

# WORKSHOP IN POLITICAL THEORY & POLICY ANALYSIS

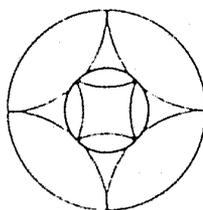
## Police Services Study Technical Report

T-11

IMPACT OF CIVILIANIZATION IN THE POLICE SERVICE

by

Phillip M. Gregg



Morgan Hall 121  
Indiana University  
Bloomington, IN 47401

36767

February, 1976

IMPACT OF CIVILIANIZATION IN THE POLICE SERVICE

by

Phillip M. Gregg  
Workshop in Political Theory and Policy Analysis  
Indiana University

NOV 15 1975  
AC

32191

This research is part of the Police Services Study which is supported by the Research Applied to National Needs Division of the National Science Foundation, Grant Number GI-43949. The joint efforts of the entire project staff have contributed to this paper. John P. McIver and Martha B. Vandivort have made important contributions in the preparation and analysis of the data. Discussions with Herbert Kiesling, Elinor Ostrom, Nancy M. Neubert, and Roger B. Parks have clarified my thinking and exposition. The opinions are the author's, and do not necessarily reflect those of the National Science Foundation or Indiana University.

TABLE OF CONTENTS

	Page
I. INTRODUCTION . . . . .	1
Summary. . . . .	1
Increasing Significance of Civilianization . . . . .	3
Personnel Management . . . . .	4
The Two Interpretations. . . . .	5
Effectiveness Interpretation . . . . .	6
Savings Interpretation . . . . .	7
II. THE TWO INTERPRETATIONS AS PROPOSITIONS IN A MODEL . . . . .	9
Nature of the Model. . . . .	9
Linkages of the Model . . . . .	.10
Influences on Expenditures . . . . .	.12
Influences on Patrol Deployment. . . . .	.13
III. INTERPRETATION AND TEST OF THE CIVILIANIZATION PRINCIPAL . . . . .	.15
Relation of the Model to the Principles. . . . .	.15
Nature of the Tests. . . . .	.15
Test of the Effectiveness Interpretation . . . . .	.16
Test of the Savings Interpretation . . . . .	.20
Impact on Patrol . . . . .	.21
Impact on Expenditures . . . . .	.22
Conclusion . . . . .	.23
IV. ANALYTIC PROCEDURES AND DATA . . . . .	.25
Multiple Regression. . . . .	.25
The Data, Sample, and Variables. . . . .	.25
Treatment of Problem Areas . . . . .	.27

	Page
V. RESULTS OF THE ANALYSIS . . . . .	31
Overview of the Findings. . . . .	31
Savings Interpretation. . . . .	35
Impact on Patrol . . . . .	35
Impact on Expenditures . . . . .	36
Summary. . . . .	37
Effectiveness Interpretation. . . . .	38
Impact on Patrol . . . . .	39
Impact on Expenditures . . . . .	40
VI. CONCLUSIONS AND POLICY IMPLICATIONS . . . . .	41
A Perspective for Policy Recommendations. . . . .	41
Policy Implications . . . . .	43
FOOTNOTES . . . . .	46
REFERENCES. . . . .	48
APPENDIX A. . . . .	50
APPENDIX B. . . . .	51
APPENDIX C. . . . .	52

Impact of Civilianization on Police Expenditures and Patrol

by

Phillip M. Gregg  
 Workshop in Political Theory and Policy Analysis  
 Indiana University

I. Introduction

Summary

Police personnel textbooks and national commissions recommend that departments increase their employment of civilians. The objective of civilianization is to increase the number of officers available for deployment without proportionate increases in expenditures. Because civilian salaries and benefits are generally lower than those of sworn officers, employment of civilians will reduce the average costs of maintaining officers in the field.

A survey of the proposals for civilianization reveals two distinct interpretations of the principle. Given a ceiling on total department manpower and expenditures, civilians can be hired to replace police officers in dispatching, record keeping, and other administrative support duties. This strategy would allow municipal governments to reduce police expenditures without curtailing services when faced with declining tax revenues. Civilian employment would allow the local government to save money.

The second interpretation calls for supplementing a given level of sworn officers with civilians. By taking over desk assignments, the civilians would free sworn officers for more time in field duties. Although this approach to civilianization would

increase total police expenditures, it should also increase the number and proportion of officers in field assignments. Trained officers could be used more effectively in providing services and deterring crime.

If either or both interpretations of civilian reform are true, they will have significant implications for police personnel policies and government expenditures. For this reason empirical study of police civilianization is a high priority. Conclusive findings require that both interpretations of civilianization be carefully analyzed. The two interpretations are based on the same set of assumptions about salaries, expenditures, and patrol deployment; they are logically reinforcing. If the benefits of civilianization have empirical substance, the data should support both interpretations.

In the following pages, the two interpretations are developed as propositions in a model of police personnel practices. The model yields predictions about the consequences of civilian employment for patrol deployment and expenditures under both sets of assumptions. Data from 273 medium-sized municipal departments are analyzed to determine if the consequences of civilian employment correspond to those predicted from the model.

The results of the regression analyses confirm both interpretations. Increases in the use of civilians -- given either strategy -- is associated with increases in the percentage of sworn officers assigned to patrol and other field duties. It is also related to reductions in the average expenditures that are required by a department to maintain a man on patrol. Although the replacement

of sworn officers with civilians is associated with lower absolute expenditure levels, this civilianization approach also reduces the number of officers on patrol. Supplementation is related to slightly higher absolute expenditure levels and larger numbers of officers on patrol.

In light of the potential significance of the analyses for police manpower policy, their limitations need emphasis. The findings are based on cross sectional data; they allow us to generalize about tendencies among all police agencies but do not support specific recommendations for individual departments. Departments have not been separated into two groups, one of which replaces officers with civilians and the other which supplements officers with civilians. The differences associated with these two civilianization interpretations are established with the statistical controls of a regression equation. For this reason the analysis is not designed to test one "civilianization strategy" against the other.

But the findings do conform to what one would predict if the civilianization principle -- both interpretations -- was operating in current police manpower practices. The implications of this conclusion are quite significant: In existing police departments, the employment of civilians yields many of the benefits promised by the reform advocates.

#### Increasing Significance of Civilianization

Over the past fifteen years a major theme of police reform in the United States has been to increase the use of civilians in police work. A.C. Germann, a former police officer, provides a succinct summary of the principle in his textbook, Police

### Personnel Management:

Too many American policemen are doing non-police tasks that could be accomplished by lower-paid civilian employees. Effective use of civilian personnel serves to release police officers for field operations and thus increase operational effectiveness. (Germann, 1958: 158)

The civilianization principle has been reaffirmed in textbooks and reports of state and national commissions over the succeeding years. In 1973 the National Advisory Commission on Criminal Justice Standards and Goals recommended:

Any other positions which do not require the presence of a sworn officer should be designated as civilian positions. In this manner, an agency may alleviate a critical shortage of sworn personnel in field-related assignments. By employing civilian personnel in selected, staff, support, and line functions, agencies can transfer sworn personnel to assignments where they can have direct affect on crime reduction.

Many police chief executives have discovered that employing civilians saves money. A trained police officer generally demands a significantly higher salary than his civilian coworker, especially in large agencies (National Advisory Commission on Criminal Justice Standards and Goals, Police, 1973: 259-261).

The "budget crunch" that now confronts local government officials has given rise to a different emphasis on the civilianization principle: increase service levels by introducing changes in the production process do not increase expenditures. In 1975 the National Commission on Productivity identified "civilianization" as a high priority for public officials who seek increased government productivity:

Police protection is one of the most costly items in the budget of every local government....

Recently, however, local governing bodies throughout the country have been discovering that they can provide better police services with the money they already have. They are doing so by increasing the productivity of the police force. This means simply that they are finding ways to provide more protection and more services for each hard-to-come-by tax dollar they spend....

In the past virtually all of the positions in police departments were filled by uniformed, sworn personnel. But today's police are too highly trained and too expensive to be doing tasks that could be performed by a less skilled less expensive person (National Commission on Productivity, 1975: 1-3).

### The Two Interpretations

These statements of the civilianization principle lend themselves to two interpretations; the distinction between the two has significant policy implications. From a viewpoint of the local government official, the two interpretations of civilianization promise different levels of budgetary savings and productivity increases. From the perspectives of a police chief, the individual officer or civilian employee, and the local association of police officers, strict application of one or the other civilianization strategy can potentially yield differences in the absolute number of sworn police officers if not the relative proportions of civilians to police officers. Many police officers argue that the quality of basic police services suffers when civilians provide the administrative and support services, especially dispatching. A major concern is the security of the officer in the field. A large contingent of civilians, who have not received police training, reduces the potential backup capacity for a man on patrol.

Salary levels may be affected. Some local governments may use the savings from substituting civilians to increase the salaries of sworn officers. On the other hand, civilianization will reduce the supply of police positions that are preserved for trained officers. The relative increase in the size of the applicant pool vis-a-vis each open position in an urban area would tend to reduce the salary

level required to recruit sworn officers. By increasing the proportion of positions which is open to lower paid civilians in any given department, civilianization may increase the impact of competition market forces on police salary levels. These differences constitute policy issues of substantial importance to local elected officials, taxpayers and residents, police chiefs, and associations of police officers.

Effectiveness Interpretation. The first will be referred to as the effectiveness interpretation: supplement a given level of sworn police officers with civilians. By adding civilians, police officers can be freed from dispatching, record keeping, and other support duties do not require the exercise of arrest powers. The department will be able to maintain a larger percentage of sworn officers doing police work in the field. Deployment of officers will be more effective.

This application of the principle will also effect expenditure levels. As civilians are hired to supplement officers, total manpower and absolute expenditures will increase. But salaries, training, insurance, pensions, and fringe benefits for civilians are generally lower than those for sworn officers. By hiring civilians, a police department can add police officers to the patrol force or other field assignments without adding the proportionate expenditures for their training, insurance coverage, pension payments, and fringe benefits.

Let us take a simple example. Assume that one civilian is added to a force comprised of officers at the beginning salary level. Now suppose that this civilian releases one police officer

to the patrol unit. Given this assumption and no differences in other factors, the cost of adding that officer to patrol would be lower than the average cost of maintaining the original number of officers in the patrol unit by the difference between the salary costs of the police officer and civilian. The particular circumstances of each police department will determine the extent to which the addition of civilians can reduce the marginal and average costs of increasing the number of officers in field assignments.

Savings Interpretation. The second interpretation of civilianization can be referred to as the savings interpretation. The local government substitutes civilians for police officers, given a constant ceiling on total department manpower, rather than employing them to supplement the force of sworn police officers. A less expensive factor of production is being substituted for one of higher cost.

Application of this interpretation of the principle would reduce absolute expenditures for police services. Furthermore, if the police officer that the civilian replaced were assigned to desk work full-time, this civilianization strategy would not reduce the absolute number of police officers assigned to field duties. As a result the average level of expenditures to maintain an officer in the field would be lower. The expenditure per taxpayer for police services would also diminish.

In light of the "budget crunch" that confronts local officials, the differences between the two interpretations of civilianization

are quite important for urban management. If the above assumptions hold, the application of the savings interpretation should reduce the average costs of maintaining police officers in the field more than the effectiveness approach. If we add the assumption that individual officers produce the same level of services under the two applications of civilianization, then the savings approach will also yield greater increases in police productivity. Taken from another perspective, the savings interpretation implies that an equivalent level of police services can be supplied with smaller expenditure outlays. Policy recommendations based on such logical implications, must be carefully examined in light of the manpower policies, expenditures, and patrol deployment.

## II. The Two Interpretations as Propositions in a Model

The explanations that scholars and commissions advance to justify the civilianization principle -- both interpretations -- can be treated as empirical propositions. As outlined above, the justifications are based on propositions that the increased employment of civilians will reduce relative (and/or absolute) expenditure levels and increase the relative (and/or absolute) deployment of police officers to field assignments. These propositions present the opportunity to design tests that will indicate if these predicted consequences of civilianization occur in existing departments.

### Nature of the Model

But to test the predicted relationships, the factors that affect the levels of police expenditures and patrol deployment -- other than civilian employment -- must be identified and controlled. The flow chart in Figure 1 draws on past research to identify these other factors that will influence patrol and expenditures independently of civilian employment.<sup>1</sup>

Let me briefly summarize the nature of the model and how it is used to design tests of the propositions used to explain the benefits of civilianization. The basic idea is straightforward: As a department's size increases, different allocations of manpower among its civilians and sworn police officers will give rise to differential increases in patrol deployment and expenditures. The research challenge is to specify and measure the absolute increments in these variables well enough to test for the differences that would exist if the civilianization principle -- both interpretations --

were operating in a sample of existing departments.

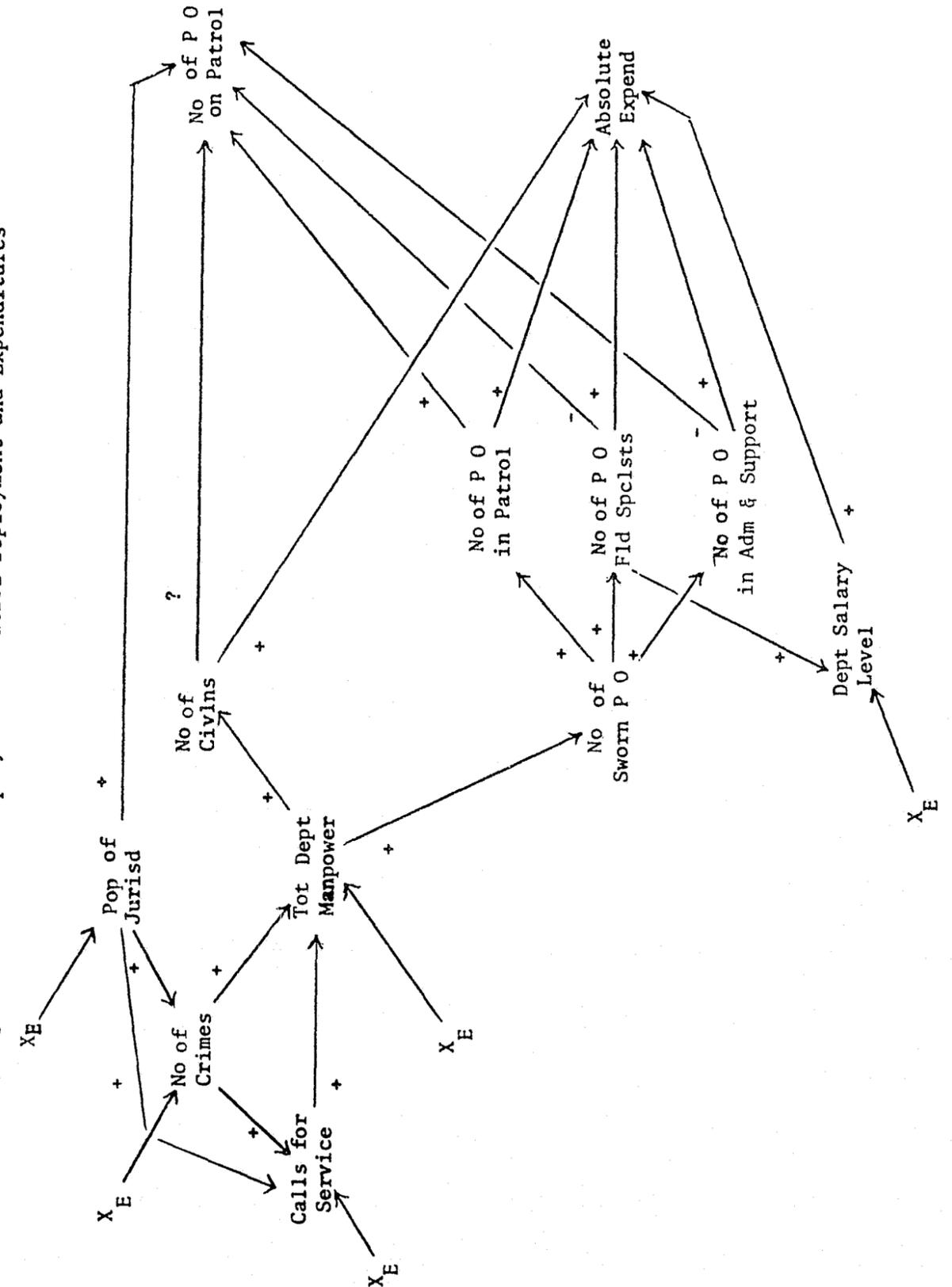
The model is designed to minimize the number of variables introduced and to maximize the parsimony in their relationships. This helps to minimize the confounding of the test due to imprecise operationalization of concepts, poor measurement, and tenuous interpretation of relationships. To the extent possible, the hypotheses have been interpreted and the model has been developed in terms of the absolute measures of variable factors rather than ratio indices (Schuessler, 1974: ).

Linkages of the Model

Now let us take a look at the individual arrows of the model beginning at the top of Figure 1 with the variable, population. In jurisdictions with larger populations, the absolute number of crimes is greater. This, as well as the larger number of residents gives rise to more calls for service. Given more crimes and calls for service, police departments tend to employ a greater number of personnel. (The arrows labeled  $X_E$  represent exogenous variables that will not be included in the analysis.)

In different departments, the increments in personnel are allocated differently among civilians and sworn police officers. Depending on the specific policing problems, department policies, and personnel practices, the complement of sworn officers is differentially assigned among specific duties in different departments. The positive arrows from police officers to duty assignments identify three categories important for the test of the civilianization principle. Officers assigned to patrol duties constitute the first category. Police officers in specialized field assignments include traffic

FIGURE 1  
Impact of Civilian Employment on Patrol Deployment and Expenditures



control, criminal investigation, and juvenile work. The third category includes officers assigned within the department to the following support and administrative duties: dispatching, detention, laboratory, training, record keeping, and administration.

As the arrows indicate, the impact of civilianization on patrol and expenditures depends upon the differential effects of different allocations of sworn officers among these duty categories. Let us consider these relationships and their consequences for expenditures and patrol deployment in some detail.

Influences on Expenditures. A larger allocation of manpower to any one of the three duty categories will yield larger absolute expenditures, assuming that the personnel in the other two duty categories -- as well as salary levels, and number of civilians -- are the same. The positive arrows to absolute expenditures from the (1) number of police officers assigned to patrol, (2) number of officers assigned to specialized field duties, and (3) number of officers assigned to administrative and support duties represent these relationships. An absolute increase in the number of civilians will also increase the department's expenditure level if the other factors do not change.

The size of the increment that is added to expenditures by a larger number of sworn or civilian personnel is proportional to the representative salary level for the department's personnel. The positive arrow from salary level to absolute expenditures depicts this influence.

Salary level itself is influenced by the number of specialists in the department and other exogenous factors (identified as  $X_E$ )--

such as the cost of living, collective bargaining, and education and training requirements. Since these factors influence expenditures via differences in salary level they are not included as independent variables in the model. (The representative salary level for the department's personnel is operationalized as the highest salary received by a police officer who is assigned to patrol duties.)

Influences on Patrol Deployment. In Figure 1, patrol deployment is operationalized by the number of officers on patrol at 10:00 P.M. The value of this variable depends to a great extent upon how different police departments allocate their sworn manpower among the three duty categories. The arrows from the three variables, which represent the duty categories, to the patrol variable specify these relationships. As a larger number of officers are assigned to (1) patrol duties, the absolute number of officers on patrol at any one time should increase. Conversely, increases in the number of officers assigned to (2) specialized field duties and (3) support and administrative duties will decrease the number on patrol, if the conditions are the same.

The arrow from number of civilians to officers on patrol is marked with a question mark. If the assumptions and propositions of the effectiveness interpretation of civilianization are incorporated in the model, the relationship would be positive. If the assumptions and propositions of the savings interpretation are incorporated, the relationship would be neutral or slightly negative. These details will be taken up in the next section.

There is a positive arrow from the population size of the jurisdiction to the number of men on patrol in the jurisdiction.

This is based on the following proposition. If two departments are the same in all respects except the number of residents in the jurisdiction, the department serving more people will maintain a larger patrol force. It is important to include this relationship -- even though the proposition is shaky -- because many would argue that population is a source of spurious relationships that must be controlled in the tests. This possibility is represented by arrows from population to calls for service and to patrol deployment.

### III. Interpretation and Test of the Civilianization Principle

#### Relation of the Model to the Principle

Given the model, the two interpretations of the civilianization principle can be incorporated as empirical propositions. In the context of the model, we can use the empirical propositions to "predict" the consequences of civilian employment for patrol and expenditures that we would expect to find if the civilianization interpretations were operating. The model facilitates precise formulation of the "predicted" relationships, the relevant variables, and analytic procedures in designing the test. It also directs our attention to intervening variables that can potentially influence the relationships under analysis.

#### Nature of the Tests

The tests are designed to determine if the consequences that advocates predict from civilian employment are realized by existing police departments. The objective is not to determine if one form of civilianization is superior to the other. But we cannot ignore the fact that reformers advocate two distinct interpretations of the principle and project different consequences from the two strategies. To conduct a conclusive test of civilianization, the jurisdictions of each interpretation must be analyzed. Otherwise the analysis is open to the criticism that it has not focused on the relevant relationship under the proper conditions.

The nature of manpower policy and budgetary constraints makes it very unlikely, however, that a local government or police chief consciously employs one civilianization strategy on the other over

an extended period of time. For this reason, departments cannot be divided into two groups for separate analyses on the basis of this distinction.

This is the dilemma. It is necessary to test the propositions advanced in each interpretation of civilianization. But the nature of existing police manpower policy precludes a direct test of the two strategies to establish their relative effectiveness. The solution is to use multiple regression techniques to establish statistical controls that correspond to the assumptions and hypotheses of each civilianization interpretation. We can design tests for the relationships that would exist in manpower, expenditures and patrol data if the beneficial consequences that reformers predict from civilian employment are occurring in existing police departments.

This type of analysis is based on tendencies in the cross-sectional differences of variables for a class of police departments, not the temporal changes in variables for a single department subject to a policy experiment. For this reason conclusions are formulated in terms of tendencies within a class of police departments rather than cause and effect in individual agencies. But this limitation is inherent in nearly all policy research.

#### Test of the Effectiveness Interpretation

The propositions of the effectiveness interpretation -- as summarized earlier -- are represented by the arrows in the right half of Figure 2. These relationships are the basis of the test. To reason through the design of the analyses, the propositions can be introduced as linkages in the flow chart in Figure 1. A test of the effectiveness interpretation requires

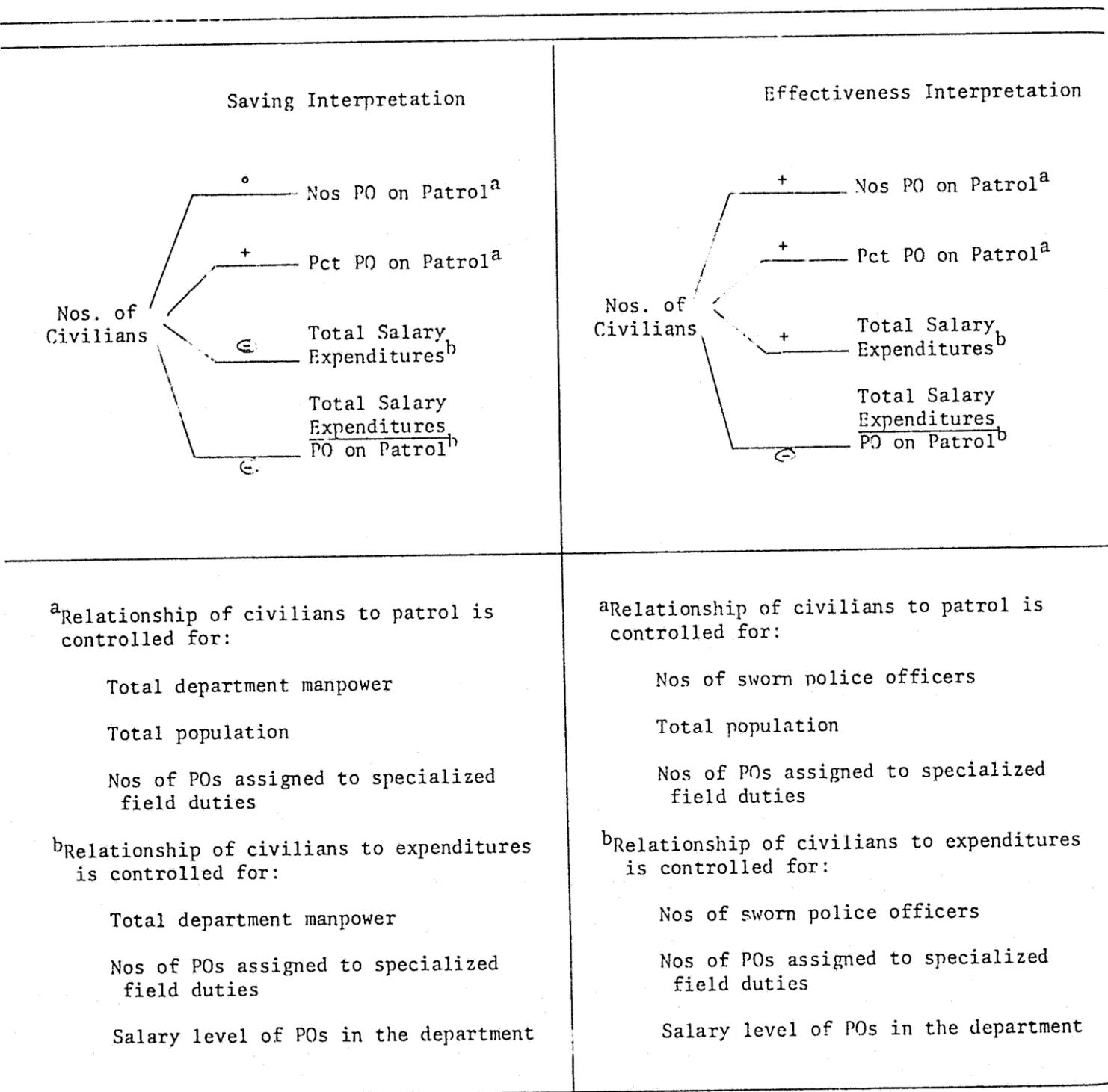
that the other variables which influence these relationships as specified in the flow chart, be controlled.

Let us consider these controls for the impact of civilianization on patrol. First, the effectiveness interpretation stipulates that civilians supplement rather than substitute for sworn police officers. In terms of the flow chart, this means that increments in manpower are allocated to civilians while the number of police officers is constant. For this reason, the number of officers is a primary control variable in the test. Given a number of sworn officers, we allow the number of civilians to increase and evaluate the regression coefficients to determine if the increment in civilians has the predicted relationships with patrol and expenditures. As represented by the signs of the arrows in Figure 2, the employment of civilians should increase the absolute number and percentage of police officers on patrol. Patrol officers per capita should also increase.

But a control only for the number of officers allows for differences in their allocation among the three types of duty assignments (viz., patrol, specialized field assignments, and administrative and support duties). As indicated by the flow chart (Figure 1), differences in allocation among these three assignments are related to the number of officers on patrol. To eliminate this confounding variation in the test, these differences in duty assignments must be controlled. However, the three variables are components of the number of sworn officers for which a control has been established. Care must be taken to minimize definitional dependence and multicollinearity between the two variables (Blalock, 1963: 233-37; Gordon, 1968: 592-616).

FIGURE 2

THE TWO INTERPRETATIONS OF THE CIVILIANIZATION PRINCIPLE



The explanation of the "effectiveness interpretation" provides guidance to reach a resolution in designing the test. A central premise is that as officers are "freed up" by additional civilians, they will be assigned to patrol or other specialized field duties such as traffic and investigation. By controlling for the number of officers assigned to the specialized field duties (specifically, traffic, criminal investigation, and juvenile work) other than patrol, we can in effect quantitatively compare departments for differences in patrol deployment when the total number of sworn officers and the total number of field specialists are the same.

Given this control for officers assigned to specialized field duties, the effects that an added civilian might have on personnel allocation among the three duty categories will show up in a tradeoff between patrol and administrative and support duties. If the supplementation interpretation holds, the data should reveal -- given the above controls -- that increments in the number of civilians are associated with an increase in the number of sworn officers on patrol. This increment in patrol officers would be associated with a decrease in the number of officers assigned to administrative and support duties where civilians are filling in. The increments in patrol cannot come from officers in specialized field assignments because variations in this factor have been controlled in the regression equation.

It is empirically and statistically possible that the regression analysis will not yield these relationships. In fact on a priori basis, it seems unlikely that increments in the number of civilian employees would have a consistent positive relationship

with the number of officers on patrol across a large number of police departments of various sizes and from different regions. The absence of a relationship would also be consistent with prevalent theories about dysfunctions and irrationality in the decision-making and organization of government agencies (Mouzelis, 1967). For example, the substitution between a higher and lower cost manpower input presumes that constraints toward rational management exist.

A third control variable must be introduced for the test of the effectiveness interpretation. As Figure 1 indicates, the number of people served by a department is hypothesized to influence patrol deployment, independently of civilian employment and the allocation of sworn officers among the three duty categories. For this reason, the effects of different population sizes must be eliminated to analyze the effects of civilian employment on patrol. Population is the last control variable, as summarized in the right side of Figure 2.

Up to this point, the discussion has focused on how to design a test for the effects of civilians on patrol deployment, given the effectiveness interpretation. According to the interpretation, civilian employment should also affect expenditures. This test will be taken up in the discussion of the savings interpretation of the next section.

#### Test of the Savings Interpretation

The propositions of the savings interpretation -- as summarized earlier -- are represented by the arrows in the left side of Figure 2. To reason through the design of the test, these propositions can be

conceived as linkages in Figure 1. A test of this interpretation requires that the other variables, which are specified in the flow chart to influence these relationships, be controlled.

Impact on Patrol. First, let us consider the impact of civilianization on patrol. The distinguishing stipulation of the savings interpretation is that civilians replace sworn officers rather than supplement them. Looking at Figure 1, this stipulation means that total departmental manpower remains constant as increments are added to the number of civilians. With this control, the number of sworn officers will decrease in a one-to-one relationship as civilians are added. For this reason, manpower -- as opposed to the number of sworn officers -- is the primary control variable in the test of the savings interpretation. Given a constant level of total manpower, we allow the number of civilians to increase and evaluate the regression coefficients to determine if this increment has the predicted relationships with patrol.

If the interpretation holds, the substitution of civilians should not markedly reduce the number of officers on patrol or patrol officers per capita. These arrows are given a neutral or slightly negative sign. But the percentage of all officers in the department that are on patrol should increase, as represented by the positive sign in Figure 2.

A control for manpower alone allows for different patterns of personnel allocation among the three duty categories. As indicated in the flow chart, these differences will influence patrol deployment. The rationale and procedures that were used to design the test of the effectiveness interpretation apply here. The appropriate control

variables are total manpower, number of officers assigned to specialized field duties, and population.

Impact on Expenditures. The second part of the savings interpretation deals with the impact of civilians on expenditures. The relationships are summarized in the left side of Figure 2. With constant levels of manpower, increases in the number of civilians will be matched with reductions in the number of sworn officers. By replacing higher paid officers with lower paid personnel, total salary expenditures will be reduced by the difference between the salary level of officers and civilians. As the signs of the arrows indicate, this form of civilianization will be associated with lower expenditures for salaries and lower salary expenditures per officer on patrol. Expenditures per capita should also be smaller.

But, differences in the allocation of sworn personnel among the three duty categories will influence expenditures independently of civilian employment. Police officers assigned to specialized duties, such as investigation, are generally higher paid than patrol officers and those assigned to administrative support duties. By controlling for the number of officers assigned to specialized field duties, as well as salary level, this potential source of confounding variation is minimized.

This control also insures that the substitution of civilians for sworn personnel does not reduce the number of officers assigned to specialized field duties. The explanation of the savings interpretation state that civilianization should decrease expenditures without substantially reducing the number of officers in field duties. A test of civilianization that allowed for this substitution

would be challenged by police chiefs and officials as invalid because it allowed for a simple reduction in service levels. This is clearly contrary to the principle.

This control for the number of specialists yields a conservative test of the relationship between civilians and expenditures. Civilians will be replacing officers assigned to administrative and support duties (primarily record keeping, dispatching, and detention). Reduction in the patrol force may be a related consequence. These officers are generally lower paid than other sworn personnel. For this reason substitution of civilians in this category may not yield substantial savings. These potential findings would erode support for the savings interpretation.

The arrows that represent the savings interpretation in the left side of Figure 2 indicate that the substitution of civilians for officers would also reduce average salary expenditures per officer on patrol. But another outcome is possible. The substitution of civilians for sworn officers could reduce the total number of men on patrol as well as reducing expenditures. If this occurs the arrow from civilian salary expenditures per police officer on patrol will be small or negative. These findings would also contradict the savings interpretation.

#### Conclusion

The foregoing discussion indicates how the flow chart in Figure 1 is used to specify control variables and to design the tests of the two civilianization interpretations. The charts in Figure 2 specify the signs of the coefficients that regression analysis would produce if the civilianization principle were operating in existing police

departments. The data may or may not yield the predicted coefficients. If not, we can conclude that current experience with the employment of civilians is not producing the desirable consequences that advocates of civilianization hypothesize.

Care has been taken to design conservative tests. Given the potential significance of the findings for the debate over civilianization and police manpower policy, it is crucial that the analysis be designed to favor null findings. The foregoing discussion explains how the model has been used to accomplish this.

#### IV. Analytic Procedures and Data

##### Multiple Regression

The explanations of the civilianization principle hypothesize that differences in the employment of civilians by police departments will be related to differences in expenditures and patrol deployment. These are propositions about the relationship between increments in one variable to increments in a second. This is the type of dependence relationship that regression analysis was designed to measure (Wonnacott and Wonnacott, 1970: 124-125).

Multiple regression is necessary because the tests of the propositions assume that controls are established on intervening variables. The standardized, partial regression coefficients (beta) which are calculated from the least squares fit of regression planes to the data distributions provide appropriate measurements to test the relationships represented by the arrows of Figure 2. Unstandardized regression coefficients (small b) are presented and emphasized where they will aid the interpretation of the findings. Partial correlation coefficients ( $r_{x.y}$ ) were computed to measure the strength of the associations (covariance) among the variables. These coefficients corroborate the relationships identified in the regression analyses (Appendix A and B).

##### The Data, Sample, and Variables

The data were collected for an enumeration of police departments in a sample of 80 middle-sized, Standard Statistical Metropolitan Areas (SMSAs). The sample of 80 SMSAs was stratified for the 10 administrative districts of the U.S. Government to insure regional representation. The middle-sized SMSAs were defined as those of more than 150,000 people

and less than 1.5 million people which did not cross state lines.

A combination of mail, phone, and personal interviews was conducted between the fall of 1974 and summer 1975 to collect the data. Information was gathered for variables pertaining to manpower, police services, expenditures, and interorganizational relations for each of the 1454 state, county, and local police agencies that exercise arrest powers and provide basic area patrol in these SMSAs.

The five primary variables of the analysis are: (1) number of civilians, (2) number of sworn officers, (3) number of officers assigned to specialized field duties, (4) number of police officers on patrol at 10:00 P.M., and (5) total expenditures for salaries of all agency personnel including pensions and fringe benefits. These are simple enumerations reported from records by police chiefs and city clerks. Problems of validity, reliability, and other measurement errors are minimal.

Initial examination of the data revealed skewed distributions, outliers, and variation in manpower practices by the type, regional location, and the size of police agencies. To minimize problems of substantive interpretation and violations of regression assumptions, cases were allocated into subgroups by type of police agency (municipal, county, county sheriff, state police, state traffic patrol, etc.) and size of agency. The initial regression analyses were performed for the 273 medium sized (10 to 49 full-time sworn officers) municipal police departments in the larger sample.

Substantial efforts were then made to determine if the findings for this subgroup of agencies varied for different size categories of municipal departments and for different regions of the country.

Partial correlation and/or regression analyses were conducted for all 927 municipal departments in the sample for the following size ranges: 10 to 14 full-time sworn officers, 15 to 19, 20 to 29, 30 to 39, 40 to 49, 50 to 99, 100 to 249, 250 to 499, 500 to 999. With the exception of the very largest size category where the number of cases was relatively small, the same patterns of relationships recurred.

The findings were also verified in each of the four U.S. Census Bureau regions for the nation. Two subsamples were used in the regional analyses: only the medium-sized municipal departments of 10 to 49 officers, and all municipal departments from 1 to 999 officers. To reduce skewness and outliers in the latter analyses, square root transformations were applied to the variables. This procedure actually strengthened the congruence of the regional findings with those reported in the next section.

These correlary analyses by region and size indicate that the findings for the medium-sized departments are not artifacts of distributional quirks that might occur because of departmental size or regional locations of the agencies. The conclusions derived with the regression analyses exhibit substantial generality for the 928 municipal police departments that were enumerated in the sample of 80 SMSAs. The coefficients produced by the regression analyses reported in the following pages represent the relationships within the larger data set.

#### Treatment of Problem Areas

The thorniest problems in the regression analyses stemmed from the assumptions of the mathematical model. The histograms and coeffic-

ients for each distribution were examined for normality, skewness, and outliers. The scattergrams for the intercorrelations of nine important variables were studied for curvilinearity and heteroscedacity.

By using a well populated segment of the distributions (the medium-sized municipal departments with 10 to 40 full-time officers) for each variable, the distributional problems that existed for the larger set of 927 departments were substantially reduced. For example, skewness coefficients that ranged up to 11.00 -- all values were positive -- were reduced to values of 1.25 or less.

However, outliers -- cases with extreme values for some variables -- remained a problem. Because of the sensitivity of the regression coefficients to extreme values, substantial efforts were made to identify and correct their spurious effects (Anscombe, 1968: 178-181). First, the data for cases with outlying values were examined. Of the 285 municipal departments, twelve revealed substantial missing manpower data and some inconsistent coding for key variables. These were dropped from the regression analyses.

Three standard treatments for outliers were then applied to determine which was most appropriate: (1) all values of greater than 2.50 standard deviations were transformed, (2) all values of greater than 2.50 standard deviations were eliminated, and (3) a square root transform was applied to each variable (Kruskal, 1968: 189-190; Frank, 1966: 251-252). These treatments did not change the sign or relative magnitude of any coefficients derived from the regression analyses. However, as expected the treatments reduced the standard deviation and the skewness values of each variable. On the whole the treatment procedures tended to reduce the beta coefficients which

indicates that the outlying values did influence the regression findings.

The second treatment procedure was selected on the grounds it was the most conservative and easiest to justify. It produced smaller beta coefficients in the regression analyses than neither the first or the third alternative. It preserved the "natural" measurement units for each variable and thereby enhanced the interpretation of the b coefficients. It did not require the manipulation of raw scores.

Examination of the scattergrams for nine primary variables revealed very little curvilinearity. Heteroscedacity was not apparent in the scattergrams. Examination of the residuals for the dependent variables in each of the 14 regression equations did not reveal abnormalities in those distributions.

Multicollinearity among independent variables did not exceed the rule-of-thumb threshold of .80 for the correlation coefficient (r). (See the zero order correlation matrix in Appendix C.) Two independent variables in each regression equation were correlated at the .70 level. But correlation of this magnitude did not involve the "experimental" variable, number of civilians. In fact the highest zero order correlations of other independent variables with the number of civilians was .47 for total department manpower and .26 for the population of the jurisdiction. When multicollinearity does not affect the independent variable of theoretical interest, it can be tolerated in regression analysis (Farrar and Glauber, 1967: 94).

In summary, the strategy of breaking the cases into mutually

exclusive subgroups for analysis substantially eliminated the violations of the regression model's assumptions. The effects of problematic outliers were treated with the most conservative of three alternative procedures. The generality of the findings in the larger data base of 927 municipal departments was confirmed by analyses of subgroups from each region of the country and size categories of departments.

## V. Results of the Analysis

### Overview of the Findings

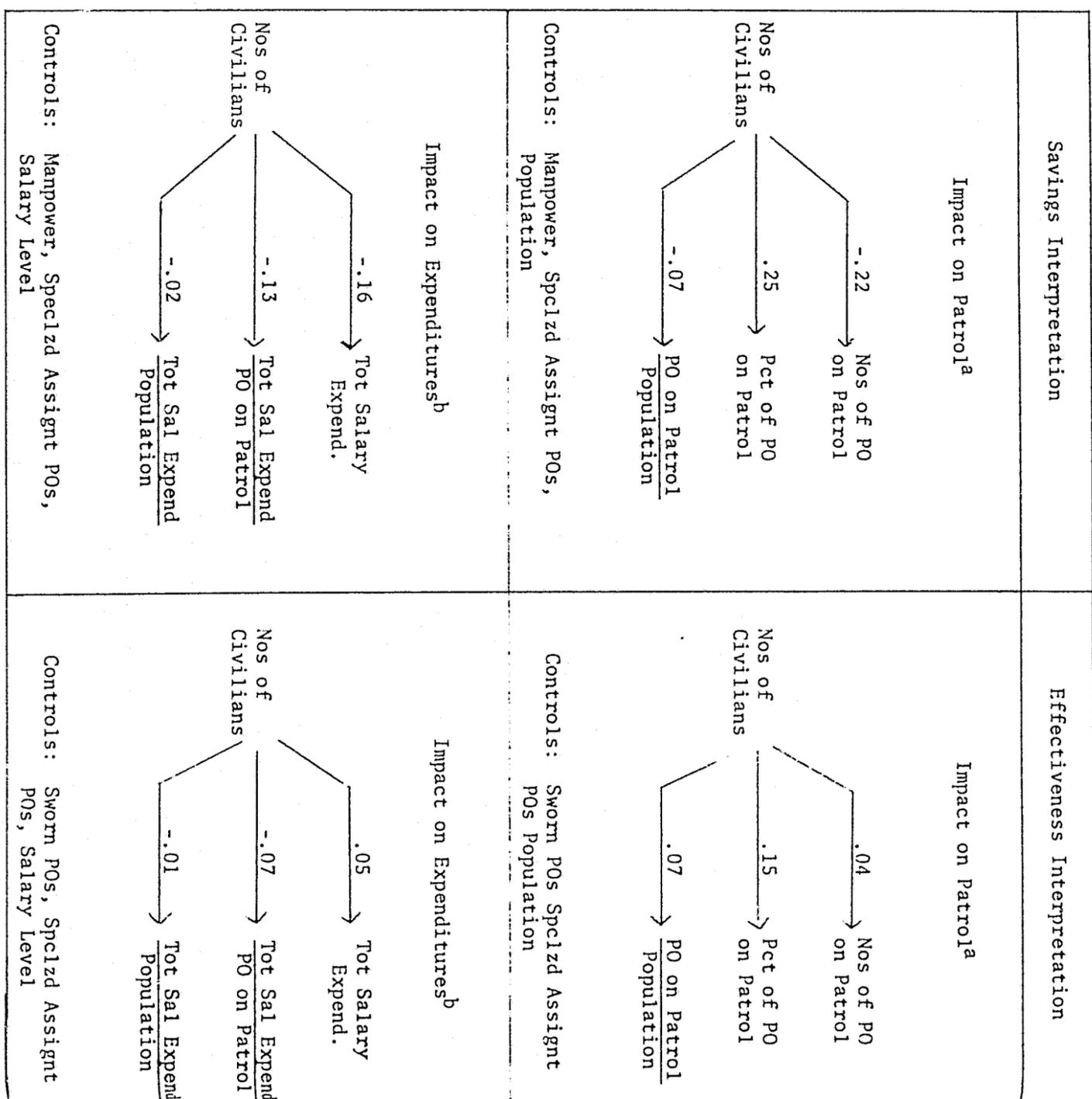
In the literature on police reform and productivity, civilianization has been given two interpretations. The empirical propositions of each interpretation -- labeled the affectiveness and savings interpretations -- were identified. These propositions were then represented as relationships in a larger model of personnel policies (Figures 2 and 3).

A conclusive evaluation of the civilianization proposal requires that both of its interpretations be tested. The logic, data, and statistical techniques for the tests were outlined in Section III and IV. These are complementary tests of mutually reinforcing propositions, not tests of mutually exclusive or competing hypotheses.

Figure 3 and Table 1 present the coefficients produced by the regression analyses. The coefficients are: the standardized partial regression coefficient (beta); the unstandardized partial regression coefficient (small b); the standard error of b (s.e.);<sup>2</sup> the value of students t for each b (t);<sup>3</sup> and the coefficient of multiple correlation for each equation (R).<sup>4</sup>

To insure comprehensive and informative tests, 12 dependent variables -- both absolute values and ratio indices (Schuessler, 1974: 395) -- were used. This produced 12 regression equations for each interpretation. The seven equations pertaining to the impact of civilianization on patrol are numbered 1 to 7 in Table 1. The equations analyzing expenditure effects are numbered 8 through 12. The coefficients in the left side of Table 1 pertain to the savings interpretation and the right side to the effectiveness interpretation.

FIGURE 3  
Regression Coefficients to Test the Propositions of the Two  
Civilianization Interpretations



<sup>a</sup>N=249 municipal police departments with 10 to 49 full time sworn police officers were included in the patrol equations.  
<sup>b</sup>N=225 municipal police departments with 10 to 49 full time sworn police officers were included in the expenditure equations. The differences in the number of cases included in the regression calculations and the divergence from the N of 273 reported earlier is due to missing data. Auxiliary calculations proved that the results were not affected by different treatments of missing data.

TABLE 1  
Standardized Regression Coefficients to Test the Alternative Interpretations of the "Civilianization Principal"

Impact on Patrol <sup>a</sup>	"Savings Interpretation" <sup>c</sup>					"Effectiveness Interpretation" <sup>c</sup>				
	beta	b	s.e.	t	R	beta	b	s.e.	t	R
1. Police Officers on Patrol at 10 PM	-.22	-.12	.03	-4.28	.77	.04	.02	.02	.99	.78
2. PO on Patrol X10,000/Population	-.07	-.04	.03	-1.24	.66	.07	.04	.03	1.27	.67
3. PO on Patrol X100/PO in Patrol Unit	.10	.25	.19	1.31	.23	.01	.02	.17	.11	.21
4. PO on Patrol X100/All PO in Dept.	.25	.46	.14	3.37	.39	.15	.27	.12	2.53	.38
5. PO Assigned to Patrol X100/All PO	.32	1.46	.28	5.28	.59	.31	1.42	.24	5.71	.59
6. Nos of PO Assigned to Patrol	-.23	0.51	.06	-8.93	.94	.06	.12	.05	2.34	.93
7. Nos of PO Assn to Patrol X1000/Pop	-.12	-.02	.01	-2.43	.74	.11	.02	.01	2.22	.72
Impact on Patrol <sup>b</sup>	"Savings Interpretation" <sup>c</sup>					"Effectiveness Interpretation" <sup>c</sup>				
	beta	b	s.e.	t	R	beta	b	s.e.	t	R
8. Tot Dept Expend	-.13	-\$7,392	1860	-3.97	.93	.07	\$4,133	1780	2.32	.92
9. Tot Expend for Personnel	-.16	-\$7,262	1600	-4.77	.92	.05	\$2,396	1411	1.70	.92
10. Tot Sal Expend/PO on Patrol	-.13	-\$1,213	612	-1.98	.64	-.07	-\$656	551	-1.19	.63
11. Tot Sal Expend X1000/Population	-.02	-\$58	278	-.21	.32	-.01	-\$33	250	-.13	.32
12. Tot Sal Expend/PO Assigned to Ptl	-.08	-\$171	132	-1.29	.73	-.11	-\$237	121	-1.96	.73

<sup>a</sup>Where patrol variables are dependent, the following independent variables have been entered in the regression calculation: number of civilians, total manpower (number of sworn officers for the effectiveness interpretation), number of officers in specialized assignments, and serviced population.

<sup>b</sup>Where expenditures are dependent variables, the following independent variables have been entered in the regression calculation: number of civilians, total manpower (number of sworn officers for the effectiveness interpretation), number of officers in specialized assignments, and salary level.

<sup>c</sup>beta is the standardized partial regression coefficient, b is the unstandardized coefficient, s.e. is the standard error for b, t is the value for the students t, R is the coefficient of multiple correlation.

Taken together, the coefficients support the propositions of civilianization -- both interpretations. The signs for twenty of the 24 beta coefficients were predicted from the civilianization propositions. The important exceptions indicate that the replacement of officers by civilians is related to absolute and per capita reductions in patrol levels.

Overall, the beta coefficients are of moderate size. But this is consistent with the propositions of civilianization and the regression technique. When one civilian supplements sworn personal or replaces a police officer in a single department, an observer would not predict dramatic reductions in expenditures or large increases in patrol levels. The magnitude of the b coefficients, which measures changes in terms of dollars and manpower units, are highly consistent with the moderate impacts that an observer would expect.

An equally important coefficient is the standard error (s.e.) for b. The relatively small values of the s.e. in comparison to b -- coefficients for which t (the ratio of b/s.e.) is greater than 1.65 -- indicate that these relationships are highly consistent for the moderate sized departments in the study. (From the perspective of inferential statistics, these relationships are significant at the .05 level.)

If these small consistent differences in expenditure reductions and patrol increases can be captured by all departments in an urban

area, civilianization can potentially yield large aggregate benefits across states and the nation. But the findings also suggest that institutional impediments limit the implementation and benefits of civilian reform.

#### Savings Interpretation

The savings interpretation can be evaluated by comparing the relationships predicted from the model (Figure 2, left side) with the coefficients computed from the regression analyses (Figure 3, left side). With the important exception of absolute and per capita patrol levels, the signs and relative magnitudes of all coefficients confirm this interpretation (Table 1, left side).

Impact on Patrol. The regression analyses for the patrol variables reveal a major exception to the savings interpretation. The replacement of police officers by civilians -- as statistically represented -- is associated with a reduction in (1) the absolute number of officers that a department deploys for patrol at 10:00 p.m., and (2) the number of patrol officers per 10,000 residents in the serviced jurisdiction. The magnitude of these reductions are moderate. Where a civilian replaces an officer, patrol levels are lower by .12 of a manpower unit (Table 1, equation 1) and per capita patrol levels are lower by .04 of a manpower unit per 10,000 residents (Table 1, equation 2).

Equation 6 (Table 1) identifies the source of these reductions in patrol levels. The replacement of officers by civilians is associated with a reduction of .51 manpower units in the officers assigned to patrol duties. In other words approximately one-half of the reduction in sworn personnel that is associated with civilian

substitutions occurs in patrol assignments and the other half occurs in the administrative and support assignments. This finding contradicts a strict interpretation of the civilianization principle. The reduction should come entirely from administrative and support duties and not reduce the number of officers on patrol or in field assignments. This finding suggests that constraints on duty assignment -- civil service regulations, employment contracts, departmental regulations, operating procedures -- impede manpower reallocation from administrative duties to patrol duties when civilians are employed.

But, in spite of these reductions in patrol assignments, civilian substitution -- as statistically represented -- is associated with a greater percentage of a department's officers on patrol at 10:00 p.m. and a greater percentage of sworn personnel assigned to patrol duties. The magnitude of these impacts is moderate: civilianization is associated with an increase of .46% of a department's sworn personnel on patrol (Table 1, equation 4), and an increase of 1.46% assigned to patrol duties (Table 1, equation 5). In other words, the reduction in the sworn manpower of a department that occurs with civilian substitution -- as represented by the statistical controls -- is associated with higher percentages of officers on patrol and higher percentages assigned to patrol. This finding supports the savings interpretation of civilianization. The analyses of expenditures add further strength.

Impact on Expenditures. Civilian employment -- substitution rather than supplementation -- is consistently associated with lower levels of personnel expenditures for salaries, pensions, and other

fringe benefits. The dollar value of this decrement is \$7,262 (Table 1, equation 9). This value approximates the difference in the expenditures for the salary, pension, and fringe benefits of a sworn officer and a civilian. Reductions in personnel expenditures of this dollar magnitude are highly congruent with the propositions of civilianization. The finding levels further support the validity of the data and the appropriateness of the statistical technique.

The expenditure analyses demonstrate that the substitution of civilians -- as statistically represented -- is associated with a reduction in absolute expenditures as well as absolute patrol levels. Justifications of civilianization hypothesize that the reduction in expenditures should be proportionately greater than the reduction in patrol levels. If this relationship exists, the expenditures per patrol officer would be reduced by civilianization. Equations 10 and 12 present coefficients to test this relationship. As would be predicted from the reform proposals, substitution of civilians for sworn officers is associated with a \$1,213 reduction in expenditures per officer on patrol and \$171 reduction in expenditures per officer in the patrol unit.

As expected, when the dollar savings are distributed over the residents of the jurisdiction, the reduction in per capita expenditures is relatively small. Civilianization is associated with a \$58 savings per 1,000 serviced residents. But the relatively large value of the standard error (\$278) indicates that the \$58 savings is not consistent among departments in the study.

Summary. On the basis of current experience with manpower practices in moderate sized departments, it is clear that

jurisdictions which employ relatively more civilians and fewer officers -- the savings interpretation -- spend less for salaries and wages. But these jurisdictions also experience lower patrol levels. The analyses indicate that the moderate but consistent savings that are associated with civilianization -- as represented by statistical controls -- are proportionately greater than the reduction in patrol levels. Civilian employment is related to lower expenditures per officer on patrol and lower expenditures per officer in the patrol unit. In addition, a larger percentage of a department's sworn officers are assigned to patrol duties and are on patrol at 10:00 p.m. These relationships confirm the predictions of the savings interpretation of civilianization.

But, the reduction in absolute and per capita patrol levels are troubling for this type of civilianization. The data indicate that the replacement of an officer by a civilian is associated with a one-half man reduction in patrol assignments. The reduction in sworn manpower does not come entirely from the administrative and support assignments. Many have suggested an explanation for this finding. The constraints of existing manpower practices -- civil service regulations, employment contracts, municipal and departmental regulations, standard operating procedures, and the distribution of command ranks -- create impediments for reallocation.

#### Effectiveness Interpretation

The effectiveness interpretation can be evaluated by comparing the signs of the regression coefficients (Figure 3) with the relationships predicted from the civilianization principle (Figure 2).

All six coefficients have the predicted signs. Moreover, all 12 equations (right hand side of Table 1) corroborate propositions about the impact of supplementing sworn personnel with civilians.

The impact on patrol levels are moderate and small. The beneficial effects of civilianization appear to be constrained. The coefficients (standardized regression coefficient, and unstandardized regression coefficient) are relatively small in magnitude. But the relatively small standard errors, the significant values of students t, and sizeable values of R indicate that these effects are highly consistent for the departments of the study.

Impact on Patrol. Supplementation of sworn officers with civilians -- as represented by the statistical controls -- is associated with increases in the number and percentage of sworn officers that a department assigns to patrol duties. There is an increase of .12 manpower units in patrol assignments (Table 1, equation 6). This increment results in 1.42% increase in the percentage of sworn officers that a department assigns to patrol (Table 1, equation 5).

These manpower reallocations, however, are associated with only small increases in absolute patrol levels. The size of the increment is .02 manpower units on patrol at 10:00 p.m. (Table 1, equation 1). This increment results in a .27% increase in the percentage of a department's sworn officers that are on patrol at 10:00 p.m. (Table 1, equation 4).

The manpower adjustments of civilianization are also associated with small but consistent increases in the number of patrol officers

for residents of the serviced jurisdictions. The number of officers assigned to patrol for each 1,000 residents increases by .02 manpower units (Table 1, equation 7), while the number on patrol per 10,000 residents increases .04 manpower units (Table 1, equation 2).

Impact on Expenditures. As expected, supplementation of sworn officers with civilians -- as represented by the statistical controls -- is associated with higher expenditure levels. Moderate increases occur in total department expenditures (personnel, equipment, and operations) and total personnel expenditures (salaries, wages, social security, pensions, hospitalization, and other fringe benefits).<sup>5</sup>

If civilianization "really works," the addition of a civilian should release sworn manpower for patrol duties without a proportionate increase in personnel expenditures. The expenditures per patrol officer should be reduced by civilian employment. The coefficients for equations 10 and 12 demonstrate that civilian supplementation -- as statistically represented -- has this impact. The addition of a civilian is associated with a reduction of \$656 in personnel expenditures per officer on patrol at 10:00 p.m. and a reduction of \$237 in personnel expenditures per officer assigned to patrol duties. The higher value of  $t$  (-1.96 as opposed to -1.19) indicates that the reduction of \$237 per officer assigned to patrol duties is much more consistent among police departments than the \$656 reduction per officer on patrol, although the dollar figure is smaller.

This is consistent with the findings reported in the preceding section: civilian supplementation is associated with moderate but

consistent increases in the number and percentage of officers assigned to patrol duties. Although these increments are translated into small increases in patrol levels, the overall effect is not very consistent among departments.

Summary. A survey of the findings highlights a few salient points. Supplementation with civilians -- as statistically represented -- is much more consistently related to reductions in personnel expenditures than increases in patrol levels. Although consistent across departments, the increases in the absolute number and percentage of officers assigned to patrol duties are relatively small. The reductions in expenditure per officer on patrol are also small and consistent.

These findings reinforce the conclusions for the savings interpretations. But they emphasize some problematic questions and issues for civilian reform. To what extent do constraints of the administrative system -- civil service regulations, employment contracts, distribution of command ranks, standard operating procedures in the police service -- impede the reallocation of sworn personnel among assignments as civilianization occurs?

## VI. Conclusions and Policy Implications

### A Perspective for Policy Recommendations

Local government and police officials will want to know what implications these findings have for their conduct of police manpower policy. First, it is important to specify the constraints on policy recommendations that are necessarily introduced by the data and analytic techniques.

In one sense, the tests compare the patrol levels and expenditures of departments that employ different proportions of civilian and sworn personnel, but that are the same with respect to the other control variables (population of the jurisdiction, number of officers assigned to specialized field duties such as investigation, salary levels, and number of total personnel). We have not studied the results of "policy" experiments in which two (or more) departments implement the civilianization principle in its different applications.

But the research approach used has major advantages. We can assess the average tendencies in patrol and expenditures for a large number of departments that employ different combinations of civilians and officers in different settings -- with controls for the most relevant differences. Our conclusions are based on the typical average experiences of a large number of departments. Research is not confined to a few departments selected because their immediate policies conform to the needs of a quasi-natural policy experiment. We are less likely to report temporary instabilities in manpower practices as major consequences of the policy reform.

The results are not subject to the criticism that those police departments which find themselves in circumstances (the most common example is a federal or state grant for innovation) such that they consciously implement a given policy change and allow systematic outside study are inherently atypical. An additional criticism is that the major policy consequences are likely to be extremely short lived. The cross sectional approach is not as sensitive to the short term instabilities associated with policy

reform. By studying a cross section of departments in different stages of change, only the strong consistent tendencies among all departments will be measured in regression studies. But as is the case in nearly all policy research these data do not support recommendations for specific departments.

#### Policy Implications

Civilianization in both its forms is consistently associated with moderate and small reductions in the total personnel expenditures per sworn officer assigned to patrol duties and per sworn officer on patrol at 10:00 p.m. Civilianization is also consistently related to moderate and small increases in the percentage of a department's officers that are assigned to patrol duties and that are on patrol at 10:00 p.m. If it is assumed that each officer on patrol produces equal service levels, these findings suggest that civilianization is associated with small increases in the productivity of service provision.

From the perspective of the individual mayor or police chief, the potential dollar savings and service increases will be small in comparison to total local expenditures and total patrol manpower. However, when these small increments are aggregated for all departments of an urban area, within a state, and across the nation, the tax dollar value will be sizeable.

The findings suggest a potentially much more important source of savings in the production of police services. Civilianization may be associated with more competitive labor markets for police manpower. This may in turn reduce the price of the labor input (sworn personnel) which constitutes 85% to 95% of the total cost

for municipal police services. The reduced expenditure levels associated with civilianization may reflect these labor market conditions for sworn personnel as will cost reductions due to civilian substitution in the department.

This needs more explanation. Conditions -- such as restrictive POST and civil service regulations, high training and education requirements, and restrictions on seniority and pension transfers may foster monopolistic positions over labor supply for police employee associations. This position of influence may in turn be used politically to increase the force of the above type of legislation which in turn reduces flexibility in the use of civilians and allocation of sworn personnel. Our data may reflect the fact that civilians are more frequently used in labor markets that are less restrictive and more competitive.

The data suggest a reservation about the potential gains of civilianization. The analyses for both interpretations indicated that the sworn manpower freed up for field duties by civilian employment was relatively small. Bureaucratic and institutional factors -- such as civil service and POST regulations, contracts with employee associations, the distribution of command ranks, standard operating procedures -- may substantially impede the flexibility in manpower assignment at the department level that is necessary to capture the benefits of civilianization. Under these conditions civilian employment may simply reduce the work load of sworn officers. Productivity would decrease.

These issues need further investigation. Do the increasing restrictions on police personnel policies -- such as the new POST regulations, the extended bargaining rights for employee associations,

civil service regulations, higher training standards, more education requirements -- substantially limit competition in police labor markets and flexible departmental policies that facilitate productivity increases through civilian employment.

## FOOTNOTES

<sup>1</sup> Zero order correlation coefficients confirm all of the primary linkages in the model of Figure 1. Given these findings and the simplicity of the model, detailed analysis of the model itself is not justified for the purposes of this paper. However, the linkages of personnel allocations with patrol and expenditures at the right side of the chart will come under intense scrutiny as we reason through the implications and tests of the civilianization principle.

<sup>2</sup> In this paper, regression analysis is used primarily as a measurement device to describe relationships in a data set rather than to make inferences about relationships in a sampled population. Under these conditions, the standard error (s.e.) for the slope (b) of an independent variable is a measure of the standard deviation of the cases (that is associated with the given variable, holding the others constant) from the regression plane. As the value of the s.e. increases toward the value of b, the deviation of residuals increases. The direction and strength of the relationship that is measured by b is not consistent across the cases included in the regression analysis. In other words the "predictive power" of that variable decreases. This does not mean that the test was a failure. These results demonstrate that a relationship between the dependent and independent variable is weak or non-existent in the data set, given the controls for the other variables. This constitutes important information.

<sup>3</sup> Student's t is used to establish the significance of a partial regression coefficient for a sample as an estimate of that value for a larger population. Here we are using regression analysis primarily to describe relationships in a data set rather than to make inferences to a larger population. However, because of the emphasis placed on significance levels by social scientists, values of t are presented in Table 1. For a one-tailed test with 120 cases or more, values of t are significant at approximately the following levels: t=1.28 is significant at p=.10; t=1.65 is significant at p=.05; t=1.97 is significant at p=.025; t=2.34 is significant at p=.01; t=2.59 is significant at p=.005; and t=3.33 is significant at p=.0005.

<sup>4</sup> The standardized partial regression coefficients (beta) are being used to test the propositions that are presented to justify civilianization. A regression equation is not being used to test a model that purports to explain patrol and expenditure levels. The objective is to determine how civilian employment affects patrol and expenditures given controls for other significant variables. The model in Figure 1 that was developed to reason through the design of the analysis is not being tested. As indicated by the exogenous variables, acknowledged influences and linkages have been omitted from the model. For this reason, the coefficient of multiple correlation (R) is not the appropriate criteria to evaluate the regression findings. But the high values of this coefficient for the absolute levels of expenditures (R=.92) and patrol (R=.77) should be noted. These values indicate that the control variables, included in the test, have substantially accounted for "other" influences on patrol and expenditure levels.

<sup>5</sup> The fact that the increase in personnel expenditures (\$2,396, Table 1, equation 9) is less than that usually required by a full-time civilian (approximately \$7,000) raises some interesting questions. In effect the statistical controls compare departments with different levels of civilian employment but with the (1) same number of sworn officers, (2) same number of officers in specialized field assignments (traffic, investigation, and juvenile duties), and (3) equivalent salary levels for the highest paid patrolman. It appears that police departments that hire more civilians do one or more of the following: they spend less for their field specialists; their beginning patrolmen; their sworn officers in administrative and support duties; and/or for police pensions, medical expenses, and fringe benefits. These effects on the price of input factors are consistent with the proposition, discussed in Section I, that civilianization increases the competitiveness on the supply side of the labor market for sworn police personnel. If this is occurring, it would seem to be a highly desirable effect of civilianization.

These same factors would also account for the negative sign of the coefficient for salary expenditures per 1000 residents in the serviced jurisdictions (Table 1, equation 11, right side). However, the large value of the standard error relative to the unstandardized coefficient (s.e. = \$250 and b = -\$33) indicates that the sign of this relationship is not consistent (or predictable) departments.

## REFERENCES

- Blalock, H. M., Jr., ed. Causal Models in the Social Sciences. Chicago: Aldine Publishing Company, 1971.
- Blalock, H. M., Jr. "Correlated Independent Variables: The Problem of Multicollinearity." Social Forces, 42, 1963, 233-37.
- Bohrstedt, George W. and T. Michael Carter. "Robustness in Regression Analysis" in Herbert L. Costner, ed., Sociological Methodology, 1971. San Francisco: Jossey-Bass Inc., Publishers, 1971.
- Eastman, George D., ed. Municipal Police Administration, 6th edition. Washington, D.C.: International City Management Association, 1969.
- Eisenberg, Terry, Kent, Deborah Ann, and Charles R. Wall. Police Personnel Practices in State and Local Governments. Washington, D.C.: International Association of Chiefs of Police and Police Foundation, 1973.
- Farrar, Donald E. and Robert R. Glauber. "Multicollinearity in Regression Analysis: The Problem Revisited." Review of Economics and Statistics, 49, 1967, 92-103.
- Frank, Ronald E. "Use of Transformations," Journal of Marketing Research, 3, August 1966, 247-253.
- Germann, A. C. Police Personnel Management. Springfield, Ill.: Charles C. Thomas Publishing, 1958.
- Gordon, Robert A. "Issues in Multiple Regression," American Journal of Sociology, 75, August 1968, 592-616.
- Grafer, Elmer D. American Police Administration: A Handbook on Police Organization and Methods of Administration in American Cities. New York: Bureau of Municipal Research, 1921.
- Kruskal, Joseph B. "Statistical Analysis: Transformation of Data" in International Encyclopedia of the Social Sciences, Vol. 15. New York: Macmillan and Free Press, 1968, pp. 182-193.
- National Advisory Commission on Criminal Justice Standards and Goals. Police. Washington, D.C.: United States Government Printing Office, 1931. (Also known as the Wickersham Commission.)
- National Commission on Productivity and Work Quality. Improving Police Productivity: More for Your Law Enforcement Dollar. Washington, D.C.: U.S. Government Printing Office, 1975.
- President's Commission on Law Enforcement and Administration of Justice. Task Force Report: The Police. Washington, D.C.: United States Government Printing Office, 1967.
- Saunders, Charles B. Upgrading the American Police: Education and Training for Better Law Enforcement. Washington, D.C.: The Brookings Institution, 1970.
- Wilson, O.W. and Roy C. McLaren. Police Administration, 3rd edition, New York: McGraw-Hill Book Company, 1972.
- Wolfe, Joan L. and John F. Heaphy. Readings on Productivity in Policing. Washington, D.C.: Police Foundation, 1975.
- Wonnacott, Ronald J. and Thomas H. Wonnacott. Econometrics. New York: John Wiley and Sons, Inc., 1970.

APPENDIX A

Partial Correlation Coefficients: Civilian Utilization with Patrol Deployment and Expenditures with Controls for Total Manpower<sup>a</sup>

	Nos. Civilians	Nos. Civilians Nos. of P.O.	Nos. Culin Disptc	Culin Disptch Total Disptch	Nos. of Ser- vices Produced	No. Splclst P.O. No. P.O. in Ptl	Presence of Coll. Barg. Assn.	Hrs. of Training	P.D. in N.E.	P.D. in South	P.D. in West
P.O. in Ptl Unit	-.75	-.71	-.42	-.40	.22	-.46	.06	-.13	.28	.10	-.25
Pct. P.O. in Ptl.	-.08	-.16	-.02	.06	.01	-.85	-.04	-.08	-.11	.16	-.03
Ptlmen/Pop.	-.12	-.20	-.19	-.22	-.03	-.22	-.10	-.01	-.08	.19	-.08
P.O. on Beat, PM	-.27	-.22	-.09	-.08	.16	-.22	-.02	-.05	.04	.03	-.06
Pct. Ptl. on Beat	.19	.23	.20	.19	.01	.22	-.05	.07	-.14	-.02	.08
Pct. P.O. on Beat	.13	.16	.18	.19	.07	-.12	-.03	.06	-.14	-.02	.11
P.O. on Beat/Pop.	-.11	-.15	-.09	.10	.07	.21	.01	.01	.08	-.04	-.02
Total Expend.	-.35	-.25	-.44	-.16	.40	.18	.21	.01	.05	-.15	.08
Sal. Expend.	-.48	-.30	-.04	-.21	.41	.21	.16	-.01	.25	-.27	-.14
Swrn Sal. Expend.	-.74	-.50	-.00	-.35	.43	.13	.11	-.14	.52	-.16	-.45
Sal. Expend./Pop.	.03	.03	-.10	-.12	.01	.08	.10	.22	.18	.08	-.03
Sal. Expend./Beat	-.07	-.08	.18	-.14	.03	.45	.12	.10	.24	-.20	-.06
Sal. Expend./Swrn	.13	.19	-.12	.06	.14	.39	.29	.33	.17	-.36	.15

<sup>a</sup>Coefficients in upper half of table are controlled for (1) total manpower, (2) number of police officers assigned to specialized duties, (3) population of the city. Coefficients in the lower half of the table are controlled for (1) total manpower, (2) number of police officers assigned to specialized duties, (3) highest salary earned by a patrolman.

APPENDIX B

Partial Correlation Coefficients: Civilian Utilization with Patrol Deployment and Expenditures with Controls for Number of Police Officers<sup>a</sup>

	Nos. Civilians	Nos. Civilians Nos. of P.O.	Nos. Culin Disptc	Culin Disptch Total Disptch	Nos. of Ser- vices Produced	No. Splclst P.O. No. P.O. in Ptl	Presence of Coll. Barg. Assn.	Hrs. of Training	P.D. in N.E.	P.D. in South	P.D. in West
P.O. in Ptl Unit	.29	.21	.37	.37	-.02	-.22	.00	-.04	-.18	.27	-.01
Pct. P.O. in Ptl.	.35	.26	.29	.36	-.10	-.84	-.08	-.03	-.30	.23	.08
Ptlmen/Pop.	.13	.04	.00	-.03	-.10	-.19	-.12	.01	-.19	.22	-.02
P.O. on Beat, PM	.09	.11	.16	.17	.07	-.13	-.05	-.01	-.11	.07	.03
Pct. Ptl. on Beat	.04	.10	.09	.09	.05	.14	-.05	.05	-.08	-.02	.03
Pct. P.O. on Beat	.12	.12	.17	.18	.07	-.20	-.04	.05	-.14	.01	.11
P.O. on Beat/Pop.	.11	.06	.07	.06	.01	.29	-.00	.03	-.03	-.01	.04
Total Expend.	.17	.20	.27	.18	.28	.28	.17	.08	-.18	-.07	.20
Sal. Expend.	-.04	.08	.09	.08	.32	.43	.14	.06	.06	-.24	-.03
Swrn Sal. Expend.	-.42	-.24	-.20	-.15	.45	.47	.11	-.10	.44	-.17	-.41
Sal. Expend./Pop.	-.04	-.05	-.13	-.16	.03	.07	.10	.21	.20	.07	-.05
Sal. Expend./Beat	-.14	-.16	-.18	-.19	.05	.50	.13	.09	.27	-.21	-.08
Sal. Expend./Swrn	.11	.16	.11	.05	.15	.35	.29	.33	.15	.34	.14

<sup>a</sup>Coefficients in upper half of table are controlled for (1) total manpower, (2) number of police officers assigned to specialized duties, (3) population of the city. Coefficients in the lower half of the table are controlled for (1) total manpower, (2) number of police officers assigned to specialized duties, (3) highest salary earned by a patrolman.

## APPENDIX C

Zero Order Correlation Coefficients for Primary Variables<sup>a</sup>

	Nos of Civlms	Total Dept Mnpwr	Nos of POs	Salary Level	Field Spclst	Pop Served	POs on Patrol	Total Salary Expend.
Nos of Civlms	1.00	.47	.23	-.03	.26	.26	.23	.23
Total Dept Manpwr		1.00	.96	.20	.70	.72	.73	.83
Nos of POs			1.00	.24	.71	.71	.76	.86
Salary Level for POs				1.00	.34	.28	.10	.49
Spclzd Field Assgnts					1.00	.60	.48	.73
Pop Served by PD						1.00	.53	.65
Nos POs on Patrol							1.00	.58
Total Salary Expend								1.00

# END

<sup>a</sup> The number of cases varies from 225 to 273. These are medium-sized municipal police departments of 10 to 49 sworn police officers.