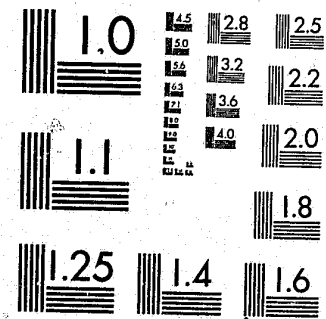


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12/29/82

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EXTERNAL EFFECTS AND THE ORGANIZATION OF
POLICING IN METROPOLITAN AREAS

by

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83378

Prepared for the 1980 Annual Meeting of the American Society of Criminology,
San Francisco, California, November 5-8, 1980.

The data presented in this report were collected with the support of the
National Science Foundation grants GI 43949 and APR 74-14059 A03. The
National Science Foundation is not responsible for any of the conclusions
reached herein. I would also like to thank the staff of the Workshop in
Political Theory and Policy Analysis for their efforts in preparing this
report and all those who attended a colloquium at the Workshop on September
29 where I first presented some of the ideas contained in this report.

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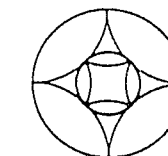
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WORKSHOP
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John P. McIver

Abstract

The principal goal of this paper is to provide a comprehensive theoretical model of the interaction of police agencies focusing on the relationship between interagency contact and the incidence of crime. Here, an attempt is made to provide some basis for policy prescriptions such as the mandate of the National Advisory Committee on Criminal Justice Standards and Goals:

Criminal activity is often multijurisdictional. The success of each police agency in its operations has a direct effect on the criminal activity in neighboring jurisdictions. The police chief executive must recognize certain criminal activity as a regional problem and realize that coping with it requires regional coordination (National Advisory Committee on Criminal Justice Standards and Goals, 1973: 115).

Our efforts are motivated by several concerns. First, the type and magnitude of positive and negative externalities in the production of direct and auxiliary police services have not been fully catalogued. Second, the role of special enclave producers as well as overlapping (primarily county and state police) agencies have not been adequately examined in studies of the impact of the externalities of crime. Third, the range of cooperative and consolidated arrangements among police service producers has not been acknowledged. We hope to incorporate all three considerations in our model of police agency interaction.

In 1973 the National Advisory Commission on Criminal Justice Standards and Goals made the following pronouncement:

Criminal activity is often multijurisdictional. The success of each police agency in its operations has a direct effect on criminal activity in neighboring jurisdictions. The police chief executive must recognize certain criminal activity as a regional problem and realize that coping with it requires regional coordination.

The National Commission goes on to discuss types of coordination that may be feasible in different settings; but what interests us here is the commissions "argument" as far as it is presented above. A series of assumptions underlie these three sentences. In this paper, I intend to discuss some of the empirical support for these assumptions and attempt to present a "theoretical" model that would incorporate regional organization of police departments into the battle against crime.

A Review of Relevant Literatures

Briefly, let us note several of the assumptions underlying the commission's statements. Then each one can be examined in turn.

1. Criminals are mobile.
 - 1a. Criminals are mobile beyond jurisdictional lines. This might be because jurisdictional lines are not salient to criminal eyes. Alternatively, criminals may recognize advantages in crossing jurisdiction boundaries.
2. Police operations in one jurisdiction affect the level of crime in another. This assumption implies that police operations are effective locally.
3. Interjurisdictional movement of criminals requires regional coordination of police agencies to deal with the problem.

This section of the paper outlines the evidence that social scientists have gathered to support or contradict the first two clusters of assumptions. Then, the effectiveness of regional coordination in dealing with criminal

movements across jurisdictional boundaries will be discussed.

Are criminals mobile? Do they commit crimes in jurisdictions other than the ones they live in? The answers provided by contemporary research are presented in Table 1. The findings contained in these eight studies as they pertain to our concerns are as follows:

1. While criminals are mobile, they sure don't seem to go very far in committing a crime and this seems true for all types of crime. Violence may be more prevalent a little closer to home, but burglars either don't own their own cars, can't afford a taxi, or, most likely, prefer to work known territory.
2. Nothing is known about travel between jurisdictions. This question has not been discussed in the literature. The closest thing available to an answer to the question posed above is the map provided by Capone-Nichols (1976) that shows the movement of all robbery trips within the Miami SMSA. It's obvious that jurisdictional boundaries are crossed to commit some of the crimes, but the number is not reported.

While these studies of criminal movement tell us little about the spillover of criminals from one jurisdiction to others we can draw some solice in that they do not rule out such movement. In our fragmented metropolitan areas, in particular, very little distance must be travelled before the criminal is out of his/her home community and into the next. Additionally, the methods used in most of these studies are likely biased against the interjurisdictional criminal. Data were gathered by interviewing adjudicated (i.e., caught) criminals. It seems probable that the interjurisdictional criminal is least likely to be caught and consequently less likely to be interviewed.

Does police activity affect the behavior of criminals? Does local police activity cause criminals to commit offenses in other jurisdictions? Considerable research efforts have been invested in providing an answer to the first question on the general deterrence of criminal sanctions.

Table 1. A Summary of Empirical Studies of Criminal Mobility

Author	Location and Date of Study	Type of Criminal Activity (No. of Cases)	Principal Findings	
			Crime	Mean Distance to Criminal's Residence
White (1932)	Indianapolis 1930	Felonies (personal & property) (N = 638)	Rape Assault Manslaughter Auto theft Embezzlement Robbery Burglary Grand Larceny Petit Larceny	1.52 miles 0.91 0.11 3.43 2.79 2.14 1.76 1.53 1.42
Bullock (1955)	Houston 1945-1949	Homicides (N = 489)	57% occur with 0.4 miles of assailant's residence.	
Normandeau (1968)	Philadelphia	Robbery	Mean distance traveled is 1.57 miles.	
Turner (1969)	Philadelphia 1960	Juvenile delinquency: assault and vandalism (N = 502)	Mean distance traveled is 0.4 miles. 75% occur within 1 mile of juvenile's residence; range is 0-23 miles.	
Amir (1971)	Philadelphia 1958, 1960	Rape (N = 885)	72% occur within 5 city blocks of the rapist's residence.	
Repetto (1976)	Boston and a 2nd medium-sized city	Robbery Burglary (N = 245)	Robbery: mean distance traveled is 0.6 miles; 90% occur within 1.5 miles. Burglary: mean distance is 0.5 miles; 93% occur within 1.5 miles.	

Table 1. A Summary of Empirical Studies of Criminal Mobility
(continued)

Author	Location and Date of Study	Type of Criminal Activity (No. of Cases)	Principal Findings
Capone & Nichols (1976)	Miami SMSA 1971	Robbery (N = 825)	Armed Robbery: 23% occur within 1 mile; 59% within 3 miles. Unarmed Robbery: 36% occur within 1 mile; 75% within 3 miles
Pope (1980)	Selected areas in 6 California jurisdictions: San Francisco, Oakland, Los Angeles, San Diego, Los Angeles County, Orange County 1972	Burglary (N = 1,196)	52% occur within 1 mile of burglar's residence

The displacement question has been of secondary importance. Consideration of spillover effects increased as the findings of the general deterrence literature became more contradictory.

Four different groups of empirical studies have attempted to assess the deterrence and displacement effects of law enforcement activities. The findings of each are detailed in Tables 2 through 5 and are summarized below.

Many of the principal nonexperimental, cross-sectional investigations of the reduction of crime rates by increased sanctions are presented in Table 2. (For a more comprehensive overview of this literature, see Chaiken, 1976; Greenberg, 1977; or Blumstein, et al., 1978.) It is obvious that the conclusions drawn by each author are the result of the sample analyzed, the operationalization of crime rates and sanctioning rates, and the statistical technique used in estimating the impact of sanctions on crime. The weight of the recent evidence (with the exception of Forst, 1976) appears to support the following conclusions:

1. Police efforts reduce crime rates. (The magnitude of this relationship is unknown and is not considered large.)
2. Increases in the crime rate result in increases in police effort.

As there is little consensus among researchers as to what constitutes a properly specified and operationalized model of the supply of crime and the sanctioning effect, the conclusions must remain very tentative.

Table 3 contains a summary of a number of analyses that explicitly treat time as an important factor in the relationship between criminal and anticriminal actions. Again the findings of each study seem to vary with the choice of data, operationalization, and statistical methodology.

Table 2.. Cross-Sectional Studies of Police Deterrence of Criminal Activities

Author	Sample	Independent Variable	Dependent Variable	Estimation Technique	Findings
Morris & Tweeten (1971)	754 cities (1967, 1968)	police per capita	violent crime property crime	OLS	Crime increased with additional police for all cities but those over 1 million population.
Greenwood & Wadycki (1972)	212 SMSAs (1960)	police per capita	violent crime property crime	3SLS	Crime increased with additional police. The violent crime rate increases more rapidly than property crime rate as police manpower increases.
Ehrlich (1973)	47 states (1940, 1950, 1960)	probability of imprisonment average prison term	violent crime property crime	OLS 2SLS	Crime decreased with additional expenditures for police services. The effect is similar for property and violent crimes.
Tittle & Rowe (1974)	Florida: 67 counties, 178 cities (1971)	probability of arrest	felony offenses	correlation, scatter-plots, partial correlation	Crime rates are negatively related to clearance rates. A threshold effect is noted for probabilities of arrest greater than 0.3.
McPheters & Stronge (1974)	43 larger U.S. cities (1970)	police expenditures per capita	felony offenses	OLS with lagged crime rate	Crime rates are reduced by increased police expenditures.
Swimmer (1974)	all cities 100,000 + (1960)	police expenditures per capita	violent crime property crime	OLS 2SLS	OLS -- crime increases (insignificantly) with additional expenditures for police services. 2SLS -- crime decreases (insignificantly) with additional expenditures for police services.
Pogue (1975)	66 SMSAs (1968)	clearance rates police expenditures per capita	felony offenses	2SLS	Crime decreases as clearance rates increase. However, police expenditures have no effect on clearance rates.
Forst (1976)	50 states (1970)	probability of incarceration average prison term	felony offenses	2SLS	Crime is not affected by the probability or severity of punishment. However, the probability of punishment is reduced as crime increases.

Table 3. Aggregate Time Series and Panel Studies of Police Deterrence of Criminal Activities

Author	Sample	Independent Variable	Dependent Variable	Estimation Technique	Findings
Jones (1973)	155 cities 1958-1970	one year change in police man- power police expenditures	one year change in UCR crimes	correlations	Year to year changes in police manpower and expenditures are not related to changes in the crime rate. This conclusion holds after controls for population, population change, income, and governmental structure.
Philips & Votey (1974)	national 1953-1968 (N = 16)	larceny clearance ratio	larceny rate	2SLS	Crime rates are negatively related to clearance rates which are a function of expenditures for police service.
Logan (1975)	50 states 1964-1968	arrest rate	index crime rate	2-wave cross- lagged panel model	Both the contemporaneous and the lagged effects of arrest rates on crimes rates were approximately zero.
Land & Felson (1976)	national 1947-1972 (N = 26)	police expend- itures per capita	property crime rate violent crime rate	OLS	Both property crime rates and violent crime rates are reduced by increased police expenditures even when lagged crime rates are included as independent variables.
Greenberg, et al. (1979)	98 U.S. cities with populations greater than 25,000 1964-1970	clearance rate	index crime rate	3-wave cross- lagged panel model: LISREL estimates	Arrest rates have no significant impact on crime rates whether one examines contemporaneous or lagged relationships.

Philips and Votey (1974) and Land and Felson (1976) find that sanctions reduce crime while Jones (1973), Logan (1975), and Greenberg, et al. (1979) find that sanctions have little effect on levels of crime. None of these analyses have found a positive relationship between crime and law enforcement activity, an initially counter-intuitive result of many of the early cross-sectional efforts. Again, we are left with the conclusion that police and prosecutorial activity may have some but not much impact on crime.

While the research reviewed in Tables 2 and 3 is based on secondary analysis of aggregate police and crime statistics, a third approach to the study of deterrence has focused on local, programmatic efforts to reduce crime. A limited experimental methodology has been used to assess the impact of changes in police operational tactics in a number of cities and counties. The results of these attempts are condensed in Table 4.

These quasi-experimental studies were designed principally to assess reduction in crime rates after the intervention of a new anti-crime strategy. In most of the cases reviewed here, this "new strategy" simply required increases in the number of police officers on the street. The evaluation of this strategy then involved ascertainment of whether or not crimes were reduced. The Kansas City Preventive Patrol Experiment attempted to demonstrate the differential productivity of alternative patterns of patrol, while the Hartford Neighborhood Redevelopment Project illustrates the co-production of safety by police, citizens, and neighborhood planners.

The results of all of these projects indicate that police can have an impact on crime if manpower levels are high enough to constitute a visible sanction.¹ In most cases, crime rates were reduced with large increases in police manpower. Where increased personnel did not affect

Table 4. Quasi-Experimental Studies of Police Deterrence (Reduction and Displacement)

Author	Location	Deterrence Program	Findings
Press (1971)	New York City	40% manpower increase in the 20th precinct October, 1966; Data: 1963-1967	Certain crimes decreased with manpower increase; 5% decrease in "inside" felonies; 36% decrease in "outside" felonies; misdemeanors not affected significantly. The major displacement effect was observed in Central Park which experienced an increase in felonies of 1/3, the decrease in the 20th precinct. (However, police manpower in Central Park decreased 11% during the study.)
Kelling, et al. (1974)	Kansas City	Comparison of reactive vs. proactive patrol strategies. 1971	No effect on crime rate as measured by index crimes and victimization surveys. No spillover effect was observed with the possible exception of auto theft.
Chaiken, et al.	New York City	245% increase in subway police in 1965 Data: 1963-1970	Both felonies and misdemeanors on the subways were reduced as were token booth robberies for 2 years after which crime rates returned to pre-intervention levels. (Problem with data corruption, however. See Chaiken, 1976). Slight time displacement was observed. Location displacement was possible in the increase in bus robberies in 1969.
Wilson (1975)	New York City	Manpower doubled in the 25th precinct. 1955	Part 1 crimes decreased substantially -- 55%. However, reported part 2 crimes -- gambling, prostitution, etc. -- increased 140%. No attempt was made to measure displacement effects.
Dahmann (1975)	Denver Cleveland St. Louis	Additional police added to targeted high-crime neighborhoods, 1972-1973	Outside crimes in target areas were reduced relative to unaffected areas. No strong displacement was found in adjacent neighborhoods.

Table 4. Quasi-Experimental Studies of Police Deterrence (Reduction and Displacement)
(continued)

Author	Location	Deterrence Program	Findings
Schnelle, et al. (1975)	Nashville	I. Home-Burglary saturation patrol II. Police walking patrol	No significant change in burglaries in targeted areas; no significant change during other shifts or in control areas. Reported crime increased in both police zones in which foot officers were available to the public.
Schnelle, et al. (1977)	Nashville	Saturation patrolling patrol movement increased 400%. 1976	Part I crimes decreased but only for night shifts; no decrease was observed for the day shifts. No surrounding zone experienced any significant change in Part I crimes. Nor was there any change in the crime rate on shifts during which the saturation patrol did not operate..
The Hartford Institute of Criminal and Social Justice (1979)	Hartford (Asylum Hill Neighborhood Development)	Redesign of a neighborhood to reduce vulnerability to crime combined with special neighborhood police team. 1976-1977	Burglary decreased 42%; street robbery decreased 27.5%. (These reductions were verified by victimization surveys.) No displacement of burglaries but possible movement of street robbery. Arrests rose significantly.
Knapp, et al. (1980)	Lexington County, South Carolina	37% increase in patrol personnel. February and May, 1977.	No evidence of change in the county crime rate for violent or property crimes after the personnel increase. Average response time decreased from 17.44 minutes to 15.82 minutes (9.3%).

crime rates, it is likely no change occurred because the manpower increases did not change the actual sanction levels, e.g., the increase in county police personnel reported by Knapp, et al. (1980) has the effect of reducing response time to approximately 16 minutes, an interval that the Kansas City Response Time Experiment (Kansas City Police Department, 1978) demonstrated was far too long to have any impact on arrest rates. Similar criticisms have been made of the Kansas City Preventive Patrol Experiment (Larson, 1975).

Several of these projects did recognize that police might have some impact on criminal activity other than reducing it. In particular, they suggest that criminals might, in response to increased police pressure, move to other locations to commit crimes, commit crimes at other times when the police presence was less intense, or change their preferred crime to one less susceptible to police. Several studies examined one or more possible types of crime displacement. Very few spillovers were observed. Given the literature on criminal movement this finding seems reasonable. Major spillovers do not occur. Furthermore, the methodologies used in these research projects are not conducive to detecting small changes in crime rates. Indeed, detecting marginal changes and attributing such changes to police activities may be impossible given limited funding for experimental programs, limited duration of those programs, and limited control over "control" neighborhoods.

Most of the simultaneous equation examinations of the relationship between crime and law enforcement haven't considered the displacement of crime because researchers have been too busy trying to establish empirical support for the hypothesized relationships between these two variables, i.e., crime should have a positive impact on police activities, while

police activities should have a negative impact on crime. Recently, however, the possibility that crime is displaced rather than reduced by law enforcement sanctions has received some attention. This literature is presented in Table 5.

Each of these four studies identified statistically significant displacement of crime from one jurisdiction to another and attributed this movement to differential sanctioning levels between communities. This conclusion holds regardless of methodology and operationalizations of variables. Hakim, et al. (1979) take the analysis one step further by simultaneously demonstrating the reduction of crime by local police effort (measured in terms of police expenditures) and the displacement of crime into a jurisdiction by increased police efforts elsewhere. The rest of this paper will build upon the Hakim, et al., model to extend the discussion of the relationship between crime and police activities.

While the studies summarized in Tables 1 through 5 are in no way exhaustive, they are meant to be representative of the research efforts to date. The empirical results just reviewed with respect to criminal mobility and police deterrence and displacement of crime must be considered tentative. Criminals do appear to be mobile although we don't know the extent to which they cross jurisdictional boundaries. Police effort does appear to reduce crime although it appears likely that environmental and demographic characteristics of offenders, victims, and settings are critical variables affecting the incidence of crime. Displacement of crime by police activity is limited, but then few of these research projects were explicitly designed to study such consequences of enhanced law enforcement. It is surely safe to say the findings reviewed above are subject to many theoretical and methodological questions. Nonetheless, these studies do not preclude examination of the external effects of police activities.

Table 5. Nonexperimental Studies of Police Displacement of Criminals

Author	Location	Independent Variable	Dependent Variable	Estimation Technique	Findings
Mehay (1977)	46 cities in Los Angeles Metropolitan Area (1969)	difference in patrol officers per capita between a jurisdiction and its neighbors	violent crime rates property crime rates	OLS	Significant displacement of property occurs. A 10% increase in differential police effort causes a 1% rise in crime in each adjacent community. For this increase in police effort about one third of the property crimes deterred are exported. There is no displacement of violent crime.
Deutsch, et al. (1979)	Atlanta (1974)	average man-power & inter-zone distances	criminal movement	Network flow analysis	No displacement of criminals from inner city to suburb occurs; significant displacement of criminals from suburb to inner city is observed.
Fabrikant (1979)	Los Angeles (1972-73)	relative clearance ratios among LA police districts	property crime rates	OLS	Juvenile behavior is reactive to clearance ratios in different sections of Los Angeles for robbery, but not for burglary and larceny. The percentage of offenses occurring outside the district in which the juvenile resides ranges from 60 to 6% for robberies, 48 to 6% for burglaries, and 61 to 10% for larcenies. Spillovers increase with increased economic opportunity and decrease as distance to targets increase.
Hakim, et al. (1979)	94 New Jersey suburban communities (1970)	police expenditures per capita weighted average of police expenditures per capita in neighboring communities	property crime rates	2SLS	Property crime increases with increased police expenditures in neighboring communities. Local police expenditures, however, reduce property crime in the community. The impact of local police expenditures on the local crime rate is greater than the effect of expenditures for police services by neighboring communities.

Cooperative Production of Police Services

An Introduction to Cooperation, Public Goods, and Externalities

Having viewed the relationship between criminals and the police from the perspective of the contemporary empirical literature, let's switch briefly to the real world of the police bureaucrat, the elected official, and the public. Crime has risen steadily and swiftly over the last several decades despite massive infusions of tax revenues into the law enforcement corpus. Demands on public officials has risen as a consequence. To meet these demands, governmental administrators have sought out ways and means to enhance the efficiency and effectiveness (and even, on occasion, the equity and responsiveness) of their police departments across the country.

One production strategy, considered an effective way to combat inter-jurisdictional crime, is the interjurisdictional agreement and subsequent cooperative production of police services. In addition to the National Advisory Commission on Criminal Justice Standards and Goals, cooperation among police agencies has been endorsed by the President's Commission on Law Enforcement and the Administration of Justice (1967) and the National Association of Counties (1977) as practical means of improving service levels. Many types of cooperative arrangements among law enforcement agencies do exist (Friesema, 1971; McDavid, 1974; McIver and Wagner, 1978). The crucial question is do these activities have any impact at all on police productivity. McDavid (1975) provides some evidence that informal mutual aid is positively related to a number of performance criteria (citizen ratings of police services, officer rating of police services, Part I crimes cleared) for the St. Louis metropolitan area. What he does not

consider is the relationship between interagency cooperation and the inter-community crime spillovers. Exactly what this relationship may be is considered after a brief discussion of the nature of "public goods" and "externalities."

Public goods are those available to all individuals simultaneously (Samuelson, 1954; 1955). Such goods are defined in terms of two principal characteristics. First, the consumption of one individual does not decrease the consumption of another. This condition is known as non-subtractibility or jointness of supply. Second, the exclusion of potential consumers of this type of good is not feasible.

Police services have regularly been treated as public goods (for an exception see Weicher, 1971). While certain aspects of policing do not exhibit jointness of supply (for example, congestion effects occur during high demand periods) and exclusion is sometimes feasible (for example, certain potential clientele can be ignored), our concern is with deterrence of crime. To the extent that potential criminals decide not to commit crimes or decide to commit them in other communities, police can be said to be providing a local public good for the citizens residing within their jurisdiction. All citizens are safer if the potential criminal gives up his trade or goes elsewhere. Exclusion of citizens from this increased safety is difficult if not impossible.

When the well-being of a one community is affected by the production of law enforcement in another, an external effect or externality has occurred (Buchanan and Stubblebine, 1962). If the welfare of the first community increases, it is said to be experiencing a positive external effect of the activities within the second community. If the community's welfare decreases, it is suffering from a negative externality.

The crime-fighting effort by police agencies has two basic goals -- deterrence of the criminal from committing a crime and apprehension of the criminal once the crime has been committed. Under certain conditions, this duality of purpose has important implications for the analysis of the relationship between crime and law enforcement in a politically fragmented nation with limited jurisdiction police agencies. The principal conditions under which the duality of apprehension and deterrence is important are: (1) the mobility of criminals and (2) the reactivity of criminals to police effort. If these conditions hold, two types of external effects may occur with production of police services.

Apprehension of criminals in one jurisdiction obviously eliminates them as a threat to a neighboring jurisdiction. Thus, positive benefits accrue to communities who have not paid for this police service. Deterrence may have two external effects. Police effort may convince the potential criminal that it is unprofitable to commit an unlawful act. If this individual decides the probability of success elsewhere is no greater (due to lack of knowledge of the territory), does not perceive the possibility of success elsewhere (or perhaps the crime under consideration is geographically unique), or feels the transportation costs offsets the gains from crime, she or he will have been effectively eliminated from the class of criminals. This effect, together with the removal of criminals from circulation by apprehension, I would term the "global deterrence" effect of police activity. Because many potential criminals could have committed crimes in neighboring jurisdictions, their elimination is a positive benefit for which these communities have not paid.

Deterrence, however, can have a second impact on crime. Rather than remove the criminal from circulation, the effectiveness of local law

enforcement may simply lead the criminal to go next door to prey on a (relatively) unprotected community. This latter phenomena is also known as a displacement effect. Displacement of crime is the externality of law enforcement typically discussed, the spatial displacement of an offender from one jurisdiction to another. Citizens in one community are forced to bear a reduction in their safety because of the law enforcement practices in adjacent communities.

Our discussion, then, suggests two types of externalities of police activities devoted to the reduction of the victimization of citizens. One is a public "good"; the other a public "bad." Yet, our empirical studies have tended to focus only on the latter effect -- the displacement of crime. (On the other hand, we only consider positive externalities when urbanists complain of the use of the center city by suburban commuters.) The external effects of law enforcement are a sum of the absolute values of these positive and negative benefits.²

Empirically-Based Theoretical Models of Policing and External Effects

The study of externalities is particularly frustrating because the primary focus of analysis is an unobservable quantity. In cross-sectional analyses, the presence of external effects due to police and prosecutorial activities are estimated from differences in observed crime rates between jurisdictions (after appropriate controls for local factors affecting the supply of crime). Yet, this is not a satisfactory method. First, this procedure obscures the magnitude of external effects of failing to distinguish deterred crime (a positive externality) from displaced crime (a negative externality). Second, the procedure obscures the magnitude of external effects because observed crime rates rather than victimization

rates are the subject of these studies. Third, there are known differences among police department reporting practices that would likely lead to biased estimates of aggregate external effects. In particular, many county and state police departments, acting as overlapping agencies will maintain records services for small police departments. These overlapping agencies do not credit the smaller departments on their crime reports to the Department of Justice. Next, a conceptual definition of crime is discussed. Then the importance of externalities in organizing policing is examined.

Crime Rate - A Preliminary Definition

Each year, the Federal Bureau of Investigation collects and publishes the rates of crimes encountered by our nation's police departments. These figures (known as the Uniform Crime Report crime index) have served social scientists for many years despite their many shortcomings for the simple reason there are no better available data. These aggregate statistics, the Part I crimes and their total, are logically composed of several "other" crime rates. The relationships among these various numbers are important because estimation of their magnitudes is required as a part of policy analyses designed to meet the crime problem.

For simplicity, the observed crime rate is defined as the "true crime rate" within a community, i , minus the total number of crimes deterred in the community plus the sum of the criminal acts committed by offenders based outside the community, i.e.:

$$D1. OLC_i = TLC_i - DC_i + \sum_{j \neq i} SDC_j$$

where OLC_i is the observed local crime rate
 TLC_i is the true local crime rate

DC_i is the deterred crime

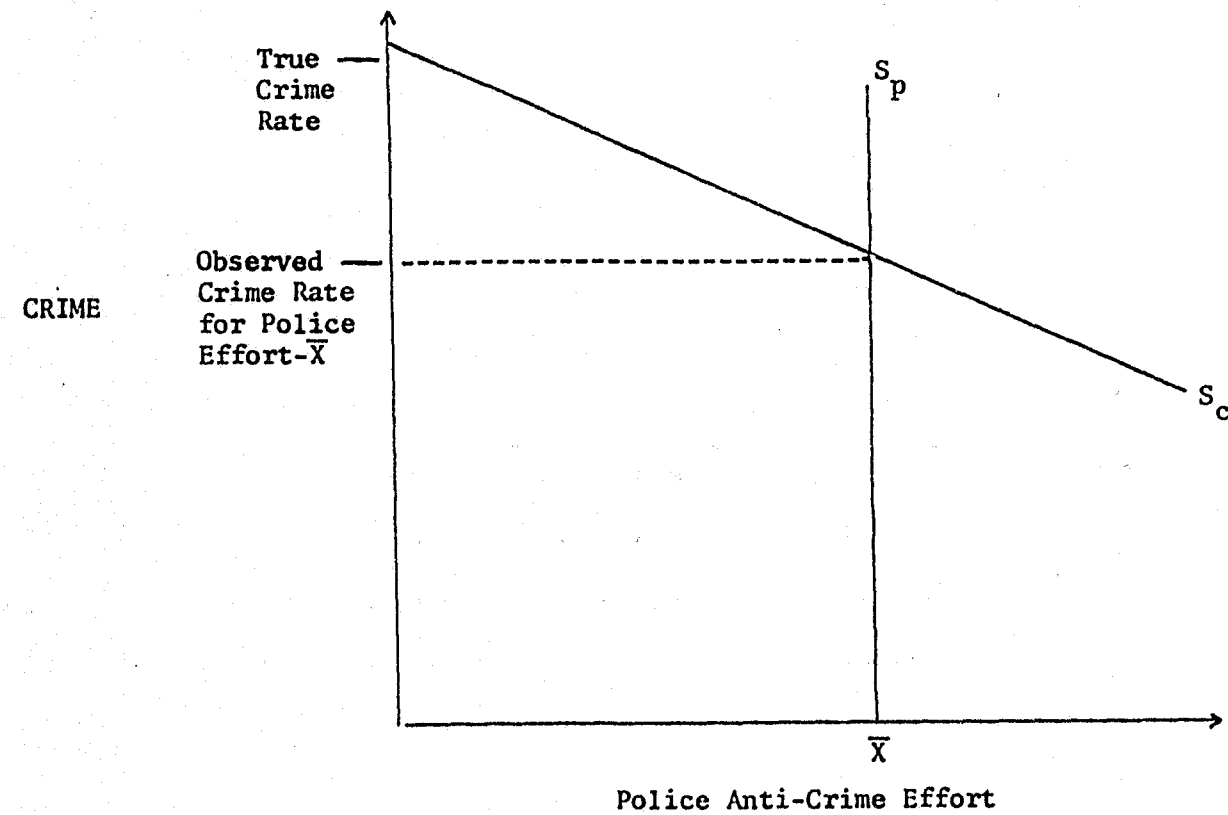
SDC_j is the crime displaced from other communities
 ("spatially displaced crime")

The DC_i term is actually the sum of two subcomponents: potential criminal acts that are not committed due to the presence of local sanctions (hereafter, globally deterred crime or GDC_i) and criminal activity that occurs outside the community because of the presence of a relatively strong local police force (spatially displaced crime or SDC_i). The real difference between this conceptualization and that used predominantly in the deterrence literature is the term for SDC .³

"True local crime" is a concept that may cause some consternation. Yet, as the term is used here it is consistent with the deterrence and supply of crime literature of the last two decades. TLC is the level of crime that might be present in a community in the absence of sanctions for unlawful behavior. It is, if one takes the deterrence literature as a point of view, an intercept construct -- the level of crime occurring at police/prosecutorial activity levels of zero (Figure 1). Such a concept seems reasonable regardless of whether one conceptualizes the state of nature as either benign or malevolent. TLC is the crime rate as determined by the desire for wealth existing among individuals in the community, the crime caused by social and demographic factors, and the crime resulting from competitive or cooperative attitudes among the human species. It serves here as a theoretical construct to help understand the various components of the crime rates reported by police agencies.

This conception of crime rates is important for two reasons. First, it illustrates what assumptions must be made for observed crime rates to be used as an operational measure. For example, the traditional deterrence literature

Figure 1. The Supply of Crime in a Community (assuming no displacement or recording-reporting bias)



Note: Deterred Crime = True Crime — Observed Crime

assumes crime is not displaced and that citizen reporting and police recording biases are negligible or at most proportionately constant. Second, it identifies two components of police productivity that have systemic consequences. These components GDC_i and SDC_i are positive and negative externalities, respectively.⁴ Furthermore, they are the benefits police administrators and public officials should consider in charting local police activities as well as organizing joint production or consumption groups. This will become more obvious as we discuss a series of models relating externalities and production strategies next.

Production-Externality Models

Models for analyzing interregional trade of public goods became an important topic for theoretical economists during the 1970s (e.g., Connolly, 1970; 1972; Shibata, 1971; Kiesling, 1974; Sandler, 1975). Hakim, et al. (1979) draws upon this literature to offer a general equilibrium model of the spillovers of crime in a metropolitan area. With minor differences, we will start with the Hakim, et al., model to explore differences in explicit and implicit models for trading the positive and negative benefits of police service. (These models will be presented in symbolic form. Appendix 1 contains a summary of all symbols and definitions used here.)

Model 1

The Hakim, et al., model can account for both explicit or implicit bargaining among police jurisdictions. It does not provide us with a bargaining mechanism so we choose to look at this model for what it can tell us about implicit bargaining.

Given the definition of observed local crime rate provided above and several assumptions we can derive a model that looks very similar to Hakim's.

$$D1b. OLC_i = TLC_i - (GDC_i + SDC_i) + \sum_{j \neq i} SDC_j$$

A1. $TLC_i = f(W_i, X_i)$ The true local crime rate is a function of local wealth (w_i) and characteristics of the local population (x_i).

A2. $GDC_i = g(TP_i, X_i)$ Globally deterred crime is a function of local police effort.

A3. $\sum SDC_j = h(TP_i/TP_j, W_i/W_j, X_i)$ Displaced crime is a function of relative police effort and relative target attractiveness.

M1. $OLC_i = k(TP_i, TP_j, W_i, W_j, X_i)$ The observed local crime function is derivable from D1 and A1-3.

$TP_i = 1(OLC_i, AC_i)$ Local police effort is a function of observed crime and agency characteristics.

Model 1 suggests that local police react to crime externalities hidden in their local crime rate. Adjustments are made as external police agencies increase or decrease their sanctioning levels. In the absence of bargaining each agency will produce at an independent adjustment level -- a suboptimal solution. By allowing time to enter into the analysis, we permit each agency to "learn" that it is producing suboptimally and improve its production strategies. This is the implicit bargaining we can account for in Model 1. In the absence of an explicit means for negotiation of service levels and production strategies, this implicit solution will likely fall short of pareto optimal supply of police services.

Model 2

In order to provide an explicit bargaining mechanism we divide total police activities conceptually in much the same way we dealt with observed

crime rates. Total police activities in community, i , are made up of two components: police activities by the local police agency (LP_i) and interjurisdictional activities within community, i , by all police agencies (IP_i).

$$D2a. TP_i \equiv LP_i + IP_i$$

Model 2 is based on the definitions of crime (D1b) and police effort (D2a), as well as several assumptions about the relationships between the components of each.

$$A4. TLC_i = f(W_i, X_i)$$

$$A5. GDC_i = g(LP_i, X_i)$$

$$A6. SDC_i = h(LP_i/LP_j, W_i/W_j, \sum(IP_i + IP_j), X_i)$$

$$A7. LP_i = k(TLC_i, AC_i)$$

$$A8. IP_i = 1(SDC_i/SDC_j, GDC_i/GDC_j, F_i)$$

These assumptions can be combined into Model 2 in which interagency arrangements are used to balance the positive benefits of relative global deterrence rates and the negative benefits of crime displacement.

$$M2. OLC_i = q_1(LP_i, LP_j, \sum(IP_i + IP_j), W_i, W_j, X_i)$$

$$TP_i = q_2(TLC_i, SDC_i, SDC_j, GDC_i, GDC_j, AC_i, F_i)$$

F_i is an additional determining factor in the system. Its purpose is to help identify the IP_i assumption and to incorporate real constraints on interagency activities. F_i includes state laws mandating, facilitating, or restricting interagency arrangements, communications, relative resource levels, bureaucratic norms, and federal incentives (the "carrot" and the "stick").

As the model is set up, the relative sizes of LP_i and LP_j determine the direction of the external effects. Assuming no wealth or population

differences, a large local police effort in community i, relative to community j, bestows greater external benefits on j in the form of deterred crime, but also causes displacement of crime into j. The sum of the interjurisdictional efforts in each community results in global deterrence of the mobile criminal or transfer of those individuals to yet another community.

Model 3

This model simply takes Model 2 and includes another organizational structure whose purpose (in the real world) is to deal explicitly with externalities within a fragmented political system. Model 3 includes a role for an agency or agencies with overlapping police jurisdiction. This is the role traditionally played by the county sheriff and by state police. Again, total police effort must be redefined. Total police effort is the sum of local police activities in the community, all interagency activity within the community and activity by overlapping police agencies in the community:

$$D2b. TP_i = LP_i + IP_i + OP_i$$

Model 3 is composed of definitions D1b and D2b and the following series of assumptions about the relationships among the components of crime and police effort.

$$A9. TLC_i = f(W_i, X_i)$$

$$A10. GDC_i = g(LP_i, X_i)$$

$$A11. SDC_i = h(LP_i/LP_j, W_i/W_j, \Sigma(IP_i + IP_j), \Sigma(OP_i + OP_j), X_i)$$

$$A12. LP_i = k(TLC_i, AC_i)$$

$$A13. IP_i = l(SDC_i/SDC_j, GDC_i/GDC_j, F_i)$$

$$A14. OP_i = p(SDC_i/SDC_j, W_i/W_j)$$

The model consists of the following two equations:

$$M3. OLC_i = q_1(LP_i, LP_j, \Sigma(IP_i + IP_j), \Sigma(OP_i + OP_j), W_i, W_j, X_i)$$

$$TP_i = q_2(TLC_i, SDC_i, SDC_j, GDC_i, GDC_j, W_i, W_j, AC_i, F_i)$$

Together with the assumptions underlying this final model, Model 3 suggests that the direction of crime displacement is determined by the relative strength of police effort in communities i and j. The magnitude of the displacement externality is determined by interagency activities and the efforts of the overlapping agencies. Remember, however, in this model as in all of the others, criminal movement is also determined by (and these may be the primary determinants) relative wealth and the characteristics of these individuals.

Model 3 is a first attempt to examine the complexities of the relationships between police agencies in a politically fragmented region with certain agencies having limited while others have full jurisdiction. What these models do is make explicit certain hypotheses about the existence of external effects for certain patterns of policing. They do not, however, make empirical testing of these hypotheses very easy.

The Relationship Between Cooperative Policing and Displacement -- A Brief Glance at the Real World

Enough models of how agency activities, interagency activities, the activities of overlapping agencies, and positive and negative benefits of these activities may be related. How are they associated in the real world of policing this nation's urban areas? Even without the theoretical problems suggested by our models, we are hard pressed to answer this question with municipal-level cross-sectional data. Lacking a direct measure of the externalities of crime, we can examine situations in which such externalities will likely occur and compare the incidence of interagency

cooperative ventures in these situations to those in which externalities will likely be limited. In other words, we can choose a surrogate indicator of the location if not the magnitude of external effects. If inter-agency arrangements occur with greater frequency in areas that likely experience externalities, this empirical result might be interpreted to imply that such activity is a response to the crime problem.

Data for this preliminary look at the cooperation production-externality question is taken from the Police Services Study, a joint project of the Workshop in Political Theory and Policy Analysis, Indiana University, Bloomington, and the Center for Regional and Urban Studies at the University of North Carolina, Chapel Hill. Phase I of this project included the collection of departmental level manpower, expenditure, and activity data, and operationalized characteristics of the structure of the police services industry in 80 SMSAs. Phase II of the Police Services Study included the intensive observation and coding of dispatcher-citizen interaction and patrol-citizen interactions, the measurement of citizen satisfaction and victimization levels, and the collections of departmental and subdepartmental data on policies, activities, and attitudes for police departments in the St. Louis (MO), Rochester (NY), and Tampa-St. Petersburg (FL) metropolitan areas. Each phase of this research project identifies one surrogate for the location of externalities. It is these data we present next.

One surrogate for the existence of external effects is provided by the Phase I measures of police industry structure. Each police agency in an SMSA is imbedded in an industry of police service producers. The fragmentation of the metropolitan area is likely to lead to greater external effects in each jurisdiction. Consequently, we expect greater cooperation among police agencies in more fragmented SMSAs. This expectation is

confirmed in Table 6A. Mutual assistance increases as urban areas become more fragmented. Formal aid agreements are strongly related to fragmentation. Note, however, the countervailing tendency displayed in Table 6B. As one agency becomes disproportionately large within a metropolitan area, cooperation decreases. Elsewhere (McIver, 1978), I have speculated that this is because large agencies recognize the logic inherent in Mancur Olson's thesis of the exploitation of the large by the small, i.e., they see no gains from participation in cooperative arrangements in which they invest more than the possible return.

Data collected during Phase II of the Police Services Study provide a second surrogate for externalities -- geographic location. Trained observers rode with police officers in 60 neighborhoods in 25 different police jurisdictions. Certain of the neighborhoods were located on the boundaries of the police agencies' jurisdictions; others were located further inside the agencies' jurisdictions. If spillovers occur, they most likely occur along the boundary regions of each jurisdiction given what we know about the limited mobility of criminals. It is in these areas, then, we would expect to find more interagency activity.

Table 7 contains reports on almost 5,000 police-citizen encounters observed during the summer of 1977. While the number of interagency contacts observed was quite small, almost all of them occurred, as expected, in the boundary districts of each police jurisdiction. This finding is suggestive of a relationship between interjurisdictional activities and externalities.

Table 6a. Fragmentation and Interagency Cooperation

	Fragmentation		
	1 - 15	16 - 27	28 - 90
Does This Agency Assist Others?	81 ^a (325) ^b	84 (358)	91 (409)
Does This Agency Receive Assistance?	87 (324)	91 (354)	93 (406)
Does This Agency Belong to a Mutual Aid Agreement?	31 (317)	48 (356)	58 (415)

Table 6b. Dominance and Interagency Cooperation

	Dominance		
	0 - .38	.38 - .52	.52 - .86
Does This Agency Assist Others?	88 (356)	86 (380)	83 (356)
Does This Agency Receive Assistance?	92 (354)	92 (378)	88 (352)
Does This Agency Belong to a Mutual Aid Agreement?	64 (360)	46 (378)	31 (350)

a - Percent yes.

b - Number reporting.

Table 7. Interjurisdictional Patrol Activity: A Geographic Phenomena

Presence of Other Law Enforcement Agencies at the Scene of the Encounter:	Location of Police-Citizen Encounters		
	Boundary District	Interior District	
Not Present	62%	38%	(4,844)
Present Prior to the Arrival of the Observed Officer	93%	7%	(46)
Present After the Arrival of the Observed Officer			
A. In Response to a Request	81%	19%	(21)
B. Without Request	94%	6%	(33)

Conclusions

In this paper, I have reviewed a considerable amount of empirical research relevant to the policy pronouncements of the National Advisory Commission on Criminal Justice Standards and Goals. This research provides some evidence that criminals are mobile and that police may have some impact on whether crimes are committed locally or in the next town. What we don't know yet is what types of interjurisdictional cooperation affects this type of crime, to what extent displaced crime and more generally all crime externalities affect interagency arrangements, and finally whether overlapping agencies impact on local crime rates and external effects. Note, therefore, we have little empirical basis for specific recommendations for the reorganization of policing.

This paper also contains the beginnings of a conceptual framework for studying the relationship between criminal activity and interjurisdictional cooperation among police agencies. This framework, however, illustrates some of the difficulties researchers will have in establishing a link between externalities and activities designed to reduce/increase them.

Finally, the last section of this paper hints that cooperative activities may be a function of displaced crime. The data are merely suggestive. More elaborate analyses will be forthcoming.

Footnotes

¹This does not imply such changes in police manpower are efficient or cost-effective.

²Our discussion of apprehension and deterrence barely dents the surface of the variety of services provided by law enforcement agencies. Ostrom, Parks, and Whitaker (1978) detail the diversity of products offered by agencies policing U.S. metropolitan areas. We have also failed to consider the multitude of positive and negative spillovers that result from the production of these services. For example, to the extent crime laboratories and detention facilities are paid for by one agency and utilized by another, positive benefits certainly accrue to the user. The sharing of radio frequencies may have positive or negative externalities. Overloaded frequencies may impair dispatcher-squad car communication during emergencies. Alternatively, shared frequencies may yield additional information or facilitate emergency mutual aid, positive benefits to the department receiving assistance. Generally, the literature has failed to acknowledge the complexity of police service production and its consequences for community safety and security.

³A more accurate version of this definition would include a citizen reporting-police recording component. This could be included as a constant term or a proportionality constant. A complex specification might include this correction as a function of police agency characteristics and true crime rates.

⁴Actually only a fraction of the GDC_i would potentially operate beyond the boundaries of community, i. It is this fraction that is the true positive externality. However, for the sake of simplicity we will consider the entire GDC_i component a benefit to neighboring communities.

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Appendix 1. Symbols and Definitions

Symbols

- OLC_i - Observed local crime rate in community i
- TLC_i - "True" local crime rate in community i
- DC_i - Deterred crime in community i
 $\equiv GDC_i + SDC_i$
- GDC_i - Globally deterred crime
- SDC_i - Spatially displaced crime
- TP_i - Total police activities by community i
- LP_i - Police activities by agency i involving its own jurisdiction
- IP_i - Interjurisdiction police activities in community i
- OP_i - Activities by overlapping agencies in community i
- W_i - Wealth of community i
- X_i - Demographic characteristics of community i
- AC_i - Organizational characteristics of agency i
- F - Additional factors affecting interagency relationships -- state laws, resources, communications, bureaucratic norms, federal carrots and/or sticks

Appendix 1. continued

Definitions

$$1a. OLC_i \equiv TLC_i - DC_i + \sum_j SDC_j$$

$$1b. OLC_i \equiv TLC_i - (GDC_i + SDC_i) + \sum_j SDC_j$$

$$2a. TP_i \equiv LP_i + IP_i \quad (\text{Model 2})$$

$$2b. TP_i \equiv LP_i + IP_i + OP_i \quad (\text{Model 3})$$

$$3. IP_i \equiv \sum_{j=1}^m IP_{ij}$$

$$4. OP_i \equiv \sum_{j=1}^m OP_{ij}$$

Models

$$1. OLC_i = k_1(TP_i, TP_j, W_i, W_j, X_i)$$

$$TP_i = k_2(OLC_i, AC_i)$$

$$2. OLC_i = q_1(LP_i, LP_j, \sum(IP_i + IP_j), W_i, W_j, X_i)$$

$$TP_i = q_2(TLC_i, GDC_i, GDC_j, SDC_i, SDC_j, AC_i, F_i)$$

$$3. OLC_i = q_1(LP_i, LP_j, \sum(IP_i + IP_j), \sum(OP_i + OP_j), W_i, W_j, X_i)$$

$$TP_i = q_2(TLC_i, SDC_i, SDC_j, GDC_i, GDC_j, W_i, W_j, AC_i, F_i)$$

END