Micro Estimates of Public Spending Demand Functions and Tests of the Tiebout and Median-Voter Hypotheses

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Responses to questions given to a random sample of Michigan households are used to estimate public spending demand functions. While income and price elasticities are similar to those obtained from aggregate data, positive income elasticities appear to arise because public services are distributed in a prorich manner. A relatively small variance in spending demands among urban and suburban communities in metropolitan areas with substantial public service variety suggests that the Tiebout mechanism works. This interpretation is supported by the fact that actual spending conforms substantially to desired levels in urban areas, but less so in rural areas with little public sector choice.

The existence of micro data on the demand for public goods makes it possible to test several hypotheses that have intrigued public finance economists. The first involves the estimation of parameters in public spending demand functions, specifically whether parameter estimates derived from the usual analyses of local government budgetary aggregates accurately reflect the demands that would be expressed by individual citizens. The second is Tiebout's (1956) now-classic idea that citizens with similar tastes for public goods will live together in

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jurisdictions that can then supply these goods with relatively little economic inefficiency. The third is that whatever determines residential location, governments will supply the level of public goods desired by the median voter.

In this paper we use data from a micro survey on demands for public spending to test these hypotheses. The survey, taken by the University of Michigan's Institute for Social Research (ISR), includes 2,001 households in the state of Michigan, sampled randomly immediately after Michigan's 1978 tax-limitation vote. Most questions dealt with why voters voted for or against various tax-limitation amendments, but the survey was also designed to treat these more basic issues of public expenditure demand.[1] The strength of a survey such as this is that a relatively complete array of fiscal, demographic, voting, and attitudinal information is available for a random sample of the state population. These data as well as some direct questions about public sector demand allow one to test the underlying hypotheses. The weakness is that like all other survey data respondents do not have to act on the basis of their answers, and the results are therefore hypothetical.[2]

The first section of the paper gives the demand estimation results. We use standard utility-maximization procedures to derive public spending demand functions that, among other things, depend on both individual and community income. Results of the estimation of these equations to micro spending preferences data are used to try to resolve several issues in the applied public finance literature: the distribution of Buchanan fiscal residuals within a community, an apparent paradox between income-elasticity estimates from aggregated community data and polling data, and why the median-voter theorem works so well.

The next section of the paper tests the Tiebout hypothesis that location decisions permit public goods to be provided with a high degree of economic efficiency. One implication of this hypothesis is that households will group themselves according to their demand for public spending—all those desiring a large public sector will live together, as will all those desiring a small public sector. In statistical terms, the test is accomplished by observing whether the intracommunity variance of public goods demand is smaller than that for the whole statewide sample, either uncorrected or corrected (by regression) for the influence of important independent variables.

The third section goes on to see whether the fiscal taste grouping of

[1] The survey is described in Courant, Gramlich, and Rubinfeld (1980).

[2] See Converse (1975) for extensive discussions of the strengths and weaknesses of surveys such as this.

individuals is related to the actual level of public spending provided in the community. In part, this is a necessary complement to the Tiebout test, for if local government fiscal actions were unrelated to the tastes of voters, there would be no reason for individuals to group themselves in a Tiebout-like manner. But this test can even go beyond Tiebout and test the median-voter hypothesis of Hotelling (1929), Bowen (1943), Downs (1957), and others. Does public spending in the jurisdiction reflect the desires of the median voter (from our sample), or are actual spending totals systematically larger or smaller?

I. The Demand for Public Spending

We first develop demand functions for public spending in terms of the ith individual. Let this individual's utility be expressed in terms of the utility obtained from private goods, C_i, and public output, X_i, by

$$U_i = U_i(C_i, X_i). \tag{1}$$

Were all publicly provided goods pure public goods, X_i would be identical for all individuals residing in a community. If publicly provided goods deviate from this archetype, however, we might expect the provision of public goods to vary from individual to individual in the community. There are many ways to describe how it could vary from individual to individual. A convenient approximation first used by Denzau and Mackay (1976) is to let income be the conditioning variable:

$$X_i = ({Y_i}^{\alpha_1}/Y^*)(E/N), \text{ where } Y^* = \sum_i (Y_i^{\alpha_1}/N). \tag{2}$$

Here Y_i is the individual's income, E the real dollar expenditure on public services, and N the number of consumers of public services. The parameter α_1 reflects the distribution of public services. When $\alpha_1 = 0$, all individuals within the jurisdiction receive the identical level of services E/N. When $\alpha_1 > 0$, the distribution of services is positively related to income (prorich); and when $\alpha_1 < 0$, the distribution is negatively related to income (propoor). Note that, as given by (2), output X is measured in real dollars.

The next question involves the price of public goods. Assume that X is produced according to the Cobb-Douglas production function

$$X = L^{\alpha_3}K^{1-\alpha_3}. \tag{3}$$

The first-order conditions are that $W = \alpha_3 PX/L$ and $R = (1 - \alpha_3)PX/K$, where W is the real wage for public employees, P is the relative gross price for public goods, and R is the rental price of capital, assumed to be constant across jurisdictions. Solving the first-

order expressions for L and K, substituting them into the production, and solving for P yields $P = \alpha_4 W^{\alpha_3}$, where α_4 is some constant.

The individual is then assumed to maximize utility subject to the usual budget constraint:

$$\begin{aligned} Y_i &= C_i + [(\alpha_4 W^{\alpha_3} H_i)/(V/N)](E/N) \\ &= C_i + [(\alpha_4 W^{\alpha_3} H_i)/(V/N)](Y^*/Y_i^{\alpha_1}) X_i, \end{aligned} \tag{4}$$

where H_i is the value of the individual's property and V is the community tax base. The tax price $(\alpha_4 W^{\alpha_3} H_i N/V)$ measures the price to the consumer of a dollar of real expenditure per capita of public spending. Note that (4) is written as if this price were a *marginal* tax price, so that fixed income tax revenues or fixed categorical or noncategorical grants will not affect it.

Maximizing (1) subject to (4) yields standard demand functions for private consumption C_i and for desired public services X_i. Writing the latter in multiplicative form, as is commonly done, and adding a random-error term to allow for omitted variables, we get

$$X_i = e^{\beta_0 + \epsilon_i} (\alpha_4 H_i N/V)^{\beta_2} W^{\alpha_3 \beta_2} Y^{*\beta_2} Y_i^{(\beta_1 - \alpha_1 \beta_2)}. \tag{5}$$

The parameter β_1 is the individual's income elasticity of demand for public services and β_2 is the price elasticity. But since income terms are now in the price equation, the total elasticity with respect to individual income depends on both the income and price elasticity.

To this point we have not dealt with the congestion problem. To allow for the possibility that the publicly provided goods might be congested, or impure public goods, we modify a procedure employed by Borcherding and Deacon (1972) and Bergstrom and Goodman (1973). This involves rewriting (2) as

$$X_i = (Y_i^{\alpha_1}/Y^*)(E/N^{\alpha_2}), \tag{6}$$

where α_2 is the crowding parameter estimated by the above authors. For α_2 equal to 0, public spending is a pure public good in the Samuelsonian sense (Samuelson 1954). Whatever the value of α_1, as α_2 increases the public goods become more and more crowded. Taking this perspective suggests that our coefficient α_1 may be thought of as an income-crowding parameter, just as α_2 is a population-crowding parameter. We might note, in addition, that more general formulations of the private-public nature of publicly provided goods—such as one allowing public goods to be distributed with house value and including various interaction terms—might also be imagined. However, these somewhat more general approaches were not found to be important in our empirical results, so we do not pursue them here.

We complete the model by accounting for some details of estima-

tion. A first is that the dependent variable, per capita public spending, is actually measured in nominal terms, but we cannot observe a cross-sectional price index for public expenditures. Hence we multiply both sides of the expression by the gross price of public goods used above. A second approximation is to replace Y^* with $\bar{Y}^{\alpha_1}$, where $\bar{Y}$ is mean income in the community.[3] A third adjustment takes account of the fact that individual voters' utility will vary according to a vector of individual characteristics (Z_i) such as the number of children, political affiliation, and so forth. Making these adjustments, we have as our basic public goods demand equation

$$\begin{aligned} \ln (W^{\alpha_3}E/N) = \beta' + [\beta_1 - \alpha_1(1 + \beta_2)] \ln Y_i + \alpha_3(1 + \beta_2) \ln W \\ + \beta_2 \ln (H_iN/V) + (\alpha_2 - 1) \ln N \\ + \alpha_1(1 + \beta_2) \ln \bar{Y} + \beta_3 Z_i + \epsilon_i, \end{aligned} \tag{7}$$

where β' is a constant. Since the dependent variable here is the logarithm of per capita *money* public expenditures, the public wage elasticity is positive or negative as demand is inelastic or elastic. Otherwise the only nonstandard features in the equation are the crowding parameters, α_1 and α_2.

Estimating the Model

Equation (7) can be estimated with either macro or micro data. The usual approach of economists is to use macro data on the overall budgetary behavior of governments and make four additional assumptions: (*a*) The Z_i for individuals cannot be observed and are either assumed to be constant within the jurisdiction or approximated by mean or median values for the community. (*b*) Individual income is set at the median for the community, as if the median voter had median income and as if all other incomes in the community were irrelevant in determining public spending. (*c*) The tax-price term is replaced through a similar assumption. Within a community individual property values are assumed to equal the median residential

[3] This approximation is tantamount to assuming that X_i is distributed according to $(Y_i/\bar{Y})^{\alpha_1}$ in eq. (2). We use the form given only to highlight its adding-up features. Clearly our approximation is exact when α_1 equals either 0 or 1. To see what happens in other cases, we can consider varying assumptions about the income distribution. First, if income is uniformly distributed from 0 to maximum income B, the mean of $Y_i^{\alpha_1}$ equals $B^{\alpha_1}/(1 + \alpha_1)$, while $(\text{mean } Y)^{\alpha_1} = B^{\alpha_1}/2^{\alpha_1}$. It is clear that for α_1 in the range $(-.5, 1.5)$, $2^{\alpha_1} \approx (1 + \alpha_1)$. Second, we can assume a Pareto distribution, a two-parameter, nonsymmetric distribution of the form $f(Y) = rA^r/Y^{r+1}$ for A positive and r greater than or equal to two. In this case we calculate that the mean of Y^{α_1} is equal to $rA^{\alpha_1+1}/[r - (1 + \alpha_1)]$ while $(\text{mean } Y)^{\alpha_1} = A^{\alpha_1}r^{\alpha_1}/(r - 1)^{\alpha_1}$. The two are likely to be approximately equal for $A = 1$ and r large, not unreasonable possibilities.

value, and the community tax price is then usually expressed as the ratio of residential value to total value, as if owners of nonresidential property did not vote in local elections. (*d*) Grants from higher levels of government are introduced to the equation. Typically, just one grant term is added, but in fact several should be. Open-ended categorical grants should have their matching ratio used in the construction of tax prices. Close-ended noncategorical grants should be included in community income, unless there are so-called flypaper effects whereby a dollar of grant spending leads to more public spending than private income at the margin. And close-ended categorical grants should be entered as a separate linear term.[4]

For the sake of comparison, we first follow these conventions and estimate a macro relationship for the 83 counties of Michigan in 1977. The public wage is expressed as the starting salary for teachers and the tax price as the residential share of property values. Categorical and noncategorical grants are treated as separate logarithmic terms, and income is expressed either as county mean income (available in 1976) or as median income (available in 1970). The results are shown in table 1. The income elasticity (β_1) is slightly below that usually found in other studies and the tax-price elasticity (β_2) much below, and not always of the correct sign. The public wage coefficients always have incorrect signs. The crowding terms indicate that public goods are definitely not Samuelsonian, with community population an important determinant of services demand (α_2 is close to one), as is found by both previous studies using the term. In this form it is impossible to identify the α_1 coefficient and thereby tell whether community income is important in determining service demands.[5] Both categorical and noncategorical state and federal grants have fairly strong effects on community spending, much as is found in other studies.

Next we estimate (7) using micro data from our household survey. The dependent variable is derived from a sequence of questions that informed respondents of how local governments in Michigan spend tax dollars; then asked them whether they thought local spending and taxes in their jurisdiction were too large, too small, or about right; and then tried to elicit their preferred percentage change in all budgetary categories. It was stressed to respondents that if they desired a cutback in local spending the outcome would be the same percentage

[4] This is all spelled out in Gramlich (1977).

[5] We note that median income works better than mean income. This is a powerful finding because median income was only available for 1970, 7 years before the date of the dependent variable. It might satisfy Romer and Rosenthal's (1978) test of the median-voter hypothesis (median income should work better than any other income), but, as our later discussion will indicate, such an inference cannot be made unambiguously when community income is included in the equation.

TABLE 1

MACRO PUBLIC SPENDING EQUATIONS, 83 COUNTIES OF MICHIGAN, 1977

	Using Mean Income (1976)	Using Median Income (1970)
Independent variable:		
Constant	1.264	−.443
Income	.442 (3.2)	.531 (4.1)
Public wage	−.138 (1.0)	−.059 (.4)
Residential value/ total value	−.058 (.9)	.010 (.2)
Population	.021 (1.1)	.010 (.5)
Categorical grants	.316 (7.6)	.320 (8.0)
Noncategorical grants	.187 (2.8)	.276 (4.0)
Fit statistics:		
R^2	.637	.663
SE	.115	.111
Parameter estimates:		
α_1	N.I.	N.I.
$\alpha_2 - 1$	.021 (1.1)	.010 (.5)
α_3	−.146* (1.1)	−.058* (.4)
β_1	.442 (3.2)	.531 (4.1)
β_2	−.058 (.9)	.010* (.2)

NOTE.—Dependent variable is per capita government spending; all variables in log form; absolute t-ratios in parentheses. N.I. = not identified.

* Incorrect sign.

cutback in all local spending and taxes.[6] Respondents' desired level of overall local spending, the dependent variable in the micro equations, was then overall per capita spending in the county multiplied by the adjustment factor. If the ith respondent desired a 5 percent cutback, we assumed that the desired spending level was 95 percent of actual local government spending in that county.[7]

The individual independent variables are also taken from our survey, from questions on individual income, tax payments, and from various demographic indicators. The same community variables that appear in the macro equations are also used in the micro equations.

The micro results are shown in table 2. These equations are fitted to

[6] The exact questions were: "Now considering just your local governments which spend mainly on schools, police, fire, parks, and sanitation services—would you favor an across-the-board increase in both local spending and taxes, a decrease in both local spending and taxes, or would you favor no change?" Those who favored a change were then asked: "How much of an increase (decrease) in *both* local spending and taxes would you favor: a 5 percent (increase/decrease), 10 percent, 15 percent, 20 percent (increase or decrease), or what?"

[7] In principle, it is possible to adjust only city spending to get the desired total for a voter. In practice, however, we had so much difficulty in allocating county spending to the various cities, some of which are big enough to have published data, some of which are not, that we simply spread all local spending in a county evenly across all people.

TABLE 2

MICRO PUBLIC SPENDING EQUATIONS,
1,125 MICHIGAN HOMEOWNER RESPONDENTS, 1978

	Adjusted by Respondent's Answer	Adjusted, with City Dummies	Not Adjusted, with City Dummies
Independent variable:			
Constant	.378	−1.24	−1.80
D, child in public school	.013 (1.7)	.011 (1.5)	−.003 (.7)
D, child in private school	.016 (1.2)	.015 (1.2)	−.005 (.7)
D, over 65	.015 (1.1)	.013 (1.1)	.005 (.8)
D, transfer recipient	.014 (.6)	.005 (.2)	−.002 (.2)
D, black	.010 (.7)	.039 (2.0)	.012 (1.2)
D, other nonwhite	−.048 (1.2)	−.046 (1.2)	−.017 (.8)
D, race not reported	.048 (.8)	.049 (.9)	−.007 (.3)
D, Republican	.001 (.1)	.004 (.5)	.006 (1.4)
D, independent	−.006 (.7)	−.004 (.4)	.005 (1.1)
D, party not reported	.052 (1.0)	.073 (1.5)	.008 (.3)
D, public employee	−.001 (.1)	−.001 (.1)	−.001 (.1)
D, nonresident public employee	.025 (1.5)	.023 (1.5)	.001 (.2)
D, expect real income up	.057 (2.9)	.048 (2.5)	.006 (.6)
D, expect no change real income	.044 (2.2)	.032 (1.7)	.003 (.3)
D, expect real income down	.011 (.6)	.002 (.1)	−.004 (.4)
D, Catholic	−.008 (1.0)	−.003 (.5)	−.003 (.9)
D, Jewish	.015 (.5)	.004 (.1)	.002 (.1)
D, religion not reported	−.020 (1.4)	−.023 (1.7)	−.006 (.9)
Individual income	.001 (.1)	.001 (.2)	.001 (.1)
House value/avg. house value	−.011 (2.2)	−.014 (2.7)	−.004 (1.4)
County income	.285 (5.5)	.347 (4.3)	.408 (9.7)
County public wage	.195 (3.4)	.358 (3.9)	.363 (7.7)
County population	.039 (6.7)	.033 (2.6)	.022 (3.3)
Categorical grants	.201 (15.4)	.178 (5.4)	.200 (11.8)
Noncategorical grants	.226 (11.1)	.265 (9.0)	.271 (17.9)
Fit statistics:			
R^2	.773	.792	.931
SE	.11	.11	.06
Parameter estimates:			
α_1	.288 (5.6)	.352 (4.4)	.410 (9.7)
$\alpha_2 - 1$	.039 (6.7)	.033 (2.6)	.022 (3.3)
α_3	.197 (3.6)	.363 (4.0)	.364 (7.7)
β_1	.286 (5.6)	.348 (4.3)	.409 (10.2)
β_2	−.011 (2.2)	−.014 (2.7)	−.004 (1.4)

NOTE.—Dependent variable is per capita government spending; continuous variables in log form; absolute t-ratios in parentheses.

the 1,125 respondents who answered the spending-demand questions, with renters omitted because of the difficulty in defining their tax payments and price.[8] Results are given only for the median-income variant, the one that fit best in table 1.

We have shown equations first using spending adjusted by our adjustment factor, then with community dummies included to test whether the dummies really measure individual city or county effects, and then with the dependent variable unadjusted by the answers to our hypothetical question to measure the importance of the adjustment. The independent variables also include a host of dummies (designated by D) to proxy the Z_i factors.

The results agree broadly with those of the macro equations, though there are some interesting differences. In all three equations the population-crowding coefficient α_2 is very close to one, indicating again that public expenditures are not for goods that are public in the Samuelsonian sense. Again the tax-price elasticity is very low, though now it is statistically significant in the first two equations.[9] The public wage coefficients are now of the correct sign, though still lower than they should be if public services have the distributive shares of most private outputs. Community income and grants have very strong and statistically significant effects in all equations, as they did before.

Taking together the Y_i and $\bar{Y}$ terms, the macro income elasticity of about .4 is confirmed in the micro regressions. But virtually all of the positive elasticity is due to *community* income, with individual family income having a coefficient that is very close to zero in all three equations. Our results do suggest a positive income elasticity of demand for public spending, but the increased demand is seen to come in a very special form. As higher-income individuals within a community are surveyed, they do not appear to have any greater taste for public spending. The apparent reason is that higher-income individuals already receive (or perceive that they receive) greater benefits from public spending than do lower-income individuals. Stated differently, if we contrast voters of the same income and tax prices residing in communities of different income but initially the same level of public spending, the voter in a high-income community, for a given level of private goods consumption, will perceive a lower level of public goods consumption and have a higher marginal rate of substitution and demand for public goods.

[8] We did some Box-Cox tests for functional form, comparing the fit of log-linear, log-log, linear, and semilog formulations of the model and found that the semilog version used gave a slightly better fit, although the substantive results were not much different. We report the log-log specifications because they are easier to interpret.

[9] We did not incorporate the federal income tax deductibility of the property tax with our measure of price. Had we done so our price elasticity estimate would have been slightly higher.

One other aspect of the individual-income term bears mentioning. A problem in inferring income elasticities from survey results is that only 1 year's income is recorded for respondents. If there were a large transitory component to income, the overall income elasticity would be understated in the micro results but not in the macro community results, because there transitory income deviations are pooled and averaged out. We have no fully satisfactory means of estimating permanent income for the micro equations, but we did try a question borrowed from other ISR surveys on whether the respondent expected real income gains or losses in the next 5 years. As can be seen from the two left-hand columns of table 2, this variable works quite well. Optimists and those who expect no decline want more public spending than those who expect a decline or did not answer the question (the null class). Hence a partial explanation for the low individual-income elasticity is a modified form of the permanent-income hypothesis. Other things equal, individuals who expect real-income growth will desire higher levels of government spending than those who do not.

Some Econometric Issues

Before trying to interpret these results, we take note of several possible econometric problems. One involves the level of information possessed by respondents. When they are poorly informed about the role that tax prices and benefit shares play in determining their utility levels, they might respond to questions as if income and prices did not matter in shaping their demand for public spending. There is no perfect way to control for the information possessed by respondents, but one imperfect way is to stratify the sample according to their education. If more educated respondents are also more informed, their absolute income and price elasticities should be greater than for those without much education. We have tested this hypothesis by simply running the model of table 2 for college-educated respondents, finding micro elasticities that were slightly greater than those given in table 2 but not enough to change the basic interpretation of the results.

A second possibility is that individuals may have differing income elasticities of demand for different budgetary items. Thus the individual-income coefficient might be low because a positive income elasticity of demand for education is canceling a negative income elasticity of demand for welfare. To pursue this issue, we used another sequence included in the survey that asks respondents whether they would like an increase, decrease, or no change in individual budgetary items. Unlike our overall expenditure-demand question, we did not try to measure quantitative preferred changes for these

individual functional categories because such a task proved to be difficult in pretesting the questionnaire, and so we were not able to control for the county spending levels for each functional category. As a result, we have not obtained quantitative estimates of micro income and price elasticities. But we can say whether micro-income and tax-price variables are significant determinants of these functional spending desires. The suggestive findings for six functional categories are shown in table 3. We see that micro income does indeed have a positive and significant income elasticity for school spending and a negative and significant elasticity for welfare spending. The relative price elasticities are also significantly negative for schools, parks, and colleges. Hence the micro-income elasticity might have been higher if we had focused on more definable bundles, such as spending for public schools.

This test can be taken one step further. Since welfare benefits are constant throughout the state, the macro-income variable should have a zero coefficient. Including macro income in welfare regressions like those shown in table 3 does lead to this result. But since education benefits are likely to be distributed in a prorich manner, macro income there should, and does, take on a positive coefficient.[10]

Another issue of concern was the choice of unit to which public services are provided. Our tabulated results utilized per capita spending as the dependent variable, even though taxes are paid on a household basis. Since some public services such as education are provided to individuals, such an assumption seems reasonable. But other services are better viewed as household services, in which case per *family* spending might be a better choice for the dependent variable. When we made such an adjustment the price elasticity of demand remained essentially unchanged, but micro-income elasticity rose slightly and became significantly different from zero. Most of the other coefficients were not changed appreciably.

Finally, we were concerned about the correct specification of price in the demand equation. In particular, we attempted to account for the possibility that individuals responded to the reduced marginal tax price of public services created by the statewide property-tax credit program. However, the model with the circuit-breaker adjusted price fit more poorly than the model reported here, suggesting that individuals were not aware of and/or did not respond to the program. Alternatively, we tried a number of different price terms associated with varying assumptions about the impact of commercial and industrial property on tax price. Our model as specified implicitly assumes

[10] We do not present these education equations here, but a number of them are given in a paper by Bergstrom, Rubinfeld, and Shapiro (in press) on a related topic.

TABLE 3

MICRO DEMAND EQUATIONS FOR INDIVIDUAL BUDGET ITEMS, 1,125 MICHIGAN HOMEOWNER RESPONDENTS, 1978

Independent Variable	Schools	Welfare	Police & Fire	Roads	Parks	State Universities
Individual income	.108 (2.9)	−.123 (3.4)	−.032 (.8)	−.005 (.1)	.029 (.8)	.044 (1.1)
Residential value/ total value	−.137 (4.2)	.013 (.4)	−.060 (1.8)	−.040 (1.3)	−.060 (−1.8)	−.080 (2.5)
D, child in public school	.100 (3.2)	.010 (.3)	.080 (2.3)	−.030 (.9)	.030 (1.0)	.020 (.7)
D, black	.154 (4.7)	.207 (6.2)	.077 (.5)	.040 (1.3)	.080 (2.5)	.020 (.7)

NOTE.—Dependent variable = 1 if the individual desired an increase in the budget, 0 if no change, −1 if a decrease; all coefficients are standardized β coefficients; absolute t-ratios in parentheses. To save space, we have not presented results for the other independent variables appearing in table 2. None of the macro coefficients could be estimated very well because the dependent variable was not adjusted for county spending levels. The other macro variables that were statistically significant were schools: expect real income up, Jewish; welfare: transfer recipient, Republican, party other, public employee; police and fire: Jewish; roads: expect real income up, expect no change in real income; parks: transfer recipient, public employee; state universities: nonresident public employee, expect real income up, expect no change in real income.

that a commercial-industrial tax base reduces tax price, since tax revenues can be used to finance residential public services without encouraging firm outmigration. An alternative specification allowed for the perceived fiscal benefits of a commercial-industrial base to fall to zero (as suggested by Ladd [1975]). Since the price elasticity is small and not very significant, our results were essentially unchanged, but we did note a small worsening in goodness of fit when we used the Ladd assumption.

Interpreting the Results

In this section we digress slightly to show how this finding of a low micro-income elasticity and a high macro–community income elasticity, if true, bears on some current public finance questions.

The first question involves benefit share progressivity. The usual economist's view, to the extent that there is one, appears to be that the benefits of public services are *not* distributed in a prorich manner. The major proponents of this view have been Gillespie (1965), who finds a neutral distribution within communities, and Musgrave and Musgrave (1980), who indicated that state and local purchases, and education in particular, are distributed propoor. This implies that high-income individuals, with higher levels of consumption of private goods, should have a higher marginal rate of substitution for public services. It also implies that if tax shares depend on income, high-income individuals pay a higher fiscal residual (Buchanan 1950) and are more likely to emigrate from the community for fiscal reasons.

In this paper we find some negative evidence for both ideas. If public services are assumed to be normal goods and since high-income individuals do not have a higher marginal rate of substitution than do low-income individuals, these high-income individuals must be consuming more public services than low-income individuals; that is, the within-community distribution of public services must be prorich. The finding corresponds to the possibility noted by Denzau and Mackay (1976) for price-inelastic consumers. It also suggests that the fiscal incentive to migrate because of the presence of fiscal residuals may be overstated. If the income elasticity of property-tax payments within a community is approximately one (as is suggested by several studies and confirmed in our own data set), the benefit side elasticity of approximately .4 suggests that fiscal residuals may be only about half as dependent on income as would be the case if benefit distributions were independent of income. Clearly the impact of such residuals on the migration of high-income individuals from a community will also be smaller.

Since our results do seem to counter the conventional wisdom, at

least as espoused by Musgrave and Musgrave, a more careful examination of the current evidence about within-jurisdiction distributional benefits seems warranted. The evidence Musgrave and Musgrave present relates to education and to medical purchases, both of which are financed in part at the state level. In addition, their analysis is based on aggregate data and so does not pretend to control for within-community spending patterns. Their conclusion about the propoor pattern of medical expenditures seems consistent with our knowledge about state and local public hospitals and health care. However, the conclusion about education involves some strong assumptions and is controversial. To allocate benefits among income groups, Musgrave and Musgrave simply examine the distribution of students among households. As a result, the calculation does not take into account quality differentials among neighborhood schools, nor does it look at spending differences across communities. Finally, as they acknowledge, their illustrative calculations are measured solely in terms of expenditures made without taking into account the value at which public services are assessed by the recipient of those services. With a decreasing marginal utility of income, one would expect higher-income individuals to pay more for education, so that their calculation is likely to understate the benefits of education received by those with higher incomes.

A more careful look at other studies by both political scientists and economists leads us to a different view of the distributional impact of local expenditures. When dealing with education, which makes up roughly 57 percent of local budgets, Katzman (1968) examined variations in spending per pupil by neighborhood within several large cities, as well as variations in factors that might affect school quality. He found that the distribution of school quality was biased in favor of upper-income areas. Levy, Meltsner, and Wildavsky (1974) found a prorich allocation in Oakland, California, compensatory programs notwithstanding. Other studies of education (Sexton 1961 [Detroit]; Berk and Hartman 1971 [Chicago]; Owen 1972; and Mandel 1974 [Detroit]) all lead to the same qualitative conclusion—a prorich distribution of educational spending within cities.

The evidence concerning other local public services is more spotty and less conclusive. For police, Bloch (1974 [Washington]) found no discernible pattern, while Weicher (1971 [Chicago]) found a strong negative relationship between police expenditures and income up to the $8,000–$9,000 range (middle income) but a positive relationship past this point. For fire, Lineberry (1977) found a negative relationship, but his study uses as a measure of output distance from the fire station, a measure that does not reflect expenditure differentials across neighborhoods and does not take into account the fact that

citizen use of the system and the value of that use are likely to vary positively with income. For libraries, both Martin (1969 [Chicago]) and Levy et al. (1974) found a prorich distribution. However, for parks the studies are mixed, Gold (1974 [Detroit]) finding a negative relationship between income and benefits and the Community Council of Greater New York (1963) a positive relationship. Finally, for street repairs Antunes and Plumlee (1977 [Houston]) were inconclusive, as were Levy et al. (1974).

One can debate the quality and reliability of each of the studies cited. However, with education making up more than half the budget, and with the studies of most other budgetary items generally inconclusive, a net prorich distribution is at least a likely possibility.[11]

A related empirical issue involves differences between the economist's and noneconomist's views of the demand for public goods. The typical economist's view, based on macro–public goods equations of the sort estimated above in table 1, is that the income elasticity of demand is positive, usually about .6.[12] The usual noneconomist's view, based on polling individuals to find whether they want more, less, or the same amount of spending on public goods, is that implicit income elasticities are zero or sometimes even negative—income cannot explain deviations of desired from actual spending (see, e.g., ACIR 1979; Citrin 1979; or Clark and Ferguson 1981). Our results yield a simple resolution to the paradox. Both studies are right. As community incomes rise, the mean or median voter desires more public goods and public spending rises. But within a community, public services appear to be distributed in a prorich manner, implying that residual desires are uncorrelated with income.

A third idea that takes on a different interpretation is that of the Pareto optimality of the median-voter outcome, a topic dealt with first by Bowen (1943) and recently by Bergstrom (1979). Bowen established the idea that if the distribution of tastes is symmetric, so that the community's median-voter marginal rate of substitution (the result of majority rule) equals the mean marginal rate of substitution (the Pareto efficiency condition), the majority rule is Pareto efficient. Bergstrom argued that this could not be the case if public spending demand depended on income, because income is not distributed symmetrically. This led him to rescue the Bowen proposition through proportional income taxation and a symmetric distribution of "tastes."

[11] The only previous attempt to quantify these distributional results known to us appears in Inman and Rubinfeld (1979). Relying primarily on the studies mentioned above, they estimated a .25 weighted-average elasticity of expenditure benefits with respect to income. This elasticity of .25 is not too different from the .41 elasticity obtained from the survey analysis presented here.

[12] A long list of such studies is cited by Gramlich (1982).

Obviously, if our micro results are right, Bergstrom need not have worried about this problem—since public spending demand does not depend on income within a community, the Bowen majority-rule outcome could be Pareto efficient even without proportional income taxation.

A final point refers more directly to the median-voter proposition. Inman (1978) has shown that most of a sample of Long Island communities behaved "as if" the family with median income were the decisive voter in setting public expenditures. He argues that this finding confirms the median-voter hypothesis. While not necessarily denying that interpretation, the equations shown here offer an alternative possibility. Perhaps communities behave as if the median voter were decisive because of the importance of community median income in setting spending levels. Individual incomes are basically uncorrelated with spending desires, but as the median income in the community rises the community spends more.

II. The Tiebout Hypothesis

Another hotly debated issue in public finance is Tiebout's idea that voters group themselves with others having similar tastes so that public goods can be supplied efficiently. In principle there are many ways in which such an idea could be tested, but in practice the ways of testing the Tiebout hypothesis have been rather limited, and in many ways quite unsatisfactory.

Most attention has been directed at property-value changes, a tradition started by Oates (1969) and taken up by a number of authors, most recently Epple, Zelenitz, and Visscher (1978). The initial Oates article established that property values would be bid up in communities with low tax rates for a given bundle of public goods, or more public goods with a given tax rate. This suggested to Oates that there was a Tiebout-like *mechanism* at work. Economic agents were locating in communities with more favorable budgetary arrangements. Critics of this paper (Edel and Sclar 1974; Hamilton 1976) have argued that in a full Tiebout *equilibrium* property taxes should be simple benefit taxes, and if tax rates were shown to influence property values this would be proof that the system was not in a full Tiebout equilibrium. Epple et al. took this argument farther and showed that Tiebout and non-Tiebout communities could only be distinguished by whether property taxes cause a deadweight loss and hence influence the demand for housing for nonmedian voter individuals (for the median voter the tax rate is determined simultaneously and the econometric test cannot be made). Moreover, they also showed that the property-value test becomes totally nonoperational

whenever housing is supplied elastically or community boundaries are changeable.[13]

The data used here suggest a different, and perhaps less ambiguous, way to test the Tiebout hypothesis. If the hypothesis is true, two conditions must hold. (*a*) Citizens should have grouped themselves together with others with similar tastes for public goods, to eliminate many of the deadweight losses implicit in the communal supply of these goods. (*b*) The community must in fact supply this community-desired level of public goods. We concentrate on the first condition in this section and the second condition in the next section.

To test the first, we compare the variance of local spending demands within a community with those throughout the state. If there is Tiebout grouping, the within-community variance will be significantly smaller than the entire statewide sample variance.

There are in principle two ways to make the test. The first and most obvious would be simply to compare variances of spending demands within a community and throughout the whole state. The second would be to use regression equations, such as those given in table 2, to control for factors that might influence spending in all districts and then do the test on regression residuals. If, for example, public spending demands depend positively on community income, higher-income communities would be expected to have a smaller intracommunity variance than a statewide sample made up of residents of high- and low-income communities. In this case, the influence of income, and other factors, can be controlled for by the regression and the test made on just the residuals.

Both tests provide somewhat different kinds of information. The residual test asks whether individuals with similar unobservables, pre-

[13] A similar test has been devised by Reschovsky (1979). He used power-company data to examine the determinants of location for intracommunity movers and nonmovers, finding that movers were influenced by fiscal variables and nonmovers were not. The criticism would be the same as that directed at Oates: In a full Tiebout equilibrium where property taxes are benefit taxes, we would expect to find fiscal variables unimportant in explaining location. Hence the resident results could be consistent either with a full Tiebout equilibrium or with disequilibrium (as Reschovsky argues). By the same token, in a full equilibrium fiscal variables would affect moving decisions only if taxes were not benefit taxes; hence this finding confirms the Tiebout mechanism but not a Tiebout equilibrium. A different test is provided by Hamilton, Mills, and Puryear (1975). They view education as the primary public good and income as the primary determinant of spending, and attempt to estimate how much income segregation within communities (and thus public goods segregation) there is. They find some evidence that income varies less in suburban communities than in central city communities, and that in SMSAs with a large number of school districts there is less income variation than in those with fewer districts. They conclude that the data provide some mild support for the Tiebout hypothesis.

TABLE 4

TEST OF LOCATIONAL GROUPING HYPOTHESIS: COMPARISON OF SPENDING DEMAND VARIANCES AND RESIDUAL VARIANCES, 426 DETROIT METROPOLITAN AREA HOMEOWNERS

Location	Observations (N)	var (PE/N)	$F(PE/N)$	var (ϵ)	$F(\epsilon)$
Wayne County:	201	. . .	. . .	. . .	. . .
Dearborn	21	3,889	8.17**	.005	2.42**
Dearborn Heights	13	26,406	1.20	.041	
Detroit	100	8,644	3.67**	.007	1.73**
Rest of Wayne	67	4,669	6.80**	.005	2.20**
Macomb County:	101	. . .	. . .	. . .	. . .
Roseville	10	880	36.09**	.001	9.31**
St. Clair Shores	10	495	64.17**	.001	10.08**
Sterling Heights	16	639	49.71**	.001	12.10**
Warren	25	7,327	4.33**	.023	.54
Rest of Macomb	40	3,058	10.39**	.007	1.66*
Oakland County:	124	. . .	. . .	. . .	. . .
Pontiac	13	23,104	1.37	.034	.36
Southfield	19	1,722	18.44**	.003	3.90**
Rest of Oakland	92	2,581	12.31**	.004	2.75**

Note.—Countywide expenditure and income data are as follows:

	PE/N	Y	PE/NY
Wayne	1,042	11,351	.092
Macomb	703	12,110	.058
Oakland	791	13,826	.057

* Significant at 5 percent level.
** Significant at 1 percent level.

sumably correlated with public sector demands, live together. The test using direct responses, however, looks at the effect of both observable and unobservable variables. Both tests are shown in tables 4 and 5.

Table 4 focuses on just the Detroit metropolitan area. Three counties—Wayne, Macomb, and Oakland—cover virtually all of the area within 30 miles of downtown Detroit and most of the area within 40 miles. Within this three-county area, it should be possible for all workers to find a residential area consisting of individuals with like tastes in public goods. Indeed, this appears to happen to an overwhelming degree, as is shown by both tests in table 4. The table shows spending demand variances, residual variances, and F-tests on each for the 426 respondents living in Wayne, Macomb, and Oakland counties, grouped by community when there are 10 or more respon-

dents and by "rest of county" when not.[14] The countywide expenditure and income figures (in the note to the table) show that there is only a modest countywide dispersion in income (the low is 82 percent of the high) but a greater dispersion in the ratio of public expenditures to income (the low is 62 percent of the high). But what is remarkable about the table is the degree of grouping shown by the residuals. Using either F-test, in Wayne County 188 of the 201 (94 percent) respondents live in communities with an intracommunity variance of residual variance significantly smaller than the overall residual variance at the 1 percent level. In Macomb, all respondents do so using the straight variance test; 76 of the 101 respondents (75 percent) do so at the 5 percent level, and 36 of the 101 do so at the 1 percent level using the residual variance test. In Oakland, 111 of the 125 (90 percent) respondents do so at the 1 percent level for either test. Across all three counties 94 percent of the respondents are grouped together at the 1 percent level in the first test, and 79 percent of the respondents are grouped together at the 5 percent level and 88 percent of the respondents at the 1 percent level in the second. These calculations then indicate a very high degree of grouping by expenditure taste residuals in the three-county Detroit metropolitan area.[15]

A first check on this finding is to see whether it obtains in other medium-size communities in Michigan. In principle we would not expect there to be as much grouping in these other communities because there would not be as many fiscally independent jurisdictions to select from in a labor-market area. In fact, there is still a high degree of grouping, as is shown in table 5, which gives the identical information for the four areas with sufficient observations to make such a test. Using the straight variance test all respondents have grouped themselves together, but with the more stringent residual variance test only one-third of the sample observations are so grouped (at both the 5 and 1 percent levels).[16] At least for the residual test, the results are reasonably consistent with a Tiebout interpretation: In

[14] The test of whether two variances σ_1^2 and σ_2^2 are equal is provided by an F-test, since s_1^2/s_2^2 (the ratio of the estimated variances) is distributed as F with N_1 and N_2 the appropriate degrees of freedom. The test is valid only if the two χ^2 distributions associated with σ_1^2 and σ_2^2 are independent.

[15] The Detroit SMSA extends much farther out, including some counties with exterior borders almost 80 miles from downtown Detroit. We had relatively few observations from these other counties—St. Clair, Lapeer, Livingston, Washtenaw, and Monroe—in our sample, but had we included them in the test our conclusions would be tempered slightly because variances are greater in these outer counties. But still at least two-thirds of the sample observations would be grouped together in the 1 percent test and three-quarters in the 5 percent test.

[16] This percentage would be slightly higher were the next most populous city areas in the sample included (Bay City, Jackson, and Midland), but still not nearly as high as in the Detroit area.

TABLE 5

TEST OF LOCATIONAL GROUPING HYPOTHESIS: COMPARISON OF SPENDING DEMAND VARIANCES AND RESIDUAL VARIANCES, 139 NON-DETROIT URBAN MICHIGAN HOMEOWNERS

Location	Observations (N)	var (PE/N)	$F(PE/N)$	var (ϵ)	$F(\epsilon)$
Flint SMSA:	35	. . .	. . .	. . .	. . .
Genessee County	15	4,692	6.77**	.008	1.53
Shiawassee County	20	722	43.99**	.003	3.56**
Grand Rapids SMSA	34	4,045	7.85**	.008	1.46
Lansing SMSA:	43	. . .	. . .	. . .	. . .
Lansing	25	7,310	5.35**	.018	0.68
Rest of Ingham	18	4,264	7.45**	.010	1.26
Kalamazoo SMSA	27	1,648	19.27**	.004	2.82**

** Significant at 1 percent level.

large metropolitan areas, there is quite extensive grouping; in smaller areas, there is some grouping.

III. The Median-Voter Hypothesis

The other aspect of the Tiebout hypothesis that can be evaluated with these data is the logically complementary one of whether the jurisdictions in question in fact supply the level of public goods desired by these grouped respondents. If they do not, there would not be much point in locating near others with similar tastes, for all voters would be forced to consume nonoptimal levels of public expenditures. Since we are now comparing actual with desired levels of public expenditures, this test generalizes to one involving the median-voter hypothesis: Do communities supply the levels of public expenditures desired by the median voter in their community?

For this we make two changes in the data. Since we are now concerned with correspondence between actual and desired expenditures, we analyze not the residuals in a public expenditure demand equation, as above, but the raw adjustment factors. The ith respondent desiring a 5 percent cutback is recorded as -5.

A second change enables us to run a straightforward test of the median-voter hypothesis. Instead of using homeowner respondents as the sample, we redefine the sample to include only voter respondents. Clearly renter voters should be added to the sample in testing

the median-voter hypothesis. By the same token, for tests of the median-voter hypothesis, nonvoting homeowners should be dropped from the sample.

The results of this test are shown in table 6. Respondents are grouped into Detroit metropolitan area, other cities, and other nonurban areas, following the classifications used in tables 4 and 5. For all voters, the table indicates remarkable support for the median-voter hypothesis and also for the idea that voters group themselves because they gain the level of public spending they desire. In the Detroit area, two-thirds of the voters want no change in the level of public spending, and the mean desired level is less than 1 percent below the actual level. Since more than half of the voters favor no change, the median voter obviously favors no change. And in the right-hand column, only 19 percent of the voters favor a level of public spending much different from actual, defined here as a positive or negative change of more than 5 percent. Essentially the same results are obtained for other urban areas in the state: two-thirds of the voters favoring no change and only 19 percent wanting a big increase or decrease.

The results are not as striking for nonurban voters. The median-voter hypothesis still gains convincing support, in that 60 percent of the nonurban voters in the state favor no change in the overall level of public spending, while only 28 percent favor big increases or decreases. But while this supports the median-voter hypothesis, there is not quite as much satisfaction with the overall level of public spending. A slightly smaller proportion of the voters want no change than in urban areas and a slightly larger proportion want a large change. If it is true that the Tiebout mechanism should work less well in large nonurban counties where voters cannot relocate without changing jobs, there should in general be lower levels of satisfaction with government spending and these urban-rural differences would be plausible.

It is possible that with so many voters—two-thirds in urban areas and three-fifths in rural areas—opting for no change, respondents are displaying less dissatisfaction with the public sector than they truly feel. However, it is perhaps still meaningful that the same questioning procedure showed differences between urban and rural areas and that these differences do, if anything, support the Tiebout hypothesis.

IV. Implications

The presence of micro data on public spending demands at least in principle allows several tests to be made of propositions of long-standing interest in the field of applied public finance. For one thing,

TABLE 6

TESTING THE MEDIAN VOTER HYPOTHESIS: DIFFERENCE BETWEEN ACTUAL AND DESIRED SPENDING OF 858 MICHIGAN VOTERS

Place	Homeowner Respondents	Voter Respondents	Want Decrease	Want No Change	Want Increase	Mean Desired Change (%)	Want No Change (%)	Want Big Change* (%)
Detroit metropolitan area:	426	374	49	249	76	−.78	66.6	19.5
Dearborn	21	22	4	14	4	−.23	63.6	13.6
Dearborn Heights	13	11	2	8	1	−5.91	72.7	18.2
Detroit	100	106	12	61	33	−.82	57.5	21.7
Rest of Wayne	67	53	5	37	11	−.23	69.8	20.7
Roseville	10	6	1	5	0	−1.67	83.3	.0
St. Clair Shores	10	6	0	6	0	.00	100.0	.0
Sterling Heights	16	14	0	10	4	2.14	71.4	14.3
Warren	25	23	4	17	2	−1.39	73.9	13.0
Rest of Macomb	40	32	8	20	4	−2.81	62.5	28.1
Pontiac	13	12	2	4	6	3.75	33.3	50.0
Southfield	19	16	2	13	1	−1.81	81.3	12.5
Rest of Oakland	92	73	9	54	10	−.62	74.0	16.4
Other cities:	139	129	23	87	19	−1.10	67.4	18.6
Genessee City	15	15	1	10	4	.67	66.7	.0
Shiawasee City	20	15	3	10	2	−.33	66.7	20.0
Grand Rapids	34	33	9	21	3	−2.58	63.6	24.2
Lansing	25	20	3	13	4	−.25	65.0	25.0
Rest of Ingham	18	23	3	16	4	−.74	69.6	21.7
Kalamazoo	27	23	4	17	2	−1.74	73.9	13.0
Nonurban counties	417	355	78	215	62	−1.81	60.5	28.5

* Want spending changes (up or down) of more than 5 percent.

it appears that spending-demand equations fitted to micro data give approximately the same parameter estimates as those fitted to macro data, though the interpretation of these micro equations can be very different and very illuminating. Positive income elasticities of public spending demand appear to arise because public services are distributed in a prorich manner within communities, implying that, other things equal, residents of higher-income communities perceive that they receive lower levels of spending on public goods and want more. As a consequence, in any given community, there appears to be little difference between the marginal public spending demands of rich and poor respondents, just as public opinion polls suggest. At the same time, respondents who anticipate increases in their own real income do desire somewhat more public spending (or are willing to pay more taxes).

The existence of micro data also permits a different test of the Tiebout hypothesis. Controlling for all the independent variables in a statewide micro–spending demand equation, residuals from the set of observations in urban communities have a significantly smaller variance than in the whole sample in a very high percentage of the cases, indicating that at least in those urban communities there appears to be a high degree of grouping by public spending demands. The obvious explanation for this phenomenon is a Tiebout mechanism, whereby people locate in communities where others want and supply a menu of public goods similar to their own preferred level. This interpretation is supported by three other propositions that can also be established. Actual spending does conform to desired levels in these purportedly Tiebout-like communities, it does so less in rural communities where a Tiebout mechanism is unlikely to operate, and there appears to be less grouping by residuals in small urban labor market areas than in large areas.

References

Advisory Commission on Intergovernmental Relations (ACIR). *Changing Public Attitudes on Government and Taxes.* Washington: Government Printing Office, 1979.

Antunes, George E., and Plumlee, John P. "The Distribution of an Urban Public Service: Ethnicity, Socioeconomic Status, and Bureaucracy as Determinants of the Quality of Neighborhood Streets." *Urban Affairs Q.* 12 (March 1977): 313–32.

Bergstrom, Theodore C. "When Does Majority Rule Supply Public Goods Efficiently?" *Scandinavian J. Econ.* 81, no. 2 (1979): 216–26.

Bergstrom, Theodore C., and Goodman, Robert P. "Private Demands for Public Goods." *A.E.R.* 63 (June 1973): 280–96.

Bergstrom, Theodore C.; Rubinfeld, Daniel L.; and Shapiro, Perry. "Micro-based Estimates of Demand Functions for Local School Expenditures." *Econometrica* (in press).

Berk, R. A., and Hartman, A. "Race and District Differences in per Pupil Staffing Expenditures in Chicago Elementary Schools, 1970–71." Evanston, Ill.: Northwestern Univ., Center for Urban Affairs, June 1971.

Bloch, P. "Equality of Distribution of Police Services: A Case Study of Washington." Washington: Urban Inst., 1974.

Borcherding, Thomas E., and Deacon, Robert T. "The Demand for the Services of Non-federal Governments." *A.E.R.* 62 (December 1972): 891–901.

Bowen, Howard R. "The Interpretation of Voting in the Allocation of Economic Resources." *Q.J.E.* 58 (November 1943): 27–48.

Buchanan, James M. "Federalism and Fiscal Equity." *A.E.R.* 40 (September 1950): 583–99.

Citrin, J. "Do People Want Something for Nothing: Public Opinion on Taxes and Government Spending." *Nat. Tax J.* 32 (suppl.; June 1979): 113–39.

Clark, Terry N., and Ferguson, L. "The Middle Class: Policy Preferences and Political Involvement." Manuscript. Chicago: Univ. Chicago, Dept. Soc., 1981.

Community Council of Greater New York. "Comparative Recreation Needs and Services in New York Neighborhoods." New York: Community Council of Greater New York, 1963.

Converse, Philip E. "Public Opinion and Voting Behavior." In *Handbook of Political Science.* Vol. 4, *Nongovernmental Politics*, edited by Fred I. Greenstein and Nelson W. Polsby. Reading, Mass.: Addison-Wesley, 1975.

Courant, Paul N.; Gramlich, Edward M.; and Rubinfeld, Daniel L. "Why Voters Support Tax Limitation Amendments: The Michigan Case." *Nat. Tax J.* 33 (March 1980): 1–20.

Deacon, Robert T. "Private Choice and Collective Outcomes: Evidence from Public Sector Demand Analysis." *Nat. Tax J.* 30 (December 1977): 371–86.

Denzau, Arthur T., and Mackay, Robert J. "Benefit Shares and Majority Voting." *A.E.R.* 66 (March 1976): 69–76.

Downs, Anthony. *An Economic Theory of Democracy.* New York: Harper, 1957.

Edel, Matthew, and Sclar, Elliott. "Taxes, Spending, and Property Values: Supply Adjustment in a Tiebout-Oates Model." *J.P.E.* 82, no. 5 (September/October 1974): 941–54.

Epple, Dennis; Zelenitz, Allan; and Visscher, Michael. "A Search for Testable Implications of the Tiebout Hypothesis." *J.P.E.* 86, no. 3 (June 1978): 405–26.

Gillespie, W. Irwin. "Effect of Public Expenditures on the Distribution of Income." In *Essays in Fiscal Federalism,* edited by Richard A. Musgrave. Washington: Brookings, 1965.

Gold, Steven D. "The Distribution of Urban Government Services in Theory and Practice: The Case of Recreation in Detroit." *Public Finance Q.* 2 (January 1974): 107–30.

Gramlich, Edward M. "Intergovernmental Grants: A Review of the Empirical Literature." In *The Political Economy of Fiscal Federalism,* edited by Wallace E. Oates. Lexington, Mass.: Lexington, 1977.

———. "Models of Excessive Government Spending: Do the Facts Support the Theories?" In *Public Finance and Public Employment,* edited by Robert H. Haveman. Detroit: Wayne State Univ. Press, 1982.

Hamilton, Bruce W. "The Effects of Property Taxes and Local Public Spending on Property Values: A Theoretical Comment." *J.P.E.* 84, no. 3 (June 1976): 647–50.

Hamilton, Bruce W.; Mills, Edwin S.; and Puryear, David. "The Tiebout Hypothesis and Residential Income Segregation." In *Fiscal Zoning and Land*

Use Controls: The Economic Issues, edited by Edwin S. Mills and Wallace E. Oates. Lexington, Mass.: Heath, 1975.

Hotelling, Harold. "Stability in Competition." *Econ. J.* 39 (March 1929): 41–57.

Inman, Robert P. "Testing Political Economy's 'As If' Proposition: Is the Median Income Voter Really Decisive?" *Public Choice* 33, no. 4 (1978): 45–65.

Inman, Robert P., and Rubinfeld, Daniel L. "The Judicial Pursuit of Local Fiscal Equity." *Harvard Law Rev.* 92 (June 1979): 1662–1750.

Katzman, Martin T. "Distribution and Production in a Big City Elementary School System." *Yale Econ. Essays* 8 (Spring 1968): 201–56.

Ladd, Helen F. "Local Education Expenditures, Fiscal Capacity, and the Composition of the Property Tax Base." *Nat. Tax J.* 28 (June 1975): 145–58.

Levy, Frank; Meltsner, Arnold J.; and Wildavsky, Aaron. *Urban Outcomes: Schools, Streets, and Libraries.* Berkeley: Univ. California Press, 1974.

Lineberry, Robert L. *Equality and Urban Policy: The Distribution of Municipal Public Services.* Beverly Hills, Calif.: Sage, 1977.

Mandel, A. S. "The Allocation of Resources inside Urban and Suburban School Districts: Theory and Evidence." Ph.D. dissertation, Univ. Michigan, 1974.

Martin, Lowell A. *Library Response to Urban Change: A Study of the Chicago Public Library.* Chicago: American Library Assoc., 1969.

Musgrave, Richard A., and Musgrave, Peggy B. *Public Finance in Theory and Practice.* 3d ed. New York: McGraw-Hill, 1980.

Oates, Wallace E. "The Effects of Property Taxes and Local Public Spending on Property Values: An Empirical Study of Tax Capitalization and the Tiebout Hypothesis." *J.P.E.* 77, no. 6 (November/December 1969): 957–71.

Owen, John D. "The Distribution of Educational Resources in Large American Cities." *J. Human Resources* 7 (Winter 1972): 26–38.

Reschovsky, A. "Residential Choice and the Local Public Sector: An Alternative Test of the 'Tiebout Hypothesis.' " *J. Urban Econ.* 6 (October 1979): 501–20.

Romer, Thomas, and Rosenthal, Howard. "Political Resource Allocation, Controlled Agendas, and the Status Quo." *Public Choice* 33, no. 4 (1978): 27–43.

Samuelson, Paul A. "The Pure Theory of Public Expenditure." *Rev. Econ. and Statis.* 36 (November 1954): 387–89.

Sexton, Patricia C. *Education and Income: Inequalities of Opportunity in Our Public Schools.* New York: Viking, 1961.

Tiebout, Charles M. "A Pure Theory of Local Expenditures." *J.P.E.* 64, no. 5 (October 1956): 416–24.

Weicher, John C. "The Allocation of Police Protection by Income Class." *Urban Studies* 8 (October 1971): 207–20.