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MICRO-BASED ESTIMATES OF DEMAND FUNCTIONS FOR LOCAL SCHOOL EXPENDITURES

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We devise and apply a new method for estimating demand for local public goods from survey data. Individuals' responses to questions about whether they want more or less of various public goods are combined with observations of their incomes, tax rates, and of actual spending in their home communities to obtain estimates of demand functions. This estimation technique requires no "median voter" assumptions. Functions estimated in this way can be much richer in detail than estimates obtained from aggregate cross-section studies and allow one to distinguish between the effects of individual characteristics and the effects of the character of one's home jurisdiction on demand. Estimates of the effects of income and price turn out to be quite similar to those found in aggregate studies.

INDIVIDUAL PREFERENCES are as central to modern public goods analysis as they are to the study of markets for private goods. The well-known Samuelson conditions for efficient provision of public goods involve the sum of individuals' marginal rates of substitution between public and private goods. Economic theories of the behavior of democratic governments have it that the supply of public goods by a community is determined by the pattern of preferences in the electorate.[2] Thus, whether we wish to investigate the efficiency of government institutions or to forecast the effects of anticipated changes in economic and demographic variables on public expenditure, we would like to be able to relate the indifference maps of individuals to observable characteristics of these individuals and their environments.

A standard result in the theory of demand for private goods is that (subject to certain regularity conditions) knowing a consumer's demand function is equivalent to knowing its indifference map. If one observes what a rational consumer would choose in many different price-income situations, one can estimate a demand function. Furthermore, the demand function can be made to depend on demander's observable characteristics, such as age, race, or sex. The estimated demand functions can, in turn, be "integrated back" to find indifference maps for consumers with each possible list of characteristics. Our objective in this

[1] We wish to thank Deborah Swift for her extremely capable research, editorial, and administrative assistance. We are grateful for financial support from the National Science Foundation. This article condenses a longer working paper of the same title. Readers wishing to see more detail and some additional results may request copies of the working paper from the authors.

[2] The individualistic theory of efficient provision of public goods dates at least from the work of Wicksell [**44**] and Lindahl [**28**]. Its definitive treatment in modern terms is found in Samuelson [**41**]. A positive theory, relating outcomes in democracies to voter preferences was developed by Bowen [**7**]. Other contributions to this tradition include Black [**6**], Downs [**18**], Buchanan and Tullock [**11**], and Barr and Davis [**3**], Barlow [**2**], and Bergstrom [**4**].

paper is to accomplish a similar program for a particular publically provided good, namely local elementary and secondary education.[3]

Estimating demand functions for public goods is in certain respects less straightforward than doing so for private goods. One can observe a consumer's income and other characteristics as well as the "tax price" that it pays per unit of public goods and the amounts of public goods provided in its community. But one cannot be certain that the consumer gets the amount of public goods that it would like to have, given the tax price that it pays. The quantity of public goods provided in a community must be a political outcome that typically will not be the unanimous choice of all citizens.

In democracies, the fundamental behavioral indicator of preferences for public goods is voting behavior. Or course with the Australian ballot, one cannot observe how any particular individual votes. Rather, one observes the "aggregate" outcomes of elections and referenda. A possible method of estimating demands for public goods is to relate aggregate outcomes of elections in different places to indicators of the economic and demographic composition of their populations. Several studies of this type are discussed in review articles by Denzau [17], Deacon [15], and Inman [24]. Deacon classifies these studies into two groups—those based on "majority rule—median voter models" and those based on voting behavior. The former group, following a line of research begun by Barr and Davis [3], attempt to infer individual demand functions from cross-sectional studies in which actual public expenditures by local governments are regressed on indicators of the economic and social composition of the jurisdiction's population. In order to draw such inferences, one needs a "political" theory that relates a jurisdiction's expenditures to the profile of preferences of its population. The theory most often used is the "median voter theory" developed by Bowen [7]. Bergstrom and Goodman [5] give this theory specific empirical content by showing that, subject to certain strong assumptions, majority rule implies that one can treat an observation of expenditure levels in a given jurisdiction as a point on the "demand curve" of a citizen of that community with median income for the community. This procedure has the advantage of presenting the researcher with a very large cross-sectional data base at very low cost in data collection. This procedure has the disadvantage that the reliability of its estimates of demand functions depends at least in part on the degree to which the political process is approximated by the median voter model. Reliability also depends on certain regularities in the structure of demand in the community, as remarked in Bergstrom and Goodman [5].[4]

The "voting behavior" studies typically estimate demand functions by relating the proportion of favorable votes on a public goods referendum in a precinct to

[3] Some might wonder whether it is appropriate to treat education as a Samuelsonian "pure public good." The operational content of our treatment is simply this. Each respondent in the sample is assumed to have a utility function that depends on an index of the quality of education offered to students in his district and on his expenditures on "all other goods." The index of quality used in this paper is total expenditures per pupil.

[4] A critique of the "median voter model" is found in Romer and Rosenthal [37].

indicators of the economic and demographic make-up of the precinct.[5] Where each precinct is a single observation and where all precincts are voting on the same issue, one typically must settle for a fairly small number of observations. In general, data of this type are much sparser and more difficult to acquire than the data needed for the "median voter" estimates. Furthermore, as we shall discuss later, data on voting in a single election are not, in general, adequate to fully identify a demand function although they can supply useful qualitative information about the determinants of demand.

Both "aggregate" methods of estimation depend on subtle inferences that allow many possibilities for statistical misspecification. With these methods it is virtually impossible to distinguish the effects of individual characteristics (e.g., income or race) from those of "neighborhood characteristics" (e.g., community income or racial composition). Since there is cause for reservations about the reliability of demand estimates founded on aggregate data, it is of considerable interest to discover whether the results of such studies are consistent with microeconomic data on individual preferences.

1. A METHOD OF ESTIMATING CONTINUOUS DEMAND EQUATIONS FROM QUALITATIVE SURVEY RESPONSES

So long as there is a secret ballot, it would seem that the only way to find out whether an individual is satisfied with his current level of public goods consumption is to ask him. Surveys of voter sentiment and intentions, such as the Gallup poll, are common. Surveys that systematically relate a voter's expressed preference to standard economic variables are rare. Interesting examples of the use of survey data to relate voting behavior to economic variables are studies by Rubinfeld [**39**], Fischel [**20**], and Citrin [**12**]. To date, however, we are aware of no estimates of demand functions for a public good based on survey data.[6]

In this paper we develop a method for estimating demand functions for public goods from survey data and proceed to estimate these functions. The data used in the paper were obtained from a survey of 2001 individuals in Michigan selected randomly immediately after the November, 1978 election. Detailed discussions of the construction of the survey are available in Courant, Gramlich, and Rubinfeld [**13, 14**].[7] Although the Courant, Gramlich, Rubinfeld survey

[5] Examples of research of this kind are Deacon and Shapiro [**16**] and Neufeld [**35**].

[6] The paper which comes closest to doing this is Gramlich and Rubinfeld [**22**]. The authors estimate demand functions of individuals for total spending in their county of residence. The methods used in that paper are quite different from those used here.

[7] Many economists view inference from survey results with suspicion. Often this attitude is justified. For example, if a survey asks a consumer how he would behave in situations that are remote from his normal experience, his answer may be very different from the behavior he would actually choose if he had time to consider carefully or perhaps experiment with responses to the hypothetical situation. Some surveys (knowingly or not) ask attitudinal questions where the response is highly sensitive to the form in which the question is posed. Other surveys may give respondents an incentive to mislead the interviewer because they fear that their answers may be used against their interests. On all of these counts, the survey reported here seems to be relatively unobjectionable. Citizens of Michigan had just been asked to vote in a highly publicized election in which three controversial

inquired about demands for several types of public expenditure, we confine our attention to school expenditures.

The interviewers asked each respondent:

> "Do you think the state and local governments should be spending more, spending less, or about the same amount on the local public school system as they are spending now?"

If the response to this question was "more," it was followed by a second question:

> "If your taxes had to be raised to pay for the additional expenditures on local public schools would you still favor an increase in expenditure in this area?"

If the response was "yes" to this second question, the respondent was recorded as favoring "more" expenditure on schools. If the response was "no" to this question, the respondent was recorded as desiring "about the same" level of expenditures. Thus for each respondent an answer of "more," or "less," or "the same" was recorded. Respondents were also asked to state their incomes, their annual property tax bills, whether they are owners or renters, their race, age, number of children, and several other personal characteristics. Asking a simple qualitative question about the direction of the respondent's preferred amount of public expenditure from the status quo, rather than asking him to specify more exactly how much he would like, reduces the burden on the respondent's imagination. On the other hand, the economist using such data must perform theoretical and statistical machinations which would be unnecessary if he observed actual quantities demanded instead of "mere" qualitative information.

One way to deal with the use of purely qualitative responses is to characterize the survey as a random drawing from a population that has been partitioned by a vector of personal and environmental attributes x. Within each partition, individual demand, q_i, is a random variable such that

$$\ln q_i = \ln D(x_i) - \ln \epsilon_i \qquad (1)$$

where $D(\cdot)$ is the demand function and $\ln \epsilon_i$ is an independently and identically distributed random variable.

The set-up here will be familiar to those acquainted with the econometric and biostatistical literature on qualitative choice models.[8] Let a_i be the actual amount of public goods supplied in i's community. We might hypothesize that individual

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amendments to the state constitution were proposed. Two of these concerned limitations on taxes to support local government expenditure and one was a "voucher plan" for education. Thus voters had recently been given an opportunity to reflect on their attitudes toward local expenditures. Furthermore, the questions that were asked did not call for a detailed response to a complicated hypothetical situation, but simply ask the respondent whether he wanted more, less, or the same amount to be spent on a specific local governmental activity, given the likely tax consequences for himself of such a change. Since it was made clear to the respondents that this survey was not going to be used to determine government tax or expenditure policies it also seems unlikely that respondents had an incentive to deliberately mislead the interviewers.

For a sample of previous studies that have utilized survey data to analyze public sector preferences, see Maital [32], Mueller [34], and Watts and Free [43].

[8] See, for example, McFadden [33] and Amemiya [1].

i will answer "more," "less," or "the same" depending on whether $q_i > a_i$, $q_i < a_i$, or $q_i = a_i$. The parameters of the function $D(\cdot)$ could then be estimated using standard techniques of *logit* or *probit* analysis. The trouble with doing this is that if the distribution function of ϵ is assumed to be continuous, then the probability of the event $q_i = a_i$ is zero for each i. This formulation would therefore be consistent with the data only if almost none of the respondents claimed to be satisfied with current levels of provision of public goods. In fact, it turns out that 58 per cent of the homeowners in the sample said that they wanted "about the same" as the current level of expenditures in their districts, while 25 per cent claimed to want "more" and 17 per cent claimed to want "less." We therefore recast the model in a way suggested by Luce's [**31**] discussion of semi-orders. This model was first applied empirically by Shapiro [**42**]. In Luce's theory, strict preference is transitive but indifference may be intransitive because consumers are unable to perceive very small differences. In our application we suppose that voters will respond "about the same" unless actual supplies of public goods differ from their most desired levels by more than some threshold amount. Specifically, we assume that for some parameter, $\delta > 1$, the respondent claims to want "more" if $q_i > \delta a_i$, "less" if $q_i < a_i/\delta$, and "about the same" if $a_i/\delta \leqq q_i \leqq \delta a_i$.[9]

Taking logs and using equation (1), we see that the respondent is assumed to answer "more," "less," or "about the same" respectively, if:

$$\text{(2)} \qquad \ln \epsilon_i < \ln D(x_i) - \ln \delta - \ln a_i,$$

$$\text{(3)} \qquad \ln \epsilon_i > \ln D(x_i) + \ln \delta - \ln a_i,$$

$$\text{(4)} \qquad \ln D(x_i) - \ln \delta - \ln a_i \leqq \ln \epsilon_i \leqq \ln D(x_i) + \ln \delta - \ln a_i.$$

For purposes of estimation, we assume that $\ln \epsilon$ has a logistic distribution[10] with

[9]One might, more generally postulate that there are two ratios $\delta_1 < 1$ and $\delta_2 > 1$ such that the respondent wants more when $q_i > \delta_2 a_i$ and less when $q_i < \delta_1 a_i$. We have also fitted a demand function using this specification. As it turns out, our data are not rich enough to enable us to reject the hypothesis that $\delta_1 = 1/\delta_2$. Furthermore, the parameters of the demand equation are not substantially different between the two specifications. Therefore we retain the hypothesis that $\delta_2 = 1/\delta_2$.

We performed a number of additional tests to check on the robustness of our results. First, we estimated an ordered logit model in which four, rather than three choices were allowed, distinguishing between those who said more, but didn't want to pay higher taxes and those that said more, but were willing to pay for it. The results were very similar to those included in the paper. Second, we checked to see whether the assumption that the choices, more, same, less are ordered was a reasonable one. In this regard we estimated an unordered multiple logit model, with the results once again not substantially different from those reported in the text.

[10]We tried two other specifications of the functional form of F. One was an ordered probit. This differs from the ordered logit in the assumption that the disturbance term is normal rather than logistic. The other thing we tried was a linear regression in which the dependent variable was -1, 0, or 1, depending on whether the respondent wanted less, the same, or more educational expenditure and the right-hand variables included the current level of expenditures in the respondent's school district as well as the list of variables to be included in the demand function. Estimates of the demand function found in each of these ways were extremely similar to those found using logit. This suggests that our results are robust with respect to the assumed form of the error distribution.

zero mean and an unknown standard error, σ. Then $\ln \epsilon/\sigma$ has a logistic distribution with zero mean and unit variance. Let $F(\cdot)$ denote the cumulative distribution of the logistic with zero mean and unit variance. Suppose that $\ln D(x_{i1}, \ldots, x_{ik}) = \beta_0 + \sum_{j=1}^{k} \beta_j x_{ij}$. From equation (2), (3), and (4), it then follows that the likelihood functions for the responses "more" and "less" are respectively:

$$(5) \qquad F\left(\frac{\beta_0}{\sigma} + \sum_{j=1}^{k} \left(\frac{\beta_j}{\sigma} \right) x_{ij} - \frac{1}{\sigma} \ln \delta - \frac{1}{\delta} \ln a_i \right)$$

and

$$(6) \qquad 1 - F\left(\frac{\beta_0}{\sigma} + \sum_{j=1}^{k} \left(\frac{\beta_j}{\sigma} \right) x_{ij} + \frac{1}{\sigma} \ln \delta - \frac{1}{\sigma} \ln a_i \right)$$

while the likelihood of the answer "about the same" is one minus the sum of (5) and (6).

Using a standard computer program for estimation of an ordered logit model, we obtain estimates of the coefficients, (β_j/σ), and $1/\sigma$ of the variables x_{ij} and a_i in equations (5) and (6). From these estimates we can obtain estimates of β_j by simple division. The logit routine also yields estimates of the "intercept terms" $(\beta_0/\sigma) + (1/\sigma)\ln \delta$ and $(\beta_0/\sigma) - (1/\sigma)\ln \delta$. From these estimates and our estimates of $1/\sigma$, we can calculate an estimate of $\ln \delta$.

From expressions (5) and (6) it is apparent that in order to estimate the parameter $1/\sigma$, we must observe variation in the a_i's.[11] For example, in Rubinfeld's 1977 study **[39]**, all of the observations were of people living in a single community. Thus Rubinfeld was able to estimate the ratio of the price elasticity to the income elasticity of demand, but he was not able to estimate these elasticities individually. The same difficulty precludes estimation of a demand function from observations of precinct returns in an expenditure referendum in a single jurisdiction.

Even with data such as ours, where we observe expenditure levels in several places, the precision of our estimates of the parameters is seriously limited by the relatively small amount of variation in expenditure levels. Thus, although we sample nearly one thousand consumers, they live in only about one hundred different school districts. Our sample, therefore, has much more variability in the x_{ij} variables than in the a_i's. Consequently we find that the standard errors of the estimates of $1/\sigma$ are about five times as large as those for the coefficients, β_i/σ, on income and price.[12]

[11]This is clear since if $a_i = a$ for all i, then the "intercept terms" would be $\beta_0/\sigma - (1/\sigma)\ln a \pm (1/\sigma)\ln \delta$.

Knowledge of these terms would not enable us to identify β_0, σ, or δ. The remaining coefficient estimates are estimates of β_j/σ and from these it is impossible to estimate β_j unless we have an estimate of σ.

[12]For this reason it might be a good idea for future studies of this type to design their sampling procedures in such a way as to include respondents distributed widely among many communities with differing expenditure levels.

2. MEASURING PRICE AND QUANTITY

The demand equation that we estimate has the form:

$$\ln E = \beta_0 + \beta_1 \ln t + \beta_2 \ln Y + \sum_{j=3}^{k} \beta_j x_j + \epsilon \tag{7}$$

where E is the respondent's desired level of per student school expenditures in his school district, t is the estimated tax cost to the respondent of an additional dollar of expenditures per pupil in his district, Y is his income after local taxes, and the x_i's are a number of other descriptive variables.

We measure quantity by expenditure rather than physical units, because the production of education requires many different inputs and there is no really satisfactory physical measure of output. This procedure would be entirely appropriate if all observed school districts faced the same input prices and had the same "production function" for education. In this case, expenditure provides a scalar measure, which is monotonically related to the quality of local education. If, on the other hand, there were variations in factor costs from place to place, expenditure would not be a good measure of quantity. Furthermore, the "price" and income variables used should be adjusted to account for any local variations in the costs of private goods as well as the cost of educational inputs.

Suppose that the price level for educational inputs in the respondent's district is p_e and the price level for all other goods is p_0. Then equation (7) would be more properly rewritten as

$$\ln \frac{E}{p_E} = \beta_0 + \beta_1 \ln \frac{t p_E}{p_0} + \beta_2 \ln \frac{Y}{p_0} + \sum_{j=3}^{k} \beta_j x_j + \epsilon, \tag{8}$$

where expenditures on education and on other goods are adjusted by the appropriate local price indices so as to measure quantities and where the price, $t(p_E/p_0)$, represents the quantity of other goods that the respondent must give up in order to acquire an additional quantity unit of educational inputs. Notice that equation (8) is equivalent to:

$$\ln E = \beta_0 + \beta_1 \ln t + \beta_2 \ln Y + (1-\beta_1)\ln p_E - (\beta_1 + \beta_2)\ln p_0 + \sum_{j=3}^{k} \beta_j x_j + \epsilon. \tag{9}$$

Therefore, if we estimate (7) without including the variables p_E and p_0, the estimates are subject to bias because of omitted variables. While we cannot obtain good direct measures of p_E and p_0, we have access to some variables which are closely related. These include the average teachers' salary and an index of average wages in the private sector in the county where the respondent lives.[13]

[13] We also estimated demand functions using an "educational cost index" compiled by Loatman **[29]**, rather than our index of average teacher wages in the county. Which index is used makes almost no difference for the coefficients on other variables. We chose to work with average teacher wages instead of the other index largely because of its greater simplicity.

It is hoped that use of these variables will largely eliminate bias from the omission of price indices.

Conceptually, the appropriate notion of "tax price" is the marginal cost to an individual of increasing the amount of expenditures per student in the school district where he resides by one dollar.[14] Essentially all locally raised school funding is obtained from the property tax. Therefore, if marginal increments to local expenditures came entirely from local sources, the tax price paid by an individual would be equal to the number of students in the local school district times the ratio of the assessed value of his property to the total assessed value in the district where he lives. The survey allowed us to make two independent estimates of this number. Respondents were asked to estimate the amount of property taxes that they paid per year. They were also asked to estimate the market values of their houses. Using published data on millage rates, assessment to market value ratios and school enrollment, we constructed a tax price based on each of these estimates. These two estimates frequently differ quite substantially. Demand functions estimated by using each of these concepts of tax price are reported in the first two columns of Table III. Fortunately, the estimates found in these different ways are very similar. We chose to confine our further analysis to the case of estimates based on the respondent's notion of his tax bill on the grounds that the fits obtained with this variable are slightly better.

Further complications are introduced by two important distributional programs operated by the state of Michigan. One of these is the state aid-to-education program. The other is the so-called "circuit breaker" property tax relief program which allows taxpayers a credit against their state income taxes, the size of which depends on their local property tax bills.[15] The current Michigan state aid formula is not lump sum, but alters marginal costs to local taxpayers. Likewise the circuit-breaker program reduces the net cost to certain taxpayers of a marginal expenditure on local education. Using the explicit

[14]One might be tempted to argue that the "price" the taxpayer pays for public education should be a price per own child. Thus for each respondent we would have to divide the respondent's price as we measure it by the number of his own children in or soon to be in public school. Of course, if people place any value on the education of the children of others this procedure would be inappropriate. In fact if a respondent has no children of his own we would have to record him as facing an infinite price. Thus, persons who have no children would all want zero expenditures on public education. This is evidently not the case in our sample since a substantial number of people without children claim to want more to be spent in their districts than is currently being spent. Even if there were no non-private aspects to demand for public goods, the assumption that the number of one's children in school acts on one's demand for per student expenditures in the schools only through an effect on price is unnecessarily restrictive and has no foundation in consumer theory. If a family has an extra child, this will have an effect on its needs for housing, food, and clothing as well as the total benefits that family members receive from additional expenditures on local schools. We certainly would expect the presence and possibly the number of children of school age in the respondent's family to influence his demand for school expenditures in his school district. However, we think it reasonable to allow the possibility that the effect acts in a different way from a simple proportionate alteration in price. For this reason we incorporate number of children of various ages as a separate variable.

[15]For detailed information about the circuit-breaker and its effects, see Rubinfeld and Wolcoff [38] and Fisher and Rasche [21].

formulae for each plan and the data we have about each individual and his district, we are able to compute the marginal tax prices that apply to each individual when these programs are taken into account. The coefficients are not much changed by inclusion of these effects as we will show in Table III below. Perhaps the reason why the coefficients are not substantially affected is that both programs are quite new and probably are not well understood by the electorate. Until 1973–74, Michigan state aid was essentially lump sum in character. Since then, there has been a significant matching component for many districts, but the operating formula has been changed quite drastically in each succeeding year (see Brazer and Anderson [**10**]). The circuit breaker was introduced in 1974, and its implications for the marginal cost of local public goods to taxpayers do not seem to be widely understood.

3. RESULTS AND INTERPRETATION

The population studied included all homeowners in the Courant, Gramlich, Rubinfeld sample.[16] Table I presents our estimates of the coefficients in three alternative specifications of a logit model. As observed in the previous discussion, the coefficient of the variable "log expenditure" is our estimate of the parameter, $1/\sigma$, while the coefficients of the other variables are estimates of β_j/σ where β_j is the elasticity of demand with respect to the jth variable.

The threshold estimate $\ln\hat{\delta}$ tells us something about the magnitude of the difference between desired and actual expenditures which is necessary to elicit a response of either more or less spending. For example, in model 1, the estimated value of $\hat{\delta}$ is $e^{.41}$ or 1.5. This suggests that desired spending would have to be about one and a half times actual spending for the individual to express a preference for more spending.

Estimates of the income and price elasticity of demand are obtained by dividing the coefficients of "log income" and "log price" by the coefficient of "log expenditures." These estimates and their estimated standard errors are reported in Table II. The first column of Table II reports estimated price and income elasticities of demand for local public education where the only explanatory variables used are price and income. The survey data enable us to introduce a rich variety of additional explanatory variables which might have a substantial influence on demand for education. The remaining columns of Table II are associated with the introduction of successively more of the explanatory variables as shown in Table I. As more variables are added, one notices that the estimated income elasticity of demand falls. This is not surprising since several of the variables which are added are positively associated both with income and with demand for education. For example, people who have more education tend both

[16] It would be of interest to analyze separately the behavior of renters and homeowners as well as of people who vote frequently and people who do not. We intend to do this in another paper. Rubinfeld [**40**] and Gramlich, Rubinfeld, and Swift [**23**] have used similar data to address the question of whether voters behave differently from nonvoters.

TABLE I

DEMAND ESTIMATES—LOGIT FORMULATION

Independent Variable	Model 1 Coefficient (Std. error)	Model 2 Coefficient (Std. error)	Model 3 Coefficient (Std. error)	Model 4 Coefficient (Std. error)
Threshold, $\ln \hat{\delta}$	.41 (.62)	.85 (.63)	.88 (1.05)	.92 (1.77)
Log expenditure	−0.261 (0.216)	−0.397 (0.219)	−0.430 (0.264)	−0.430 (0.329)
Log income	0.217 (0.052)	0.255 (0.053)	0.210 (0.064)	0.164 (0.067)
Log tax price	−0.150 (0.048)	−0.153 (0.049)	−0.176 (0.051)	−0.187 (0.054)
Black	—	0.984 (0.138)	1.139 (0.192)	1.130 (0.202)
Jewish	—	—	—	0.787 (0.317)
Catholic	—	—	—	−0.014 (0.084)
# kids age 1–5	—	—	0.271 (0.064)	0.244 (0.067)
# kids age 6–11	—	—	0.161 (0.056)	0.144 (0.059)
# kids age 12–16	—	—	0.043 (0.053)	0.029 (0.054)
Child in non-public school	—	—	−0.231 (0.141)	−0.232 (0.145)
Not high school grad	—	—	−0.121 (0.099)	−0.077 (0.102)
College grad	—	—	0.170 (0.106)	0.175 (0.014)
Log enrollment	—	—	−0.053 (0.044)	−0.162 (0.059)
Log pupils per school	—	—	—	0.400 (0.149)
% black in district	—	—	—	0.006 (0.003)
Republican	—	—	—	−0.043 (0.084)
Female	—	—	—	0.100 (0.076)
School employee	—	—	—	0.329 (0.140)
Age 65 or over	—	—	0.103 (0.134)	0.272 (0.146)
Retired or disabled	—	—	—	−0.354 (0.131)
Unemployed	—	—	—	−0.518 (0.251)
On welfare	—	—	—	0.184 (0.246)
Detroit	—	—	0.089 (0.214)	−0.351 (0.293)
Lower income, expect higher	—	—	—	−0.078 (0.172)
Lower income, expect lower	—	—	—	−0.244 (0.113)

TABLE I Cont.

Independent Variable	Model 1 Coefficient (Std. error)	Model 2 Coefficient (Std. error)	Model 3 Coefficient (Std. error)	Model 4 Coefficient (Std. error)
Higher income, expect lower	—	—	—	−0.155 (0.175)
Higher income, expect higher	—	—	—	0.183 (0.094)
Log county avg. teacher salary	—	—	—	1.488 (0.695)
Log county avg. wage rate	—	—	—	1.353 (1.035)
Log median county income	—	—	0.721 (0.364)	− 1.234 (0.844)
Log per capita city income	—	—	−0.084 (0.148)	− 0.067 (0.211)
n	949	949	949	943
− 2*Log (Likelihood)	21.35	76.06	115.32	172.17
Fraction Explained	.385	.397	.405	.417

Log Expenditure: (natural) log of general fund school expenditure per pupil (in district in which respondent resides), 1977–78.

Log Income: log of respondent's reported family income less his reported property taxes. (Some 19% of respondents did not report their income. Many of these respondents were assigned a predicted value of income based on a regression of income on race, age, education, occupation of head, occupation of spouse, sex of head, number of hours worked by head, and number of hours worked by spouse.)

Log Tax Price: log of (respondent's property taxes/total millage in place of residence)/state equalized value per pupil; mills and S.E.V. per pupil are for 1977–78.

to have higher incomes and, even controlling for income, to desire more expenditures on schools. In a demand equation including both education and income, the coefficient of income registers a "pure" income effect, holding education level constant. If education is not included, the coefficient on income has an additional component due to the effect that people with higher income tend also to be better educated and better educated people like more money to be spent on education. Which type of estimate is more appropriate depends on the purpose one has in mind. If one simply wants to know the extent to which the rich want to spend more than the poor do, then estimates based on equations excluding the education levels seem appropriate. If, however, one wants to predict the effect of a widespread exogenous increase in income in the population, then controlling for the education level and other characteristics of the voters would be more apt.

TABLE II
DEMAND ELASTICITIES

	Elasticities (Std. error)			
Variable	Model 1	Model 2	Model 3	Model 4
Income	0.83 (0.74)	0.64 (0.40)	0.49 (0.34)	0.38 (0.34)
Tax price	− 0.57 (0.54)	− 0.39 (0.26)	− 0.41 (0.30)	− 0.43 (0.36)

To us, most of the coefficients estimated seem plausible and consistent with *a priori* economic reasoning. One of the statistically strongest and, to us, most surprising results is the evidence that black homeowners desire significantly and substantially higher educational expenditures than do whites who have similar incomes and tax prices.[17] Perhaps there are special reasons why blacks respond differently to interviews than whites. The fact that our study is restricted to homeowners may provide misleading signals about black demands. For example, if black homeowners differ more radically from black renters in their demand for education than is the case for whites, then truncating our sample by homeownership will bias comparisons of black and white behavior. These possibilities are worthy of serious investigation, and we intend to look into them. Still it seems unlikely that we will explain away the strong differences found here.

Among the most important variables affecting demand for public school expenditures, one would expect to find the number, age, and enrollment status of the respondent's children. People with children of preschool age may desire improvements in the school system with the anticipation that their children will soon begin a long period of schooling. People with children who have nearly completed school may regard the benefits of an improvement in the school system as small since their children will soon be departing. As it turns out, our estimates show the effect on demand of children aged 1–5 to be slightly larger than the effect of children aged 6–11. However, the coefficient on children aged 12–16 is significantly lower. Our estimates imply that having a child aged 1–11 increases one's demand for education by about forty per cent. Our coefficient estimates also suggest that having a child in a non-public school can be expected to reduce one's demand for public education expenditures by about thirty per cent. Since the number of respondents with children in non-public schools was small, the standard error of this estimate is quite large.

In an attempt to account for differences between current and permanent income we asked respondents how their financial status had changed from five years ago and how they expect it to change in the next five years. Thus we have dummy variables for each of the situations: (i) worse now than in past, expect better; (ii) better now than in past, expect better; (iii) worse now than in past, expect worse; (iv) better now than in past, expect worse.

It seems reasonable to us that the ratio of permanent income to current income would be highest for answer (i) and successively lower for (ii), (iii), and (iv). The permanent income hypothesis would then suggest positive coefficients on (i) and (ii) and negative coefficients on (iii) and (iv) with (i) having the highest and (iv)

[17] In fact, taken literally, the point estimate given by our coefficients would imply that a black would want seven times as much expenditures as a white with the same characteristics other than race. This implausibly large magnitude appears to be an artifact of extrapolation of data which is not well-fitted to extreme values. Furthermore the confidence intervals on this point estimate indicate that while we can with large confidence assert that blacks demand more than whites, our black sample is not large enough, nor our measurement techniques subtle enough, to determine "how much more" with much precision.

the lowest coefficient. It turned out that (ii) had a strong positive effect and (iii) a strong negative effect, but (i) and (iv) were insignificant. This places our interpretation of the relation between these responses and permanent income in some doubt. On the other hand, it might be that answers (ii) and (iii) indicate optimists and pessimists respectively while answers (i) and (iv) suggest less decisive attitudes. Thus it might be that those who see steady improvement or steady decline in their fortunes are the ones with the greatest differences between current and permanent income.

It is interesting to see the effects of dummy variables for persons aged 65 or more and for whether the respondent is retired or disabled. When one omits the variable "retired or disabled" the coefficient of age 65 is close to zero. However when one includes this variable, our estimates suggest that people over 65 who are not retired or disabled want more expenditures than people under 65 (controlling, of course, for the effect of having children in school). Someone who is over 65 and retired, however, would want slightly less than persons under 65. Unemployed respondents tended to want substantially less expenditures than the employed while recipients of welfare payments (ADC or food stamps) tended to want slightly higher expenditures. Since the number of unemployed and welfare recipients in our sample was fairly small, however, the standard errors on these estimates are large and the statistical significance of the coefficients is slight.

We employed two variables related to the scale of operations in a school district. One variable is total enrollment in the district. A second variable is the number of pupils per school in the district. Since larger districts may contain several schools physically separated from each other there seems to be a problem analogous to the question of whether returns to scale accrue to the firm or the plant in a multi-plant firm. As it turns out, total district enrollment has a negative effect and enrollment per school in the district has a positive effect. We do not have a good explanation for this result. If there are increasing returns to scale, then provision of equivalent education is cheaper in larger schools. Since the price elasticity of demand is estimated to be less than one in absolute value, the effect of increasing returns to district size would be to produce the observed negative coefficient on total enrollment. By the same token, if there were increasing returns to school size, we should have expected a negative coefficient on the pupils per school variable. Instead we found a positive coefficient. Possibly this represents diseconomies of scale at the plant level. Alternatively this result may be an artifact of some missing variables related to population density and urbanization.

We included as variables, mean per capita income in the city and in the county where the school district is located. This allows us to check whether there are neighborhood effects of some kind on individual demands. Such an effect could never be disentangled in an aggregate study of the type we discussed previously and if such an effect appeared it would present a serious obstacle to estimations based on aggregate data. As it turns out, the effect of city income is negligible. Although the variations in county income in the sample were not large

TABLE III

DEMAND ESTIMATES USING ALTERNATIVE TAX PRICES
MODEL 2—LOGIT FORMULATION

Independent Variable	Price 1 Coefficient (Std. error)	Price 2 Coefficient (Std. error)	Price 3 Coefficient (Std. error)	Price 4 Coefficient (Std. error)	Price 5 Coefficient (Std. error)
Log expenditure[a]	−0.397 (0.219)	−0.460 (0.216)	−0.421 (0.212)	−0.415 (0.224)	−0.407 (0.224)
Log income[a]	0.255 (0.053)	0.243 (0.056)	0.265 (0.055)	0.288 (0.066)	0.262 (0.068)
Log tax price[a]	−0.153 (0.049)	—	—	—	—
Log house value tax price[b]	—	−0.107 (0.052)	—	—	—
Log state aid tax price[c]	—	—	−0.131 (0.047)	—	—
Log circuit breaker price[d]	—	—	—	−0.143 (0.056)	—
Log combined price[e]	—	—	—	—	−0.092 (0.056)
Dummy for circuit breaker[d]	—	—	—	0.287 (0.175)	0.189 (0.182)
Black[a]	0.984 (0.138)	0.996 (0.143)	0.959 (0.145)	1.018 (0.140)	1.000 (0.146)
n	949	970	972	941	916

− 2*LOG (Likelihood)	21.35	69.96	75.92	73.48	70.71
Fraction explained	.385	.398	.398	.396	.397

[a] Log Expenditure, Log Income, Log Tax Price, Black, as defined in Table I.

[b] Log House Value Tax Price: log of reported marketed house values × assd.-to-market ratio in county, 1977/S.E.V. per pupil in district, 1977–78.

[c] Log State Aid Tax Price: to allow for the effects of state aid, price was adjusted for those respondents whose school district millage rate was less than 3 per cent and for whom the value (($40,000 - S.E.V. per pupil) × school millage rate) was greater than or equal to zero. Price for these respondents was set equal to: log of (reported market value × assd.-to-market ratio/$40,000). Otherwise, price was kept at the value of "Log Tax Price."

[d] Log Circuit Breaker Price: to adjust for the effects of the circuit-breaker program, price was set equal to 40 per cent of its previous value for those respondents eligible, on the margin, for the tax credit (corresponding to the 60 per cent of taxes which are refunded). Specifically, if the difference between the respondent's reported property taxes and 3.5 per cent of his income were greater than $0 and less than the maximum credit of $1200, his price became: log of (.4 × property taxes/total tax millage)/S.E.V. per pupil. Senior citizens eligible for the credit have the entire amount of their property taxes refunded (up to $1200). For these respondents, price was set equal to one (ln(price) = 0) and a dummy variable for these respondents was added to the equation.

[e] (Log of Circuit Breaker Price × State Aid Price)/Tax Price: It is a proxy for $P(1 - m)(1 - b)$ where P is the tax price before state and or the circuit breaker, m is the state and matching rate, and b is the per cent returned under the circuit breaker. Again, for those senior citizens whose taxes are zero under the circuit breaker, the log of this price is set equal to zero and a dummy variable added to the equation (see footnote d).

DESCRIPTIVE STATISTICS

Variable	Mean	Std. Dev.
Log house value tax price	− 0.66	0.74
House value tax price	0.65	0.46
Log state aid tax price	− 0.96	0.81
State aid tax price	0.52	0.57
Log circuit breaker price	− 1.21	0.83
Circuit breaker price	0.42	0.56
Circuit breaker dummy	0.09	0.28
Log combined price	− 1.30	0.86
Combined price	0.40	0.57

enough to give us a very tight estimate, the possibility is left open that county income has some effect. One possible explanation for such an effect is that county income differs largely because of different aggregate price levels between rural and urban areas. As we remarked earlier, a case can be made for including in our estimating equations proxy variables for local prices of school inputs and other goods. We have measures of average teacher salary and average wage rates in the private sector for the county in which each school district is located. The coefficient of average teachers' salary in the county is positive and significant. The coefficient of average wage in the private sector is positive, but not significant.[18]

4. COMPARISON WITH OTHER STUDIES

It is of interest to see how survey-based estimates compare with demand functions obtained from aggregate "behavioral" data. If demand functions estimated from these two very different kinds of data yield similar results, credence is lent to both estimation methods. We would then have reason to hope that as evidence accumulates there may be some convergence of opinion on the nature of individual demand functions for public education.

In the literature on demand for public education there are several papers that measure price and quantity variables in a way that is at least roughly similar to our approach. In Table IV we record all of the conceptually comparable estimates of income and price elasticity that we have been able to find. The studies we list here all differ in at least minor ways, in their methods of measurement and in the list of independent variables included in their estimations. Price elasticity, in particular, was measured in different ways in different studies. As we have argued previously, the "price" that we would like to measure is the cost to a tax payer of increasing per student educational inputs by one unit. This price

$$(10) \qquad t_i = \left(\frac{p_E}{1+m}\right) H_i \left(\frac{PUP}{A.V.}\right) = \left(\frac{p_E}{1+m}\right)\left(\frac{H_i}{H}\right)\left(\frac{PUP}{N}\right)\left(\frac{RES}{A.V.}\right),$$

where p_E is the local price index for educational inputs, m is the matching rate on the margin from the state school aid program, H_i is the assessed value of i's house, $A.V.$ is total assessed value, PUP is the number of pupils, N is the population, and RES is the total assessed value of residential housing in the school district where household i resides. Some of the authors were able to

[18] Since our wage variables are at best crude proxies for price, we checked on the sensitivity of our results by reestimating the equation while dropping both variables. Most of the results were quite similar to those described in Table I, although the price and income elasticities rose to $-.50$ and $.49$, respectively. The only important change in coefficient, as expected (with price effects omitted), was associated with the county income variable. Here the coefficient became positive (.40) although statistically insignificant.

estimate t_i directly from their data. Others had access to estimates of only some of the factors on the right side of (10) and had to treat the other factors as omitted variables, with the hope that no bias would be thereby introduced. Thus, for example, Barlow estimates price as $(RES/A.V.)$ while Bradford and Oates estimate price as (PUP/N). Many of the other researchers were able to estimate price as the product of two or more such factors. Feldstein, Ladd, and Lovett all allow the possibility that each of the four factors in the expression for price might have a different effect on total demand. Thus they each have more than one distinct estimate for the price elasticity of demand. In our *Notes on Table IV*, we discuss idiosyncracies of each study and how these might affect the coefficient estimates.

The estimated income elasticities in Table IV are strikingly similar. Furthermore, our micro-based estimates are very close to most of the macro estimates.[19] Exceptions among the macro studies are Peterson's estimates and our own macro-based estimate of income elasticity.[20] Despite the anomalies, we are impressed with the amount of independent evidence suggesting that the income elasticity of demand for local public education is on the order of 2/3.

The estimates of price elasticity in Table IV are in less agreement than the estimates of income elasticity. This is no doubt partly due to the fact that different studies specified the price variable differently. The outliers in this case are Feldstein's coefficient on matching aid and the coefficients for pupils per family found by Feldstein [**19**], Ladd [**27**], and Lovell [**32**]. We have no explanation for the first discrepancy. The variable "pupils per capita," however, probably cannot be satisfactorily regarded as only a price variable in a macro study. It is true that the more pupils per capita there are, the more it costs the median voter to increase per student expenditure. It is also true that where there are more pupils per capita, a larger percentage of the population has children in school. As our micro data show, people who have children in school are more likely to favor increased expenditures than people without children. The two effects work in offsetting directions. This may explain why the coefficient of "pupils per capita" is not significantly different from zero in the estimates of Feldstein, Ladd, and Lovell.[21] The remaining estimates of price are in rough agreement, and again our micro-based estimate seems to be generally in concert with the macro estimates. Most of these estimates place the price elasticity of demand somewhere between $-1/4$ and $-1/2$.

[19]The micro estimates reported in Table IV are taken from column 2 of Table I. We use this specification with a short list of variables because the other studies which we compare typically have few variables other than income and price.

[20]In fact, using 1969–1970 data for Michigan school districts, Peterson finds an elasticity of 1.2, while using 1979 data we find an income elasticity of .38. Thus the two outliers among the macro studies come from nearby years in the same state. Worse yet, one of them is our own. We continue to seek an explanation.

[21]It is fair to point out that none of the authors cited above, except for Bradford and Oates, claimed that (PUP/N) should be treated as a price variable.

TABLE IV

COMPARISON OF ESTIMATED INCOME AND PRICE ELASTICITIES

Investigator	Sample	Estimated Income Elasticity	Price Elasticity Estimates Based on: % of Tax Base Non-Residential	Pupils Per Capita	State Matching Aid Rate	Other Basis
Barlow[a]	52 Urban Michigan Districts (1960)	.64 (.10)	−.34 (.04)			
Bradford–Oates[b]	58 New Jersey Districts (1960)	.65 (.08)		−.33 (.07)		
Brazer[c] U.S.	40 Large Cities (1953)	.73 (.34)		−.73 (.13)		
Feldstein[d]	105 Mass. towns (1970)	.48 (or .76) (.07)	−.12 (.04)	+.21 (.14)	−1.0 (.18)	−.28 .04
Inman[e]	58 Long Island Districts (1970)	.61 (.11)				−.42 (.28)
Ladd[f]	78 Boston SMSA Districts (1970)	.46 (or .70) (.15)	−.31 (.11)	−.03 (.25)	−.48 (.30)	−.29 (.10)
Lovell[g]	136 Conn. Districts (1970)	.65	−.16 (.04)	.02 (.06)		−.83 (.14)
Peterson[h]	See note below	.84 to 1.35 (.10)				−.25 to −.70 (.05)
B-R-S "Micro"	Survey of 2,000 Michigan voters (1978)	.64 (.40)				−.39 (.25)

B-R-S "Macro"	469 Mich. School Districts (1973)	.38 (.03)		−.15 (.015)

[a] Barlow [2] uses no variables other than "income" and "price." Barlow's income variable is family personal income per pupil in the community. Most other studies listed here use median family income.

[b] Bradford and Oates [8] use no variables other than "income" and "price."

[c] Brazer [9] measured expenditure as expenditure per capita in the community. Most other researchers measured expenditure as expenditure per pupil. Brazer did not explicitly include a "price" term in his equation. However Brazer did include the ratio of pupils to population as an independent variable. We can therefore find the coefficients of the demand function that Brazer would have found if he, like Bradford and Oates, had written his demand function with expenditures per pupil as a function of income and price. Since this transformation simply involves multiplying both sides of Brazer's equation by (N/PUP), the resulting equation has the same income elasticity which is equal to Brazer's coefficient on (PUP/N) minus one. Brazer also included state aid for education and the ratio of city to SMSA population as independent variables.

[d] Feldstein [19] obtains measures of the variables $(RES/A.V.)$, (PUP/N), $(1/(1+m))$ as well as $(A.V./PUP)$. He includes all four variables in his regression. In his discussion, he treats $1/(1+m)$ as the "price" variable and $(A.V./PUP)$ as a "wealth" variable. We think it is reasonable also to view $(RES/A.V.)$, (PUP/N), and $(A.V./PUP)$ as price variables. In particular, we notice that the tax price paid by the consumer with median income for his community will be $\hat{t} = (PE/(1+m))(PUP/A.V.)\hat{H}$ where $\hat{H}$ is the value of his house. Thus it could be argued that the way in which $(A.V./PUP)$ should enter the demand equation is through the tax price since t is inversely proportional to $(PUP/A.V.)$. Therefore the negative of the coefficient on $(A.V./PUP)$ should be an estimate of the price elasticity of demand. We record this estimate under "other basis." When we look at the equation in this way, we notice that an important omitted variable in Feldstein's specification is $\hat{H}$, median house value. We claim that omission of this variable biases the estimated income elasticity downward. This can be seen as follows. According to most housing demand studies, the income elasticity of demand for housing is about one. Suppose, then that $\hat{H} = k\hat{Y}$, for some k. Then $\hat{t} = (PE/(1+m))(PUP/A.V.)k\hat{Y}$. Therefore the income elasticity estimated by Feldstein with the variable $\hat{H}$ omitted would be the sum of the ordinary income elasticity and the (negative) price elasticity. In this table we record (in parentheses) the estimate of income elasticity obtained if one corrects for this effect by adding the absolute value of the estimated price elasticity to the estimated income elasticity.

Other variables in Feldstein's specification include: "block-grant" state aid, federal grants, private school enrollment, and growth rate of school enrollment.

[e] Inman [25, 26] uses only one price variable which is his estimate of the price $\hat{t}_i = (1/(1+m))\ (PUP/A.V.)\ \hat{H}$. The estimates reported here are from a specification that included only income, price, and "state aid" as variables. Inman used a two-stage least squares procedure to allow for possible effects of the endogeneity of state aid.

[f] Ladd's [27] specification of variables is similar to Feldstein's. Our remarks on the Feldstein procedure apply here as well. In the case of Feldstein's estimates, there were disturbingly large differences among the estimates of price elasticity obtained from using each of the factors of price as an independent variable. Ladd's results are much more reassuring on this account. The only coefficient substantially different from the others is that based on (PUP/N). Even this coefficient differs only by one standard deviation from the others.

[g] Lovell [30] includes as independent variables, the factors $(RES/A.V.)$, (PUP/N), and $(\hat{H}/\overline{H})$ of the price term. We list his coefficient for $\hat{H}/\overline{H}$ under, "other basis." The estimates appearing in our table come from Column 1 of Lovell's Table 5. Of Lovell's several specifications, this one is closest conceptually to the others reported here. The parameter γ reported in Lovell's Table can be shown to be very close to the income elasticity of demand. Lovell estimated $\gamma = .65$ and this is the income elasticity we report.

[h] Peterson [36] estimates five separate demand equations based on school expenditure data in California, Michigan, New Jersey, New York, and the Kansas City SMSA. All of his data are for years adjacent to 1970. Our Table 12 reports the range of his coefficients. Peterson's specification of the model differs from all others treated here in that he uses locally raised revenue per student as the dependent variable rather than total expenditure per pupil. Since total expenditure per pupil is nearly equal to locally raised revenue per pupil plus state aid per pupil, and since Peterson included state aid as a variable, we should not expect this difference to affect the coefficients of variables other than state aid.

TABLE V

EFFECTS OF VARIABLES OTHER THAN PRICE AND INCOME

Variables \ Study	Feldstein	Inman	Ladd	Lovell	Peterson	B-R-S Macro	B-R-S Micro
% Non-White						+	+
% Renters		0		+	+	+	+
% Old		−				0	+
Education of Parents				+		+	+
Catholic		0					0
Children in Private School	−		0				−
Democrat				0			0
Poverty			0	0			0
Children Under 5							+
Children Over 5							+
Jewish							+
Sex							0
School Employee							+
Retired or Disabled							−
Unemployed							−
Optimist							+
Pessimist							−
On Welfare							0

In Table V we summarize the estimated effects of a number of variables other than price and income. Most of the macro studies suggest that renters favor greater expenditures than homeowners. This is strongly confirmed in our micro study. Education levels of parents are shown to have significant positive effects on demand both in the micro and in the macro studies. Poverty status and political affiliation do not appear to be significant in either micro or in macro studies. Race was not used as a variable in any of the previous macro studies. As it turned out, both our macro and our micro based estimates suggest that *ceteris paribus*, blacks want to spend more on local public education than whites.

Our survey-based data enabled us to study the effects of many variables which are not readily measured from the usual data sources. This is illustrated by the fact that Table V includes ten interesting variables from our micro study which were included in none of the macro studies. Furthermore, the micro nature of our data enables us to probe the structural relations between variables with more subtlety than is possible with macro data. For example, aggregate studies can tell us the effect of the variable "number of school children as a fraction of the population." This variable is related to demand for "expenditure per student" both through a price effect and through the fact that in districts where there are more children per capita, more families have children of their own and hence value educational expenditures more highly. Only with micro data are we able to disentangle these two effects in a reasonable way. We know for each of our respondents whether he has children of his own in public school and the tax price he pays per dollar of per student expenditure. Similarly, aggregate demand studies can relate expenditure per student to the percentage of children of school age who attend private schools. However, it is possible that districts in which many children go to private schools differ in other, unmeasured, ways from the average district so that estimates of the effect of private school enrollment are contaminated. Our data enable us to determine whether each respondent sends his own children to private school. A similar observation applies to the case of blacks and the aged.

5. POSTSCRIPT

We have demonstrated a method for estimating individual demand functions from individual qualitative responses to a survey. This leads to estimates of income and price elasticities of demand for local school expenditure that are similar to those obtained in aggregate studies using "median-voter" models. The fact that similar estimates are derived from two very different kinds of data lends some support to the validity of both approaches. Although survey data are typically much more expensive to obtain than the data for cross-sectional median-voter studies, a survey does enable one to obtain a richness of detail about voter characteristics that seems unobtainable from other sources. We have attempted to convey some of this richness in our reported results. For example, our results indicate that on the average one is more likely to desire higher expenditures on local public education if one is black, Jewish, a renter, a college graduate, a school employee,[22] if one has children in public schools or if one is over 65 years old. One is more likely to demand lower expenditures if one has children in private school or is retired, disabled, or unemployed. Variables which might have mattered but appear to be insignificant are political party affiliation, sex, lack of a high school education, and Catholicism. We do not pretend to have adequate explanations for all of these results, nor to have pursued all of the interesting possibilities for interpretation. It is our hope that this paper will help others to advance empirical knowledge about preferences for particular public goods, both through collection of more evidence and through interpretation of the rather interesting collection of results in the existing empirical literature on public goods.

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[22] Courant, Gramlich, and Rubinfeld [**14**] provide a theoretical discussion of the effect of public employees' voting their self-interest. Our results provide some support for their theory.

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