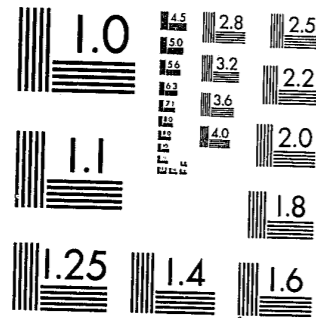


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METROPOLITAN SERVICE DELIVERY STRUCTURE AND POLICE PERFORMANCE

by

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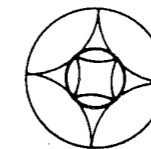
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Does the organization of agencies and systems of agencies for the delivery of public services affect the quantity and quality of services supplied? If so, in what ways? Do different forms of organization lead to differences in costs for the same quantity and quality of service? Can, for example, changes in the current structure of the metropolitan areas be expected to produce changes in police performance or the cost of policing? If so, in what directions?

These are important questions. The production of services by agencies of local governments has been a major growth industry in twentieth century America. At the same time, an increasing awareness of budget constraints in the presence of growing service demands has led to redoubled efforts to determine ways of supplying services more efficiently. Public sector productivity has become a major concern of national commissions, scholars, and public officials.

Many endeavors to improve service delivery or to reduce service delivery costs have focused on the organization of agencies that produce public services and on the patterns of interorganizational arrangements among such agencies. Many recommendations for the reform of organizational and interorganizational arrangements for the delivery of public services have been made. Advocates of structural change clearly believe that organization influences performance.

Most conventional analyses of public service delivery employ a unitary model of local governments. In such models, the "government"

aggregates consumer preferences, procures and organizes means of service production, and delivers services as a monopoly supplier to constituents. Decisions about output and expenditure levels are assumed to be made by simple referenda or by omniscient and benevolent administrators. But, few local government service delivery structures are so simple.

Since the early 1960s, scholars have argued for more complex models of public service delivery (e.g., Ostrom, Tiebout, and Warren, 1961; Margolis, 1964). Noting that the local public sector is most frequently composed of several layers of enterprises engaging in a wide variety of exchanges, they argued the need to consider the structure of intra- and inter-jurisdictional arrangements as influences on service delivery. Margolis, for example, argued that the structure of interorganizational arrangements might make it possible to deal with problems that are less amenable to solution at the level of individual organizations or jurisdictions.

A consideration of the structure of governments gives a new perspective to old questions. We might ask whether some of the insoluble problems posed in the theory of public expenditures are worked out through the behavior of the structure. That is, does the structure have some of the characteristics of an industry and market, so that there is an interaction among governments which leads to desirable results (Margolis, 1964: 236).

In addition to his concern over the neglect of interorganizational structure, Margolis also criticized analysts of public finance for excessively collapsing the internal organization of governmental units. Instead of direct democracy or pure hierarchy, most governmental structures are far more complex. As Margolis recognized, these governmental structures may give rise to opportunities for private gain.

Just as the market can be rigged, the government can be manipulated to protect private interests of some constituents. Just as promoters can orient and stimulate the market, there is a government bureaucracy which can gain from government activities (Margolis, 1964: 236-237).

Despite the cogency of these arguments by Margolis and others (e.g., McKean, 1964), few analysts of local service outputs and expenditures have taken into account overtly the ways the structure of intra- and inter-organizational arrangements may affect the performance of local public sector economies. This paper examines some of these effects; in particular, how the structure of service delivery arrangements for policing in a metropolitan area, conceptualized as a multi-firm industry, affects the behavior of that industry and of individual police agencies within the industry. An explanation of these effects based on intra- and inter-organizational factors is posed.

Policing as the Substantive Focus

The delivery of police services provides the substantive focus of this paper. Policing is an important public service. It deals in part with one of the major concerns of Americans over the past 2 decades, crime and disorder.¹ In fiscal year 1976, an estimated 11 billion dollars were spent for police protection, nearly 8 billion dollars by local governments (U.S. Department of Justice, 1978). The rapid rise in police salaries and pension benefits in recent years suggests that these expenditures will continue to increase. In 1977, more than 450,000 full-time personnel were employed in agencies

supplying police services. This placed policing second only to education as a public employer at the local level (U.S. Bureau of the Census, 1978: 9).

As one of the common services supplied by local governments, policing has been the subject of many studies and recommendations. Much of the debate surrounding the delivery of police services has focused on policy variables that concern the organizational and interorganizational structure of police service delivery. The size of police agencies and the number of -- and relations among -- agencies in any given area have been frequent subjects for debate. The large number and the diversity of police agencies in America offer a wide range of policy choices from which to draw relevant empirical data.

For at least 50 years, critics of American police organization have believed they knew the answers to the questions posed initially. Their answers have been that organization does influence performance and costs, and does so in specific directions. Changes could be made to present structures of service delivery arrangements that would lead to improved performance and, often, to reduced costs. The recommended changes have usually been the same; eliminate small police agencies and fragmented policing through consolidation of departments, and reorganize the remaining large departments according to management principles emphasizing specialization of assignment and hierarchical control. Reformers believed that these changes in industry structure and producer agency organization would result in more effective police agencies, that costs would be reduced through the capture of economies-of-scale in production, and that consolidation would eliminate spillovers of crime from jurisdiction to jurisdiction that

were seen as hampering law enforcement.² Despite these remarkably uniform prescriptions, however, few changes consistent with their thrust have resulted.³

In recent years some scholars have come to question such prescriptions. Agreeing that organization is likely to influence performance, these scholars have argued that the direction of relationships is different from that advanced by earlier reformers. These scholars suggest that smaller public service jurisdictions organized in less concentrated service delivery arrangements might often be more effective than large consolidated structures for the delivery of some services. They can be more responsive to citizen preferences, offering, through their numbers and diversity, a choice among service mixes and tax costs. Smaller producing agencies might be able to avoid some of the bureaucratic pathologies seen to plague large agencies. If structures of service delivery arrangements for police service are in need of reform, those reforms might better involve vertical and horizontal differentiation of the more concentrated industry structures. Large jurisdictions might be maintained or even increased for the production of some specialized services, but other services would benefit by the disaggregation of large production units.⁴

Service Delivery Industries

In order to investigate effects that may extend across and among multiple jurisdictions in the supply of public services, a conceptual

framework that can accommodate this multiplicity is necessary. One useful framework is that of the "public service industry." Ostrom, Tiebout, and Warren (1961) and Ostrom and Ostrom (1965) argued for the utility of conceptualizing public service delivery structures as "industries." Public service industries, they claimed, might be analyzed using many of the same tools as those employed by economists of the industrial organization persuasion (e.g., Bain, 1959). Consideration of service delivery structures in terms of their monopoly, duopoly, oligopoly, or competitive forms might enable behavioral predictions analogous to those made for private firms in market structures. In an early application of industrial organization concepts to the public sector, Bain, Caves, and Margolis studied the water industry in northern California (1968). But, little other empirical or theoretical application of industrial organization concepts to the public sector occurred until the middle 1970s. This was due to a lack of conceptual tools for characterizing the structure of service delivery arrangements in the public sector and a consequent lack of theoretically related empirical measures of this structure.

As a result of National Science Foundation supported studies of the organization of service delivery in metropolitan areas, two similar conceptualizations of service delivery arrangements in the public sector have been developed (Ostrom, Parks, and Whitaker, 1974; 1978; Savas, 1978). In both conceptualizations, service delivery arrangements are disaggregated by specific type of service (e.g., general area police patrol, investigation of residential burglaries, radio communications, garbage collection, dry trash collection, newspaper recycling). The participants in the service delivery

arrangements are separately classified as producers of the service, as consumers of the service, or as providers or collective decision-making units that link producer and consumer. Once these three types of participants are separated conceptually, they can be identified empirically for any given service in a particular geographic area (e.g., a city, a county, an SMSA). Matrices can be constructed arraying, for example, all of the producers against all of the consumers (or all groups of consumers for services with attributes of public goods). Each cell in the matrix identifies whether a service link exists between a particular producer and a particular consumer (or group) and, if so, the nature of that service link. Matrices can also be constructed for producer and provider linkages, for provider and consumer linkages, and for linkages between producers of one service and producers of other services that are necessary or useful to the former producers. These service structure matrices, together with computations based upon their sizes and the patterns and types of entries, can then be used to characterize the structure of service delivery arrangements for each service of interest in many different geographic areas (see Ostrom, Parks, and Whitaker, 1978).

In our study of service delivery arrangements for the supply of police services in U.S. metropolitan areas, my colleagues and I inventoried the agency and interagency structure of police service systems in 85 Standard Metropolitan Statistical Areas.⁵ We catalogued all producers of a number of police services (e.g. patrol, burglary investigation, homicide investigation, radio communications, entry-level training, and others). We recorded the structure of each agency and its relationships with other agencies producing the same or

related services. We also recorded the linkages of producing agencies to consumer groupings within each metropolitan area, noting where unique arrangements linked a single producer to a single consumer group and where more complex, multiagency links were found. We developed mathematical indices to characterize the structure of each of the metropolitan areas. These indices are of two types, compositional and relational.

The compositional indices of metropolitan structure are based on counts of service producers, organized service consumer units,⁶ and the populations contained within the latter. For services supplied directly to consumers, we measure compositional structure using the following:

Multiplicity - the number of suppliers of a given service in the metropolitan area.

Relative Multiplicity - the number of suppliers per 100,000 metropolitan inhabitants.

Fragmentation - the number of organized consumer units for a given service in the metropolitan area.

Relative Fragmentation - the number of organized consumer units per 100,000 metropolitan inhabitants.

Dominance - the proportion of the metropolitan population supplied by the producer with the largest served population for a given service.

Slight variants in the definitions of these indices were made services such as radio communications, training, or crime lab, which are not supplied directly to consumers, but serve as intermediate products (we used the term auxiliary services) in the production of services for consumers.

The relational indices of metropolitan structure take into account the ties or interactions among service suppliers and between suppliers and service consumers in metropolitan areas. Among the relational measures for services supplied directly to consumers are:

- Independence - the proportion of the metropolitan population that receives a given service from an agency of its own local government.
- Autonomy - the proportion of the metropolitan population that receives a given service exclusively from an agency of its own local government.
- Coordination - the proportion of the metropolitan population that receives a given service through the coordinated efforts of two or more producers.
- Alternation - the proportion of the metropolitan population that receives a given service from two or more producers that alternate their service delivery.
- Duplication - The proportion of the metropolitan population that receives a given service from two or more producers that make no effort to coordinate or alternate their activities.
- Assistance - the proportion of the metropolitan population that receives patrol service from producers reporting frequent mutual assistance.

Here, too, variants on these measures were made for auxiliary service relationships.

By analyzing the relationships between these measures of service delivery structure and measures of the behavior of participants within structures of very different forms, improved understanding of interorganizational influences on public bureau behavior may result. Does a public bureau that occupies a monopoly supply position with respect to a large population and across several different services behave differently than a set of smaller monopolists serving an equivalent total population or a mixed set of more specialized

producers of particular service that, in the aggregate, supply an equivalent population? Does the availability of service supply to a given consumer (or group) from two or more different producers lead to inefficient duplication as some would argue, or does the presence of potential competition, even if oligopolistic, lead to more vigorous supply efforts by all producers?

To begin answering these questions, measures of police performance, in addition to measures of police industry structure, are required. In the next section a relative measure of productive efficiency based on two common police outputs is developed. Following this development, relative efficiency is related to variations in industry structure.

Measuring Relative Efficiency in Policing

The particular performance criterion chosen here is limited, though quite important. It is the relative technical efficiency of police agencies in the production of two common outputs, clearances by arrest and response capacity. By response capacity is meant deployment of patrol units available to respond to citizens' requests for police services. By technical efficiency is meant the transformation of input factors to outputs. More efficient production units obtain more output from the same inputs. Relative technical efficiency measures the technical efficiency of each police agency against that of other police agencies who are attempting to utilize similar production techniques and/or to obtain similar outputs. The

sense of the term relative should become clear in the development of the efficiency measure.

This focus on relative technical efficiency in the production of only two outputs requires some justification. The choice of only two outputs is not too serious. While police do many, many things, clearing crimes and responding to citizens' service requests are among the more important in most communities and are certainly among the most resource consuming. But, the limitation to relative technical efficiency ignores other criteria, including broader concepts of efficiency as well as those of effectiveness, responsiveness, or equity in service delivery.

Rather than solely pleading data inadequacies, though the lack of adequate measures of effectiveness, responsiveness, or equity across a large sample of police agencies is clear, I argue that technical efficiency is at minimum a necessary condition for scoring well on these larger criteria. If one is technically inefficient, one could, by lessening the inefficiency, produce more output without increasing costs. This additional output could then be allocated to improve the effectiveness, the responsiveness, or the equity of service delivery. For this reason, use of relative technical efficiency as the performance measure for these analyses seems justifiable, though uncomfortable.

Technical Efficiency

Police agencies utilize productive factors including sworn personnel, civilian personnel, automobiles and other vehicles,

communications gear, and many other items in the production of crime clearances and response capacity. The production function for either of these outputs is not well known, however. That is, we do not know with any certainty how many officers, civilians, cars, and so forth are needed to produce X clearances, Y response units, or various combinations of these. There are a few engineering estimates with respect to response units, suggesting that a minimum of 4 to 5 sworn officers are required for each unit deployed around the clock (e.g., Callahan, 1973; Misner, 1960). But, empirical data on police agencies shows a very wide dispersion from this ideal type calculation (Ostrom, Parks, and Whitaker, 1978: 5). There are no estimates available with respect to clearance production.

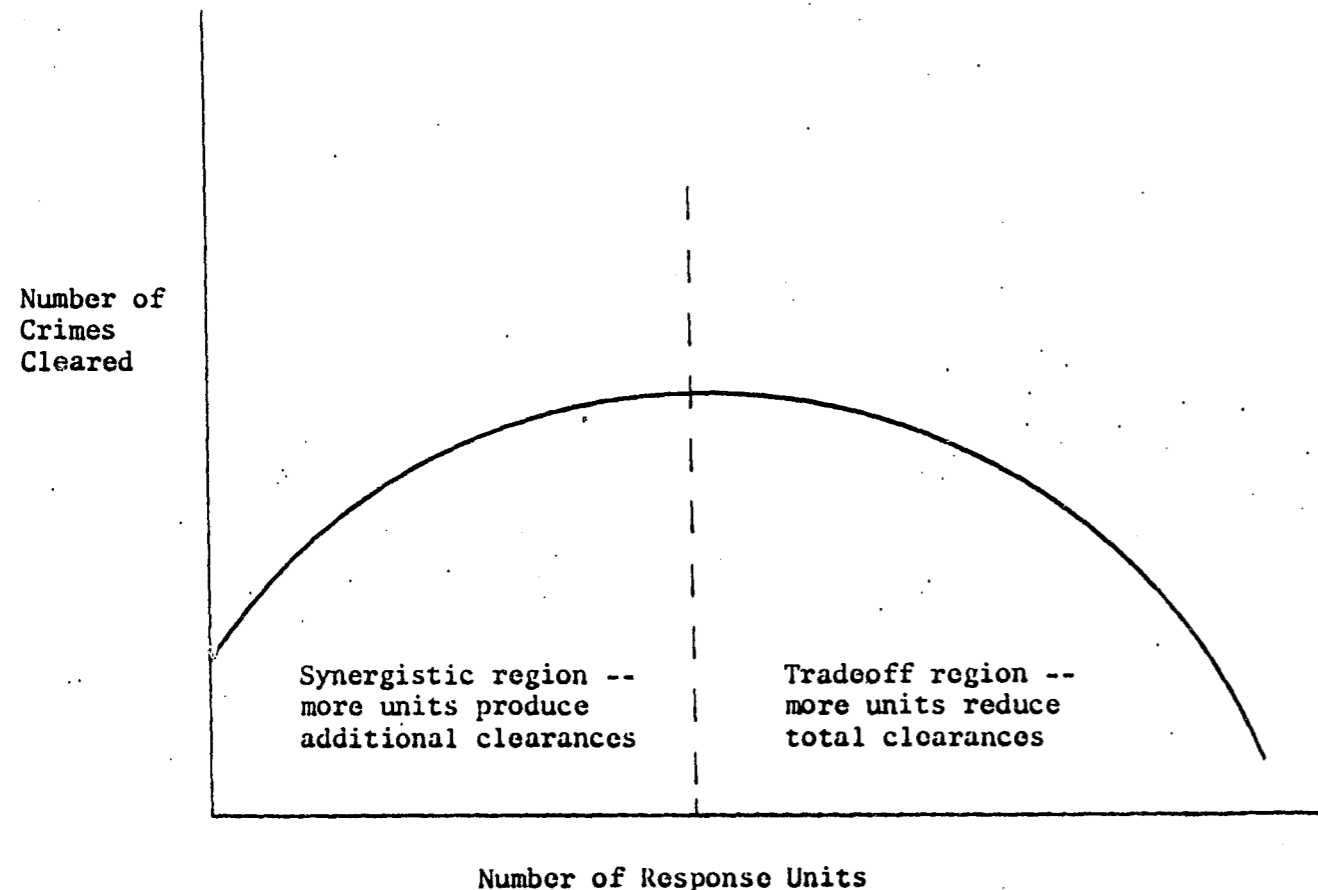
Conceptually, the two outputs should be cooperative over some range of values and competitive beyond that range. That is, a department with fixed resources can obtain both clearances and response units as it begins to deploy units to the street. It is well known that on-street patrol officers supply a large number of the crime clearances obtained by most agencies. But, it may be possible to increase the response force to the detriment of clearances that could be obtained through the use of resources in specialized nonpatrol units. At the point where this begins to occur, police decision makers confront a trade-off between these outputs and must choose the combination deemed most beneficial to their communities. Pictorially, the situation is as shown in Figure 1.

As noted, there are no well-known production functions for these police outputs. What is available is a large number of observations on police agencies and on metropolitan police industries. For the

agencies we can measure their employment of productive factors like officers, civilians, and cars; and measure the outputs they achieve, the number of clearances in a year, for example, and the number of response units they deploy. Relating the obtained outputs to the input factors employed could, in theory, allow the estimation of an empirical production relationship for these departments. A similar estimate could be formed at the metropolitan level, relating aggregate measures of inputs to outputs and examining variations in such relationships across different metropolitan structures. In practice these estimations can be quite difficult.

Figure 1

Conceptual Relationship of Clearances and Response
Units with Fixed Resources



While it is possible for a police agency to choose to operate anywhere along the curve shown in Figure 1, it is also possible for agencies to operate anywhere below such a curve. Inefficiency in transforming their fixed resources into the outputs in question would place a department below the curve. Observations on departments that lie below such a curve do not tell us about the true production function, what can be obtained with optimal use of the resources available. That can only be found by using observations from departments that are doing the best possible with the resources they have. Where we can identify that group of departments that are doing the best possible with their resources, we can estimate the production function for these outputs and then use that function to assess the relative efficiency of departments that are operating below the curve in Figure 1.

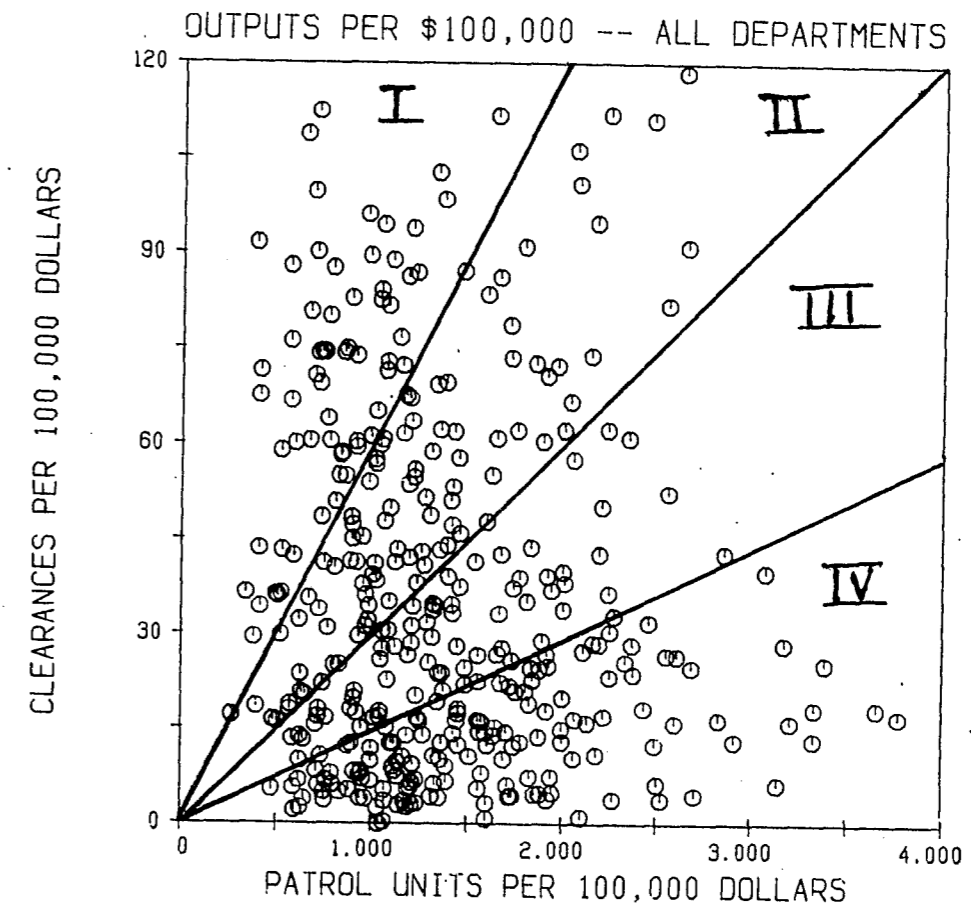
Relative Technical Efficiency

The technique employed here to identify efficient departments is graphical in nature. It is a gross simplification of more complex linear programming methods such as Data Envelopment Analysis (see Charnes, Cooper, and Rhodes, 1978; Farrell, 1957). We are currently working toward the implementation of these more sophisticated techniques, but find this simple method to offer some interesting results. The technique used is to divide each of the output measures by a measure of the input resources available and then to plot the standardized outputs against each other.

Figure 2 shows one such plot, where the standardizing measure of input resources is the total salary expenditure of a police agency. Each circle in the figure represents one police agency with its unique combination of salary expenditure, number of clearances in a year, and average number of patrol units deployed.⁷ It is obvious that there is wide variation in the number of clearances obtained per \$100,000 and in the number of patrol units deployed per \$100,000 in this sample of police agencies. The variation has two components. The first is a choice of emphasis. Those departments in the portion of the figure labeled I have chosen to emphasize the production of clearances over the supply of response units. Those in the area labeled IV have made the opposite choice. Those in the area labeled II and III fall in the middle of this choice dimension.

The second component of the variation in Figure 2 is inefficiency. An agency in the upper portion of region I, producing 100 clearances and 1 patrol unit per \$100,000 is clearly more efficient than an agency lower in that region that produces only 50 clearances and 0.5 patrol units per \$100,000. Likewise, an agency to the right in region IV, producing 15 clearances and 3 patrol units for each \$100,000 is more efficient than an agency in the same region that produces 10 clearances and 1 patrol unit for each \$100,000. Other efficiency comparisons are less clear, however. Without knowledge of the production function, it is not possible to compare directly the efficiency of an agency producing 70 clearances and 1.5 patrol units per \$100,000 to a different agency that produces 50 clearances and 2 patrol units per \$100,000. In the economist's terms, the marginal rate of transformation between clearances and patrol units, necessary

Figure 2
Clearance and Response Capacity Outputs
Standardized by Total Salary Expenditures

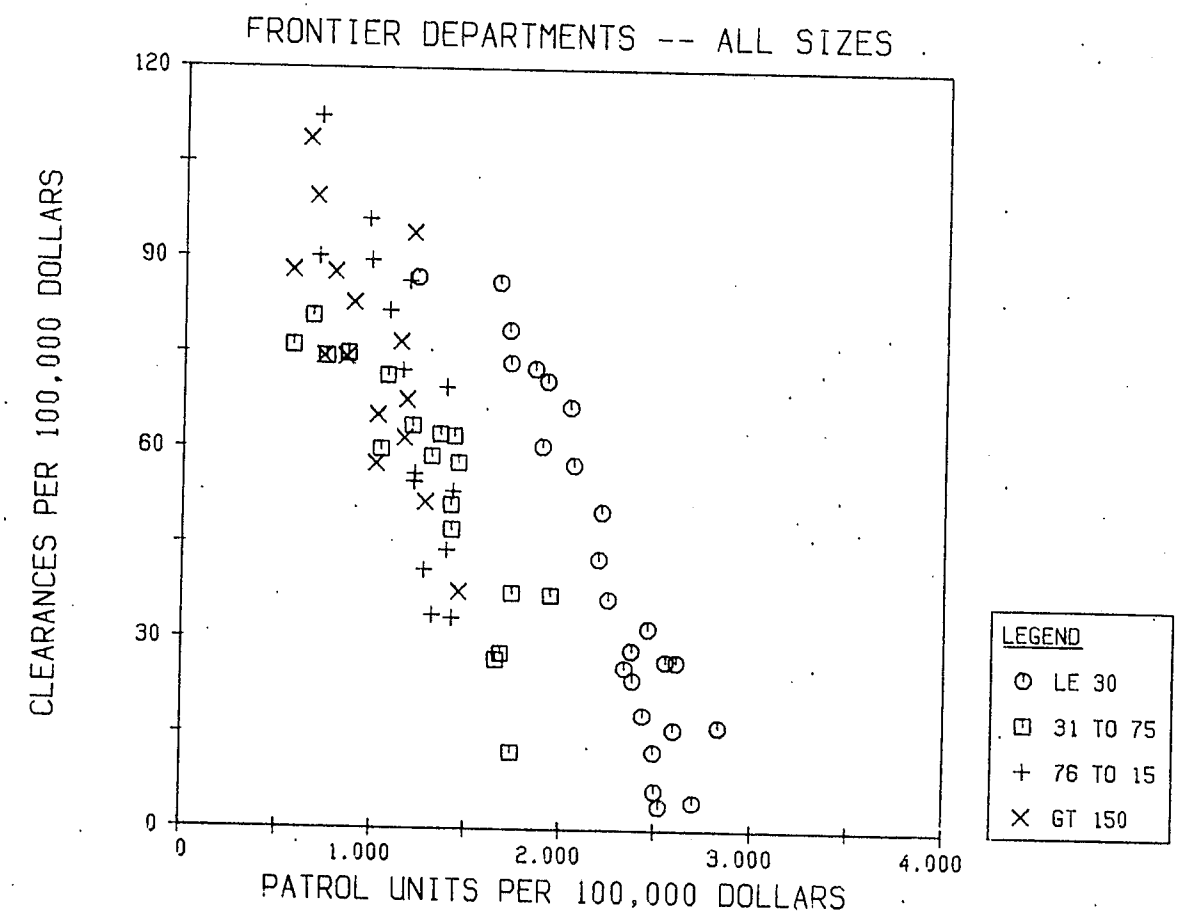


to compare efficiency directly, is unknown.⁸ By computing a measure of relative technical efficiency, however, such comparisons can be made indirectly.

The method for computing relative technical efficiency requires two steps. The first is to determine an envelope that fits the outer bounds of the points in Figure 2. This could be done deterministically, simply connecting the points that lie on the outer edge of the cloud in Figure 2. Alternatively, it can be done statistically, taking not only the outermost points, but also points that lie close to the outer bound and then using a curve-fitting technique, such as regression, to fit a line to this set of points. The latter method was used here as there was some distribution of error about each of the points in the data set, pushing some points out beyond actual performance and others inward to understate their performance. Statistical curve-fitting appeared to compensate somewhat for this difficulty.⁹ Figure 3 shows the points used for this curve-fitting approach to envelope construction. Points were chosen and envelopes fitted in four different ranges of police agency size because there appeared to be a substantial difference in output emphasis that was related to size. Larger departments tended to emphasize clearances at the expense of response capacity, while smaller departments reversed this choice.

Once the envelope is computed, the computation of relative technical efficiency is straightforward. A separate ray is scribed from the origin through the point representing each department and on to an intersection with the envelope. All points along such a ray represent a similar output emphasis in that the ratio of clearances to

Figure 3
Departments Used for Frontier Envelope Estimates



patrol units is constant. In this sense, all departments represented by points along a given ray are trying to accomplish the same thing. The measure of relative technical efficiency is then computed for each agency as the ratio of the distance it lies out from the origin on its ray to the distance out from the origin of the intersection of the ray and the envelope. This ratio measures the proportional accomplishment of a given department to what it could have accomplished with the same resources had it been as efficient as a department in the outer envelope.

Comparing Efficient and Average Police Agencies

As Figure 2 demonstrates, there is a wide variation in the technical efficiency of American municipal police agencies. Table 1 illustrates some of this variation by comparing the outputs obtained by efficient departments to those obtained by median police agencies. These data indicate that the spread in efficiency is particularly wide among the smaller departments, those employing fewer than 30 sworn officers. Efficient smaller departments are 68 percent more effective at converting resources to clearances and 50 percent more effective at converting resources to response capacity than are average smaller departments. The patterning of output emphasis with agency size is also apparent from these data, showing increasing emphasis on clearances to the detriment of response capacity as department size increases.

Table 1
Comparing Efficient and Average Police Agencies

	<u>Number of Full-Time Sworn Police Officers</u>			
	<u>LE 30</u>	<u>31 to 75</u>	<u>76 to 150</u>	<u>GT 150</u>
<u>Clearances per \$100,000</u>				
Median efficient departments	31.9	58.8	69.7	74.5
Median all departments	19.0	37.0	54.8	58.9
Percent improvement for efficient	68%	59%	27%	26%

<u>Patrol units per \$100,000</u>				
Median efficient departments	2.34	1.35	1.21	1.01
Median all departments	1.56	1.04	0.95	0.73
Percent improvement for efficient	50%	30%	27%	38%

Comparing the characteristics of efficient and average police agencies may help to identify some of the factors that are associated with higher efficiency in the production of these outputs. Table 2 presents some data for such a comparison.

One factor that appears to be characteristic of more efficient departments is the use of civilian employees, particularly among the smaller size ranges of agencies. The median efficient department in the smallest size category employs twice as many civilians as the median department of all those with fewer than 30 sworn officers. In the next range the median efficient department employs 50 percent more civilians. This factor does not seem significant among the larger departments, however. A second factor in two of the size categories is an emphasis on patrol over other assignments in the department. For departments with fewer than 30 officers and those with 76 to 150 officers, the percentage of those officers assigned to the patrol force in the median efficient department is well above the same percentage in the average department.

Regional location is a third factor associated with efficiency. There is a relatively higher percentage of efficient departments in the South and Southwest and, to a lesser extent, in the Midwestern regions of the country than are found in the Northeast or the Western regions. This regional difference appears to be the result of two different factors. One is a difference in salary levels for all employment among these regions. Adjustment factors for these salary differences are currently being developed. The second regionally related factor is department age. Police departments in the South and Southwest, in particular, tend to have been established much more

Table 2

Comparison of Related Factors for Efficient and Average Police Departments

	<u>Number of Full-Time Sworn Police Officers</u>							
	<u>LE 30</u>		<u>31 to 75</u>		<u>76 to 150</u>		<u>GT 150</u>	
	<u>efficient</u>	<u>average</u>	<u>efficient</u>	<u>average</u>	<u>efficient</u>	<u>average</u>	<u>efficient</u>	<u>average</u>
Median sworn officers	11	14	50	45	106	106	203	306
Median civilians	4	2	9	6	24	22	60	59
Region of country								
Northeast	12%*	46%	39%	47%	20%	24%	0%	27%
South/Southwest	52	21	28	25	40	26	74	40
Midwest	24	16	22	14	27	26	13	17
West	12	16	12	15	14	26	14	17
Median salary expenditures per sworn officer	\$10,200	\$12,308	\$12,052	\$13,558	\$12,018	\$13,115	\$10,771	\$12,168
Median percent of sworn officers assigned to patrol division	87%	77%	69%	68%	67%	61%	57%	57%

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* Regional percents may not total 100 due to round off errors.

recently than those in the Northeast and somewhat more recently than those in the West. The relationship with department age may represent the effect of organizational entropy as older departments find themselves loaded down with the results of decisions made years before and, thus, in many instances unable to adopt more efficient modes of operation.

Industry Structure Effects on Police Agency Efficiency

The structure of the police service industry in a metropolitan area could be related to police agency performance, technical efficiency in this instance, in different ways. First, structure could have an indirect influence on performance through intermediate effects on individual agency structure. In a metropolitan area exhibiting substantial vertical integration, that is with a number of specialized producers of services like radio communications, training, criminal investigation, or detention, many local agencies might turn to these specialists for the supply of some or all of these services. If the specialists were able to capture economies-of-scale, overall service should be more efficient because of this. Local agencies would be better able to allocate personnel to direct service activities in these circumstances.

Structure might have a direct influence as well. Where there are multiple agencies of similar size confronting similar service conditions in a metropolitan area, police chiefs, elected officials, and citizens may be afforded more opportunities to learn about

efficient modes of operation. Police chiefs can learn from one another at local chief's meetings which occur frequently in many areas. Elected officials can do likewise at their professional association meetings. Citizens can gain information from friends who reside in other communities and by simply passing through other communities in their daily business. The fact that elected officials and citizens have the opportunity for such learning increases the likelihood that police chiefs will be willing to put more efficient procedures into operation, even at the expense of perquisites they might obtain from less efficient operations. Where citizens and officials are better able to detect inefficiencies, police chiefs are more exposed to removal if these persist (Parks and Ostrom, 1981).

Evidence on the possible indirect influence of metropolitan structure is shown in Table 3. Two of the compositional measures of metropolitan structure are related to agency specialization and police patrol availability. Police agencies in metropolitan areas characterized by low relative multiplicity and high dominance tend to be more specialized, to deploy relatively fewer of the officers for on-street duties, and to have a lower availability of patrol officers per citizens served than do agencies in areas with lesser dominance and higher multiplicity. This is in part an effect of differing agency size in differently structured metropolitan areas. The fewer police agencies found in low multiplicity, high dominance areas tend to be larger than police agencies found in areas with lesser dominance and higher multiplicity. In the latter areas, the metropolitan area is divided among more numerous, smaller police jurisdictions.

Table 3

Metropolitan Patrol Service Delivery Structure, Production Strategies, and Patrol Availability

Percent of Full-Time Sworn Officers Assigned to Patrol Duties in Metropolitan Areas With:

	Low Dominance	High Dominance	All Metropolitan Areas
Low Relative Multiplicity	56 (17) ^a	51 (23)	53 (40)
High Relative Multiplicity	60 (23)	57 (17)	59 (40)
All Metropolitan Areas	58 (40)	54 (40)	56 (80)

Number of Full-Time Sworn Officers Employed Per Officer on Patrol at 10 pm in Metropolitan Areas With:

	Low Dominance	High Dominance	All Metropolitan Areas
Low Relative Multiplicity	7.4 (17) ^a	9.5 (23)	8.6 (40)
High Relative Multiplicity	6.8 (23)	7.1 (17)	6.9 (40)
All Metropolitan Areas	7.1 (40)	8.5 (40)	7.8 (80)

Table 3 - Continued

Metropolitan Patrol Service Delivery Structure, Production Strategies, and Patrol Availability

Number of Citizens Per Officer on the Street at 10 pm in Metropolitan Areas With:

	Low Dominance	High Dominance	All Metropolitan Areas
Low Relative Multiplicity	3,457 (17) ^a	4,135 (23)	3,847 (40)
High Multiplicity	3,416 (23)	3,803 (17)	3,580 (40)
All Metropolitan Areas	3,434 (40)	3,994 (40)	3,714 (80)

^aNumber of metropolitan areas with this combination of relative multiplicity and dominance.

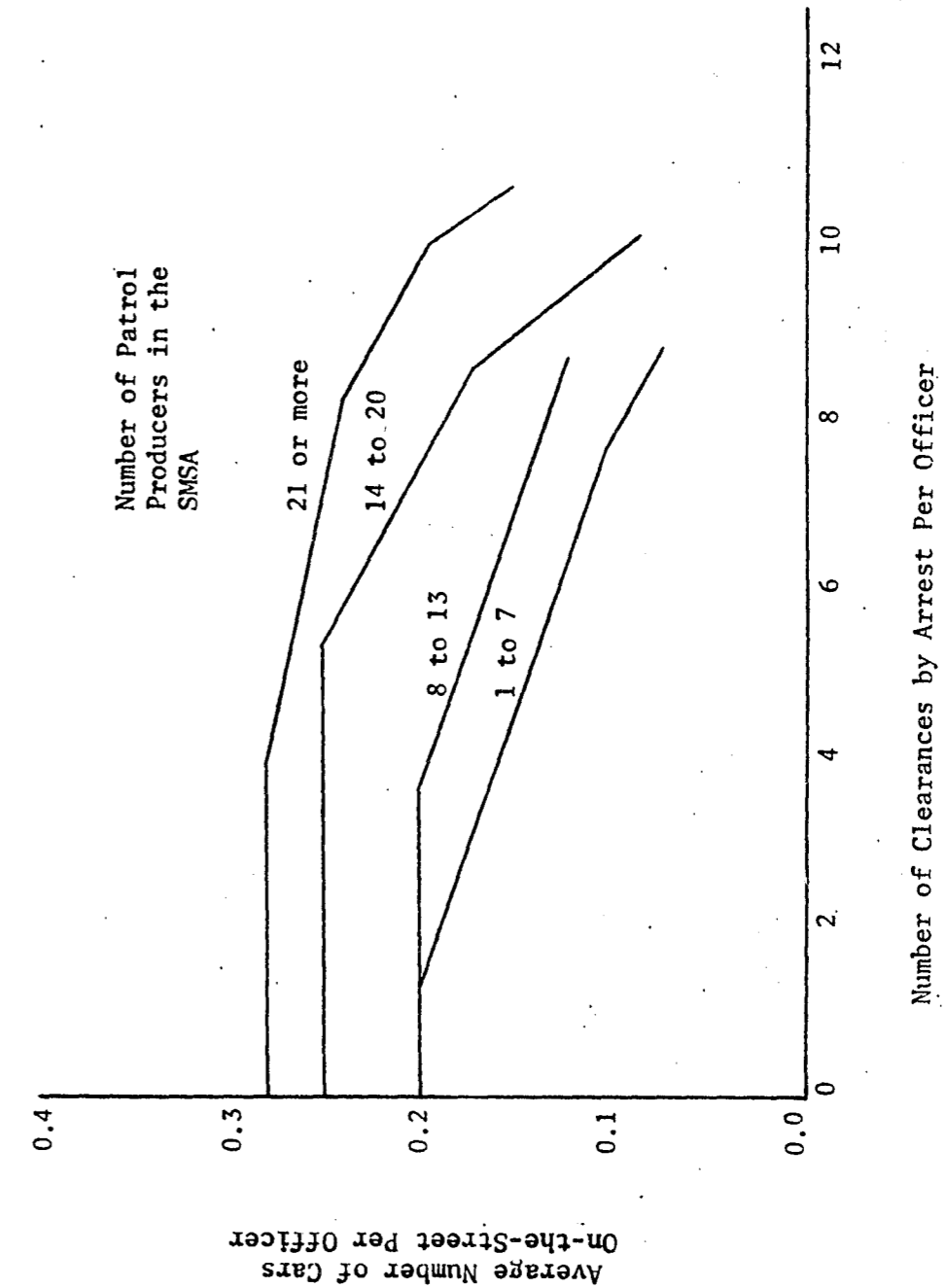
Evidence consistent with a direct influence of metropolitan structure on performance is shown in Figure 4. The figure shows the frontier production possibility curves or envelopes for the outputs of interest, here standardized by the number of full-time sworn officers employed rather than by salary expenditures. Four envelopes are shown, one each for varying levels of metropolitan multiplicity, the number of patrol service producers in each metropolitan area.

The envelopes in Figure 4 are increasingly far from the origin as multiplicity increases. This means that the most efficient producers in high multiplicity areas are more efficient at transforming inputs (sworn officers) to outputs (clearances and response units) than are the efficient producers in low multiplicity areas. This finding is consistent with a greater availability of information in the areas with more police producers. Agencies in such areas, together with elected officials and citizens interested in improving police performance, may take advantage of this increased information to improve police efficiency. If so, one would expect results such as those presented in the figure.

Summary

In this paper I have argued that the structure of organizational and interorganizational arrangements for service delivery in metropolitan areas should affect the performance of service delivery agencies in those areas. To demonstrate such effects requires the development of a method for conceptualizing and measuring metropolitan

Figure 4
Frontier Production Possibility Curves



structure. One such method is presented in the paper. The demonstration also requires development of performance measures across a large number of agencies. One such measure, relative technical efficiency, is presented in the paper.

Some preliminary results linking metropolitan service delivery structure and police agency performance are presented. Measures of production multiplicity and concentration are related to the choice of resource allocations by police agencies and to the resulting effects of such choices for on-street deployment. A measure of production multiplicity is related to the relative efficiency of police agencies identified to be doing the best job in their respective metropolitan areas. Relative efficiency of the most efficient departments is higher in areas with a greater multiplicity of patrol producers.

These preliminary findings are consistent with arguments built on the logic of industry production and information availability as a function of metropolitan service delivery structure. This consistency by no means confirms those arguments, but does offer support for them. What are needed are a series of multivariate analyses, allowing adjustment for varying metropolitan and jurisdiction service conditions and other nonstructural factors. Such analyses are in work at present. I hope to be able to present results from them in the near future.

Footnotes

¹Nehnevajsa conducted a secondary analysis of major survey-based studies of crime from 1960 to 1976. These studies, covering some 130,000 Americans showed that, "when specific questions are raised about the extent to which crime may be, or may not be, a major problem of the residential areas of the respondents, some 4 in 10 Americans consistently indicate that it is, indeed, a serious concern" (1977: 87).

²National commissions since at least 1931 have advanced these arguments. See, for example, National Commission on Law Observance and Enforcement, 1931: 125; President's Commission on Law Enforcement and Administration of Justice, 1967: 68-72; and National Advisory Commission on Criminal Justice Standards and Goals, 1973: 110. Police scholars too have made these same arguments. Prominent among them are MacNamara (1950), Misner (1960), and Callahan (1973).

³Although no hard data is available, it is likely that the number of police agencies has increased substantially during the years covered by the recommendations. Many new communities have incorporated and established local police agencies and many special purpose forces have been established.

⁴Scholars arguing the merits of smaller jurisdictions and fragmented service delivery structures include Tiebout (1956), Banfield and Grodzins (1958), V. Ostrom, Tiebout, and Warren (1960), Williams, et al. (1966), E. Ostrom (1971), E. Ostrom and Parks (1973), and E. Ostrom, Parks, and Whitaker (1978b).

⁵This study was the first phase of the Police Services Study conducted during 1974 and 1975. Data on police personnel resources, their allocation and deployment, together with extensive data on personnel policies and service delivery arrangements were collected in a series of in-person, mail, and telephone interviews with police administrators in 85 metropolitan areas (Ostrom, Parks, and Whitaker, 1978). Data on reported crimes, clearances, officer deployment, and assaults on police officers were made available by the Uniform Crime Reporting Section of the Federal Bureau of Investigation and merged with the organizational data.

⁶Organized service consumer units were defined to be any grouping of 100 or more citizens who, collectively, had some regularized decision-making arrangements with a supplier of a given service. Such units were most commonly identified as the jurisdictions of local police agencies, but often included additional entities such as residential college campuses, military bases, and other specialized collectivities.

⁷This analysis utilizes data from a subset of the departments studied in the Police Services Study. These are municipal, town, and township police agencies with five or more full-time sworn police officers for which FBI UCR data were available. More than 400 such departments are in the data set.

The departments ranged in size from 5 to 1,376 full-time sworn officers. They were widely distributed geographically, generally matching the geographic distribution of all municipal police agencies. The response force supplied by the departments ranged from a single patrol unit on the street to more than 100 units. The number of crimes cleared by arrest ranged from 0 to 11,000. In sum, the departments provide a fairly representative sample of local police agencies in America, though not of the very largest departments.

⁸To measure efficiency in more than this strictly technical sense, one would have to know even more than the production function or the production possibility curve for these two outputs. The relative prices of the input resources chosen by each agency would be needed to examine its allocational efficiency. In other words, does the agency choose the least cost combination of input factors to produce a given set of outputs? Secondly, and much more difficult, the relative valuation placed upon the two outputs by the consumers in each agency's jurisdiction would be necessary. The extent of the match of output mix to that preferred by consumers would measure the agency's efficiency in a social welfare sense (see Levin, 1974).

⁹Further error compensation was made by eliminating arbitrarily those points which seemed "too good to be true." That is, those points that lay beyond what appeared to be the outer boundary of the cloud of points. These points reflected reporting and/or coding errors of sufficient magnitude to warrant their exclusion. The frontier or envelope estimates are, therefore, conservative in nature.

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