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Table of Contents

About the Editors

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City–Suburban Variations in Police Expenditures*

Roy Bahl and Greg Lewis

The objective in this paper is to describe and explain city-suburban disparities in expenditures for police protection. The question is whether cities have higher police expenditures than suburbs because they face different conditions or because they respond differently to those conditions. A model for the determination of police compensation and employment levels is specified and tested on 1979 data for 66 SMSA's with central city populations in excess of 100,000. The results of this analysis show that city-suburban disparities in per capita expenditures for police services are both pronounced and variable by region. In part the disparities are due to the greater need for police services in cities—crime rate and population size exert important pressures on police spending in cities, but not in suburbs. In part, however, the disparities are due to institutional arrangements and policy choices—unionization and local government structure.

The study of city-suburb fiscal disparities is not new to those interested in local public finance. The courts have asked in deciding school finance cases whether the higher level of central city spending is necessary or discretionary. The federal government has asked whether higher levels of need justify increased aid to central cities. Bond rating agencies have asked whether central cities are inherently poorer credit risks than their surrounding suburbs. So far, there have been no clear

*The authors are indebted to Professors Janet Johnson and Jan Ondrich for a number of helpful comments regarding the preparation of this paper.

answers. Such ambiguities, together with the prospects of another new federalism, which shifts more fiscal responsibility to state and local governments, underline the need to gain a better understanding of intrametropolitan fiscal disparities.

The objective in this paper is to describe and explain the city/suburban disparity in expenditures for one locally provided service, police protection. The question is whether cities have higher police expenditures than suburbs because they face different conditions or because they respond differently to those conditions. A model for the determination of police compensation and employment levels is specified and tested on 1979 data for 66 Standard Metropolitan Statistical Areas (SMSA) in the U.S. with central city populations in excess of 100,000.

The unit of analysis is overlapping governments within SMSAs. "Central city" refers to all city governments overlying the central city area (as defined by the census), i.e., multiple central cities like Los Angeles-Long Beach are treated as one city. "Suburb" refers to all governments except the "central city." Note that comparisons based on these definitions will understate disparities between cities and suburbs, because county and special district police employment and expenditures are attributed wholly to suburbs. This bias should be minimal because police protection is primarily the responsibility of municipalities.

VARIATIONS IN POLICE SERVICES

Both criminal activity and police expenditures vary substantially between cities and suburbs as well as among regions (Table 1). In all regions, crime rates, police employment, salaries, and expenditures are higher in central cities than in suburbs. Suburban crime rates average only 57 percent of their respective city rates. On average, suburban governments hire only 61 percent as many uniformed officers per 10,000 population, but each officer has to deal with only 89 percent as many reported crimes. The suburbs pay their officers from 10 to 20 percent less and have a much lower level of per capita expenditures (45 percent less) than do cities.

Regional variations are not so consistent. Northern cities have the lowest crime rates but hire the most police. The West differs in many respects. Western cities suffer the most crime, hire the fewest police, and pay them the highest salaries, but have relatively low per capita expenditures. Western cities hire only 63 percent as many police officers as do northern cities, despite a crime rate that is 16 percent

higher. Among suburbs, those in the West have the highest crime rates, the highest police compensation, and the lowest police employment levels, but, unlike western cities, they also have the highest per capita expenditures. In general, the West also displays the least disparity between cities and suburbs. Suburban crime rates are over 70 percent as high as city crime rates in the West, but only 50 percent as high as the urban rates in the rest of the nation. Although the greatest pay differentials are in the West, western suburbs hire 72 percent as many police as their cities, while other suburbs hire only about 60 percent as many. They spend 66 percent as much as their central cities overall, while suburbs in other regions spend only 50 to 56 percent as much as their cities.

The result of these regional differences is that per capita expenditures in SMSAs are highest in the West, where salaries are the highest and employment levels the lowest, and in the North, where employment levels are the highest and salaries are low.*

THE DETERMINANTS OF POLICE EXPENDITURES

Most recent work on police expenditure determinants relies on a straightforward constrained maximization model from microeconomic theory. A set of community preferences for government and private goods is assumed, and the community is assumed to maximize its satisfaction given a set of prices for public and private goods and an income constraint. This process and another heroic assumption or two lead to the estimation of a demand function in which police output is a function of the price of a unit of police services, the price of all other goods, personal income, and various indicators of tastes, needs, or preferences.[1]

The major difficulty with this approach is how to finesse the problem of measuring a unit of police service or its price. Two schools of thought have emerged. One, the expenditure approach, uses per capita expenditures as the proxy for output and assumes a constant labor share in total output,[2] and the other assumes that police output is proportional to police employment and that a fixed amount of nonlabor input is required for each employment unit.[3]

The primary weakness of the expenditure approach is that price

*Although there is no statistically significant simple correlation between average police compensation and police employment, per capita police expenditure is highly and positively correlated with both: for the 66 SMSAs, the correlation is .71 with employment and .54 with compensation.

Table 1

Variations in Components of Police Expenditures and Activities: Means and Coefficients of Variation[a,b]

	Total	*North*	*Central*	*South*	*West*
Number of SMSAs	66	17	15	22	12
Per Capita Expenditures					
SMSA	$49.42 (27.6)	$51.36 (32.9)	$47.46 (25.8)	$47.84 (29.4)	$52.04 (18.4)
city	69.83 (44.9)	74.37 (36.0)	70.14 (36.8)	67.19 (65.4)	67.81 (19.7)
suburb	38.95 (32.5)	41.36 (35.9)	34.74 (24.2)	36.81 (36.3)	44.72 (24.4)
city/suburb	1.87 (38.5)	1.91 (32.8)	2.03 (28.7)	1.87 (49.6)	1.61 (34.7)
Police Employment per 10,000 population					
SMSA	19.2 (28.2)	23.0 (32.7)	18.5 (25.4)	18.6 (16.9)	15.9 (18.7)
city	25.6 (38.9)	31.2 (29.8)	25.4 (38.2)	24.8 (44.0)	19.6 (26.7)
suburb	15.8 (28.2)	18.8 (35.2)	14.7 (18.9)	15.1 (18.5)	14.2 (20.8)
city/suburb	1.66 (34.8)	1.76 (29.7)	1.71 (26.0)	1.68 (44.2)	1.43 (31.1)
Average Compensation[c] Per Police Officer					
SMSA	$17,738 (16.5)	$17,145 (8.4)	$17,563 (11.1)	$16,205 (16.9)	$21,608 (12.2)
city	19,204 (21.4)	18,128 (10.7)	18,763 (11.0)	17,490 (18.5)	24,423 (22.9)
suburb	16,375 (17.7)	16,337 (10.0)	16,429 (13.1)	14,648 (20.1)	19,524 (13.0)
city/suburb	1.18 (18.5)	1.11 (12.6)	1.15 (8.0)	1.21 (13.0)	1.27 (32.8)

Table 1 *(Continued)*

Variations in Components of Police Expenditures and Activities: Means and Coefficients of Variation[a,b]

	Total	*North*	*Central*	*South*	*West*
Crimes per 10,000 population					
SMSA	632.9 (21.2)	538.5 (22.8)	575.8 (14.1)	675.0 (18.5)	760.6 (10.7)
city	865.8 (23.9)	816.8 (29.9)	831.4 (25.6)	884.4 (22.8)	943.9 (14.4)
suburb	500.7 (30.3)	404.0 (21.9)	445.6 (19.8)	518.2 (32.9)	674.5 (12.2)
city/suburb	1.82 (27.2)	2.04 (23.8)	1.93 (28.8)	1.80 (24.9)	1.41 (17.0)
Crimes per Police Officer					
SMSA	35.0 (31.9)	24.6 (24.4)	32.7 (25.1)	37.0 (21.8)	49.0 (17.6)
city	37.5 (34.7)	27.9 (35.8)	35.4 (30.4)	39.3 (30.5)	50.2 (19.9)
suburb	33.5 (37.3)	22.8 (25.7)	31.6 (32.5)	34.4 (29.2)	49.1 (20.3)
city/suburb	1.20 (38.6)	1.28 (42.2)	1.18 (30.1)	1.25 (44.9)	1.04 (21.3)

[a]Coefficients of variation shown in parentheses.
[b]Unweighted means.
[c]Average October earnings multiplied by twelve.

Sources: U.S. Department of Commerce, Bureau of Census, *Local Government Finances in Selected Metropolitan Areas and Large Counties: 1978–79* (Washington, D.C.: U.S. Government Printing Office, 1980) pp. 104–145; *Local Government Employment in Selected Metropolitan Areas and Large Counties: 1979* (Washington, D.C.: U.S. Government Printing Office, 1980) pp. 80–116; U.S. Department of Justice, FBI Uniform Crime Reports, *Crime in the United States 1979* (Washington, D.C.: U.S. Government Printing Office, 1980) pp. 60–86.

and quantity variations are collapsed into one measure. This suggests the underlying assumption that either (a) both higher prices and higher service levels increase community satisfaction, or (b) all governments pay the same price for a unit of police services. By ignoring relative prices, these studies mask the process of resource allocation and make little headway in separating the factors that affect demand for public goods from those that affect supply.

The public employment approach treats per capita police employment as the output proxy and then estimates supply and demand equations for police employees. This approach is plausible if the quantity and quality of police protection are dependent on the number of police officers. On the other hand, such non-labor inputs as patrol cars, dispatching systems, and police computers also affect the quality of service. The employment approach assumes a fixed-factor production function. If there is a trade-off between police manpower and non-labor inputs, the employment approach cannot capture it. Nonetheless, the view here is that the decided advantage of being able to separate price and quantity effects makes employment the superior proxy.

MODEL SPECIFICATION

The approach taken here is to specify a behavioral model of police spending, to estimate its parameters, and to use these observed relationships to better understand central city-suburban variations in police expenditures. The model used is an adaptation of one developed by Bahl, Johnson and Wasylenko and benefits from other police expenditure determinants studies, which are summarized in Appendix Table A.[4] It requires estimation of compensation and employment equations to represent supply and demand effects, respectively. A third equation to allow for the simultaneous determination of crime rates and police employment, which has been used with success in various studies of city crime and police,[5] is rejected here because of the weak interaction between police employment and crime rates at the metropolitan area level. Variable sources, definitions, and mean values are listed in Appendix Table B.

The Compensation Equation

The average salary (SALARY) of uniformed police officers is specified as a function of the level of unionization of police employees (UNION), the opportunity wage in the private sector (MFGWAGE), per capita personal income (INCOME), central city dominance of the police labor

market (PCTCITY), the number of officers employed (OFFICERS), and region (WEST, SOUTH, NORTH).

UNION. Many researchers have found that strong unions mean higher police salaries. Police unions have been reputed to have not only the economic power of private sector unions but to benefit from (a) political power over relevant politicians, (b) the sympathy of local citizens, and (c) an inelastic demand for police services. Though some research on union power in comparable public and private occupations finds no significant advantage for public sector unions, most studies have found that unions have small but statistically significant positive effects on police and firefighter salaries.[6] Union strength is measured here as the percentage of central city police officers who are union members.

MFGWAGE. Theory leads us to expect that public sector wage rates will rise with the opportunity wage. For a service-intensive, multiple goal public good such as police protection, measurement of output is so difficult that setting salaries equal to marginal productivity would present an impossible task. Instead, the expectations of both public employers and employees are that governments will pay the "going rate" for employees—based on some notion of comparability. In past determinants studies, that rate has generally been specified as a fixed proportion of average manufacturing wages in the SMSA. The same practice is followed here.

INCOME. Per capita income or some other measure of community prosperity has been introduced as an explanatory variable in most studies and found to have a positive and significant coefficient. Generally, it has been taken as a measure of ability to pay, but a case can also be made for using income as a proxy for the opportunity wage. As employment shifts increasingly from manufacturing to the service sector, police officers have far more job alternatives than factory work. Per capita income may offer a better proxy for what workers in general are earning in an SMSA than do manufacturing wages.

PCTCITY. Researchers have found evidence of monopsony power in the determination of teacher salaries,[7] but the one study of monopsony power in police hiring found that the greater the share of SMSA population residing in the central city, the higher the police salaries.[8] This study rejected the monopsony hypothesis, but the potential for the dominant employer to exert market power remains. Most SMSAs are dominated by one central city government, which hires the bulk of the police. The larger the city relative to the SMSA, the greater should be its market power and, accordingly, the lower should be average salaries.

OFFICERS. Monopsony power is effective only if demand is restricted. In any type of market, as the quantity of police officers demanded rises, the price should also rise. Schmenner, Victor, Wasylenko, and Bahl *et al.*[9] have demonstrated a positive effect of employment levels on salaries, but there is little agreement on whether the response is elastic or inelastic.

REGION. As discussed earlier, variations in salaries across regions are substantial, with compensation being particularly high in the West and particularly low in the South. To account for these variations, dummy variables were entered with the expectation of a positive coefficient for WEST and negative ones for SOUTH and NORTH.

The Employment Equation

The demand for police officers (OFFICERS) is specified as a function of the price of a uniformed officer (SALARY), the price of other goods and services (COST), the crime rate (CRIME), the size of the population to be served (POP), the degree of metropolitan fragmentation (PCGOVT), and the form of city government (MGR).

SALARY. A higher cost for a police officer should discourage the hiring of police. Ehrenberg performed two-stage least squares regression to adjust for the simultaneous determination of salaries and employment.[10] Both found inelastic demands for police employees. Ehrenberg estimated the own-price elasticity at -0.281, while Bahl *et al.*, estimated -0.320.

COST. Where prices of other goods and services are higher, the hiring of police will appear cheaper in comparison, and accordingly, the quantity of police demanded should be greater. The intermediate budget for a family of four, computed by the U.S. Bureau of Labor Statistics, is used as a proxy for those prices.

CRIME. The effect of crime rates on police expenditures is not as strong as one might expect. Most researchers using two-stage least squares have found crime rates to have a statistically significant, though not necessarily large effect on police employment and expenditures. Hakim, for instance, argues that police expenditures are determined primarily by resource availability and only secondarily by crime rates.[11] On the other hand, Jones examined 12 one-year changes for 155 cities and found that year-to-year changes in expenditures and employment had virtually no relationship to year-to-year changes in crime rates.[12] Carr-Hill and Stern, using two-stage least squares and police employment, also found that knowledge of crime rates added nothing

significant to their employment equation.[13] In fact, the crime coefficient was negative.

POP. While Hirsch's study of St. Louis found no significant correlation between population and per capita police expenditures once other factors were held constant,[14] most studies have found per capita expenditures rising with population. The conclusion that positive correlations measure diseconomies of scale is only one of several possible interpretations of the data, however. The reported results may also mean that,

(a) while population grows arithmetically, externalities grow geometrically;[15]

(b) economies of scale exist but are hidden by factors such as population density, which are associated with large populations; or

(c) larger cities provide higher quality services (and more services to non-residents) than do smaller cities.

Kasarda presents an interesting perspective with a path analysis that finds central city police expenditures more highly correlated with suburban than with central city population growth.[16] He argues that this could be expected because cities must provide "free" services to suburban commuters.

PCGOVT. Several researchers suggest that political fragmentation of the metropolitan area leads to lower police expenditures. Adams entered the number of jurisdictions per county as a variable "under the premise that balkanization of a county area leads to an undervaluation of social benefits by each political unit due to benefit spillovers, and thus to an underallocation of resources."[17] Others have found evidence to support a negative correlation between number of jurisdictions and per capita public expenditures, but do not all agree with Adams on the normative implications. Braswell in particular implies that the same quality of public services is provided at lower cost in fragmented metropolitan areas due to efficiency gains.[18] If we accept the findings of Mehay and Hakim,[19] among others, that increased police effectiveness in one jurisdiction drives crime to neighboring jurisdictions, the "balkanization" of metropolitan areas should more likely lead to over- rather than underallocation of police services.

MGR. The form of city government may also affect the delivery of services. The literature on city reform has argued that professional management leads to more efficient and lower cost service provision.

Lineberry and Fowler have also found that reformed cities tend to be less responsive to citizen demands than unreformed cities.[20] Either theory would suggest lower police expenditures in city manager cities, either from pure efficiency improvements or from failure to respond to public pressure for unproductive police deployment. A dummy variable is used in this model to indicate the presence of a council-manager form of government.*

The Model Restated

A set of equations is proposed to account for the simultaneous determination of police compensation and employment levels. The equations to be estimated are:

(1) $SALARY = f(UNION, MFGWAGE, INCOME, PCTCITY, OFFICERS, NORTH, WEST, SOUTH)$

(2) $OFFICERS = f(SALARY, COST, CRIME, POP, PCGOVT, MGR)$

In the compensation equation, all coefficients are expected to be positive except those for PCTCITY, NORTH, and SOUTH. In the employment equation, the coefficients should be positive for COST, CRIME, and POP and negative for the others.

This approach ignores private alternatives to public police protection, despite work by Clotfelter and Vehorn suggesting significant cross-price elasticities between public and private protection methods.[21] The difficulty of obtaining prices for such goods as padlocks, firearms, and private detective agencies is the weak justification for their omission.

STATISTICAL RESULTS

The employment and compensation models are estimated using two-stage least squares with OFFICERS and SALARY as endogenous variables. Separate equations have been estimated for central cities and suburbs. The prime objective here is to derive a reduced form equation for explaining city-suburb variations in per capita police expenditures. Results are presented in Table 2.

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*In most cases of multiple central cities, all cities had the same form of government. In the six cases where forms differed, the dummy variable was coded to represent the form of the largest government.

Table 2

Regression Coefficients and T-Statistics for Compensation and Employment Equations: SMSAs, Central Cities, and Suburbs[a]

Salary Equations

	SMSA	*City*	*Suburb*
UNION	27.4	32.7	20.7
	(2.82)	(2.01)	(2.07)
MFGWAGE	– 11.2	– 15.4	– 9.3
	(1.61)	(1.35)	(1.28)
INCOME	0.90	0.93	0.84
	(2.84)	(1.90)	(2.47)
PCTCITY	– 27.6	– 18.5	– 44.1
	(1.64)	(0.62)	(2.60)
OFFICERS	169	106	262
	(2.08)	(1.40)	(2.29)
NORTH	– 2390	– 2740	– 2220
	(2.75)	(1.96)	(2.42)
WEST	3220	4830	2050
	(3.55)	(3.18)	(2.30)
SOUTH	– 1370	– 1460	– 1780
	(1.73)	(1.11)	(2.19)
Constant	9000	11000	8200
R^2	.64	.50	.61
Standard Error	$1940	$3200	$2000

Employment Equations

	SMSA	*City*	*Suburb*
SALARY	– 0.0012	– 0.0012	– 0.0006
	(3.85)	(3.06)	(1.40)
COST	0.0015	0.0015	0.0014
	(4.89)	(2.69)	(3.48)
CRIME	0.0035	0.0081	0.0028
	(0.67)	(1.67)	(0.54)
POP	0.0020	0.0034	0.0008
	(5.45)	(4.55)	(1.18)
PCGOVT	– 0.157	–	– 0.197
	(2.67)	–	(3.63)
MGR	–	– 3.9	–
	–	(1.77)	–
Constant	5.96	6.89	2.81
R^2	.54	.44	.34
Standard Error	3.86	7.75	3.85

Compensation Equation

All coefficients in the salary equation, except the manufacturing wage, have the correct sign. The effects of unionization and per capita income are positive and significant. A strong union in the central city increases police salaries not only in the city but also in the surrounding suburbs. A point estimate of the effects of total unionization (100%) versus no unionization is a salary difference of $3,262 among central cities (16.9%) and $2,072 (12.2%) among suburbs. This is within the 6–16 percent range estimated by Ashenfelter[22] and the 2–18 percent range estimated by Ehrenberg[23] for firefighters' wages, and similar to the 17.5 percent estimated by Bahl *et al.*[24] for police salaries. Higher per capita income is associated with higher police salaries: a one-dollar higher per capita income is associated with an 85¢ to $1 higher level of police salaries.

There is some support for the monopsony hypothesis in the suburban equation. The average salary is about $44 lower for each 1 percent greater share of the metropolitan population living in the central city. No such effect is evident in the central city. The surprising implication is a monopsony effect from which the non-monopsonists benefit.

The troubling result in the salary equations is the negative coefficients on the manufacturing wage variable. This suggests that police salaries rise when the opportunity wage falls, and vice versa. This may be an artifact resulting from the depressed state of the manufacturing sector in the late 1970s, making manufacturing earnings a poor proxy for opportunity wage. In any case, our results contradict those in Ehrenberg[25] and Bahl *et al.*[26]

Even controlling for all of these effects, regional variations are important. Treating the Midwest region as the base, we find that western salaries are substantially higher, by $2,000 in the suburbs, and nearly $5,000 in the cities. Northern and southern salaries are lower than those in the Midwest—from $2,100 to $2,700 lower in the North and from $1,400 to $1,800 lower in the South.

Employment Equation

The coefficients of the SMSA employment equation all have the hypothesized sign and, except for the crime variable, are significant at the .01 level. The estimated own-price elasticity for police employment is −1.03, which is considerably more elastic than the −0.281 reported by Ehrenberg[27] and the −0.320 found by Bahl *et al.*[28] The number of officers hired rises with the cost-of-living, with a cross-price elasticity of

1.61. As the relative price of goods in general becomes higher, hiring more police looks like a bargain.

Police employment per 10,000 population rises with SMSA population, suggesting that large populations present adverse conditions for supplying police services. It may also imply diseconomies of scale, since employment is lower where there are more governments per 100,000 population. These results are consistent with the hypothesis that more fragmented SMSAs hire too few police because small governments ignore external effects of their police expenditures. Research on the exportation of crime, however, suggests that the primary externalities of increased police effectiveness experienced by neighboring jurisdictions are negative. Lower police employment levels in "fragmented" metropolitan areas imply either that these smaller governments are able to provide services more cheaply or that they are responding to less public demand for police services.

The employment equations do not fit so well for the separate city and suburban samples. City police employment is positively correlated with crime rates, the cost-of-living, and SMSA population. The results also suggest substantially lower employment levels (four fewer officers for every 10,000 population) in council-manager cities. This coefficient, significant at the .05 level for a one-tailed test, indicates either greater efficiency or less responsiveness to demands for greater police expenditures.

The suburban employment equation shows lower coefficients and significance levels for salary levels, crime rates, cost-of-living, and population size than does the city employment equation. Only the cost-of-living and fragmentation coefficients are clearly significant. If a metropolitan area had ten more local governments per 100,000 population, we would expect it to have approximately two fewer officers per 10,000 residents.

Pooled Results

To test whether suburban governments respond to the same socioeconomic factors differently from city governments, the data were pooled and a dummy interaction variable was introduced for each independent variable (cities were coded zero). Where these interaction dummy variables are statistically significant, suburban responses may be interpreted to be different from those of cities.* The results are presented in Table 3.

*The "interaction" variables are the product of the one-zero dummy variable and each independent variable.

Table 3

Pooled City and Suburban Regression Equations

Salary Equations

	Estimate For Cities	*Differential For Suburbs*
UNION	31.6 (2.48)	– 16.2 (.71)
MFGWAGE	– 16.2 (1.92)	8.5 (.82)
INCOME	1.21 (3.50)	– 0.81 (2.01)
PCTCITY	– 21.1 (.94)	– 26.0 (.91)
OFFICERS	68.4 (1.22)	305.1 (2.59)
NORTH	– 2600 (3.09)	
WEST	3670 (4.17)	
SOUTH	– 1770 (2.28)	
Constant	10100	
R^2	.55	
Standard Error	$2693	

Employment Equations

	Estimate For Cities	*Differential For Suburbs*
SALARY	– 0.0014 (3.56)	0.0008 (1.34)
CRIME	0.080 (2.03)	– 0.057 (.73)
COST	0.0020 (4.96)	– 0.00079 (1.83)
POP	0.0033 (5.11)	– 0.0028 (3.42)
PCGOVT	– 0.093 (1.08)	– 0.095 (.77)
MGR	– 3.77 (2.01)	
Constant	1.65	
R^2	.58	
Standard Error	6.18	

The suburban police salary response to central city unionization is not significantly different from the city response, though the coefficients reported in Table 3 are quite different. However, suburban salary levels are significantly less responsive to variations in metropolitan area per capita income. We are unable to reject a null hypothesis that city and suburban salaries react equally to differences in city population shares, again suggesting suburban benefits from an oligopsony market. Finally, the suburban salary response to variations in employment levels is substantially and significantly higher than the city's response. One additional officer in the city, holding all else constant, is associated with a salary increase of approximately $70. In the suburbs, the salary increase is $300 greater.

In the employment equation, variations in police salaries, crime rates, and the cost-of-living seem to have somewhat less impact in the suburbs than in the cities, but we are unable to reject the null hypothesis that cities and suburbs respond similarly to these variations. Population size has significantly less impact on suburban than on city employment levels. This is consistent with either the diseconomies of scale or the city-services-for-suburban-commuters argument.

The Expenditure Equation

These structural employment and compensation equations may be combined to get at the issue in question in this paper: the determinants of city-suburb disparities in police spending. The equation for per capita expenditures is calculated from the estimated employment and compensation equations. We begin with the identity,

$$EXP = LC + NLC, \tag{3}$$

where,

EXP = *police expenditures;*
LC = *labor costs; and*
NLC = *non-labor costs.*

Now if we assume a fixed factor production function and assume a constant non-labor cost per employee, i.e.,

$$\beta = \frac{NLC}{OFFICER} \tag{4}$$

then, dividing by population,

$$EXP = [SALARY][OFFICER] + [\beta]OFFICER = [SALARY + \beta]\, OFFICER.$$

By substituting the estimated equations for OFFICER and SALARY (as reported in Table 2), a reduced form can be obtained that expresses the marginal expenditure impact of each exogenous variable in terms of its effects on compensation and employment.

Table 4

Elasticities of Per Capita Police Expenditures with Respect to Selected Variables: All Variables Taken at Mean Values

Variable	*SMSA*	*City*	*Suburb*
Unionization	– .035	– .016	.007
Per Capita Income	– .170	– .065	.042
City Share of SMSA Population	.019	.006	– .009
Crime Rate	.098	.297	.079
Population Size	.162	.215	.049
Number of governments per 100,000 Population	– .118	–	– .188
Cost of Living	1.55	1.16	1.86
Number of Officers per 10,000 Population	1.12	1.12	1.17
Average Compensation	– .378	– .158	.096

One approach to studying central city-suburban disparities is to calculate and compare the per capita expenditure elasticities of each independent variable. The results, shown in Table 4, must be interpreted as showing *magnitudes* of response and not statistical significance. The clearest difference between cities and suburbs derives from the more elastic demand for police officers in cities.Thus, elasticities for average salaries and the variables that drive them up (unionization and per capita income) are negative for cities and positive in the suburbs. The effect of a larger city share of SMSA population is the opposite, as it drives down salaries. In each case, however, the response is quite inelastic.

The number of officers has a much stronger impact on per capita expenditures, with a 1 percent increase in employment associated with a 1.12 percent increase in city expenditures and a 1.17 percent increase in suburban expenditures. Elasticities of response to crime rates and population size are higher in cities than in suburbs, though still quite inelastic. City elasticities are 0.30 for crime and 0.22 for population, whereas suburban elasticities are only 0.08 and 0.05, respectively. Only variations in the cost of living elicit elastic response in expenditures. Increases in the cost of living drive up suburban expenditures more

rapidly, with a suburban elasticity of 1.86 versus only 1.16 in the cities.

SUMMARY

City-suburban disparities in per capita expenditures for police services are pronounced and vary by region. The underlying causes of this variation, however, are more complex than has been indicated in most previous research. In part, the disparities are due to the greater needs faced in cities, but they are also due to institutional arrangements and policy choices.

Unionization of city employees not only increases city police salaries, but has a clear rollout effect on suburban salaries as well. The smaller the suburban share of SMSA population, the lower are suburban police salaries. Yet suburban salaries rise much more rapidly with increased police employment than city salaries.

The higher crime rates in central cities explain part of the higher level of police employment in cities, but do not have a significant effect in suburbs. Higher police salaries in cities dampen the level of police employment more than in suburbs, perhaps a result of greater budget constraints. Police spending is also affected by governmental structure. For instance, police employment levels are lower in council-manager cities and "fragmented" suburbs. This suggests greater efficiency in more professional and smaller governments.

The reduced form expenditure equations give some interesting insights into the magnitude of various effects on city and suburban police spending. Crime rate and population size exert important pressures on police spending in cities but not in suburbs. Unionization dampens city spending for police services, but has relatively little effect on suburban expenditures. This would seem to provide some support for the municipal overburden argument that has so interested the courts. Cities appear to spend more for police because they have to, rather than because they choose to.

Another interesting policy implication emerges from the suburban equations. Suburban expenditures tend to be lower where there is more governmental fragmentation. Perhaps this is due to more competition among suburban governments in keeping the tax price low, or perhaps it is because there is increased use of private substitutes. In either case, no support is found for the argument that governmental consolidation will lead to lower per capita expenditures.

These are important policy implications, and they require a more thorough statistical analysis than has been possible here. Despite the

great amount of work that has been done in this area, further studies are required.

Notes

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25. Ehrenberg, "Government Structure, Unionization, and Wages of Firefighters."

26. Bahl, Gustely, and Wasylenko, "Determinants of Local Police Expenditures."

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Appendix Table A

Police Expenditure Determinants Studies

Authors	Dependent Variable	Unit of Analysis	Data Year	Statistical Method[1]	Effect of Independent Variables[2]										
					Wealth/Income	Unionization	Employment Level	Opportunity Wage	City Pop. Share	Salary	Population	Crime Rate	% Nonwhite	Fragmentation	City Manager
Ashenfelter[3]	wages of firefighters	cities 25,000 – 100,000 pop.	1961 – 1966	MR	–	P	–	+	–	–	–	–	+	–	+
Schmenner[4]	wages of police & firefighters	11 large cities	1962 – 1970	MR	P	P	P	P	–	–	–	–	–	–	–
Ehrenberg[5]	wages of firefighters	cities	1969	MR	P	M/P	–	P	–	–	–	–	–	–	M
Wasylenko[6]	wages of police & firefighters	175 cities over 50,000 pop.	1968	MR	–	I	P	P	–	–	–	–	+	–	–
Bartel & Lewin[7]	police wages	215 cities over 25,000 population	1973	MR	P	P	–	P	–	–	P	–	–	–	P

Appendix Table A *(Continued)*

Police Expenditure Determinants Studies

Authors	Dependent Variable	Unit of Analysis	Data Year	Statistical Method[1]	Effect of Independent Variables[2]										
					Wealth/Income	*Unionization*	*Employment Level*	*Opportunity Wage*	*City Pop. Share*	*Salary*	*Population*	*Crime Rate*	*% Nonwhite*	*Fragmentation*	*City Manager*
Victor[8]	police salaries &	cities over 50,000	1975	MR	P	P	N	P	–	–	–	–	–	–	–
	police employment				P	I	–	–	–	I	P	–	–	–	–
Bahl, Gustely, Wasylenko[9]	police salaries	79 cities	1972	MR	–	P	P	P	–	–	–	–	–	–	–
	police employment				P	–	–	–	–	N	P	P	P	–	–
Ehrenberg[10]	police employment	50 states	1958 – 1969	MR	P	–	–	–	–	N	–	–	–	–	–
Morris & Tweeten[11]	police employment	754 cities over 25,000 population	1967 – 1968	MR	–	–	–	–	–	–	–	P	–	–	–
Carr-Hill & Stern[12]	police employment	police districts in England & Wales	1961 & 1966	MR	N	–	–	–	–	–	–	I	–	–	–

Appendix Table A *(Continued)*

Police Expenditure Determinants Studies

Authors	Dependent Variable	Unit of Analysis	Data Year	Statistical Method[1]	Effect of Independent Variables[2]										
					Wealth/Income	Unionization	Employment Level	Opportunity Wage	City Pop. Share	Salary	Population	Crime Rate	% Nonwhite	Fragmentation	City Manager
Jones[13]	police employment & expenditures	155 cities	1958 – 1970	MR	–	–	–	–	–	–	–	I	–	–	–
Weicher[14]	police manpower allocation	38 Chicago police districts	1959	MR	N	–	–	–	–	–	N	–	–	–	–
Bahl[15]	police expenditures	198 cities	1960	MR	P	–	P	–	–	–	–	–	P	–	–
Sunley[16]	police expenditures	4 SMSAs	1962	MR	P	–	–	–	–	–	–	–	–	–	–
Kasarda[17]	police expenditures	168 SMSAs	1950, 1960 & 1970	PA	–	–	–	–	–	–	P	–	–	–	–
Greenwood & Wadycki[18]	police expenditures	199 SMSAs	1962	MR	P	–	–	–	–	–	–	N	–	–	–

Appendix Table A *(Continued)*

Police Expenditure Determinants Studies

Authors	*Dependent Variable*	*Unit of Analysis*	*Data Year*	*Statistical Method*[1]	Effect of Independent Variables[2]										
					Wealth/Income	*Unionization*	*Employment Level*	*Opportunity Wage*	*City Pop. Share*	*Salary*	*Population*	*Crime Rate*	*% Nonwhite*	*Fragmentation*	*City Manager*
Beaton[19]	police expenditures	562 New Jersey cities	1970	MR	P	–	–	–	–	–	P	P	–	–	–
McPheters & Stronge[20]	police expenditures	43 cities	1970	PC	P	–	–	–	–	–	–	P	–	–	–
Isserman[21]	police expenditures	21 New Jersey cities	1970	MR	P	–	–	–	–	–	–	–	–	N	–
Lyons & Morgan[22]	public safety expenditures	242 cities over 50,000	1950 – 1970	MR	P	–	–	–	–	–	P	–	P	–	I
Hakim[23]	police expenditures	94 New Jersey communities	1970	MR	P	–	–	–	–	–	–	P	–	–	–
Hutcheson & Prather[24]	city employment	all cities over 25,000 population	1970	MR	–	–	–	–	–	–	P	–	–	–	–
Gustely[25]	local expenditures	25 cities in Florida SMSAs	1952 & 1972	MR	–	–	–	–	–	–	–	–	–	N	–

Appendix Table A *(Continued)*

Police Expenditure Determinants Studies

Note: All studies of expenditures and employment standardize them for population, i.e., most are on a per capita basis.

[1]MR = multiple regression; PA = path analysis;
PC = principle components.

[2]P = positive relationship; N = negative; M = mixed;
I = insignificant; – = variable not tested.

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[23]Simon Hakim, "The Attraction of Property Crimes to Suburban Localities: A Revised Economic Model," *Urban Studies* 17 (1980).

[24]John D. Hutcheson, Jr. and James E. Prather, "Economy of Scale or Bureaucratic Entropy? Implications for Metropolitan Government Reorganization," *Urban Affairs Quarterly* 15 (1979).

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Appendix Table B

Variable Names, Definitions, Sources, and Mean Values

Variable Name	*Definition*	*Mean Value*
SALARY	*Average monthly salary of full-time uniformed officers in October, 1979, multiplied by twelve (U.S. Bureau of Census, Local Government Employment in Selected Metropolitan Areas and Large Counties: 1979, pp. 80-116)*	*$17,738 (SMSA)* *19,205 (CITY)* *16,375 (SUBURB)*
UNION	Percentage of central city police employees belonging to union in 1980 (unpublished U.S. Bureau of Census data).	68.2 percent
INCOME	Per capita income in SMSA in 1979 (U.S. Bureau of Economic Analysis, *Survey of Current Business*, April 1981, pp. 43-45).	$ 9,264
MFGWAGE	Average weekly earnings in the manufacturing sector in 1979 (U.S. Bureau of Labor Statistics, *Employment and Earnings*, May 1981, pp. 132-6).	$ 281.
PCTCITY	City Share of SMSA population in 1980, expressed as a percentage (U.S. Bureau of Census, *Census of Population: Advance Reports*, 1980, PHC80-V).	38.9 percent
NORTH	Northern region	.18
WEST	Western region	.26
SOUTH	Southern region	.33
OFFICERS	Uniformed officers per 10,000 population in 1980 (*Local Government Employment in Selected Metropolitan Areas and Large Counties: 1979*, pp. 80-116).	19.2 (SMSA) 25.6 (CITY) 15.8 (SUBURB)
CRIME	FBI crime index for 1979, expressed as crimes per 10,000 population (U.S. Department of Justice, *Crime in the United States* – 1979).	632.8 (SMSA) 865.8 (CITY) 500.7 (SUBURB)
COST	Intermediate budget for family of four in 1979 (U.S. Bureau of Labor Statistics, *Handbook of Labor Statistics*, 1979, p. 387[1])	$20,348
POP	SMSA population in 1980, expressed in thousands (*Census of Population: Advance Reports*, 1980).	1,656.9