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A NEW APPROACH TO THE DEMAND FOR PUBLIC GOODS

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The individual demand for public goods is measured by a new survey research instrument which permits respondents to make hypothetical expenditure and tax recommendations with moveable penny coupons. Because each respondent faces an identical coupon budget constraint, it may be expected that observed expenditure and tax recommendations represent individual maximum utility. The instrument was applied to a random sample of 1000 residents of North Carolina. Statistical analysis of the resultant data indicates significant socio-economic differences in the preferences for particular spending and tax categories.

1. Introduction

The demand for public goods has generally been analyzed at the theoretical level in terms of the choice between public and private goods, either in a partial or general equilibrium setting. Empirical evidence on the individual demand for public goods, or the demand for public versus private goods is quite limited, although Mueller (1963) and Akin, Fields, and Neenan (1973) have examined public attitudes toward particular public expenditures.[1]

The absence of an extensive empirical literature on the demand for public goods is somewhat surprising in view of the size of the public sector in most industrial democracies. This shortfall in our knowledge of what individuals prefer in the public sector may be due to the absence of convenient, market generated demand data as well as the generally recognized problem of the 'free rider.' That is, empirical investigation of citizen preferences for public goods may be limited, because it is generally thought that a rational person will not reveal his true demand for and willingness to finance public sector activities. An individual may understate his true willingness to pay, since he may be able to participate in certain public services without financing them.

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[1]See also ACIR (1974).

We seek in this paper to examine individual preferences for public goods (and tax reductions) with the use of a new survey research instrument which permits the respondent to make constrained, hypothetical budget allocations. With such a measurement device, we may be able to overcome the measurement problems usually encountered in public sector demand analysis. Section 2 describes the survey instrument, its rationale, and compares it to those used in previous studies. Section 3 discusses the basic response obtained to the instrument. Section 4 explores the determinants of an individual's choice to spend and/or reduce taxes as a whole as well as the determinants of individual preferences toward particular spending and tax categories. Section 5 concludes.

2. A new survey instrument to assess the demand for public goods

Survey research typically relies on either multiple choice responses to inquiries about likes or dislikes of particular options or open-ended responses to broadly worded questions. Scaling techniques[2] such as multidimensional scaling or coded interpretation of the open-ended verbal responses are then applied to obtain an individual profile. Besides the usual problems of miscoding and nonresponse which accompany either research strategy, additional problems usually occur and are pertinent to the particular issue of demand measurement. Mueller noted in the 1961 study that respondent interest in program expansion depended critically on the wording of the question. Second, there was substantial evidence of inconsistency and instability of attitudes through the questionnaire. That is, many who favored expansion of six or more (the largest category) government programs at a later point favored financing such an expansion by 'spending less on other things.'

Such respondent unreliability reflects the physical limitations of a traditional questionnaire. Usually, the respondent answers the questions serially with little thought of the overall profile being developed. Also, because the respondent merely indicates likes and dislikes for particular policy options, it is reasonable to assume that he will not make constrained recommendations. That is, the probing of preferences may not be specific enough to force the subject to spending and taxing recommendations that in effect maximize his utility.

A novel solution to these problems developed by one of the authors[3] is to allow the respondent to make a constant sum series of recommendations on a questionnaire which is sufficiently large to permit consideration of all options at once. In effect, the 'coupon scale' survey instrument allows each respondent to simulate his solution to the actual aggregate taxing–spending decision.

Each questionnaire[4] when unfolded provides the basic twelve expenditure

[2]A representative sample of the scaling literature may be found in Guilford (1954), Hughes (1971), and Green and Tull (1975).

[3]See Hughes (1971) for a discussion of a constant sum scale.

[4]A copy of the questionnaire is available from the authors upon request.

programs in the North Carolina State Budget and their historical percent distribution. Also, the four major sources of State tax revenues are provided. Affixed to the questionnaire are fifteen moveable 1¢ coupons which can be 'spent' on expenditure increases in any of the programs and/or reductions in the major taxes. The respondent is asked to allocate the coupons to expenditure or tax reduction categories to match his preferences. Each major line item contains a list of current program descriptions and also what programs would be expanded by additional spending. It should be noted that the instrument devised does not allow for expenditure *reductions*, although this could be handled by modifying the questionnaire.

The major advantage of the coupon scale is that the resultant data forms an interval scale, because the absolute distance between two points is well understood. Each coupon has an interval interpretation in comparison to the historical pattern of resource allocation. As a consequence, metric statistical devices such as multiple regression may be used that are more powerful and richer in interpretation than rank correlation techniques. Because the respondents are urged to move the coupons about until they reflect their opinion, it is reasonable to assume that the final coupon allocation reflects individual maximum utility.[5] This overcomes the problems of ordering the questions and subsequent response bias as well as possible instability of preferences found in traditional techniques. Finally, because the coupon scale is self-administered, the survey can be obtained via mailout without personal interview. In terms of allocating a fixed research budget, this permits one to trade interview costs for a larger sample size. The mail survey also eliminates the bias of the interviewer's presence.

After a pretest of the instrument among different socio-economic groups, the survey was mailed out in early November, 1973. Followup reminders were mailed one week later. A month after the followup, 1001 were received of the 3517 which went to viable addresses. A five-week cutoff was used to assure that the respondents would not react to the Governor's budget message the following January. Overall, a 28.5% response rate was achieved.[6] It is worth noting that

[5]While the use of moveable coupons may suggest that the responses reflect maximum individual utility, there remains the possibility that the responses do not reflect actual or true preferences. There are, however, several reasons why observed responses may be accurate. First, the sample of individuals was such that it is unlikely that there was any collusion or discussion among the respondents. Thus, each response is most probably independent. Second, the questionnaire was presented as a study rather than a subsequent tool for decision making. It would appear unlikely that in such a purely informational context that the respondents would take the trouble to under or overstate their preferences. However, whether or not this in fact occurred can not be ascertained without additional independent information which is not available.

[6]A return rate of 28% is reasonable for a questionnaire to the general public [Kanuk and Berenson (1975]. Two follow-up letters generally increase the return to over 60% (*ibid*)., and the inclusion of monetary incentives may increase it even more. However, extensive follow-up was not used because of an agreement to protect the anonymity of the respondents, and the likelihood that such later responses might be materially biased.

the entire project was achieved for less than $6,000; this small cost reflects in main the self-administered nature of the questionnaire.

3. Basic survey responses

More than three-quarters of the respondents used their coupons for both spending increases and tax reductions. Those favoring expenditure increases only numbered about one-fifth, those favoring only tax reduction numbered 4%, and those for whom the results were unusable because of a misunderstanding of the instructions numbered 0.8%. The idea of a self-administered instrument which permits metric scaling then was well communicated.

The interagency allocation of the coupons is displayed in table 1. Note that 68.1% of the coupons went for increased spending and 31.9% for decreased taxes. Put another way, faced with a 15% state surplus, the respondents wishes to use 10.2% of it for more programs and the remainder for lower taxes. The average per capita coupon outlays display substantial variability. Primary and secondary education (essentially state financed in North Carolina), medical care and hospitals, and public health were clearly the agencies where more expenditures were desired. Motor vehicles experienced the smallest allocation. Clearly, the respondents did not wish an across the board increase in all agencies, but distinguished among them. For example, the mean expenditure on medical care or public schools was twice that on highways, social services, and higher education taken separately.

A rather different picture emerges of the budgetary recommendations of the population when we relate the average per capita outlay to the existing budget allocation they faced (column 5 of table 1). Thus, while public schools were the most desired agency, the implied budget increase is quite modest: 2.8%. On the other hand, the absolutely smaller agency categories (higher education, highways, and social services) would experience larger proportional increases as a consequence of public preferences. Social services would grow by 13.2% while higher education and highways would grow by 4.8% and 4.9%, respectively. Two of the three health areas, public health and medical care and hospitals, evidence budgetary increases in excess of 60%.

Among the six tax reduction categories, the state personal income tax, followed by the local property tax were the taxes most frequently decreased. In fact, mean outlays of coupons for reduction of these two categories of taxes exceeded mean outlays for any agency programs. Because substantial numbers of coupons were used for items toward the end of the questionnaire (the tax categories followed the agency categories), it is apparent that there were no order effects, and that respondents did not simply randomly distribute their coupons.

We may analyze the intensity of attitudes of the respondents by examining the fraction who spent unusually large absolute amounts on particular items.

Table 1
Citizens' allocation of a state surplus.

	Historical pattern (1)	Mean per capita coupon use (2)	% of coupons allocated to category (3) [(3)/15]	% of respondents using 4 coupons (4)	% increase in budget (5) [(2)/(1)]	Median coupon use (6)
Spending category						
E1: Public schools	46¢	1.295	8.7%	7.7%	2.8%	0.987
E2: Community colleges	6	0.915	6.2	2.2	15.3	0.738
E3: Higher education	13	0.617	4.2	1.2	4.8	0.377
E4: Public health	1	1.122	7.6	3.1	112.2	0.984[b]
E5: Mental health	6	0.911	6.1	1.9	15.5	0.771
E6: Social services	5	0.658	4.4	2.0	13.2	0.387
E7: Med. care & hospitals	2	1.302	8.8	3.8	65.1	1.156[b]
E8: Resource development	2	0.881	5.9	1.5	44.1	0.721
E9: Agriculture	1	0.837	5.6	1.7	83.7	0.702
E10: Motor vehicles	2	0.261	1.8	0.1	13.1	0.149
E11: Highways	13	0.637	4.3	1.8	4.9	0.353
E12: Corrections system	3	0.666	4.5	0.6	22.2	0.481
	100		68.1%			
Tax reduction category[a]						
TSI: State corp. income tax	8¢	0.069	0.5%	0.4%	0.8%	0.020
TS2: State gasoline tax	17	0.825	5.6	3.9	4.9	0.348
TS3: State sales tax	25	0.713	4.8	3.8	2.9	0.276
TS4: State personal inc. tax	49	1.534	10.3	12.5	3.1	0.801
TL1: Local property tax	–	1.370	9.2	11.1	–	0.968
TL2: Local inventory tax	–	0.218	1.5	0.9	–	0.075
	100		31.9%			

[a]Information not directly provided to respondent.
[b]Modal coupons were 1 for these classifications, and 0 for all others.

For this purpose, we define four or more coupons as 'unusual' and note that only public schools and personal and property tax reductions had as many as 5% or more of the respondents spending unusual amounts. These are the three areas of the public sector which contact the highest fraction of the population. Virtually all of the population goes to public school and pays income and property taxes. It is of course surprising that the sales tax does not arouse analogous interest. Note the dissatisfaction with the local property tax vis-a-vis the state sales tax; this is consistent with other studies, e.g. ACIR (1974).

4. Determinants of individual taxing and spending decisions

Two complementary hypotheses have been forwarded to explain individual preferences for public goods. The first hypothesis argues that public goods are substitutes for private goods, which in turn suggests the application of ordinary demand theory to data on spending preferences. The second theory suggests that people will prefer those public goods which benefit them the most. The first theory simply encourages the estimation of such typical demand parameters as income elasticities. The second theory provides some a priori expectations about the signs of various income effects in the demand for particular public services and/or tax changes.

The presence of metric data on desired expenditures[7] should provide an opportunity for the estimation of a complete system of demand equations (e.g. the Stone–Geary linear expenditure system or, were time dependent data available, the Theil–Barten differential demand model) which would be a complete operational counterpart to the second theory just noted. Unfortunately, due to insufficient variance in our data, such models proved to be unworkable. As table 1 indicates, the modal response in all but two categories was not to spend, and the median response was in all but one case an outlay of less than one coupon.

As a consequence of the essentially qualitative but nonetheless cardinal nature of the data (the number of categories *does* exceed the number of coupons so a constrained choice is being made), we shall investigate the qualitative demand functions for public goods by means of the multinomial logit model.[8]

[7]Our coupon approach to measuring demand for public goods parallels in spirit the recent work on token economies. See Ayllon and Azrin (1968), Kagel (1972), and Kagel et al. (1975) for work on token economies.

[8]See Theil (1969) for its development and Schmidt and Strauss (1975) for an analogous development in the context of continuous right hand side variables.

There is some correspondence between our multinomial logit specification and various models of systems of demand equations which are based on maximization of an underlying utility function. [See Goldberger (1963) and Parks (1969) for a discussion of various demand models and their estimation.] It is closest in spirit to Stone's (1954) linear expenditure system. Recall that in such a system, all supernumerary income is spent on N commodities. The income share devoted to each commodity sums to unity. In our experimental coupon context, each respondent has the same additional 'income' to allocate, and we are concerned in the context of

Let us consider first a model of the spending vs. taxing decision under the presumption that public and private goods are interchangeable. Then a multinomial logit specification would be:

$$\log_e[Pr_2/Pr_1]t = X_tB_1, \tag{1}$$

$$\log_e[Pr_3/Pr_1]t = X_tB_2, \tag{2}$$

$$\log_e[Pr_2/Pr_3]t = X_t(B_1-B_2) = X_tB_3, \tag{3}$$

where Pr_1 is the odds of only spending, Pr_2 is the odds of only reducing taxes, Pr_3 is the odds of both spending and reducing taxes, X is a $T\times M$ matrix of personal characteristics, B_j ($j = 1, \ldots, 3$) is a $M\times 1$ matrix of response coefficients, and t is an observation index from $1, \ldots, T$.

Thus, given that an individual will only spend, only reduce taxes, or both spend and reduce taxes, we may predict the relative odds of an individual so doing on the basis of his income and other factors. Maximum likelihood estimation of (1)–(3) can be pursued, although it should be noted that (3) is not independent. One in effect estimates (1) and (2). The logical extension of (1)–(3) is to provide 18 basic comparisons. Such a complete system of qualitative demand equations would be of the form:

$$\log_e[Pr_k/Pr_1]t = X_tB_k, \qquad k = 1, \ldots, 18, \tag{4}$$

where the k are spending and tax reduction categories. However, because allocations of more than one coupon per category occurred, Pr_k is not bounded per person. A complete specification would entail 15 (number of coupons) $\times$ 18 (number of categories) = 270 separate groups. The reader will note, however, that the resulting computational burden with a reasonable number of right hand side variables becomes quite onerous. Thus, with $M = 15$, the current circumstances, 4050 parameters need to be obtained, which exceeds the storage capacity of current computer systems. We propose, therefore, a compromise model which yields some useful information:

$$\log_e[Pr_2/Pr_1]tk = X_tB_{4k}, \tag{5}$$

where Pr_2 is the odds of spending, Pr_1 is the odds of not spending, $k = 1, \ldots, 18$

(1)–(3) with which type of allocation (all spending, all tax reduction, or some combination of the two) each person makes, given that he must make an allocation of the coupon income. The place of characteristic income, or the income of the respondent, is then an attribute which affects the type of allocation made. Put another way, the adding up condition common to systems of demand equations is in our context a characteristic of the sample, namely that they allocate the entire budget. The logit specification normalizes to ensure that the odds of being of one of the three types necessarily add to unity.

independent categories. That is, we estimate 18 separate logit equations and do not, because of physical computer limitations, impose the system-wide constraints implied by (4).

Table 2 displays the maximum likelihood estimates of (1)–(3) and the *t*-ratios in parentheses. Note that the numeraire in the first two equations is to only spend. Thus, the positive effect of age in (1) may be interpreted to mean that as the respondents grow older, they prefer to reduce taxes rather than to increase spending. Interestingly, there is a distinct male–female difference in these preferences. Males systematically prefer to just reduce taxes rather than just increase spending. Yet, higher income suggests a greater desire for more public goods. The measures of demographic status and region do not exhibit by and large any systematic relations to the question of tax reduction or increased spending; however, residents of medium size cities in North Carolina (10,000 to 49,999 population) distinctly prefer more spending to tax reduction.

The derived equation which compares both spending and tax reduction to just tax reduction evidences few systematic relationships. Males prefer to reduce taxes rather than to increase spending somewhat and also reduce taxes, consistent with the above results, and, residents of the largest cities prefer spending and tax reduction to just tax reduction.

In table 3, the individual spending and tax reduction equations are displayed in the top and bottom panels respectively. Recall that the numeraire in each equation is to *not* spend a coupon. Accordingly, we may interpret the effect of a regressor in terms of its effect on the odds to spend rather than not spending a coupon.

Older persons tend to prefer to spend on community colleges and on motor vehicles, and not to spend on resource development. Of the 12 spending equations, age has a significant effect only 3 times.

More education tends to encourage spending on more education at all three levels: public schools, community colleges, and higher education. Also, more highly educated people tend to want to spend more on public health, mental health, natural resources, and the corrections systems. Also, they systematically prefer not to spend more on agriculture, motor vehicles, and highways. Men systematically prefer to spend on resource development, motor vehicles, and highways, and not to spend on social services (for the poor) and corrections.

In some respects our results for income are disappointing in view of the infrequency of significant effects of income (4 of 12). This may in part be due to possible interdependencies between income and education (their simple correlation is 0.4042 in the sample); however, where income is significant, so is education. We find that income significantly affects the demand for community colleges and higher education, and has a depressing or inverse effect on spending for resource development and corrections. In a sense, then, resource development and corrections are 'inferior public goods' while community colleges and higher education are 'normal public goods.'

Table 2

Determinants of total expenditure and tax reductions.[a]

	β_1	$\beta_2 X_1$	$\beta_3 X_2$	$\beta_4 X_3$	$\beta_5 X_4 \times 10^{-4}$	$\beta_6 X_5$	$\beta_7 X_6$	$\beta_8 X_7$	$\beta_9 X_8$	$\beta_{10} X_9$	$\beta_{11} X_{10}$	$\beta_{12} X_{11}$	$\beta_{13} X_{12}$	$\beta_{14} X_{13}$	$\beta_{15} X_{14}$
(1)															
$\log_e \frac{Pr_2}{Pr_1}$	0.5299	0.01228	0.02937	0.4730	−0.214	0.1001	0.1210	0.4386	0.4786	0.3214	0.3284	0.02695	−0.1547	−0.6624	−0.4277
	(0.7421)	(1.669)	(0.8193)	(1.7823)	(−2.183)	(0.3483)	(0.3402)	(1.226)	(1.3519)	(0.7948)	(0.844)	(0.0787)	(−0.4486)	(−2.54)	(−1.62)
(2)															
$\log_e \frac{Pr_3}{Pr_1}$	−0.6270	0.01653	−0.0419	−0.2980	−0.3988	−0.3116	−1.3250	−0.3796	0.2450	0.2330	−0.6125	−1.572	0.8041	−0.8057	0.6595
	(−0.4689)	(1.181)	(−0.6102)	(−0.5811)	(−1.58)	(−0.5762)	(−1.2064)	(−0.5439)	(−0.3536)	(0.3034)	(−0.7497)	(−1.334)	(1.3622)	(−1.2709)	(1.2569)
(3)															
$\log_e \frac{Pr_3}{Pr_2}$	−1.1569	0.00425	−0.07125	−0.7710	−0.1848	−0.4117	−1.4459	−0.8182	−0.7236	−0.0884	−0.9409	−1.5989	0.9588	−0.1433	1.087
	(−0.9537)	(0.3362)	(−1.1476)	(−1.6425)	(−0.7691)	(−0.8339)	(−1.3630)	(−1.2742)	(−1.1347)	(−0.1262)	(−1.2385)	(−1.3996)	(1.8513)	(−0.2384)	(2.265)

[a] Pr_1 is the odds of just spending, Pr_2 is the odds of just reducing taxes, Pr_3 is the odds of both spending and reducing taxes, χ_1 is age in years, χ_2 is years of completed schooling χ_3 is sex (male=1, female=0), χ_4 is money income in 1974 in dollars, χ_5 is spouse of head of household, χ_6 is relative of head of household, (head of household is suppressed category), χ_7 is N. Piedmont region, χ_8 is S. Piedmont region, χ_9 is Coastal Plains, (the mountains is the suppressed category), χ_{10} is S. Coastal Plains, χ_{11} is towns up to 2,499 population, χ_{12} is cities 2,500 to 9,999, χ_{13} is cities 10,000 to 49,999, χ_{14} is cities 50,000+ (rural is the suppressed category).

Table 3

Determinants of expenditure and tax reduction categories.[a]

	β_1	$\beta_2 X_1$	$\beta_3 X_2$	$\beta_4 X_3$	$\beta_5 X_4$	$\beta_6 X_5$	$\beta_7 X_6$	$\beta_8 X_7$	$\beta_9 X_8$	$\beta_{10} X_9$	$\beta_{11} X_{10}$	$\beta_{12} X_{11}$	$\beta_{13} X_{12}$	$\beta_{14} X_{13}$	$\beta_{15} X_{14}$
Spending equations															
E1	−0.8761	−0.00391	0.1139	−0.1566	0.04409	0.05604	0.2017	−0.1215	−0.3826	−0.09331	0.2177	0.2808	0.00461	0.1559	0.4406
	(−1.571)	(−0.6166)	(4.1531)	(−0.7367)	(0.5200)	(0.2405)	(0.7182)	(−0.4205)	(−1.3467)	(−0.2905)	(0.6853)	(1.1282)	(0.0185)	(0.7480)	(2.252)
E2	−1.683	0.1015	0.1117	0.3257	0.1514	0.1150	0.5153	−0.1447	−0.3869	0.00672	−0.1609	0.2136	−0.5659	−0.06541	0.1093
	−3.028)	(1.8463)	(4.111)	(1.5643)	(1.7530)	(0.50639)	(1.833)	(−0.4982)	(−1.3529)	(0.02078)	−0.5130)	(0.8652)	(−2.266)	(−0.3151)	(0.5443)
E3	−1.798	0.001659	0.1124	−0.08682	0.1340	−0.3510	0.6884	−0.07037	−0.2596	− 0.4569	0.2975	−0.1243	−0.1365	−0.04899	−0.01195
	(−3.2532)	(0.3062)	(4.093)	(−0.41894)	(1.657)	(−1.537)	(2.5158)	(−0.2467)	(−0.9178)	(1.4397)	(0.9703)	(−0.5049)	(−0.5365)	(−0.2337)	(−0.0601)
E4	1.030	−0.007355	0.0570	−0.08579	−0.1218	−0.244	−0.2053	−0.2887	−0.5483	0.5053	−0.2361	−0.08019	−0.1073	−0.1964	−0.3299
	(1.7537)	(−1.2857)	(2.0464)	(−0.3789)	(−1.468)	(−0.9993)	(0.6646)	(−0.9152)	(−1.7715)	(−1.4552)	(0.6657)	(−0.3066)	(−0.4042)	(0.8658	(−1.5785)
E5	0.1578	0.001823	0.05438	−0.1640	−0.12	0.2681	0.1464	−0.1751	−0.4025	−0.552	−0.1307	−0.1064	−0.3098	−0.03865	−0.5722
	(0.2869)	(0.3365)	(2.0566)	(−0.7906)	(−0.15033)	(1.1709)	(0.5363)	(−0.6007)	(−1.3992)	(−1.7908)	(−0.4119)	(−0.4314)	(−1.244)	(−0.1840)	(−2.884)
E6	0.3559	0.005894	−0.01313	−0.3595	−0.07281	−0.1961	0.3034	−0.2690	−0.6002	−0.9222	−0.3662	0.3111	0.04271	0.2620	−0.02679
	(0.6654)	(1.1089)	(−0.5057)	−1.7699)	(−0.9211)	(−0.8825)	(1.128)	(−0.9748)	(−2.1948)	(−2.929)	(−1.224)	(1.304)	(0.1732)	(1.2805)	(−0.1367
E7	0.8343	0.00805	0.01314	−0.1681	−0.03901	0.02408	0.7715	−0.05112	−0.04588	−0.2670	−0.01446	0.4871	−0.1452	0.2359	−0.4475
	(1.3315)	(1.2994)	(0.4320)	(−0.6934)	(−0.4893)	(0.0915)	(2.232)	(−0.1542)	(−0.1391)	(−0.7213)	(0.03969)	(1.5663)	(−0.5172)	(0.9595)	(−2.048)
E8	−0.5457	−0.01253	0.1156	0.3584	−0.1841	0.05793	0.2515	0.1307	0.06024	−0.2120	−0.01322	−0.00756	−0.6056	−0.07424	−0.1362
	(−0.9989)	(−2.3187)	(4.266)	(1.7080)	(−2.303)	(0.2983)	(0.8713)	(0.4565)	(0.2137)	(−0.6664)	(−0.04287)	(−0.03087)	(−2.4347)	(0.3523)	(−0.6753)
E9	0.9866	0.00191	−0.05248	0.1236	0.0645	−0.06253	0.8756	0.1031	−0.07332	0.1542	0.07216	−0.3208	−0.3193	−0.4184	−0.5474
	(1.8145)	(0.3578)	(−1.982)	(0.5939)	(0.8159)	(−0.2775)	(1.9267)	(0.3636)	(−0.2624)	(0.4847)	(0.2356)	(−1.3266)	(−1.2749)	(−2.024)	(−2.7622)
E10	−2.095	0.02487	−0.0669	0.5622	−0.008	0.3989	0.3127	0.1275	0.3152	0.6814	0.2207	−0.1487	−0.1933	−0.1234	0.2641
	(−3.246)	(4.0037)	(−2.254)	(2.1708)	(−0.0865)	(1.419)	(0.9378)	(0.3704)	(0.9351)	(1.834)	(0.5961)	(−0.5205)	(−0.6366)	(−0.5073)	(1.155)
E11	−0.3426	0.00469	−1.05016	0.4334	0.01	0.3030	0.5648	0.1627	0.4037	0.2169	0.3339	−0.07605	−0.2333	−0.2991	−0.4598
	(−0.6284)	(0.8747)	(−1.909)	(2.057)	(0.1408)	(1.315)	(2.093)	(0.575)	(1.449)	(0.6973)	(1.096)	(−0.3218)	(−0.94827)	(−1.457)	(−2.3162)
E12	−1.072	0.002527	0.1141	−0.4347	−0.1662	−0.1528	0.2683	−0.08339	−0.3376	−0.5547	−0.02680	0.5056	−0.1461	0.3294	0.1880
	(−1.9717)	(0.4704)	(4.2380)	(−2.1044)	(−2.109)	(−0.6766)	(0.9907)	(−0.2977)	(−1.2181)	(−1.7528)	(−0.0880)	(2.079)	(−0.5372)	(1.6043)	(0.9613)

Tax reduction equations

TS1	−3.104	0.00782	−0.01492	0.4119	−0.1019	0.2531	−0.00167	−0.4177	0.09832	0.04951	−0.3942	−0.6092	0.2159	−0.1356	−1.217
	(−2.31)	(0.6018)	(−0.2388)	(0.6871)	(−0.4489)	(0.4063)	(−0.00714)	(−0.5868)	(0.1494)	(0.06833)	(−0.5060)	(−0.9263)	(0.3984)	(−0.2624)	(−1.8013)
TS2	0.7131	−0.00931	−0.04407	−0.1736	−0.2489	−0.07461	−0.1197	0.2435	0.4048	0.1703	0.4568	0.1005	0.1667	−0.1598	−0.1033
	(1.3082)	(−1.724)	(−1.672)	(−0.8467)	(−2.855)	(−0.3328)	(−0.4420)	(0.8492)	(1.4330)	(0.53467)	(1.4825)	(0.4202)	(0.6803)	(−0.7700)	(−0.5207)
TS3	−0.0697	−0.00513	−0.03033	−0.00024	−0.0978	−0.2405	−0.1225	0.1543	0.2223	−0.1780	0.3020	−0.2729	0.1358	−0.1366	0.1038
	(−0.1257)	(−0.9931)	(−1.130)	(−0.00115)	(−1.172)	(−1,0449)	(−0.4467)	(0.5303)	(0.7731)	(−0.5342)	(0.9623)	(−1.0731)	(0.5453)	(−0.64102)	(0.52081)
TS4	0.3109	0.00103	−0.03015	0.02578	−0.05926	−0.1006	−0.3231	0.3186	0.3826	0.1267	0.2128	0.4481	0.2740	−0.02535	0.04011
	(0.5846)	(0.1953)	(−1.1616)	(0.1273)	(−0.7654)	(−0.4539)	(−1.213)	(1.1575)	(1.4066)	(0.41159)	(0.7145)	(1.8484)	(1.1141)	(−0.1256)	(0.2074)
TL1	0.4270	0.01090	−0.02099	0.2357	−0.2018	0.1087	−0.5020	0.3072	−0.009015	−0.1100	0.08324	0.06145	−0.1319	−0.3819	−0.1409
	(0.7764)	(1.978)	(−0.7748)	(1.1337)	(−2.487)	(0.4781)	(−1.858)	(1.077)	(−0.0322)	(−0.3476)	(0.2703)	(0.2464)	(−0.5256)	(−1.8451)	(−0.7022)
TL2	−1.845	0.00679	−0.05966	0.1016	−0.02422	−0·08582	0.6048	0.2298	0.2073	0.5142	0.5426	−0.1058	0.2198	−0.09856	0.06253
	(−2.279)	(0.8557)	(−1.5852)	(0.3379)	(−0.1968)	(−0.2527)	(1.6613)	(0.5155)	(0.4705)	(1.0740)	(1.1642)	(−0.2941)	(0.6412)	(−0.3179)	(0.2132)

[a]Each equation is the log$_e$ of the probability of spending to not spending for the dependent variable categories:

Dependent variables

- E1 Public schools
- E2 Community colleges
- E3 Higher education
- E4 Public health
- E5 Mental health
- E6 Social services
- E7 Medical care and hospitals
- E8 Resource development
- E9 Agriculture
- E10 Motor vehicles
- E11 Highways
- E12 Corrections
- TS1 State corp. income tax
- TS2 State gasoline tax
- TS3 State sales tax
- TS4 State personal income tax
- TL1 Local property tax
- TL2 Local inventory tax

Independent variables

- x_1 is age in years
- x_2 years of completed schooling
- x_3 is sex (male=1, female=0)
- x_4 is money income in 1974 in dollars
- x_5 is spouse of head of household
- x_6 is relative of head of household (head of household is suppressed category)
- x_7 is N. Piedmont Region
- x_8 is S. Piedmont Region
- x_9 is Coastal Plains
- x_{10} is S. Coastal Plains (the mountains is the suppressed category)
- x_{11} is towns up to 2,499 population
- x_{12} is cities 2,500 to 9,999
- x_{13} is cities 10,000 to 49,999
- x_{14} is cities 50,000+ (rural is the suppressed category)

Our measures of place in the family (vis-a-vis the suppressed category of head of household) do not indicate substantial systematic relations to spending preferences, although dependents (children and relatives of the head, e.g. parents living with children) desire more post-secondary education, medical care, agriculture, and less corrections. Also, there do not seem to be substantial regional differences in the preferences or demand for various public goods that are not explainable in terms of the education and income of the respondents. We do note, however, a marked interest in terms of not spending on social services (for the poor) in 2 of the 4 regions as compared to the Mountains region in the western part of the state, which is the suppressed category. These two particular regions happen to be perhaps the most politically conservative in the state.

While there do not seem to be pervasive regional differences in the demand for various public goods, there does seem to be a systematic demand for particular services by the larger urban areas. Big city dwellers systematically prefer more spending on public education, not spending on public health and mental health and not spending on medical care and hospitals as well as on social services, agriculture, and highways. The finding that those in the larger urban areas in the State, as compared to those in rural areas of the State (the suppressed category) do not want to spend on various forms of health care perhaps reflects the geo-imbalance in terms of availability of health care which recently prompted the state to develop regional public health clinics to serve outlying areas. This problem of maldistribution of health resources is apparently chronic nationally; our results reflect rather strong citizen concern on the matter.

Because spending a coupon on a tax reduction is to decrease taxes as compared to not spending a coupon on a reduction of that tax, some care in interpretation of the tax reduction panel is required. The numeraire is to not reduce the tax. Thus, we find that increased age leads to an increased desire not to reduce the gas tax but to reduce the property tax. Perhaps the most surprising result is the absence of any relation between income and a reduction in the individual income tax. That is, we know from table 1 that reduction of the individual income tax had the highest average per capita coupon usage and also the highest fraction of extreme (more than 4) outlays. Yet, there is no relation between income and a desire to reduce the tax on it. We may conclude, then, that the desire to reduce the income tax was widespread and not explainable by any particular characteristics of the respondents. The only significant relation between income and any of the tax reduction categories is the apparent desire of those with higher incomes not to reduce the local property tax. This may reflect an awareness as one moves up the income ladder of the tax advantage of such local property taxes vis-a-vis the Federal individual income tax (they are deductible), or it may reflect a self-interest of higher income persons who regard the property tax as regressive and therefore in a narrow sense in their favor. Interestingly, dependents as compared to the head of household share a

similar attitude toward the local property tax, for they prefer not to spend on local property tax reduction. Perhaps another explanation for this phenomenon is that such a reduction would curtail certain immediate services such as public safety, fire protection, and sanitation – the bread and butter as it were of public sector activity.

Again, interregional differences in the demand for tax reduction are not apparent, nor are there particularly marked urban–rural differences. We do note that large city dwellers do not want to reduce the State corporation income tax, and that small town dwellers do want to reduce the individual income tax.

5. Conclusions

In this paper we have developed and applied a new survey approach to the measurement of the demand for public goods. As such, certain innovations in methodology, the measurement of individual preferences for public and private goods, and the measurement of preferences for particular public goods have been accomplished.

In terms of methodology, the coupon scale is a simple and inexpensive means of measuring citizen preferences for fiscal programs. While the research results reported were primarily exploratory, it would appear that because the data are fixed sum and refer to actually desired allocations of resources, the outcome of such survey research can be readily translated into public policy. Public officials who are not familiar with scaling techniques may find data using the coupon scale more understandable than data resulting from attitudinal scaling techniques usually employed. We should note that the coupon scale is not limited to the fiscal surplus allocation question examined in this study; the technique can be used for gauging a wide variety of attitudes towards fiscal programs, e.g. uses of revenue sharing, allocation of school budgets, and zero-base budget procedures.

Without restating our empirical results here, we do note by way of conclusion that systematic socio-economic differences in preferences for public goods were apparent: strong differences among men and women were apparent in terms of their demand for particular public goods, and education had a substantial impact on the demand for particular public goods.

It would appear this approach to the measurement of the demand for public goods overcomes some of the theoretical objections usually lodged against inquiring hypothetically or in fact about what an individual desires and is willing to pay for public goods. To be sure, providing a set of choices and a budget constraint to each person does not ensure that he will not mislead in stating his spending and taxing preferences. On the other hand, the long held concern that rational individuals will never truly reveal their preferences has not been subject to much empirical scrutiny. It may be that until we have completed surveys

similar to the one reported here, and then examined how people in fact use public facilities which result from their recommendations, we will not know how serious this problem is.

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