THE DETERMINANTS OF COUNTY AND CITY

EXPENDITURES FOR COMMUNITY SERVICES

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In recent years several researchers have reported empirical

findings on the determinants of expenditures for community services

such as crime prevention.and detection, fire prevention, and social

welfare. [Bahl, Bahl and Saunders, Beaton, Brazer, Fisher, Gabler

and Brest, Hirsch, Kee, McIntyre, Morss, Sunley, Spangler, Walzer,

Weicher (1970), Weicher (1971), Weicher (1972)]. Two common char-

acteristics of these studies are their reliance on ordinary least

square estimation and their consideration of expenditures at the per

capita level. These studies differ in respect of the number and

kind of independent variables considered, the types of community

services contemplated, and the unit of observation examined. The

most frequently examined community service is crime prevention and

detection. The number of variables considered has often varied from

as low as six to as high as twenty-three. While some researchers have

investigated interstate differences in expenditures for community ser-

vices, others have concentrated on differences in the central cities

and the suburbs, central and non-central portions of SMSAs, cities

growing in population and cities declining in population, and so on.

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One area that has not been fully explored is the determinants of expenditures for community services in the cities and the counties within a state, nor within the predominantly white and racially mixed cities and counties. City and county expenditures for community services differ for several reasons which involve differences in preferences for community services, as well as fiscal, demographic, and socio-political characteristics.

The purpose of this paper is to discuss some empirical findings on the determinants of the per capita expenditures for community services in the counties and the cities in the Commonwealth of Virginia as a whole, and in the predominantly white and racially mixed counties and cities. Two major hypotheses tested in this paper are as follows:

(1) the determinants of the per capita expenditures for community services differ between the cities and the counties, and between the predominantly white and racially mixed counties and cities; and

(2) separate least square estimation may be required for the expenditures for community services in the predominantly white and racially mixed cities and counties, and in the counties and the cities as a whole.

The discussion in the following pages is divided into five sections. The first section discusses the differences in the city and county expenditures for community services in Virginia. The second section deals with independent and dependent variables

Abstract

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The Determinants of County and City Expenditures for Community Services

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The composition of the determinants of expenditures for community services differ between the counties and cities as a whole and between the "predominantly white" and "racially mixed" communities. Separate regression equations should be fitted to the city and county expenditures for police protection, fire prevention, public health, and public works.

Key words: Police Protection, Fire Prevention, Social Welfare, Public Health, Public Works, Community Services.

considered in the analysis. The empirical findings are discussed in the third and fourth sections. The results are summarized in the last section.

Variation in City and County Expenditures in Virginia

The Commonwealth of Virginia is comprised of 96 county and 38 city governments. In 1970, 3 out of every 5 persons in the state lived in the counties. [Bureau of the Census]. County size varies from 24 to 1,012 square miles, with population per square mile ranging from 6 to 6,703. City size ranges from 2 to 341 square miles, with population per square mile ranging from 263 to 7,395. In 1970, the median family income in the cities varied from $6,969 to $14,525, as compared with $3,901 to $15,697 in the counties [Bureau of the Census].

The bulk of city and county revenue in the state of Virginia comes from local sources, particularly from property taxes. Each local government expends large amounts of money on the provision and maintenance of community services, capital equipment, bank interest and other debts, and the redemption of bonds. For example, in 1971-1972, the total expenditures for schools, social welfare, and general and financial administration accounted for 90 percent of the operation and maintenance budgets of the counties and 78 percent of the cities' budgets [Auditor of Public Accounts of Commonwealth of Virginia (County), Auditor of Public Accounts of Commonwealth of Virginia (City)].

Table 1. Variation in Per Capita County and City Government Expenditures on Community Services in Virginia, Fiscal Year Ended June 30, 1971

Community Service	Range Low	Range High	Mean	Variance	Stand. Dev.	Coeff. of Var.
Pol. Protection and Detection						
96 Counties	0.84	24.60	3.17	9.15	3.02	.96
38 Cities	13.16	56.58	31.61	112.71	10.62	.34
Fire Prevention and Extinction						
96 Counties	0.03	19.17	1.27	5.34	2.31	1.82
38 Cities	0.42	24.55	8.70	38.93	6.24	.72
Social Welfare						
96 Counties	6.14	58.61	21.77	109.87	10.48	.48
38 Cities	2.83	81.41	29.41	509.67	22.58	.77
Public Health						
96 Counties	0.34	6.32	1.41	0.68	0.82	.58
38 Cities	0.52	7.73	2.53	2.98	1.73	.68
Administrative and General Services						
96 Counties	4.80	45.81	11.59	31.54	5.62	.48
38 Cities	10.93	68.96	29.03	142.08	11.92	.41
Public Works						
96 Counties	0.44	56.44	3.69	43.81	6.62	1.79
38 Cities	15.93	46.57	30.15	58.68	7.66	.25
All Community Services						
96 Counties	$20.78	$175.21	$ 42.88	$ 400.11	$20.00	.47
38 Cities	83.75	275.09	131.56	1,647.52	40.59	.31

Source: Auditor of Public Accounts, Commonwealth of Virginia (County); Auditor of Public Accounts, Commonwealth of Virginia (City).

Table 1 summarizes the variation in the 1970 per capita city
and county expenditures for community services. The table indicates
that considerable differences existed in the per capita city and county
expenditures for community services. Among the counties themselves,
the greatest variation in the expenditures was for fire prevention and
extinction, followed by public works and police protection. The
smallest variation was for both social welfare and administrative
and financial services. In the cities, the greatest variation in
the per capita expenditures was for social welfare, followed by fire
prevention and public health. The least variation was for public
works.

Independent and Dependent Variables

The dependent variables considered in this study are the 1970
per capita expenditures (henceforth, the expenditures) for the fol-
lowing six community services: (i) police protection and detec-
tion, (ii) fire prevention and extinction, (iii) social welfare,
(iv) public health, (v) administrative and general services, and
(vi) public works. The choice of the year 1970 was based upon the
availability and comparability of data for all the cities and counties
of Virginia.

Six fiscal, six demographic, and five socio-political characteris-
tics were considered possible explanatory variables in the preliminary
stages of the analysis. While many of these variables had been pre-
viously investigated by other researchers, some new variables were

Table 2. Description of Independent and Dependent Variables

	Independent Variables	Symbol Used	Source of Information
Demographic	1. Population per square mile, 1970	X_1	1
	2. Percent change in population, 1960-1970	X_2	1
	3. Percent change in year round housing units, 1960-1970	X_7	1
	4. Percent of year round housing units built prior to 1950	X_8	1
Socio-Political	5. White population as percent of total population, 1970	X_3	1
	6. Median age, 1970	X_4	1
	7. Percent families with female head, 1970	X_5	1
Fiscal	8. Median family income in thousand dollars, 1970	X_6	1
	9. Retail sales per 1,000 population, 1970 (in thousand dollars)	X_9	4
	10. Local revenue collected per capita, fiscal year ended June 30, 1971	X_{10}	2,3
	11. State and federal supplements received per capita, fiscal year ended June 30, 1971	X_{11}	2,3

Dependent Variables

1.	Per capita expenditures on police protection and detection	PCEPP	2,3
2.	Per capita expenditures on fire protection and extinction	PCEFP	2,3
3.	Per capita expenditures on social welfare	PCESW	2,3
4.	Per capita expenditures on public health	PCEPH	
5.	Per capita expenditures on administrative and general services	PCEAG	2,3
6.	Per capita expenditures on public works	PCEPW	2,3

Source: 1. U. S. Department of Commerce, Bureau of the Census.
2. Auditor of Public Accounts, Commonwealth of Virginia (County)
3. Auditor of Public Accounts, Commonwealth of Virginia (City)
4. Sales Management, The Marketing Magazine.

added to the list. From the original list of 17 variables, 6 variables
were dropped in the final analysis either because they contributed
very little toward explaining the variation in expenditures or because
they were closely associated with other variables. In the final ana-
lysis, four fiscal, four demographic, and three socio-political
variables were selected to explain the variation in the expenditures
for each of the six community services in the 96 counties and the 38
cities of Virginia. The symbols and the data sources for the inde-
pendent and dependent variables are summarized in Table 2.

Determinants of Community Service Expenditures in 96 Counties and 38 Cities

The results of the least square linear estimation are summarized
in Table 3. All regression coefficients reported in Table 3 are at
least 1.5 times their standard errors. Table 3 also summarizes re-
sults on the coefficients of determination, the standard error of
the estimates, the intercept, the F score, and the degrees of freedom
due to error. A few of the highlights of the regression results are
discussed below.

(1) The percentage variation in the expenditures explained by
the regression equations varied from .42 to .91 in the counties and
from .50 to .86 in the cities. The F tests established that the R^2
values were significant at the .05 level for the counties and the
cities for each of the six community services.

(2) The F tests for differences in regression equations esta-
blished that, at the .05 significance level, significant differences
existed in the city and county expenditures for police protection,

Table 3. The Regression Coefficients and their Standard Errors for 96 Counties and 38 Cities of Virginia, 1970 [a/] [b/]

Independant Variables	Police Prot. and Det. All Counties	Police Prot. and Det. All Cities	Fire Prevn. and Extn. All Counties	Fire Prevn. and Extn. All Cities	Social Welfare All Counties	Social Welfare All Cities	Public Health All Counties	Public Health All Cities	Admin. and Gen. Services All Counties	Admin. and Gen. Services All Cities	Public Works All Counties	Public Works All Citi
X_1	0.00186 (0.00027)		0.00179 (0.00017)			0.00426 (0.00198)	0.00035 (0.00011)	0.00065 (0.00015)			0.00605 (0.00053)	-0.0031 (0.0011
X_2		-0.48887 (0.12955)		-0.26689 (0.10020)	0.22198 (0.13061)		0.01111 (0.00734)	-0.03888 (0.02366)		0.53180 (0.26026)		
X_3		-0.18537 (0.11541)		-0.13843 (0.08927)								
X_4			0.05129 (0.02882)		0.52978 (0.33841)		0.03776 (0.01901)	-0.07565 (0.04868)				0.6709 (0.3662
X_5	0.16257 (0.08378)	1.56522 (0.78409)	0.09408 (0.05096)		1.12924 (0.59841)							
X_6		2.64805 (1.37595)	0.25200 (0.10740)		-4.04465 (1.26114)	-5.93625 (3.39624)				0.76968 (0.49122)		
X_7		0.26803 (0.08874)		0.23397 (0.06864)	-0.24195 (0.09761)			0.02902 (0.01621)		-0.43740 (0.17828)		
X_8	-0.05060 (0.02005)	-0.24096 (0.14237)	-0.03085 (0.01219)				0.01338 (0.00804)	-0.04425 (0.02601				
X_9							-0.00019 (0.00012)	-0.00045 (0.00016)		-0.00356 (0.00175)		
X_{10}	0.02735 (0.00449)	0.06147 (0.02799)	0.01571 (0.00273)	0.05282 (0.02165)	0.08681 (0.03210)		0.01145 (0.00180)	0.01071 (0.00511)	0.06658 (0.01250)	0.20624 (0.05623)	0.04771 (0.00875)	
X_{11}					0.05743 (0.02943)	0.22040 (0.05612)	0.00345 (0.00165)			0.03417 (0.01146)		
Intercept	.87	11.90	-2.33	26.97	17.39	81.56	-1.14	5.94	-7.34	-66.06	1.82	-38.6
Coeff. of Det.	.86*	.86*	.91*	.75*	.42*	.81*	.70*	.82*	.69*	.54*	.89*	.5(
Std. Err. of Est.	1.18	4.80	.72	3.71	8.47	11.85	.48	.88	3.30	9.64	2.31	6.5
F score	48.51	14.10	80.91	7.14	5.57	9.85	18.14	10.68	17.37	2.78	63.33	2.1
D. F. due to Error	84	26	84	26	84	26	84	26	84	26	84	26

a/ All regression coefficients reported in Table 3 are at least 1.5 times their standard errors reported in parentheses.
b/ See Table 2 for explanation of symbols used for independent and dependent variables.
* Significant at .05 significance level.

fire prevention, public health, and public works.[1]   In other words, separate regression lines should be fitted to the city and county expenditures for community services other than social welfare, and administrative and general services.

(3) The expenditures for police protection, fire prevention, and social welfare were sensitive to socio-political variables. The results indicated the following: (i) the city expenditures for police protection and fire prevention were inversely related to the proportion of whites in the total population; (ii) the expenditures for fire prevention, social welfare and public health in the counties and for public works in the cities were positively related to median age; (iii) the expenditures for police protection (county and city), fire prevention (county), social welfare (county) were directly related to the percentage of families with female heads.

(4) Among the demographic variables, population density was positively correlated with the expenditures for police protection, fire prevention, public health, and public works (county), and social welfare and public health (city). In the cities, population density was negatively associated with the per capita expenditures for public works. The percentage increase in year-round housing from 1960 to 1970 was positively associated with the city expenditures for police protection, fire prevention, and public health, and negatively associated with the city expenditures for administrative and general services, versus social welfare

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1/ The general procedure used for testing differences in regression equations closely followed the method given in Snedecor and Cochran's textbook on statistical methods [Snedecor and Cochran].

for the county expenditures. The percentage of year-round housing
units built prior to 1950, in general, was inversely related to the
expenditures for police protection (city and county), fire prevention
(county), and public health (city), yet directly related to the county
expenditures for public health.

(5) Median family income was inversely related to the city and
county expenditures for social welfare and positively associated with
the expenditures for police protection (city), and administrative
and general services (county). The regression coefficients for the
median family income variable suggested that for every $1,000 increase
in median family income, the expenditures for social welfare declined
by $4.04 in the cities and $5.94 in the counties.

(6) The state and federal supplements tend to be positively
associated with the expenditures for social welfare (city and county),
public health (county), and administrative and general services (county).
The regression coefficients indicated that for every $1.00 increase
in the per capita state and federal supplements, the expenditures for
social welfare increased by $0.06 in the counties, and $0.22 in the
cities.

(7) Per capita local revenue was positively correlated with the
expenditures for police protection (city and county), fire prevention
(city and county), social welfare (county), public health (city and
county), and public works (county). The regression coefficients
for the per capita local revenue indicated that for every $1.00 in-
crease in per capita local revenue, the expenditure for community
services would increase as follows:

	County	City
Social welfare	$0.09	--
Admin. and gen. services	0.07	0.21
Public works	0.05	--
Police protection	0.03	0.06
Fire prevention	0.02	0.05
Public health	0.01	0.01

Predominantly White and Racially Mixed Counties and Cities

The Census of Population indicates that in 1970, 81 percent of
the state of Virginia's population was white   [Bureau of the Census].
In that year, the average proportion of whites in the cities was
85.45 percent as compared with 74.4 percent for the counties   [Bureau
of the Census]. In 1970, the smallest percentage of whites in the
total population was 15 in the counties and 45 in the cities.

In this study "predominantly white communities" are defined
as the counties and cities whose white population in 1970 constituted
82 percent or more of the total. All the counties and cities in
which whites constituted less than 82 percent of the total population
in 1970 were labeled "racially mixed communities". According to
these criteria, 47 counties (48 percent of all the counties) and 23
cities (61 percent of all the cities) were labeled "predominantly
white", and the remaining 49 counties (52 percent) and 15 cities
(39 percent) were called "racially mixed."

Linear least square estimates were obtained for expenditures for community services in the predominantly white cities vs. counties, the racially mixed cities vs. counties, and the 70 predominantly white vs. the 64 racially mixed communities. Table 4 presents a summary of the significant variables identified in the 36 independent regression equations and the corresponding R^2 values.[2/] The results of the F tests for the independence of the linear regression estimates for the predominately white and racially mixed counties and cities are summarized in Table 5. In Table 5 the left column indicates the regression equations that are compared for significant differences. The results of the F tests are indicated by the asterisk in the remaining columns for each of the six community services.

Several important findings can be noted from Tables 4 and 5.

(1) The proportionate variation in the expenditures for each of the six public services explained by the regression equation was significant in the 70 predominantly white and 64 racially mixed communities, and in the 47 predominantly white counties. In the 23 predominantly white cities, the R^2 values were significant for all community services excluding public works, and administrative and general services. In the 49 racially mixed counties, the R^2 values were significant with respect to social welfare and public health only.

(2) The number and composition of the significant explanatory variables differed between predominately white and racially mixed counties and cities (Table 4).

2/ Due to limitation on the length of this paper, it is impossible to present all the statistical results here. However, interested readers may obtain such information upon request from the author.

Table 4. Comparison of the Determinants of Expenditures for Community Services: Predominantly White and Racially Mixed Communities of Virginia, 1970 a/ b/ c/

Regression Group	Police Prot. and Det.	Fire Prevention	Social Welfare	Public Health	Admin. and Gen. Services	Public Works
Predominately White Communities (70)	$X_1, X_5, X_6, X_9, X_{10}, X_{11}$ $R^2 = .90*$	$X_1, X_2, X_3, X_4, X_6, X_7, X_{10}, X_{11}$ $R^2 = .82*$	X_6, X_{10}, X_{11} $R^2 = .50*$	$X_1, X_2, X_3, X_7, X_9, X_{10}, X_{11}$ $R^2 = .78*$	$X_2, X_3, X_5, X_6, X_7, X_8, X_{10}$ $R^2 = .74*$	$X_2, X_5, X_7, X_{10}, X_{11}$ $R^2 = .77*$
Racially Mixed Communities (64)	X_1, X_5, X_6, X_{10} $R^2 = .91*$	$X_1, X_2, X_7, X_{10}, X_{11}$ $R^2 = .88*$	X_1, X_{11} $R^2 = .70*$	$X_1, X_6, X_9, X_{10}, X_{11}$ $R^2 = .76*$	$X_1, X_2, X_3, X_4, X_7, X_9$ $R^2 = .80*$	X_{10} $R^2 = .83*$
Predominately White Counties (47)	$X_1, X_5, X_8, X_{10}, X_{11}$ $R^2 = .96*$	X_1, X_6, X_{10} $R^2 = .96*$	X_4, X_6, X_{10} $R^2 = .54*$	X_1, X_4, X_{10}, X_{11} $R^2 = .89*$	$X_3, X_6, X_9, X_{10}, X_{11}$ $R^2 = .83*$	X_1, X_6, X_8, X_{10} $R^2 = .93*$
Racially Mixed Counties (49)	X_1, X_4 $R^2 = .31$	X_1, X_3 $R^2 = .43*$	$X_1, X_2, X_3, X_4, X_7, X_8, X_8, X_{10}, X_{11}$ $R^2 = .62*$	$X_1, X_5, X_8, X_9, X_{10}, X_{11}$ $R^2 = .49*$	X_3, X_4, X_9, X_{10} $R^2 = .50*$	X_9, X_{11} $R^2 = .25$
Predominately White Cities (23)	$X_1, X_2, X_3, X_5, X_6, X_7, X_8, X_{10}$ $R^2 = .97*$	X_2, X_3, X_4, X_7 $R^2 = .85*$	X_1, X_6, X_9, X_{11} $R^2 = .86*$	$X_1, X_2, X_3, X_5, X_6, X_7, X_9, X_{10}$ $R^2 = .89*$	X_3 $R^2 = .57$	X_1, X_6 $R^2 = .64$
Racially Mixed Cities (15)	X_2, X_4, X_7, X_8, X_9 $R^2 = .89$	$X_1, X_2, X_4, X_5, X_6, X_7, X_8, X_9$ $R^2 = .94$	----- $R^2 = .90*$	X_1, X_6, X_{10}, X_{11} $R^2 = .99*$	$X_1, X_2, X_3, X_4, X_7, X_8, X_9, X_{10}, X_{11}$ $R^2 = .99$	X_4, X_7 $R^2 = .89$

a/ Variables reported in Table 4 are those whose regression coefficients are at least 1.5 times their standard errors.
b/ See Table 2 for explanation of symbols used for independent variables.
c/ See footnote 2.
* Significant at the .05 significance level.

Table 5. Summary of Tests for Differences in Regression Equations: Predominantly White and Racially Mixed Counties and Cities of Virginia, 1970.

	Police Prot. and Det.	Fire Prevn.	Social Welfare	Pub. Health	Admi. and Gen. Serv.	Public Works
Predominantly white vs. racially mixed communities	*	*	***	---	---	---
Predominantly white vs. racially mixed counties	---	---	---	---	---	---
Predominantly white vs. racially mixed cities	---	---	---	***	---	---
Predominantly white counties vs. pre-dominately white cities	*	***	---	---	---	*
Racially mixed counties vs. racially mixed cities	**	***	---	*	*	*

  * Significant at the .01 significance level
 ** Significant at the .05 significance level
*** Significant at the .10 significance level

(3) A comparison of the least square regression estimates of 5 different groups of predominately white and racially mixed counties and cities indicated the following: (a) significant differences existed between the 70 predominantly white and 64 racially mixed communities for the expenditures for police protection, fire prevention, and social welfare; (b) significant differences existed between the 49 racially mixed counties and 15 racially mixed cities, for the expenditures for police protection, fire prevention, public works, and administrative and general services; (c) significant differences existed between the 47 predominantly white counties and 23 cities for the expenditures police protection, fire prevention, and public works; (d) significant differences existed between the 23 predominantly white and the 15 racially mixed cities for the expenditures for public health; and (e) no significant differences existed between the 47 predominantly white and 49 racially mixed counties for the expenditures for community services.

Summary and Conclusion

The cross-sectional analysis of the per capita expenditures for certain community services indicates that the expenditures for public services are more sensitive to fiscal factors followed by demographic and sociopolitical factors. The state and federal supplements are positively associated with the expenditures for social welfare (city and county), public health, and administrative and general services (county). Per capita local revenue tends to be positively correlated with the expenditures for police protection, fire prevention, public health, and administrative and general services in the cities and the

counties, and for social welfare and public works in counties only.
The results indicate that separate least square estimates are needed
for the city and county expenditures for police protection, fire pre-
vention, public health, and public works.

The results show that the determinants of expenditures for com-
munity services tend to differ between the predominantly white and
racially mixed communities. Further, separate least square estimates
are required for the expenditures for police protection, fire preven-
tion, and social welfare in the predominantly white and racially mixed
communities.

The major objective of this paper has been to demonstrate that
the determinants of expenditures for community services differ between
the cities and the counties as a whole and between the predominantly
white and racially mixed communities. In addition, separate regression
equations are required for the expenditures for selected community ser-
vices in the predominantly white and racially mixed communities, and in
the counties and cities as a whole. The breakdown of the cities and the
counties according to their racial composition has added a new dimension
to the analysis of expenditures for community services. It is difficult
to say if the findings reported here can be generalized for other states.
Further research in this area may be worthwhile.

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