
0 OR K = ZERO							
4	1	66.	30841.	0.	0.	201689.	12950.
0 OR K = ZERO							
4	1	67.	30910.	0.	0.	233094.	14450.
0 OR K = ZERO							
4	1	68.	31852.	0.	0.	271765.	16950.
0 OR K = ZERO							
4	1	69.	30767.	0.	0.	289236.	19250.
0 OR K = ZERO							
4	1	70.	29683.	0.	0.	308129.	21575.
0 OR K = ZERO							
4	2	60.	27893.	0.	0.	132998.	25020.

0 OR K_4 = ZERO	2	61.	27733.	0.	0.	144776.	25740.
0 OR K_4 = ZERO	2	62.	27572.	0.	0.	149908.	24050.
0 OR K_4 = ZERO	2	63.	28854.	0.	0.	155573.	27050.
4	2	64.	30137.	1.	1.	172493.	11950.
0 OR K_4 = ZERO	2	65.	30773.	0.	0.	198431.	13050.
0 OR K_4 = ZERO	2	66.	30841.	0.	0.	201689.	12950.
0 OR K_4 = ZERO	2	67.	30910.	0.	0.	233094.	14450.
4	2	68.	31852.	4.	4.	271765.	16950.
4	2	69.	30767.	1.	1.	289236.	19250.
4	2	70.	29683.	3.	3.	308129.	21575.
0 OR K_4 = ZERO	3	60.	27893.	0.	0.	132998.	25020.
4	3	61.	27733.	2.	2.	144776.	25740.
4	3	62.	27572.	2.	1.	149908.	24050.
4	3	63.	28854.	3.	3.	155573.	27050.
4	3	64.	30137.	5.	1.	172493.	11950.
4	3	65.	30773.	1.	1.	198431.	13050.
4	3	66.	30841.	4.	2.	201689.	12950.
4	3	67.	30910.	1.	0.	233094.	14450.
4	3	68.	31852.	2.	2.	271765.	16950.
4	3	69.	30767.	2.	2.	289236.	19250.
4	3	70.	29683.	2.	1.	308129.	21575.
4	4	60.	27893.	2.	2.	132998.	25020.
4	4	61.	27733.	1.	1.	144776.	25740.
4	4	62.	27572.	2.	2.	149908.	24050.
4	4	63.	28854.	5.	5.	155573.	27050.
4	4	64.	30137.	12.	11.	172493.	11950.
4	4	65.	30773.	7.	7.	198431.	13050.
4	4	66.	30841.	5.	5.	201689.	12950.
4	4	67.	30910.	10.	4.	233094.	14450.
4	4	68.	31852.	7.	6.	271765.	16950.
4	4	69.	30767.	31.	26.	289236.	19250.
4	4	70.	29683.	24.	23.	308129.	21575.
4	5	60.	27893.	63.	25.	132998.	25020.
4	5	61.	27733.	100.	44.	144776.	25740.
4	5	62.	27572.	82.	38.	149908.	24050.
4	5	63.	28854.	67.	30.	155573.	27050.
4	5	64.	30137.	55.	15.	172493.	11950.
4	5	65.	30773.	90.	21.	198431.	13050.
4	5	66.	30841.	118.	29.	201689.	12950.
4	5	67.	30910.	99.	19.	233094.	14450.
4	5	68.	31852.	121.	46.	271765.	16950.
4	5	69.	30767.	82.	27.	289236.	19250.
4	5	70.	29683.	145.	56.	308129.	21575.
4	6	60.	27893.	53.	20.	132998.	25020.
4	6	61.	27733.	55.	12.	144776.	25740.
4	6	62.	27572.	48.	10.	149908.	24050.
4	6	63.	28854.	47.	6.	155573.	27050.
4	6	64.	30137.	72.	6.	172493.	11950.
4	6	65.	30773.	79.	19.	198431.	13050.
4	6	66.	30841.	84.	19.	201689.	12950.
4	6	67.	30910.	82.	17.	233094.	14450.
4	6	68.	31852.	102.	11.	271765.	16950.
4	6	69.	30767.	123.	30.	289236.	19250.
4	6	70.	29683.	212.	33.	308129.	21575.

4	7	60.	27893.	308.	45.	132998.	25020.
4	7	61.	27733.	260.	33.	144776.	25740.
4	7	62.	27572.	186.	22.	149908.	24050.
4	7	63.	28854.	226.	22.	155573.	27050.
4	7	64.	30137.	245.	26.	172493.	11950.
4	7	65.	30773.	200.	46.	198431.	13050.
4	7	66.	30841.	193.	64.	201689.	12950.
4	7	67.	30910.	183.	37.	233094.	14450.
4	7	68.	31852.	162.	21.	271765.	16950.
4	7	69.	30767.	230.	42.	289236.	19250.
4	7	70.	29683.	303.	51.	308129.	21575.
4	8	60.	27893.	11.	8.	132998.	25020.
4	8	61.	27733.	33.	18.	144776.	25740.
4	8	62.	27572.	21.	16.	149908.	24050.
4	8	63.	28854.	9.	5.	155573.	27050.
4	8	64.	30137.	21.	9.	172493.	11950.
4	8	65.	30773.	16.	12.	198431.	13050.
4	8	66.	30841.	15.	6.	201689.	12950.
4	8	67.	30910.	11.	5.	233094.	14450.
4	8	68.	31852.	14.	3.	271765.	16950.
4	8	69.	30767.	12.	5.	289236.	19250.
4	8	70.	29683.	13.	3.	308129.	21575.
5	1	60.	20009.	1.	1.	91375.	22550.
0 OR K = ZERO							
5	1	61.	19687.	0.	0.	91077.	26000.
0 OR K = ZERO							
5	1	62.	19364.	0.	0.	82780.	23000.
0 OR K = ZERO							
5	1	63.	19684.	0.	0.	91250.	24150.
5	1	64.	20004.	2.	2.	94108.	24830.
5	1	65.	20354.	1.	1.	100133.	28160.
0 OR K = ZERO							
5	1	66.	20381.	0.	0.	109111.	19950.
0 OR K = ZERO							
5	1	67.	20409.	0.	0.	120996.	20800.
0 OR K = ZERO							
5	1	68.	21167.	0.	0.	140233.	22026.
5	1	69.	20442.	1.	1.	151543.	23803.
0 OR K = ZERO							
5	1	70.	19718.	0.	0.	178863.	27699.
5	2	60.	20009.	2.	2.	91375.	22550.
0 OR K = ZERO							
5	2	61.	19687.	0.	0.	91077.	26000.
0 OR K = ZERO							
5	2	62.	19364.	0.	0.	82780.	23000.
0 OR K = ZERO							
5	2	63.	19684.	0.	0.	91250.	24150.
0 OR K = ZERO							
5	2	64.	20004.	0.	0.	94108.	24830.
5	2	65.	20354.	1.	1.	100133.	28160.
5	2	66.	20381.	1.	1.	109111.	19950.
5	2	67.	20409.	1.	1.	120996.	20800.
5	2	68.	21167.	1.	1.	140233.	22026.
0 OR K = ZERO							
5	2	69.	20442.	0.	0.	151543.	23803.
0 OR K = ZERO							
5	2	70.	19718.	0.	0.	178863.	27699.
5	3	60.	20009.	1.	0.	91375.	22550.
5	3	61.	19687.	1.	0.	91077.	26000.
5	3	62.	19364.	3.	0.	82780.	23000.
5	3	63.	19684.	1.	0.	91250.	24150.

5	3	64.	20004.	2.	2.	94108.	24830.
5	3	65.	20354.	4.	1.	100133.	28160.
5	3	66.	20381.	1.	1.	109111.	19950.
5	3	67.	20409.	2.	0.	120996.	20800.
5	3	68.	21167.	1.	1.	140233.	22026.
5	3	69.	20442.	8.	2.	151543.	23803.
5	3	70.	19718.	3.	1.	178863.	27699.
5	4	60.	20009.	5.	5.	91375.	22550.
5	4	61.	19687.	1.	0.	91077.	26000.
O OR K = ZERO							
5	4	62.	19364.	0.	0.	82780.	23000.
O OR K = ZERO							
5	4	63.	19684.	0.	0.	91250.	24150.
5	4	64.	20004.	2.	2.	94108.	24830.
5	4	65.	20354.	10.	9.	100133.	28160.
5	4	66.	20381.	7.	7.	109111.	19950.
5	4	67.	20409.	8.	9.	120996.	20800.
5	4	68.	21167.	13.	12.	140233.	22026.
5	4	69.	20442.	9.	9.	151543.	23803.
5	4	70.	19718.	11.	5.	178863.	27699.
5	5	60.	20009.	64.	44.	91375.	22550.
5	5	61.	19687.	122.	0.	91077.	26000.
5	5	62.	19364.	67.	0.	82780.	23000.
5	5	63.	19684.	69.	0.	91250.	24150.
5	5	64.	20004.	48.	20.	94108.	24830.
5	5	65.	20354.	71.	7.	100133.	28160.
5	5	66.	20381.	71.	15.	109111.	19950.
5	5	67.	20409.	78.	14.	120996.	20800.
5	5	68.	21167.	112.	13.	140233.	22026.
5	5	69.	20442.	131.	21.	151543.	23803.
5	5	70.	19718.	89.	8.	178863.	27699.
5	6	60.	20009.	20.	5.	91375.	22550.
5	6	61.	19687.	34.	0.	91077.	26000.
5	6	62.	19364.	49.	0.	82780.	23000.
5	6	63.	19684.	36.	0.	91250.	24150.
5	6	64.	20004.	61.	3.	94108.	24830.
5	6	65.	20354.	79.	26.	100133.	28160.
5	6	66.	20381.	149.	24.	109111.	19950.
5	6	67.	20409.	111.	10.	120996.	20800.
5	6	68.	21167.	117.	10.	140233.	22026.
5	6	69.	20442.	147.	4.	151543.	23803.
5	6	70.	19718.	215.	7.	178863.	27699.
5	7	60.	20009.	341.	80.	91375.	22550.
5	7	61.	19687.	229.	0.	91077.	26000.
5	7	62.	19364.	337.	0.	82780.	23000.
5	7	63.	19684.	263.	0.	91250.	24150.
5	7	64.	20004.	234.	40.	94108.	24830.
5	7	65.	20354.	192.	40.	100133.	28160.
5	7	66.	20381.	230.	39.	109111.	19950.
5	7	67.	20409.	286.	51.	120996.	20800.
5	7	68.	21167.	228.	24.	140233.	22026.
5	7	69.	20442.	209.	21.	151543.	23803.
5	7	70.	19718.	230.	19.	178863.	27699.
5	8	60.	20009.	28.	14.	91375.	22550.
5	8	61.	19687.	22.	0.	91077.	26000.
5	8	62.	19364.	18.	0.	82780.	23000.
5	8	63.	19684.	13.	0.	91250.	24150.
5	8	64.	20004.	24.	6.	94108.	24830.
5	8	65.	20354.	11.	9.	100133.	28160.
5	8	66.	20381.	34.	30.	109111.	19950.
5	8	67.	20409.	19.	2.	120996.	20800.

5	8	68.	21167.	20.	11.	140233.	22026.
5	8	69.	20442.	24.	6.	151543.	23803.
5	8	70.	19718.	17.	3.	178863.	27699.
O OR K = ZERO							
6	1	60.	38859.	0.	0.	192820.	7824.
6	1	61.	39475.	1.	1.	188555.	9945.
6	1	62.	40092.	1.	1.	190446.	7850.
6	1	63.	40987.	1.	0.	199085.	11892.
O OR K = ZERO							
6	1	64.	41882.	0.	0.	202459.	11512.
6	1	65.	43164.	1.	1.	230800.	12861.
6	1	66.	43874.	2.	2.	243226.	19875.
6	1	67.	44585.	4.	4.	293475.	22697.
6	1	68.	45275.	2.	2.	343917.	29140.
6	1	69.	44641.	2.	2.	359253.	26250.
6	1	70.	44008.	1.	1.	388403.	24931.
O OR K = ZERO							
6	2	60.	38859.	0.	0.	192820.	7824.
O OR K = ZERO							
6	2	61.	39475.	0.	0.	188555.	9945.
O OR K = ZERO							
6	2	62.	40092.	0.	0.	190446.	7850.
6	2	63.	40987.	2.	0.	199085.	11892.
6	2	64.	41882.	1.	1.	202459.	11512.
6	2	65.	43164.	1.	1.	230800.	12861.
6	2	66.	43874.	2.	2.	243226.	19875.
6	2	67.	44585.	3.	3.	293475.	22697.
O OR K = ZERO							
6	2	68.	45275.	0.	0.	343917.	29140.
6	2	69.	44641.	1.	1.	359253.	26250.
6	2	70.	44008.	1.	0.	388403.	24931.
O OR K = ZERO							
6	3	60.	38859.	0.	0.	192820.	7824.
6	3	61.	39475.	5.	1.	188555.	9945.
6	3	62.	40092.	5.	0.	190446.	7850.
6	3	63.	40987.	8.	0.	199085.	11892.
6	3	64.	41882.	3.	2.	202459.	11512.
O OR K = ZERO							
6	3	65.	43164.	0.	0.	230800.	12861.
6	3	66.	43874.	11.	4.	243226.	19875.
6	3	67.	44585.	14.	14.	293475.	22697.
6	3	68.	45275.	6.	3.	343917.	29140.
6	3	69.	44641.	11.	2.	359253.	26250.
6	3	70.	44008.	10.	2.	388403.	24931.
O OR K = ZERO							
6	4	60.	38859.	0.	0.	192820.	7824.
6	4	61.	39475.	4.	4.	188555.	9945.
O OR K = ZERO							
6	4	62.	40092.	0.	0.	190446.	7850.
6	4	63.	40987.	4.	0.	199085.	11892.
6	4	64.	41882.	14.	9.	202459.	11512.
6	4	65.	43164.	9.	6.	230800.	12861.
6	4	66.	43874.	11.	5.	243226.	19875.
6	4	67.	44585.	22.	15.	293475.	22697.
6	4	68.	45275.	46.	30.	343917.	29140.
6	4	69.	44641.	42.	41.	359253.	26250.
6	4	70.	44008.	20.	9.	388403.	24931.
6	5	60.	38859.	140.	44.	192820.	7824.
6	5	61.	39475.	134.	46.	188555.	9945.
6	5	62.	40092.	137.	66.	190446.	7850.
6	5	63.	40987.	108.	0.	199085.	11892.

6	5	64.	41882.	168.	33.	202459.	11512.
6	5	65.	43164.	218.	49.	230800.	12861.
6	5	66.	43874.	209.	38.	243226.	19875.
6	5	67.	44585.	315.	147.	293475.	22697.
6	5	68.	45275.	305.	73.	343917.	29140.
6	5	69.	44641.	342.	158.	359253.	26250.
6	5	70.	44008.	319.	44.	388403.	24931.
6	6	60.	38859.	59.	19.	192820.	7824.
6	6	61.	39475.	75.	14.	188555.	9945.
6	6	62.	40092.	80.	8.	190446.	7850.
6	6	63.	40987.	84.	0.	199085.	11892.
6	6	64.	41882.	113.	17.	202459.	11512.
6	6	65.	43164.	191.	15.	230800.	12861.
6	6	66.	43874.	234.	28.	243226.	19875.
6	6	67.	44585.	288.	50.	293475.	22697.
6	6	68.	45275.	282.	27.	343917.	29140.
6	6	69.	44641.	332.	36.	359253.	26250.
6	6	70.	44008.	395.	47.	388403.	24931.
6	7	60.	38859.	520.	175.	192820.	7824.
6	7	61.	39475.	550.	148.	188555.	9945.
6	7	62.	40092.	632.	111.	190446.	7850.
6	7	63.	40987.	551.	0.	199085.	11892.
6	7	64.	41882.	576.	87.	202459.	11512.
6	7	65.	43164.	730.	90.	230800.	12861.
6	7	66.	43874.	586.	56.	243226.	19875.
6	7	67.	44585.	697.	146.	293475.	22697.
6	7	68.	45275.	563.	123.	343917.	29140.
6	7	69.	44641.	708.	170.	359253.	26250.
6	7	70.	44008.	801.	58.	388403.	24931.
6	8	60.	38859.	129.	11.	192820.	7824.
6	8	61.	39475.	90.	12.	188555.	9945.
6	8	62.	40092.	76.	9.	190446.	7850.
6	8	63.	40987.	74.	0.	199085.	11892.
6	8	64.	41882.	145.	56.	202459.	11512.
6	8	65.	43164.	110.	2.	230800.	12861.
6	8	66.	43874.	112.	46.	243226.	19875.
6	8	67.	44585.	65.	30.	293475.	22697.
6	8	68.	45275.	78.	33.	343917.	29140.
6	8	69.	44641.	70.	51.	359253.	26250.
6	8	70.	44008.	92.	81.	388403.	24931.
7	1	60.	61697.	4.	4.	197038.	22850.
7	1	61.	63075.	7.	7.	245582.	30550.
7	1	62.	64453.	5.	5.	259960.	33927.
7	1	63.	66750.	4.	4.	257664.	32958.
7	1	64.	69047.	7.	7.	297315.	37900.
7	1	65.	71868.	7.	7.	317495.	42070.
7	1	66.	76688.	5.	5.	370076.	51675.
7	1	67.	81508.	7.	5.	404520.	63000.
7	1	68.	83785.	9.	8.	473372.	73800.
7	1	69.	79127.	4.	3.	546025.	83957.
7	1	70.	74470.	5.	3.	684780.	86603.
7	2	60.	61697.	7.	6.	197038.	22850.
7	2	61.	63075.	6.	4.	245582.	30550.
7	2	62.	64453.	3.	0.	259960.	33927.
7	2	63.	66750.	9.	7.	257664.	32958.
7	2	64.	69047.	12.	11.	297315.	37900.
7	2	65.	71868.	11.	7.	317495.	42070.
7	2	66.	76688.	22.	7.	370076.	51675.
7	2	67.	81508.	27.	14.	404520.	63000.
7	2	68.	83785.	20.	11.	473372.	73800.
7	2	69.	79127.	31.	14.	546025.	83957.

7	2	70.	74470.	32.	10.	684780.	86603.
7	3	60.	61697.	29.	10.	197038.	22850.
7	3	61.	63075.	35.	19.	245582.	30550.
7	3	62.	64453.	39.	15.	259960.	33927.
7	3	63.	66750.	52.	23.	257664.	32958.
7	3	64.	69047.	37.	17.	297315.	37900.
7	3	65.	71868.	36.	16.	317495.	42070.
7	3	66.	76688.	48.	8.	370076.	51675.
7	3	67.	81508.	66.	21.	404520.	63000.
7	3	68.	83785.	66.	30.	473372.	73800.
7	3	69.	79127.	100.	20.	546025.	83957.
7	3	70.	74470.	120.	21.	684780.	86603.
7	4	60.	61697.	29.	27.	197038.	22850.
7	4	61.	63075.	41.	42.	245582.	30550.
7	4	62.	64453.	28.	28.	259960.	33927.
7	4	63.	66750.	83.	72.	257664.	32958.
7	4	64.	69047.	149.	111.	297315.	37900.
7	4	65.	71868.	172.	144.	317495.	42070.
7	4	66.	76688.	219.	145.	370076.	51675.
7	4	67.	81508.	288.	178.	404520.	63000.
7	4	68.	83785.	300.	201.	473372.	73800.
7	4	69.	79127.	297.	192.	546025.	83957.
7	4	70.	74470.	310.	79.	684780.	86603.
7	5	60.	61697.	361.	164.	197038.	22850.
7	5	61.	63075.	353.	141.	245582.	30550.
7	5	62.	64453.	394.	101.	259960.	33927.
7	5	63.	66750.	500.	171.	257664.	32958.
7	5	64.	69047.	494.	110.	297315.	37900.
7	5	65.	71868.	504.	183.	317495.	42070.
7	5	66.	76688.	550.	111.	370076.	51675.
7	5	67.	81508.	687.	171.	404520.	63000.
7	5	68.	83785.	839.	276.	473372.	73800.
7	5	69.	79127.	853.	149.	546025.	83957.
7	5	70.	74470.	1205.	147.	684780.	86603.
7	6	60.	61697.	121.	33.	197038.	22850.
7	6	61.	63075.	215.	57.	245582.	30550.
7	6	62.	64453.	187.	39.	259960.	33927.
7	6	63.	66750.	278.	66.	257664.	32958.
7	6	64.	69047.	451.	78.	297315.	37900.
7	6	65.	71868.	466.	115.	317495.	42070.
7	6	66.	76688.	692.	110.	370076.	51675.
7	6	67.	81508.	737.	102.	404520.	63000.
7	6	68.	83785.	854.	166.	473372.	73800.
7	6	69.	79127.	873.	125.	546025.	83957.
7	6	70.	74470.	1239.	126.	684780.	86603.
7	7	60.	61697.	1256.	235.	197038.	22850.
7	7	61.	63075.	1298.	342.	245582.	30550.
7	7	62.	64453.	1404.	280.	259960.	33927.
7	7	63.	66750.	1354.	241.	257664.	32958.
7	7	64.	69047.	1502.	147.	297315.	37900.
7	7	65.	71868.	1197.	231.	317495.	42070.
7	7	66.	76688.	1616.	266.	370076.	51675.
7	7	67.	81508.	1777.	381.	404520.	63000.
7	7	68.	83785.	2027.	504.	473372.	73800.
7	7	69.	79127.	1748.	214.	546025.	83957.
7	7	70.	74470.	1632.	128.	684780.	86603.
7	8	60.	61697.	139.	24.	197038.	22850.
7	8	61.	63075.	186.	38.	245582.	30550.
7	8	62.	64453.	176.	52.	259960.	33927.
7	8	63.	66750.	231.	58.	257664.	32958.
7	8	64.	69047.	202.	42.	297315.	37900.

7	8	65.	71868.	139.	38.	317495.	42070.
7	8	66.	76688.	193.	30.	370076.	51675.
7	8	67.	81508.	280.	60.	404520.	63000.
7	8	68.	83785.	275.	98.	473372.	73800.
7	8	69.	79127.	278.	41.	546025.	83957.
7	8	70.	74470.	227.	46.	684780.	86603.
O OR K = ZERO							
8	1	60.	17419.	0.	0.	64573.	0.
O OR K = ZERO							
8	1	61.	17483.	0.	0.	64630.	15787.
8	1	62.	17548.	2.	2.	74387.	13999.
O OR K = ZERO							
8	1	63.	17977.	0.	0.	73000.	13638.
8	1	64.	18407.	1.	1.	85000.	14000.
O OR K = ZERO							
8	1	65.	18613.	0.	0.	95391.	17112.
8	1	66.	19728.	1.	1.	96363.	18499.
8	1	67.	20843.	1.	1.	124055.	21142.
8	1	68.	20949.	1.	1.	127059.	22274.
8	1	69.	19875.	1.	1.	130322.	23148.
8	1	70.	18802.	1.	1.	143842.	24765.
O OR K = ZERO							
8	2	60.	17419.	0.	0.	64573.	0.
8	2	61.	17483.	1.	1.	64630.	15787.
O OR K = ZERO							
8	2	62.	17548.	0.	0.	74387.	13999.
8	2	63.	17977.	1.	1.	73000.	13638.
O OR K = ZERO							
8	2	64.	18407.	0.	0.	85000.	14000.
O OR K = ZERO							
8	2	65.	18613.	0.	0.	95391.	17112.
O OR K = ZERO							
8	2	66.	19728.	0.	0.	96363.	18499.
O OR K = ZERO							
8	2	67.	20843.	0.	0.	124055.	21142.
O OR K = ZERO							
8	2	68.	20949.	0.	0.	127059.	22274.
O OR K = ZERO							
8	2	69.	19875.	0.	0.	130322.	23148.
8	2	70.	18802.	6.	5.	143842.	24765.
8	3	60.	17419.	2.	1.	64573.	0.
8	3	61.	17483.	3.	2.	64630.	15787.
8	3	62.	17548.	2.	1.	74387.	13999.
8	3	63.	17977.	2.	2.	73000.	13638.
8	3	64.	18407.	4.	4.	85000.	14000.
8	3	65.	18613.	2.	2.	95391.	17112.
8	3	66.	19728.	2.	2.	96363.	18499.
8	3	67.	20843.	2.	2.	124055.	21142.
8	3	68.	20949.	4.	0.	127059.	22274.
8	3	69.	19875.	2.	1.	130322.	23148.
8	3	70.	18802.	4.	1.	143842.	24765.
O OR K = ZERO							
8	4	60.	17419.	0.	0.	64573.	0.
8	4	61.	17483.	2.	2.	64630.	15787.
8	4	62.	17548.	4.	4.	74387.	13999.
8	4	63.	17977.	3.	3.	73000.	13638.
8	4	64.	18407.	13.	13.	85000.	14000.
8	4	65.	18613.	7.	7.	95391.	17112.
8	4	66.	19728.	30.	30.	96363.	18499.
8	4	67.	20843.	8.	8.	124055.	21142.
8	4	68.	20949.	6.	6.	127059.	22274.

8	4	69.	19875.	6.	5.	130322.	23148.
8	4	70.	18802.	12.	12.	143842.	24765.
8	5	60.	17419.	81.	10.	64573.	0.
8	5	61.	17483.	82.	11.	64630.	15787.
8	5	62.	17548.	59.	21.	74387.	13999.
8	5	63.	17977.	70.	19.	73000.	13638.
8	5	64.	18407.	45.	21.	85000.	14000.
8	5	65.	18613.	40.	18.	95391.	17112.
8	5	66.	19728.	82.	8.	96363.	18499.
8	5	67.	20843.	90.	16.	124055.	21142.
8	5	68.	20949.	84.	13.	127059.	22274.
8	5	69.	19875.	103.	21.	130322.	23148.
8	5	70.	18802.	109.	24.	143842.	24765.
8	6	60.	17419.	20.	4.	64573.	0.
8	6	61.	17483.	19.	5.	64630.	15787.
8	6	62.	17548.	6.	3.	74387.	13999.
8	6	63.	17977.	23.	5.	73000.	13638.
8	6	64.	18407.	12.	5.	85000.	14000.
8	6	65.	18613.	23.	9.	95391.	17112.
8	6	66.	19728.	19.	5.	96363.	18499.
8	6	67.	20843.	40.	8.	124055.	21142.
8	6	68.	20949.	58.	5.	127059.	22274.
8	6	69.	19875.	87.	13.	130322.	23148.
8	6	70.	18802.	76.	6.	143842.	24765.
8	7	60.	17419.	274.	44.	64573.	0.
8	7	61.	17483.	306.	43.	64630.	15787.
8	7	62.	17548.	270.	43.	74387.	13999.
8	7	63.	17977.	191.	40.	73000.	13638.
8	7	64.	18407.	136.	88.	85000.	14000.
8	7	65.	18613.	122.	67.	95391.	17112.
8	7	66.	19728.	136.	47.	96363.	18499.
8	7	67.	20843.	161.	23.	124055.	21142.
8	7	68.	20949.	227.	24.	127059.	22274.
8	7	69.	19875.	230.	28.	130322.	23148.
8	7	70.	18802.	222.	35.	143842.	24765.
8	8	60.	17419.	19.	7.	64573.	0.
8	8	61.	17483.	16.	5.	64630.	15787.
8	8	62.	17548.	10.	4.	74387.	13999.
8	8	63.	17977.	22.	11.	73000.	13638.
8	8	64.	18407.	20.	16.	85000.	14000.
8	8	65.	18613.	16.	11.	95391.	17112.
8	8	66.	19728.	12.	5.	96363.	18499.
8	8	67.	20843.	15.	4.	124055.	21142.
8	8	68.	20949.	13.	3.	127059.	22274.
8	8	69.	19875.	15.	2.	130322.	23148.
8	8	70.	18802.	21.	6.	143842.	24765.
0 OR K = ZERO							
9	1	60.	36058.	0.	0.	97434.	10150.
0 OR K = ZERO							
9	1	61.	37899.	0.	0.	109362.	12842.
9	1	62.	39741.	1.	1.	123821.	16434.
9	1	63.	41729.	1.	0.	145171.	19808.
9	1	64.	43717.	3.	3.	157745.	20703.
9	1	65.	53544.	1.	1.	165507.	11900.
0 OR K = ZERO							
9	1	66.	54936.	0.	0.	219488.	15969.
9	1	67.	56329.	2.	1.	263790.	16350.
9	1	68.	58604.	1.	0.	305023.	18200.
9	1	69.	53359.	1.	1.	336431.	16175.
9	1	70.	48114.	1.	1.	365021.	14862.
9	2	60.	36058.	2.	0.	97434.	10150.

9	2	61.	37899.	3.	2.	109362.	12842.
9	2	62.	39741.	2.	0.	123821.	16434.
9	2	63.	41729.	1.	0.	145171.	19808.
9	2	64.	43717.	2.	1.	157745.	20703.
9	2	65.	53544.	2.	1.	165507.	11900.
O OR K = ZERO							
9	2	66.	54936.	0.	0.	219488.	15969.
9	2	67.	56329.	4.	4.	263790.	16350.
9	2	68.	58604.	2.	2.	305023.	18200.
9	2	69.	53359.	1.	0.	336431.	16175.
9	2	70.	48114.	6.	5.	365021.	14862.
9	3	60.	36058.	4.	0.	97434.	10150.
9	3	61.	37899.	9.	5.	109362.	12842.
9	3	62.	39741.	7.	3.	123821.	16434.
9	3	63.	41729.	5.	0.	145171.	19808.
9	3	64.	43717.	15.	7.	157745.	20703.
9	3	65.	53544.	10.	2.	165507.	11900.
9	3	66.	54936.	7.	5.	219488.	15969.
9	3	67.	56329.	2.	1.	263790.	16350.
9	3	68.	58604.	5.	2.	305023.	18200.
9	3	69.	53359.	6.	5.	336431.	16175.
9	3	70.	48114.	9.	5.	365021.	14862.
O OR K = ZERO							
9	4	60.	36058.	0.	0.	97434.	10150.
9	4	61.	37899.	1.	1.	109362.	12842.
9	4	62.	39741.	4.	4.	123821.	16434.
9	4	63.	41729.	5.	0.	145171.	19808.
9	4	64.	43717.	17.	15.	157745.	20703.
9	4	65.	53544.	28.	28.	165507.	11900.
9	4	66.	54936.	62.	58.	219488.	15969.
9	4	67.	56329.	32.	32.	263790.	16350.
9	4	68.	58604.	48.	47.	305023.	18200.
9	4	69.	53359.	82.	75.	336431.	16175.
9	4	70.	48114.	106.	98.	365021.	14862.
9	5	60.	36058.	120.	0.	97434.	10150.
9	5	61.	37899.	219.	29.	109362.	12842.
9	5	62.	39741.	208.	31.	123821.	16434.
9	5	63.	41729.	237.	0.	145171.	19808.
9	5	64.	43717.	238.	33.	157745.	20703.
9	5	65.	53544.	267.	77.	165507.	11900.
9	5	66.	54936.	209.	58.	219488.	15969.
9	5	67.	56329.	214.	88.	263790.	16350.
9	5	68.	58604.	209.	81.	305023.	18200.
9	5	69.	53359.	232.	72.	336431.	16175.
9	5	70.	48114.	295.	79.	365021.	14862.
9	6	60.	36058.	134.	0.	97434.	10150.
9	6	61.	37899.	137.	6.	109362.	12842.
9	6	62.	39741.	151.	17.	123821.	16434.
9	6	63.	41729.	178.	0.	145171.	19808.
9	6	64.	43717.	218.	30.	157745.	20703.
9	6	65.	53544.	257.	36.	165507.	11900.
9	6	66.	54936.	280.	39.	219488.	15969.
9	6	67.	56329.	282.	42.	263790.	16350.
9	6	68.	58604.	406.	50.	305023.	18200.
9	6	69.	53359.	441.	41.	336431.	16175.
9	6	70.	48114.	443.	41.	365021.	14862.
9	7	60.	36058.	486.	0.	97434.	10150.
9	7	61.	37899.	432.	37.	109362.	12842.
9	7	62.	39741.	542.	42.	123821.	16434.
9	7	63.	41729.	477.	0.	145171.	19808.
9	7	64.	43717.	452.	66.	157745.	20703.

9	7	65.	53544.	552.	82.	165507.	11900.
9	7	66.	54936.	522.	71.	219488.	15969.
9	7	67.	56329.	499.	87.	263790.	16350.
9	7	68.	58604.	455.	103.	305023.	18200.
9	7	69.	53359.	522.	83.	336431.	16175.
9	7	70.	48114.	539.	154.	365021.	14862.
9	8	60.	36058.	28.	0.	97434.	10150.
9	8	61.	37899.	43.	5.	109362.	12842.
9	8	62.	39741.	83.	23.	123821.	16434.
9	8	63.	41729.	49.	0.	145171.	19808.
9	8	64.	43717.	83.	17.	157745.	20703.
9	8	65.	53544.	54.	22.	165507.	11900.
9	8	66.	54936.	83.	23.	219488.	15969.
9	8	67.	56329.	86.	30.	263790.	16350.
9	8	68.	58604.	113.	48.	305023.	18200.
9	8	69.	53359.	85.	34.	336431.	16175.
9	8	70.	48114.	108.	32.	365021.	14862.
O OR K = ZERO							
10	1	60.	38059.	0.	0.	184000.	28000.
10	1	61.	38230.	1.	1.	186000.	30000.
10	1	62.	38402.	4.	4.	192880.	32000.
10	1	63.	38663.	2.	2.	200585.	34000.
10	1	64.	38925.	1.	1.	224159.	35423.
10	1	65.	38832.	3.	3.	251682.	34525.
O OR K = ZERO							
10	1	66.	38830.	0.	0.	261503.	32110.
10	1	67.	38828.	5.	4.	307005.	28200.
10	1	68.	39147.	1.	1.	319770.	32731.
10	1	69.	38239.	6.	6.	374624.	29124.
10	1	70.	37331.	3.	3.	448278.	36500.
10	2	60.	38059.	3.	3.	184000.	28000.
10	2	61.	38230.	4.	4.	186000.	30000.
10	2	62.	38402.	1.	1.	192880.	32000.
10	2	63.	38663.	1.	1.	200585.	34000.
10	2	64.	38925.	9.	7.	224159.	35423.
10	2	65.	38832.	5.	3.	251682.	34525.
O OR K = ZERO							
10	2	66.	38830.	0.	0.	261503.	32110.
10	2	67.	38828.	2.	1.	307005.	28200.
10	2	68.	39147.	4.	3.	319770.	32731.
10	2	69.	38239.	11.	4.	374624.	29124.
10	2	70.	37331.	6.	3.	448278.	36500.
10	3	60.	38059.	3.	1.	184000.	28000.
10	3	61.	38230.	6.	4.	186000.	30000.
10	3	62.	38402.	4.	1.	192880.	32000.
10	3	63.	38663.	4.	0.	200585.	34000.
10	3	64.	38925.	15.	10.	224159.	35423.
10	3	65.	38832.	14.	7.	251682.	34525.
10	3	66.	38830.	14.	6.	261503.	32110.
10	3	67.	38828.	18.	7.	307005.	28200.
10	3	68.	39147.	19.	7.	319770.	32731.
10	3	69.	38239.	25.	7.	374624.	29124.
10	3	70.	37331.	23.	5.	448278.	36500.
10	4	60.	38059.	2.	1.	184000.	28000.
10	4	61.	38230.	18.	18.	186000.	30000.
10	4	62.	38402.	5.	5.	192880.	32000.
10	4	63.	38663.	3.	3.	200585.	34000.
10	4	64.	38925.	24.	20.	224159.	35423.
10	4	65.	38832.	25.	22.	251682.	34525.
10	4	66.	38830.	25.	21.	261503.	32110.
10	4	67.	38828.	47.	36.	307005.	28200.

10	4	68.	39147.	26.	14.	319770.	32731.	
10	4	69.	38239.	50.	33.	374624.	29124.	
10	4	70.	37331.	54.	32.	448278.	36500.	
10	5	60.	38059.	118.	49.	184000.	28000.	
10	5	61.	38230.	155.	51.	186000.	30000.	
10	5	62.	38402.	166.	43.	192880.	32000.	
10	5	63.	38663.	119.	34.	200585.	34000.	
10	5	64.	38925.	294.	74.	224159.	35423.	
10	5	65.	38832.	315.	58.	251682.	34525.	
10	5	66.	38830.	346.	49.	261503.	32110.	
10	5	67.	38828.	255.	58.	307005.	28200.	
10	5	68.	39147.	287.	52.	319770.	32731.	
10	5	69.	38239.	248.	17.	374624.	29124.	
10	5	70.	37331.	301.	33.	448278.	36500.	
10	6	60.	38059.	72.	17.	184000.	28000.	
10	6	61.	38230.	104.	25.	186000.	30000.	
10	6	62.	38402.	109.	25.	192880.	32000.	
10	6	63.	38663.	88.	20.	200585.	34000.	
10	6	64.	38925.	96.	9.	224159.	35423.	
10	6	65.	38832.	130.	19.	251682.	34525.	
10	6	66.	38830.	170.	21.	261503.	32110.	
10	6	67.	38828.	212.	45.	307005.	28200.	
10	6	68.	39147.	328.	29.	319770.	32731.	
10	6	69.	38239.	350.	46.	374624.	29124.	
10	6	70.	37331.	459.	26.	448278.	36500.	
10	7	60.	38059.	529.	105.	184000.	28000.	
10	7	61.	38230.	624.	81.	186000.	30000.	
10	7	62.	38402.	594.	104.	192880.	32000.	
10	7	63.	38663.	477.	75.	200585.	34000.	
10	7	64.	38925.	518.	56.	224159.	35423.	
10	7	65.	38832.	531.	63.	251682.	34525.	
10	7	66.	38830.	617.	33.	261503.	32110.	
10	7	67.	38828.	456.	75.	307005.	28200.	
10	7	68.	39147.	436.	53.	319770.	32731.	
10	7	69.	38239.	340.	38.	374624.	29124.	
10	7	70.	37331.	427.	13.	448278.	36500.	
10	8	60.	38059.	60.	19.	184000.	28000.	
10	8	61.	38230.	100.	24.	186000.	30000.	
10	8	62.	38402.	60.	21.	192880.	32000.	
10	8	63.	38663.	82.	12.	200585.	34000.	
10	8	64.	38925.	123.	32.	224159.	35423.	
10	8	65.	38832.	109.	4.	251682.	34525.	
10	8	66.	38830.	132.	13.	261503.	32110.	
10	8	67.	38828.	81.	13.	307005.	28200.	
10	8	68.	39147.	87.	42.	319770.	32731.	
10	8	69.	38239.	138.	25.	374624.	29124.	
10	8	70.	37331.	123.	17.	448278.	36500.	
O OR K = ZERO								
11	1	60.	33412.	0.	0.	125841.	10580.	
O OR K = ZERO								
11	1	61.	35187.	0.	0.	131741.	12180.	
O OR K = ZERO								
11	1	62.	36962.	0.	0.	140187.	12500.	
O OR K = ZERO								
11	1	63.	38943.	0.	0.	143880.	12600.	
O OR K = ZERO								
11	1	64.	40925.	0.	0.	156908.	15745.	
11	1	65.	41902.	1.	1.	167054.	16000.	
O OR K = ZERO								
11	1	66.	48579.	0.	0.	207801.	19075.	
11	1	67.	55257.	3.	3.	259738.	22275.	

0 OR K = ZERO							
11	1	68.	57475.	0.	0.	297648.	25650.
0 OR K = ZERO							
11	1	69.	54796.	0.	0.	311651.	25090.
11	1	70.	52117.	4.	2.	387025.	61200.
11	2	60.	33412.	3.	2.	125841.	10580.
11	2	61.	35187.	1.	1.	131741.	12180.
11	2	62.	36962.	1.	1.	140187.	12500.
0 OR K = ZERO							
11	2	63.	38943.	0.	0.	143880.	12600.
0 OR K = ZERO							
11	2	64.	40925.	0.	0.	156908.	15745.
0 OR K = ZERO							
11	2	65.	41902.	0.	0.	167054.	16000.
11	2	66.	48579.	6.	0.	207801.	19075.
11	2	67.	55257.	3.	1.	259738.	22275.
11	2	68.	57475.	3.	1.	297648.	25650.
11	2	69.	54796.	1.	0.	311651.	25090.
11	2	70.	52117.	2.	2.	387025.	61200.
11	3	60.	33412.	2.	0.	125841.	10580.
11	3	61.	35187.	5.	1.	131741.	12180.
11	3	62.	36962.	4.	1.	140187.	12500.
11	3	63.	38943.	4.	1.	143880.	12600.
11	3	64.	40925.	2.	0.	156908.	15745.
11	3	65.	41902.	2.	2.	167054.	16000.
11	3	66.	48579.	6.	2.	207801.	19075.
11	3	67.	55257.	8.	7.	259738.	22275.
11	3	68.	57475.	8.	6.	297648.	25650.
11	3	69.	54796.	7.	1.	311651.	25090.
11	3	70.	52117.	7.	1.	387025.	61200.
0 OR K = ZERO							
11	4	60.	33412.	0.	0.	125841.	10580.
11	4	61.	35187.	1.	1.	131741.	12180.
0 OR K = ZERO							
11	4	62.	36962.	0.	0.	140187.	12500.
11	4	63.	38943.	1.	1.	143880.	12600.
11	4	64.	40925.	7.	6.	156908.	15745.
11	4	65.	41902.	19.	16.	167054.	16000.
11	4	66.	48579.	24.	10.	207801.	19075.
11	4	67.	55257.	11.	4.	259738.	22275.
11	4	68.	57475.	29.	17.	297648.	25650.
11	4	69.	54796.	39.	36.	311651.	25090.
11	4	70.	52117.	17.	15.	387025.	61200.
11	5	60.	33412.	69.	25.	125841.	10580.
11	5	61.	35187.	58.	14.	131741.	12180.
11	5	62.	36962.	104.	19.	140187.	12500.
11	5	63.	38943.	130.	28.	143880.	12600.
11	5	64.	40925.	232.	28.	156908.	15745.
11	5	65.	41902.	204.	24.	167054.	16000.
11	5	66.	48579.	328.	68.	207801.	19075.
11	5	67.	55257.	311.	87.	259738.	22275.
11	5	68.	57475.	304.	32.	297648.	25650.
11	5	69.	54796.	377.	47.	311651.	25090.
11	5	70.	52117.	452.	76.	387025.	61200.
11	6	60.	33412.	192.	18.	125841.	10580.
11	6	61.	35187.	178.	18.	131741.	12180.
11	6	62.	36962.	216.	28.	140187.	12500.
11	6	63.	38943.	272.	27.	143880.	12600.
11	6	64.	40925.	351.	34.	156908.	15745.
11	6	65.	41902.	315.	32.	167054.	16000.
11	6	66.	48579.	327.	20.	207801.	19075.

11	6	67.	55257.	371.	13.	259738.	22275.
11	6	68.	57475.	429.	35.	297648.	25650.
11	6	69.	54796.	435.	59.	311651.	25090.
11	6	70.	52117.	586.	117.	387025.	61200.
11	7	60.	33412.	597.	63.	125841.	10580.
11	7	61.	35187.	545.	57.	131741.	12180.
11	7	62.	36962.	727.	53.	140187.	12500.
11	7	63.	38943.	611.	50.	143880.	12600.
11	7	64.	40925.	668.	46.	156908.	15745.
11	7	65.	41902.	531.	18.	167054.	16000.
11	7	66.	48579.	528.	12.	207801.	19075.
11	7	67.	55257.	610.	17.	259738.	22275.
11	7	68.	57475.	617.	39.	297648.	25650.
11	7	69.	54796.	494.	17.	311651.	25090.
11	7	70.	52117.	619.	28.	387025.	61200.
11	8	60.	33412.	35.	9.	125841.	10580.
11	8	61.	35187.	40.	13.	131741.	12180.
11	8	62.	36962.	60.	11.	140187.	12500.
11	8	63.	38943.	46.	10.	143880.	12600.
11	8	64.	40925.	78.	23.	156908.	15745.
11	8	65.	41902.	81.	18.	167054.	16000.
11	8	66.	48579.	77.	25.	207801.	19075.
11	8	67.	55257.	74.	13.	259738.	22275.
11	8	68.	57475.	67.	27.	297648.	25650.
11	8	69.	54796.	60.	10.	311651.	25090.
11	8	70.	52117.	76.	13.	387025.	61200.
12	1	60.	324253.	25.	21.	1576437.	201348.
12	1	61.	331027.	18.	17.	1657085.	214244.
12	1	62.	337801.	29.	27.	1662925.	237429.
12	1	63.	344110.	22.	16.	1753103.	253638.
12	1	64.	350419.	21.	20.	2053835.	295721.
12	1	65.	361826.	27.	27.	2162959.	297158.
12	1	66.	364588.	34.	30.	2351555.	330103.
12	1	67.	367351.	36.	36.	2830924.	391143.
12	1	68.	371561.	36.	33.	3084779.	469001.
12	1	69.	369021.	44.	41.	3613254.	493067.
12	1	70.	366481.	32.	32.	4219883.	581984.
12	2	60.	324253.	33.	18.	1576437.	201348.
12	2	61.	331027.	57.	43.	1657085.	214244.
12	2	62.	337801.	39.	18.	1662925.	237429.
12	2	63.	344110.	61.	24.	1753103.	253638.
12	2	64.	350419.	80.	35.	2053835.	295721.
12	2	65.	361826.	64.	18.	2162959.	297158.
12	2	66.	364588.	94.	52.	2351555.	330103.
12	2	67.	367351.	113.	77.	2830924.	391143.
12	2	68.	371561.	117.	66.	3084779.	469001.
12	2	69.	369021.	95.	51.	3613254.	493067.
12	2	70.	366481.	122.	87.	4219883.	581984.
12	3	60.	324253.	284.	134.	1576437.	201348.
12	3	61.	331027.	336.	117.	1657085.	214244.
12	3	62.	337801.	388.	106.	1662925.	237429.
12	3	63.	344110.	489.	123.	1753103.	253638.
12	3	64.	350419.	518.	135.	2053835.	295721.
12	3	65.	361826.	488.	158.	2162959.	297158.
12	3	66.	364588.	463.	146.	2351555.	330103.
12	3	67.	367351.	351.	122.	2830924.	391143.
12	3	68.	371561.	482.	168.	3084779.	469001.
12	3	69.	369021.	534.	166.	3613254.	493067.
12	3	70.	366481.	548.	169.	4219883.	581984.
12	4	60.	324253.	112.	98.	1576437.	201348.
12	4	61.	331027.	361.	302.	1657085.	214244.

12	4	62.	337801.	428.	297.	1662925.	237429.
12	4	63.	344110.	630.	360.	1753103.	253638.
12	4	64.	350419.	506.	214.	2053835.	295721.
12	4	65.	361826.	371.	157.	2162959.	297158.
12	4	66.	364588.	368.	201.	2351555.	330103.
12	4	67.	367351.	495.	330.	2830924.	391143.
12	4	68.	371561.	575.	331.	3084779.	469001.
12	4	69.	369021.	783.	443.	3613254.	493067.
12	4	70.	366481.	647.	409.	4219883.	581984.
12	5	60.	324253.	3310.	566.	1576437.	201348.
12	5	61.	331027.	3837.	581.	1657085.	214244.
12	5	62.	337801.	3772.	771.	1662925.	237429.
12	5	63.	344110.	4336.	653.	1753103.	253638.
12	5	64.	350419.	4387.	859.	2053835.	295721.
12	5	65.	361826.	3773.	921.	2162959.	297158.
12	5	66.	364588.	4016.	716.	2351555.	330103.
12	5	67.	367351.	4355.	961.	2830924.	391143.
12	5	68.	371561.	5328.	1072.	3084779.	469001.
12	5	69.	369021.	5565.	1189.	3613254.	493067.
12	5	70.	366481.	5656.	1261.	4219883.	581984.
12	6	60.	324253.	512.	210.	1576437.	201348.
12	6	61.	331027.	575.	261.	1657085.	214244.
12	6	62.	337801.	740.	146.	1662925.	237429.
12	6	63.	344110.	564.	93.	1753103.	253638.
12	6	64.	350419.	707.	99.	2053835.	295721.
12	6	65.	361826.	556.	93.	2162959.	297158.
12	6	66.	364588.	606.	155.	2351555.	330103.
12	6	67.	367351.	1643.	177.	2830924.	391143.
12	6	68.	371561.	1826.	94.	3084779.	469001.
12	6	69.	369021.	1339.	105.	3613254.	493067.
12	6	70.	366481.	1843.	198.	4219883.	581984.
12	7	60.	324253.	5906.	744.	1576437.	201348.
12	7	61.	331027.	6142.	807.	1657085.	214244.
12	7	62.	337801.	6823.	715.	1662925.	237429.
12	7	63.	344110.	6643.	517.	1753103.	253638.
12	7	64.	350419.	7234.	783.	2053835.	295721.
12	7	65.	361826.	6590.	922.	2162959.	297158.
12	7	66.	364588.	6346.	859.	2351555.	330103.
12	7	67.	367351.	7498.	1061.	2830924.	391143.
12	7	68.	371561.	7435.	814.	3084779.	469001.
12	7	69.	369021.	7032.	1016.	3613254.	493067.
12	7	70.	366481.	8442.	1367.	4219883.	581984.
12	8	60.	324253.	1638.	352.	1576437.	201348.
12	8	61.	331027.	1643.	350.	1657085.	214244.
12	8	62.	337801.	1926.	322.	1662925.	237429.
12	8	63.	344110.	1944.	338.	1753103.	253638.
12	8	64.	350419.	1899.	290.	2053835.	295721.
12	8	65.	361826.	1846.	250.	2162959.	297158.
12	8	66.	364588.	1538.	333.	2351555.	330103.
12	8	67.	367351.	1378.	336.	2830924.	391143.
12	8	68.	371561.	1774.	318.	3084779.	469001.
12	8	69.	369021.	2180.	347.	3613254.	493067.
12	8	70.	366481.	2538.	469.	4219883.	581984.
O OR K = ZERO							
13	1	60.	15951.	0.	0.	64615.	13566.
O OR K = ZERO							
13	1	61.	16028.	0.	0.	65080.	12744.
13	1	62.	16106.	1.	1.	66323.	12526.
13	1	63.	16051.	1.	1.	68930.	14574.
13	1	64.	15996.	1.	1.	73802.	15876.
13	1	65.	16404.	1.	1.	78118.	13564.

13	1	66.	16487.	1.	1.	83119.	13634.
13	1	67.	16570.	2.	2.	92579.	14580.
O OR K = ZERO							
13	1	68.	16644.	0.	0.	100742.	14135.
O OR K = ZERO							
13	1	69.	15912.	0.	0.	108751.	22553.
O OR K = ZERO							
13	1	70.	15180.	0.	0.	111818.	18296.
O OR K = ZERO							
13	2	60.	15951.	0.	0.	64615.	13566.
O OR K = ZERO							
13	2	61.	16028.	0.	0.	65080.	12744.
13	2	62.	16106.	2.	2.	66323.	12526.
O OR K = ZERO							
13	2	63.	16051.	0.	0.	68930.	14574.
O OR K = ZERO							
13	2	64.	15996.	0.	0.	73802.	15876.
O OR K = ZERO							
13	2	65.	16404.	0.	0.	78118.	13564.
13	2	66.	16487.	1.	1.	83119.	13634.
13	2	67.	16570.	4.	3.	92579.	14580.
13	2	68.	16644.	1.	1.	100742.	14135.
O OR K = ZERO							
13	2	69.	15912.	0.	0.	108751.	22553.
O OR K = ZERO							
13	2	70.	15180.	0.	0.	111818.	18296.
13	3	60.	15951.	2.	0.	64615.	13566.
13	3	61.	16028.	3.	1.	65080.	12744.
13	3	62.	16106.	5.	0.	66323.	12526.
13	3	63.	16051.	2.	1.	68930.	14574.
13	3	64.	15996.	3.	1.	73802.	15876.
13	3	65.	16404.	3.	3.	78118.	13564.
13	3	66.	16487.	1.	1.	83119.	13634.
13	3	67.	16570.	4.	1.	92579.	14580.
13	3	68.	16644.	1.	1.	100742.	14135.
O OR K = ZERO							
13	3	69.	15912.	0.	0.	108751.	22553.
13	3	70.	15180.	4.	3.	111818.	18296.
13	4	60.	15951.	25.	25.	64615.	13566.
13	4	61.	16028.	11.	11.	65080.	12744.
13	4	62.	16106.	11.	11.	66323.	12526.
13	4	63.	16051.	7.	7.	68930.	14574.
13	4	64.	15996.	15.	14.	73802.	15876.
13	4	65.	16404.	5.	5.	78118.	13564.
13	4	66.	16487.	2.	2.	83119.	13634.
13	4	67.	16570.	2.	2.	92579.	14580.
13	4	68.	16644.	3.	3.	100742.	14135.
13	4	69.	15912.	4.	4.	108751.	22553.
13	4	70.	15180.	3.	3.	111818.	18296.
13	5	60.	15951.	47.	15.	64615.	13566.
13	5	61.	16028.	54.	19.	65080.	12744.
13	5	62.	16106.	82.	20.	66323.	12526.
13	5	63.	16051.	46.	13.	68930.	14574.
13	5	64.	15996.	66.	11.	73802.	15876.
13	5	65.	16404.	55.	38.	78118.	13564.
13	5	66.	16487.	95.	68.	83119.	13634.
13	5	67.	16570.	56.	21.	92579.	14580.
13	5	68.	16644.	138.	79.	100742.	14135.
13	5	69.	15912.	120.	49.	108751.	22553.
13	5	70.	15180.	104.	104.	111818.	18296.
13	6	60.	15951.	27.	5.	64615.	13566.

13	6	61.	16028.	22.	4.	65080.	12744.
13	6	62.	16106.	21.	4.	66323.	12526.
13	6	63.	16051.	30.	7.	68930.	14574.
13	6	64.	15996.	46.	5.	73802.	15876.
13	6	65.	16404.	11.	3.	78118.	13564.
13	6	66.	16487.	20.	9.	83119.	13634.
13	6	67.	16570.	20.	9.	92579.	14580.
13	6	68.	16644.	24.	15.	100742.	14135.
13	6	69.	15912.	33.	33.	108751.	22553.
13	6	70.	15180.	36.	36.	111818.	18296.
13	7	60.	15951.	281.	47.	64615.	13566.
13	7	61.	16028.	253.	46.	65080.	12744.
13	7	62.	16106.	248.	43.	66323.	12526.
13	7	63.	16051.	243.	61.	68930.	14574.
13	7	64.	15996.	219.	58.	73802.	15876.
13	7	65.	16404.	146.	57.	78118.	13564.
13	7	66.	16487.	124.	43.	83119.	13634.
13	7	67.	16570.	106.	111.	92579.	14580.
13	7	68.	16644.	95.	95.	100742.	14135.
13	7	69.	15912.	73.	47.	108751.	22553.
13	7	70.	15180.	63.	63.	111818.	18296.
13	8	60.	15951.	12.	5.	64615.	13566.
13	8	61.	16028.	20.	6.	65080.	12744.
13	8	62.	16106.	26.	15.	66323.	12526.
13	8	63.	16051.	23.	20.	68930.	14574.
13	8	64.	15996.	17.	15.	73802.	15876.
13	8	65.	16404.	18.	6.	78118.	13564.
13	8	66.	16487.	12.	9.	83119.	13634.
13	8	67.	16570.	7.	5.	92579.	14580.
13	8	68.	16644.	11.	4.	100742.	14135.
13	8	69.	15912.	6.	1.	109751.	22553.
13	8	70.	15180.	6.	6.	111818.	18296.
14	1	60.	24411.	1.	1.	183670.	46845.
14	1	61.	22471.	1.	0.	179913.	52324.
0 OR K = ZERO							
14	1	62.	20531.	0.	0.	203638.	46738.
0 OR K = ZERO							
14	1	63.	24820.	0.	0.	218791.	50569.
14	1	64.	29110.	1.	1.	232863.	50311.
0 OR K = ZERO							
14	1	65.	29209.	0.	0.	238878.	48090.
14	1	66.	28392.	3.	3.	244893.	45869.
0 OR K = ZERO							
14	1	67.	27575.	0.	0.	264400.	42345.
0 OR K = ZERO							
14	1	68.	27673.	0.	0.	272212.	41345.
0 OR K = ZERO							
14	1	69.	26806.	0.	0.	290810.	40263.
0 OR K = ZERO							
14	1	70.	25940.	0.	0.	328154.	47562.
0 OR K = ZERO							
14	2	60.	24411.	0.	0.	183670.	46845.
0 OR K = ZERO							
14	2	61.	22471.	0.	0.	179913.	52324.
14	2	62.	20531.	1.	1.	203638.	46738.
0 OR K = ZERO							
14	2	63.	24820.	0.	0.	218791.	50569.
0 OR K = ZERO							
14	2	64.	29110.	0.	0.	232863.	50311.
0 OR K = ZERO							
14	2	65.	29209.	0.	0.	238878.	48090.

O OR K = ZERO							
14	2	66.	28392.	0.	0.	244893.	45869.
14	2	67.	27575.	5.	4.	264400.	42345.
14	2	68.	27673.	2.	1.	272212.	41345.
14	2	69.	26806.	2.	2.	290810.	40263.
O OR K = ZERO							
14	2	70.	25940.	0.	0.	328154.	47562.
14	3	60.	24411.	5.	4.	183670.	46845.
14	3	61.	22471.	1.	0.	179913.	52324.
14	3	62.	20531.	2.	2.	203638.	46738.
14	3	63.	24820.	2.	0.	218791.	50569.
14	3	64.	29110.	2.	2.	232863.	50311.
14	3	65.	29209.	1.	1.	238878.	48090.
14	3	66.	28392.	4.	4.	244893.	45869.
14	3	67.	27575.	5.	1.	264400.	42345.
14	3	68.	27673.	3.	1.	272212.	41345.
14	3	69.	26806.	2.	1.	290810.	40263.
14	3	70.	25940.	4.	3.	328154.	47562.
14	4	60.	24411.	8.	8.	183670.	46845.
14	4	61.	22471.	10.	0.	179913.	52324.
14	4	62.	20531.	5.	3.	203638.	46738.
14	4	63.	24820.	9.	0.	218791.	50569.
14	4	64.	29110.	8.	8.	232863.	50311.
14	4	65.	29209.	6.	6.	238878.	48090.
14	4	66.	28392.	6.	5.	244893.	45869.
14	4	67.	27575.	3.	3.	264400.	42345.
14	4	68.	27673.	15.	5.	272212.	41345.
14	4	69.	26806.	10.	7.	290810.	40263.
14	4	70.	25940.	8.	7.	328154.	47562.
14	5	60.	24411.	101.	40.	183670.	46845.
14	5	61.	22471.	124.	0.	179913.	52324.
14	5	62.	20531.	132.	54.	203638.	46738.
14	5	63.	24820.	76.	0.	218791.	50569.
14	5	64.	29110.	57.	12.	232863.	50311.
14	5	65.	29209.	107.	33.	238878.	48090.
14	5	66.	28392.	115.	38.	244893.	45869.
14	5	67.	27575.	130.	51.	264400.	42345.
14	5	68.	27673.	118.	12.	272212.	41345.
14	5	69.	26806.	144.	45.	290810.	40263.
14	5	70.	25940.	145.	24.	328154.	47562.
14	6	60.	24411.	42.	12.	183670.	46845.
14	6	61.	22471.	44.	0.	179913.	52324.
14	6	62.	20531.	35.	11.	203638.	46738.
14	6	63.	24820.	60.	0.	218791.	50569.
14	6	64.	29110.	36.	15.	232863.	50311.
14	6	65.	29209.	42.	11.	238878.	48090.
14	6	66.	28392.	58.	8.	244893.	45869.
14	6	67.	27575.	77.	15.	264400.	42345.
14	6	68.	27673.	99.	3.	272212.	41345.
14	6	69.	26806.	102.	3.	290810.	40263.
14	6	70.	25940.	133.	12.	328154.	47562.
14	7	60.	24411.	237.	106.	183670.	46845.
14	7	61.	22471.	179.	0.	179913.	52324.
14	7	62.	20531.	145.	46.	203638.	46738.
14	7	63.	24820.	86.	0.	218791.	50569.
14	7	64.	29110.	167.	69.	232863.	50311.
14	7	65.	29209.	140.	54.	238878.	48090.
14	7	66.	28392.	86.	8.	244893.	45869.
14	7	67.	27575.	93.	16.	264400.	42345.
14	7	68.	27673.	225.	12.	272212.	41345.
14	7	69.	26806.	212.	14.	290810.	40263.

15	4	66.	25662.	6.	8.	128114.	24415.
15	4	67.	25874.	7.	4.	138500.	28975.
15	4	68.	25628.	28.	20.	152986.	35072.
15	4	69.	25351.	21.	12.	169100.	36900.
15	4	70.	25075.	29.	20.	181600.	37550.
15	5	60.	24326.	123.	19.	109578.	20920.
15	5	61.	24874.	97.	0.	107322.	21920.
15	5	62.	25422.	86.	28.	111650.	22720.
15	5	63.	25550.	98.	0.	116550.	22920.
15	5	64.	25679.	137.	40.	120500.	24550.
15	5	65.	25450.	154.	57.	122125.	24125.
15	5	66.	25662.	134.	30.	128114.	24415.
15	5	67.	25874.	142.	40.	138500.	28975.
15	5	68.	25628.	120.	30.	152986.	35072.
15	5	69.	25351.	154.	32.	169100.	36900.
15	5	70.	25075.	164.	15.	181600.	37550.
15	6	60.	24326.	62.	11.	109578.	20920.
15	6	61.	24874.	44.	0.	107322.	21920.
15	6	62.	25422.	28.	9.	111650.	22720.
15	6	63.	25550.	50.	0.	116550.	22920.
15	6	64.	25679.	98.	24.	120500.	24550.
15	6	65.	25450.	146.	50.	122125.	24125.
15	6	66.	25662.	123.	30.	128114.	24415.
15	6	67.	25874.	115.	31.	138500.	28975.
15	6	68.	25628.	124.	24.	152986.	35072.
15	6	69.	25351.	174.	29.	169100.	36900.
15	6	70.	25075.	162.	17.	181600.	37550.
15	7	60.	24326.	234.	16.	109578.	20920.
15	7	61.	24874.	149.	0.	107322.	21920.
15	7	62.	25422.	131.	10.	111650.	22720.
15	7	63.	25550.	238.	0.	116550.	22920.
15	7	64.	25679.	310.	54.	120500.	24550.
15	7	65.	25450.	215.	57.	122125.	24125.
15	7	66.	25662.	226.	46.	128114.	24415.
15	7	67.	25874.	294.	46.	138500.	28975.
15	7	68.	25628.	252.	45.	152986.	35072.
15	7	69.	25351.	312.	38.	169100.	36900.
15	7	70.	25075.	240.	16.	181600.	37550.
15	8	60.	24326.	44.	11.	109578.	20920.
15	8	61.	24874.	67.	0.	107322.	21920.
15	8	62.	25422.	50.	19.	111650.	22720.
15	8	63.	25550.	57.	0.	116550.	22920.
15	8	64.	25679.	91.	29.	120500.	24550.
15	8	65.	25450.	70.	19.	122125.	24125.
15	8	66.	25662.	76.	28.	128114.	24415.
15	8	67.	25874.	84.	20.	138500.	28975.
15	8	68.	25628.	51.	11.	152986.	35072.
15	8	69.	25351.	69.	12.	169100.	36900.
15	8	70.	25075.	93.	16.	181600.	37550.
16	1	60.	23965.	1.	0.	84411.	8743.
0 OR K = ZERO							
16	1	61.	24746.	0.	0.	94508.	8593.
16	1	62.	25528.	1.	1.	110055.	12593.
0 OR K = ZERO							
16	1	63.	26137.	0.	0.	111548.	14100.
0 OR K = ZERO							
16	1	64.	26746.	0.	0.	130535.	18460.
0 OR K = ZERO							
16	1	65.	26899.	0.	0.	137700.	20600.
16	1	66.	27114.	2.	2.	149561.	20488.
16	1	67.	27330.	1.	1.	162550.	22025.

14	7	70.	25940.	212.	14.	328154.	47562.
14	8	60.	24411.	22.	11.	183670.	46845.
14	8	61.	22471.	40.	0.	179913.	52324.
14	8	62.	20531.	30.	7.	203638.	46738.
14	8	63.	24820.	29.	0.	218791.	50569.
14	8	64.	29110.	36.	24.	232863.	50311.
14	8	65.	29209.	22.	11.	238870.	48090.
14	8	66.	28392.	37.	13.	244893.	45869.
14	8	67.	27575.	48.	22.	264400.	42345.
14	8	68.	27673.	28.	13.	272212.	41345.
14	8	69.	26806.	59.	22.	290810.	40263.
14	8	70.	25940.	44.	19.	328154.	47562.
15	1	60.	24326.	1.	1.	109578.	20920.
15	1	61.	24874.	1.	0.	107322.	21920.
0 OR K = ZERO							
15	1	62.	25422.	0.	0.	111650.	22720.
0 OR K = ZERO							
15	1	63.	25550.	0.	0.	116550.	22920.
0 OR K = ZERO							
15	1	64.	25679.	0.	0.	120500.	24550.
15	1	65.	25450.	2.	0.	122125.	24125.
0 OR K = ZERO							
15	1	66.	25662.	0.	0.	128114.	24415.
0 OR K = ZERO							
15	1	67.	25874.	0.	0.	138500.	28975.
0 OR K = ZERO							
15	1	68.	25628.	0.	0.	152986.	35072.
0 OR K = ZERO							
15	1	69.	25351.	0.	0.	169100.	36900.
15	1	70.	25075.	2.	1.	181600.	37550.
15	2	60.	24326.	2.	0.	109578.	20920.
15	2	61.	24874.	1.	0.	107322.	21920.
15	2	62.	25422.	1.	1.	111650.	22720.
15	2	63.	25550.	1.	0.	116550.	22920.
0 OR K = ZERO							
15	2	64.	25679.	0.	0.	120500.	24550.
15	2	65.	25450.	1.	0.	122125.	24125.
15	2	66.	25662.	1.	0.	128114.	24415.
0 OR K = ZERO							
15	2	67.	25874.	0.	0.	138500.	28975.
0 OR K = ZERO							
15	2	68.	25628.	0.	0.	152986.	35072.
15	2	69.	25351.	3.	0.	169100.	36900.
15	2	70.	25075.	1.	0.	181600.	37550.
15	3	60.	24326.	3.	0.	109578.	20920.
15	3	61.	24874.	2.	0.	107322.	21920.
15	3	62.	25422.	3.	2.	111650.	22720.
15	3	63.	25550.	3.	0.	116550.	22920.
15	3	64.	25679.	6.	1.	120500.	24550.
15	3	65.	25450.	2.	1.	122125.	24125.
15	3	66.	25662.	5.	2.	128114.	24415.
15	3	67.	25874.	5.	2.	138500.	28975.
15	3	68.	25628.	1.	0.	152986.	35072.
15	3	69.	25351.	1.	0.	169100.	36900.
15	3	70.	25075.	5.	1.	181600.	37550.
15	4	60.	24326.	2.	1.	109578.	20920.
15	4	61.	24874.	3.	0.	107322.	21920.
15	4	62.	25422.	1.	1.	111650.	22720.
15	4	63.	25550.	9.	0.	116550.	22920.
15	4	64.	25679.	10.	7.	120500.	24550.
15	4	65.	25450.	5.	5.	122125.	24125.

0 OR K = ZERO							
16	1	68.	27575.	0.	0.	201059.	26245.
16	1	69.	29350.	1.	0.	216651.	25560.
0 OR K = ZERO							
16	1	70.	31126.	0.	0.	236057.	34535.
0 OR K = ZERO							
16	2	60.	23965.	0.	0.	84411.	8743.
16	2	61.	24746.	1.	0.	94508.	8593.
0 OR K = ZERO							
16	2	62.	25528.	0.	0.	110055.	12593.
0 OR K = ZERO							
16	2	63.	26137.	0.	0.	111548.	14100.
0 OR K = ZERO							
16	2	64.	26746.	0.	0.	130535.	18460.
0 OR K = ZERO							
16	2	65.	26899.	0.	0.	137700.	20600.
0 OR K = ZERO							
16	2	66.	27114.	0.	0.	149561.	20488.
16	2	67.	27330.	1.	1.	162550.	22025.
0 OR K = ZERO							
16	2	68.	27575.	0.	0.	201059.	26245.
0 OR K = ZERO							
16	2	69.	29350.	0.	0.	216651.	25560.
0 OR K = ZERO							
16	2	70.	31126.	0.	0.	236057.	34535.
0 OR K = ZERO							
16	3	60.	23965.	0.	0.	84411.	8743.
0 OR K = ZERO							
16	3	61.	24746.	0.	0.	94508.	8593.
16	3	62.	25528.	4.	1.	110055.	12593.
16	3	63.	26137.	3.	0.	111548.	14100.
0 OR K = ZERO							
16	3	64.	26746.	0.	0.	130535.	18460.
0 OR K = ZERO							
16	3	65.	26899.	0.	0.	137700.	20600.
16	3	66.	27114.	2.	1.	149561.	20488.
0 OR K = ZERO							
16	3	67.	27330.	0.	0.	162550.	22025.
16	3	68.	27575.	2.	2.	201059.	26245.
16	3	69.	29350.	2.	1.	216651.	25560.
16	3	70.	31126.	4.	1.	236057.	34535.
16	4	60.	23965.	2.	0.	84411.	8743.
16	4	61.	24746.	7.	6.	94508.	8593.
16	4	62.	25528.	3.	3.	110055.	12593.
16	4	63.	26137.	4.	0.	111548.	14100.
16	4	64.	26746.	11.	9.	130535.	18460.
16	4	65.	26899.	20.	19.	137700.	20600.
16	4	66.	27114.	12.	9.	149561.	20488.
16	4	67.	27330.	9.	5.	162550.	22025.
16	4	68.	27575.	9.	5.	201059.	26245.
16	4	69.	29350.	9.	5.	216651.	25560.
16	4	70.	31126.	6.	3.	236057.	34535.
16	5	60.	23965.	32.	0.	84411.	8743.
16	5	61.	24746.	42.	20.	94508.	8593.
16	5	62.	25528.	39.	21.	110055.	12593.
16	5	63.	26137.	46.	0.	111548.	14100.
16	5	64.	26746.	63.	2.	130535.	18460.
16	5	65.	26899.	63.	10.	137700.	20600.
16	5	66.	27114.	87.	9.	149561.	20488.
16	5	67.	27330.	83.	8.	162550.	22025.
16	5	68.	27575.	118.	33.	201059.	26245.

16	5	69.	29350.	95.	39.	216651.	25560.
16	5	70.	31126.	171.	33.	236057.	34535.
16	6	60.	23965.	47.	0.	84411.	8743.
16	6	61.	24746.	56.	10.	94508.	8593.
16	6	62.	25528.	73.	15.	110055.	12593.
16	6	63.	26137.	73.	0.	111548.	14100.
16	6	64.	26746.	87.	26.	130535.	18460.
16	6	65.	26899.	101.	7.	137700.	20600.
16	6	66.	27114.	82.	7.	149561.	20488.
16	6	67.	27330.	157.	6.	162550.	22025.
16	6	68.	27575.	298.	53.	201059.	26245.
16	6	69.	29350.	220.	18.	216651.	25560.
16	6	70.	31126.	200.	9.	236057.	34535.
16	7	60.	23965.	186.	0.	84411.	8743.
16	7	61.	24746.	240.	41.	94508.	8593.
16	7	62.	25528.	238.	22.	110055.	12593.
16	7	63.	26137.	205.	0.	111548.	14100.
16	7	64.	26746.	214.	30.	130535.	18460.
16	7	65.	26899.	229.	20.	137700.	20600.
16	7	66.	27114.	134.	2.	149561.	20488.
16	7	67.	27330.	154.	11.	162550.	22025.
16	7	68.	27575.	253.	47.	201059.	26245.
16	7	69.	29350.	261.	77.	216651.	25560.
16	7	70.	31126.	326.	156.	236057.	34535.
16	8	60.	23965.	18.	0.	84411.	8743.
16	8	61.	24746.	7.	3.	94508.	8593.
16	8	62.	25528.	7.	4.	110055.	12593.
16	8	63.	26137.	27.	0.	111548.	14100.
16	8	64.	26746.	2.	1.	130535.	18460.
16	8	65.	26899.	9.	3.	137700.	20600.
16	8	66.	27114.	34.	3.	149561.	20488.
16	8	67.	27330.	20.	5.	162550.	22025.
16	8	68.	27575.	20.	5.	201059.	26245.
16	8	69.	29350.	17.	3.	216651.	25560.
16	8	70.	31126.	17.	8.	236057.	34535.
17	1	60.	261685.	15.	14.	1463368.	209770.
17	1	61.	260579.	8.	0.	1544108.	238582.
17	1	62.	259472.	9.	9.	1454192.	248011.
17	1	63.	269286.	18.	15.	1559731.	291410.
17	1	64.	279101.	14.	14.	1680003.	317619.
17	1	65.	287565.	12.	11.	1726194.	378080.
17	1	66.	303252.	15.	15.	1802680.	279150.
17	1	67.	318940.	32.	27.	2102488.	331330.
17	1	68.	324193.	29.	29.	2888532.	324646.
17	1	69.	327915.	18.	17.	3173080.	381830.
17	1	70.	331638.	31.	27.	3643063.	427277.
17	2	60.	261685.	30.	19.	1463368.	209770.
17	2	61.	260579.	48.	0.	1544108.	238582.
17	2	62.	259472.	21.	13.	1454192.	248011.
17	2	63.	269286.	25.	13.	1559731.	291410.
17	2	64.	279101.	29.	15.	1680003.	317619.
17	2	65.	287565.	29.	19.	1726194.	378080.
17	2	66.	303252.	67.	38.	1802680.	279150.
17	2	67.	318940.	52.	23.	2102488.	331330.
17	2	68.	324193.	71.	27.	2888532.	324646.
17	2	69.	327915.	79.	38.	3173080.	381830.
17	2	70.	331638.	74.	26.	3643063.	427277.
17	3	60.	261685.	132.	41.	1463368.	209770.
17	3	61.	260579.	137.	0.	1544108.	238582.
17	3	62.	259472.	145.	74.	1454192.	248011.
17	3	63.	269286.	161.	57.	1559731.	291410.

17	3	64.	279101.	173.	69.	1680003.	317619.
17	3	65.	287565.	183.	73.	1726194.	378080.
17	3	66.	303252.	201.	60.	1802680.	279150.
17	3	67.	318940.	261.	68.	2102488.	331330.
17	3	68.	324193.	386.	114.	2888532.	324646.
17	3	69.	327915.	362.	114.	3173080.	381830.
17	3	70.	331638.	384.	104.	3643063.	427277.
17	4	60.	261685.	154.	106.	1463368.	209770.
17	4	61.	260579.	130.	0.	1544108.	238582.
17	4	62.	259472.	130.	101.	1454192.	248011.
17	4	63.	269286.	158.	123.	1559731.	291410.
17	4	64.	279101.	327.	216.	1680003.	317619.
17	4	65.	287565.	335.	241.	1726194.	378080.
17	4	66.	303252.	239.	167.	1802680.	279150.
17	4	67.	318940.	333.	206.	2102488.	331330.
17	4	68.	324193.	480.	312.	2888532.	324646.
17	4	69.	327915.	522.	338.	3173080.	381830.
17	4	70.	331638.	546.	259.	3643063.	427277.
17	5	60.	261685.	2552.	588.	1463368.	209770.
17	5	61.	260579.	1936.	0.	1544108.	238582.
17	5	62.	259472.	1926.	764.	1454192.	248011.
17	5	63.	269286.	1910.	648.	1559731.	291410.
17	5	64.	279101.	2543.	616.	1680003.	317619.
17	5	65.	287565.	2270.	599.	1726194.	378080.
17	5	66.	303252.	2776.	542.	1802680.	279150.
17	5	67.	318940.	3136.	640.	2102488.	331330.
17	5	68.	324193.	3725.	683.	2888532.	324646.
17	5	69.	327915.	3817.	649.	3173080.	381830.
17	5	70.	331638.	4682.	635.	3643063.	427277.
17	6	60.	261685.	1498.	115.	1463368.	209770.
17	6	61.	260579.	1443.	0.	1544108.	238582.
17	6	62.	259472.	1556.	149.	1454192.	248011.
17	6	63.	269286.	1718.	129.	1559731.	291410.
17	6	64.	279101.	2002.	126.	1680003.	317619.
17	6	65.	287565.	1929.	130.	1726194.	378080.
17	6	66.	303252.	2358.	131.	1802680.	279150.
17	6	67.	318940.	2711.	139.	2102488.	331330.
17	6	68.	324193.	3728.	219.	2888532.	324646.
17	6	69.	327915.	4707.	246.	3173080.	381830.
17	6	70.	331638.	4781.	237.	3643063.	427277.
17	7	60.	261685.	3119.	292.	1463368.	209770.
17	7	61.	260579.	3457.	0.	1544108.	238582.
17	7	62.	259472.	3619.	285.	1454192.	248011.
17	7	63.	269286.	4216.	284.	1559731.	291410.
17	7	64.	279101.	4630.	364.	1680003.	317619.
17	7	65.	287565.	4182.	391.	1726194.	378080.
17	7	66.	303252.	4067.	466.	1802680.	279150.
17	7	67.	318940.	4210.	408.	2102488.	331330.
17	7	68.	324193.	4926.	515.	2888532.	324646.
17	7	69.	327915.	4470.	723.	3173080.	381830.
17	7	70.	331638.	4226.	691.	3643063.	427277.
17	8	60.	261685.	976.	296.	1463368.	209770.
17	8	61.	260579.	761.	0.	1544108.	238582.
17	8	62.	259472.	893.	298.	1454192.	248011.
17	8	63.	269286.	968.	357.	1559731.	291410.
17	8	64.	279101.	1059.	303.	1680003.	317619.
17	8	65.	287565.	1159.	256.	1726194.	378080.
17	8	66.	303252.	1234.	325.	1802680.	279150.
17	8	67.	318940.	1564.	406.	2102488.	331330.
17	8	68.	324193.	1592.	670.	2888532.	324646.
17	8	69.	327915.	1926.	585.	3173080.	381830.

17	8	70.	331638.	2169.	385.	3643063.	427277.

APPENDIX B

CRIME INCIDENCE MEASURE

It is possible to depict the relative distribution of crime among cities in several ways. The common method devised by the FBI is to compute offense rates per 100,000 population. Offenses per 1,000,000 population were calculated and used as the dependent variable in Chapter V. Mean values for offense rates per 1,000,000 population are depicted in Table 21. It is possible to make comparisons of relative crime in the cities by using the calculated rates depicted in printouts of the results of calculations used in Chapter V.

An alternative method that facilitates comparisons is to calculate the ratio of the percentage of total offenses to the percentage of total population for each city, a quotient that may be considered as a relative incidence index. If the distribution of offenses were uniform according to population, the relative incidence index would be equal to one for each city.

Three relative incidence indexes were calculated for the Oklahoma cities for each year from 1960 through 1970. Table A1 displays the results for the violent offenses: homicide, forcible rape, robbery, and aggravated assault. Table A2 provides the incidence index for property crimes: burglary, the two larcenies, and auto theft. Table A3 provides the incidence measures for all Index offenses combined.

The purpose of this appendix is the limited one of providing some indication of offense levels in the seventeen cities not dealt with in the chapter proper. Nonetheless, it is difficult to avoid pointing out the relatively high levels for Oklahoma City, Tulsa, and Lawton. Although this is quite as expected from publicity, the differences between these three cities and the others are probably not as great as popular impressions suggest. It would also be worthwhile for planning groups at the state level to use incidence measures as these, with attention to changes over time, in the allocation of monies for law enforcement. No evidence was found to suggest that this is presently being done in the state.

Appendix C examines several of the alternative methods that can be used in allocating available police manpower among districts in a single city. Although in Oklahoma there is not any statewide allocation of police manpower among cities by a central law enforcement organization, if the encouragement of LEAA leads to this type of central coordination measures such as the incidence indices shown here would be highly useful.

TABLE A1

RELATIVE INCIDENCE INDEX FOR VIOLENT CRIMES IN OKLAHOMA CITIES; PERCENT OF VIOLENT CRIMES DIVIDED BY PERCENT OF POPULATION: 1960-70

City	1960	1962	1964	1966	1968	1970
Ada	0.1408	0.3093	0.0970	0.4285	0.1297	1.0476
Altus	---	---	0.9136	0.5198	0.0142	---
Ardmore	0.5721	0.5665	1.2412	---	0.3977	0.6101
Bartlesville	0.0722	0.1865	0.2971	0.1622	0.1679	0.3466
Duncan	0.4723	0.1117	0.1475	0.2457	0.2931	0.2514
Enid	0.0000	0.1102	0.2135	0.3306	0.5000	0.2573
Lawton	1.1742	0.8644	1.4802	2.1482	1.9753	2.2202
McAlester	0.1156	0.3352	0.4880	0.9294	0.2151	0.4339
Midwest City	0.1727	0.2609	0.4225	0.7019	0.3983	0.8970
Muskogee	0.2189	0.2707	0.6292	0.5598	0.5341	0.8168
Norman	0.1566	0.1002	0.1093	0.4138	0.2902	0.2036
Oklahoma City	1.4863	1.9431	1.6016	1.4689	1.3637	1.3017
Okmulgee	1.7848	0.8782	0.5890	0.1690	0.1250	0.1640
Ponca City	0.6008	0.2864	0.1879	0.2540	0.2995	0.1636
Shawnee	0.3429	0.1457	0.3106	0.2579	0.4714	0.5235
Stillwater	0.1302	0.2298	0.2040	0.3304	0.1637	0.1136
Tulsa	1.3279	0.8729	0.9703	0.9613	1.2478	1.1038

TABLE A2

RELATIVE INCIDENCE INDEX FOR PROPERTY CRIMES IN OKLAHOMA CITIES; PERCENT OF PROPERTY CRIMES DIVIDED BY PERCENT OF POPULATION: 1960-70

City	1960	1962	1964	1966	1968	1970
Ada	0.4295	0.7410	0.6343	0.7218	0.6793	0.6825
Altus	---	---	0.2590	0.4702	0.3981	---
Ardmore	0.5273	0.8128	0.6080	---	0.6353	0.8474
Bartlesville	0.5595	0.3955	0.4057	0.4528	0.3473	0.5378
Duncan	0.8090	0.7827	0.5683	0.8114	0.6206	0.6646
Enid	0.7803	0.7461	0.7447	0.8862	0.7526	0.8659
Lawton	1.0895	1.0845	1.1943	1.3570	1.3236	1.3740
McAlester	0.8092	0.6352	0.3571	0.4294	0.5058	0.5408
Midwest City	0.7604	0.7984	0.7075	0.6786	0.5601	0.6838
Muskogee	0.7308	0.7989	0.8258	1.1137	0.8043	0.8354
Norman	0.9578	0.9693	1.0106	0.8851	0.6843	0.7895
Oklahoma City	1.2551	1.2693	1.2645	1.1705	1.2224	1.1978
Okmulgee	0.8227	0.7564	0.6780	0.5140	0.4485	0.3281
Ponca City	0.5884	0.5376	0.3157	0.3565	0.4713	0.4863
Shawnee	0.6818	0.3724	0.7702	0.7420	0.5904	0.6226
Stillwater	0.4201	0.4516	0.4244	0.4248	0.6858	0.5416
Tulsa	1.1143	1.1207	1.1422	1.1740	1.1961	1.1361

TABLE A3

RELATIVE INCIDENCE INDEX FOR INDEX CRIMES IN OKLAHOMA CITIES; PERCENT OF INDEX CRIMES DIVIDED BY PERCENT OF POPULATION: 1960-70

City	1960	1962	1964	1966	1968	1970
Ada	0.4225	0.7266	0.6044	0.7067	0.6488	0.6984
Altus	---	---	0.3000	0.4752	---	---
Ardmore	0.5323	0.8029	0.6482	---	0.6187	0.8305
Bartlesville	0.5451	0.3843	0.3985	0.4377	0.3358	0.5258
Duncan	0.7989	0.7606	0.5464	0.7771	0.6034	0.6347
Enid	0.7571	0.7179	0.7135	0.8544	0.7311	0.8284
Lawton	1.0960	1.0749	1.2116	1.4027	1.3642	1.4263
McAlester	0.7919	0.6235	0.3690	0.4588	0.4825	0.5345
Midwest City	0.7437	0.7771	0.6900	0.6807	0.5497	0.6960
Muskogee	0.7176	0.7774	0.8146	1.0808	0.7888	0.8322
Norman	0.9337	0.9331	0.9573	0.8588	0.6610	0.7511
Oklahoma City	1.2665	1.2973	1.2844	1.1877	1.2309	1.2042
Okmulgee	0.8607	0.7628	0.6712	0.4929	0.4264	0.3125
Ponca City	0.5967	0.5276	0.3082	0.3483	0.4581	0.4681
Shawnee	0.6694	0.3643	0.7446	0.7149	0.5857	0.6179
Stillwater	0.4117	0.4435	0.4122	0.4163	0.6548	0.5151
Tulsa	1.1246	1.1104	1.1320	1.1618	1.1994	1.1340

APPENDIX C

ALLOCATION OF PATROL MANPOWER

It is often asserted that law enforcement activity is a pure public good similar to the classic example, national defense. The basic nature of a public good is that once provided the good yields benefits to all persons in a given area, the exclusion principle is not applicable. There are, however, significant differences between national defense as a public good and police protection.

In the case of national defense all persons in the defended area are likely to benefit equally in terms of protection from risk while police protection is infrequently distributed in a manner that provides equal protection from criminal risk. For a given level of law enforcement resources there are several alternative methods that can be used in allocating these resources over an area. A 1968 study on allocation of police resources in the city of Chicago is useful in amplifying this point.[1]

In matters involving deployment of police manpower, the police administrator can identify several possible goals each of which may lead to a different method of allocation. Complete eradication of crime is

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[1] U.S., Department of Justice, National Institute of Law Enforcement and Criminal Justice, Allocations of Resources in the Chicago Police Department (Washington, D.C.: Government Printing Office, 1972), pp. 18-30. This appendix draws heavily from this study.

an occasionally stated goal although this is clearly impossible to achieve. An often stated goal is to attempt achievement of an "irreducible minimum" level of criminal activity. However, the meaning of irreducible minimum is not known, it is a purely conceptual goal.

The following represents various approaches that could be used in distributing patrol manpower. This may communicate the sensitivity of resource allocation to the specific intent or goal of manpower allocation. In what follows, allocation is made by allocating a fixed number of men in 20 districts with the districts fixed and the number of men on patrol in each variable. The actual distribution is shown in column 2 of Tables A4 and A5.

1. Equalized Per Capita Service (Column 3)

This goal attempts to achieve a distribution of patrol which generates a constant ratio of police to population. The approach does not consider crime incidence, characteristics of the neighborhood, or area. Rather, it seems based on an intent to provide equal service of police (in terms of time) for all people in the community.

2. Equalized Density of Police Service (Column 4)

This goal directs no attention to population, offenses, and factors associated with characteristics of people. The approach uses as its criterion the number of police per square mile.

3. Index Crimes Per 100,000 (Column 5)

This criterion assumes offense differences among districts are most important in the allocation method. It uses Index crimes per 100,000. A district with twice as many Index offenses as another district would have twice the level of patrol manpower. (The approach treats all Index offenses as equally reprehensible).

4. Victim-Oriented Distribution

The Index crime approach (#3 above) does not consider the differences in relative importance of different offenses. One exemplary weighting scheme is that known as the Sellin-Wolfgang index.[2] The relative weights which can be used are as follows:

Homicide	26
Rape	12
Robbery	7
Aggravated Assault	7
Burglary	3
Theft ($50. and over)	3
Auto Theft	2

Due to the data required in this approach allocations are not shown in the accompanying tables. The procedure used would be:

(1) Identify number of Index offenses of each type in each district.

(2) Multiply each by weights above or an appropriate weighting system derived from an attitude survey (or Sellin-Wolfgang index).

(3) Total weighted Index offenses for each district.

(4) Allocate available manpower in relation to population through division of total weighted Index offenses by proportion of total population in each district.

5. Shoup-Dosser Method

This method cannot be explained simply. The approach attempts to minimize the average crime rate for a city. The general solution for a city with 20 districts and 6,700 patrolmen would be:

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[2] Ivan Sellin and Marvin E. Wolfgang, The Measurement of Delinquency (New York: John Wiley, 1964).

TABLE A4

ALLOCATION OF POLICE MANPOWER IN CHICAGO DISTRICTS USING DIFFERENT CRITERIA: IN PERCENT FOR 1968

(1) District	(2) Actual Current	(3) Equal Per Capita Service	(4) Equal Density of Police Service	(5) Index Crimes Per 100,000
2	7.68	4.4	1.9	9.0
3	6.66	4.9	2.4	5.9
4	3.80	4.8	11.6	2.5
5	4.15	5.0	8.8	3.4
6	3.53	4.6	7.1	2.4
7	7.10	4.4	2.9	7.1
8	3.80	6.7	10.4	1.8
9	4.81	5.0	5.8	2.4
10	5.69	4.8	3.2	7.0
11	5.96	3.5	2.1	11.4
12	5.24	3.6	2.8	6.9
13	5.32	4.0	2.3	7.5
14	4.16	5.2	3.4	3.1
15	4.27	5.6	5.2	3.5
16	3.53	5.9	12.5	1.7
17	2.63	4.8	4.6	2.4
18	6.48	3.8	1.9	8.6
19	4.59	5.8	2.5	3.9
20	5.20	8.2	5.1	3.1
21	5.28	3.7	2.2	6.2
Total[a]	99.88	98.7	98.7	99.8

[a]Totals may not add to 100 percent due to rounding.

Source: U.S., Department of Justice, National Institute of Law Enforcement and Criminal Justice, Allocations of Resources in the Chicago Police Department (Washington, D.C.: Government Printing Office, 1972), pp. 19, 23, and calculations.

TABLE A5

COMPARATIVE ALLOCATIONS OF POLICE MANPOWER IN CHICAGO DISTRICTS IN 1968

(1) District	(2) Actual Current	(3) Equal Per Capita Service	(4) Equal Density of Police Service	(5) Index Crimes Per 100,000
2	487	295	137	604
3	422	329	161	396
4	241	322	778	168
5	263	335	590	228
6	224	309	476	161
7	450	295	195	475
8	241	449	698	121
9	305	335	389	161
10	361	322	215	470
11	378	235	141	765
12	332	241	188	463
13	337	268	154	503
14	264	349	228	208
15	271	376	349	235
16	224	396	838	114
17	167	322	309	161
18	411	255	127	577
19	291	389	168	262
20	330	550	342	208
21	335	248	148	416
Total	6,334	6,620	6,631	6,697

Source: U.S., Department of Justice, National Institute of Law Enforcement and Criminal Justice, Allocations of Resources in the Chicago Police Department (Washington, D.C.: Government Printing Office, 1972), p. 24, and calculations.

$$t_i = T \frac{\sqrt{Z_i / K_i}}{\sum_{i=1}^{n} \sqrt{Z_i / K_i}}$$

where: n: number of districts = 20.
i: the particular district: i = 1, 2,··, 20.
Z: average number of crimes in each district.
K: an effectiveness constant for a patrolman in each district.
t: number of patrolmen assigned to each district.
T: $\sum t_i$, total number of patrolmen: 6,700.

The Shoup-Dosser method involves an effectiveness constant (K) for patrolmen. But, how can the effectiveness of patrolmen be judged? One approach has been suggested by operations research activity during World War II when attempts were made to calculate sweep rates for infantry.[3] Translating the military application where:

K: sweep rate or effectiveness rate.
C: number of arrests.
A: area patrolled.
N: number of offenses in an area.
T: total time spent by patrol units in an area.

The effectiveness of patrolmen may be represented as:

$$K = \frac{CA}{NT} .$$

At the present time many departments use the clearance rate which is approximated by C/N, as a measure of effectiveness.[4] The introduction of area and patrol time enables the effectiveness measure to reflect the effect of patrol density which undoubtedly represents an improvement over the clearance rate alone. At the present time inability of police to know the value of this clearance rate in affecting offense rates is a matter of serious concern in this paper.

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[3] P.M. Morse and E.E. Kimball, Methods of Operations Research (Washington, D.C.: Office of Chief of Naval Operations, 1946), pp. 32-34.

[4] Allocations of Resources in the Chicago Police Department, pp. 106-08.

APPENDIX D

PROJECTED COSTS OF CRIME IN OKLAHOMA

It is possible to use the projected offenses of Table 31 to estimate the victim costs that will likely occur in the period from 1971 through 1980. Though there is no completely acceptable measure of victim costs associated with the individual offenses, the President's Commission in its studies provided estimates that are used here. Without taking inflation or changes in the severity of the individual offenses into account the cost figures used for each offense are:[5]

Homicide	$85,700.
Forcible Rape	1,000.
Robbery	275.
Aggravated Assault	350.
Burglary	170.
Larceny ($50. and over)	120.
Auto Theft	200.

The results of simple multiplication are shown in Table A6. Though the totals of $20.8 to $24.5 million may be of some interest it is probably more important to note the relative costs of the different offenses. Homicide is the most costly; followed by burglary, larceny,

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[5] Crime and Its Impact--An Assessment, pp. 42-43. The figures used here are net of recoveries. Some adjustment was made on the Commission's estimates, especially in the case of rape. Nonetheless only dollar costs are estimated with no cognizance of psychological losses, changes in patterns of behavior, protection costs, etc.

aggravated assault, auto theft, forcible rape, and robbery, in this order. As this ranking is quite different from public perception of the importance of the different offenses it is apparent that many alternative methods of cost measurement are possible.

TABLE A6

ESTIMATES OF VICTIM COSTS DUE TO INDEX OFFENSES IN OKLAHOMA
FROM 1971 THROUGH 1980
(Thousands of Dollars Using 1965 Costs)

Offense	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Homicide	12,600.0	12,600.0	12,600.0	12,687.5	12,687.5	12,687.5	12,775.0	12,775.0	12,775.0	12,862.5
Forcible Rape	389.0	402.0	415.0	429.0	442.0	456.0	469.0	483.0	496.0	509.0
Robbery	368.2	382.5	396.8	411.1	425.4	440.0	454.3	468.6	482.9	497.2
Aggravated Assault	1,119.0	1,183.4	1,254.1	1,325.1	1,395.8	1,466.5	1,537.2	1,607.9	1,679.0	1,749.7
Burglary	3,262.3	3,393.2	3,524.1	3,655.0	3,785.9	3,918.5	4,049.4	4,180.3	4,311.2	4,442.1
Larceny--$50. and over	1,822.8	1,928.4	2,032.8	2,138.4	2,242.8	2,348.4	2,454.0	2,558.4	2,664.0	2,769.6
Auto Theft	1,282.2	1,327.6	1,373.0	1,418.4	1,463.8	1,509.2	1,554.6	1,600.0	1,645.4	1,690.8
Total for all Index Offenses	20,843.5	21,217.1	21,596.1	22,064.5	22,443.2	22,826.1	23,293.5	23,673.2	24,053.5	24,520.9

Sources: Table 31 and President's Commission cost estimates for individual offenses.

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