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TAX DEDUCTIBILITY AND MUNICIPAL BUDGET STRUCTURE

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ABSTRACT

This paper investigates the effects of deductibility of local taxes on communities' budgetary decisions. Our focus is on how changes in the tax price of local spending induced by deductibility affect the mix between deductible and nondeductible revenue sources, and on expenditures. The econometric analysis is based on a rich data set that tracks the fiscal behavior of 172 local governments from 1978 to 1980. We find that the elasticity of deductibile taxes with respect to the tax price is in the range -1.2 to -1.6; the tax price has no statistically significant effect on the use of nondeductible revenue sources; and the elasticity of local expenditures with respect to the tax price is about -1.8. Hence, if deductibility were eliminated, we would expect to see a substantial decline in local government spending.

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I. Introduction

Historically, federal tax law has allowed itemizers to deduct state and local property, income, and general sales taxes on their personal income tax returns. This provision is estimated to have decreased federal tax revenues by about $30.8 billion in 1985. (Executive Office of the President [1986, p. G-42]). The last several years have witnessed a serious public debate about the merits of partially or totally eliminating state and local tax deductibility. The U.S. Treasury recommended complete abolition of deductibility in 1984, as did President Reagan in 1985.[1] The Tax Reform Act of 1986 disallowed state sales tax deductions, but continued those for income and property taxes. More changes in the tax code are likely in the next few years, and state and local tax deductibility is likely to remain a controversial issue.

Those who favor deductibility argue that its elimination would have a disastrous impact on state and local public finance.[2] In this view, if people cannot deduct state and local taxes on their federal tax returns, then state and local government goods and services in effect become more expensive, and the demand for them declines. State and local public officials appear to believe this scenario. When the United States Conference of Mayors convened in 1985, the New York Times reported that the meeting"... ended with an unusual display of bipartisan unanimity: only one 'no' vote was audible on a resolution urging Congress to amend the [President's] tax plan to keep deductibility of state and local taxes..."[3]

This very simple story about the impact of deductibility ignores the fact that sub-federal governments have access to non-deductible sources of revenue, such as user charges, license fees, special assessments, etc. It could be that eliminating deductibility would lead only to the substitution of nondeductible for deductible revenue sources, and have no impact on spending. However, econometric studies by Inman [1985], Hettich and Winer [1984], and Noto and Zimmerman [1984] find that a jurisdiction's choice of revenue instruments is not responsive to its "tax price": the effective cost of a dollar of expenditure taking into account federal deductibility. Recently, Feldstein and Metcalf (F&M) [1986] challenged this result, arguing that these studies employed inappropriate data, incorrect tax price measures, and/or inconsistent econometric techniques. F&M's examination of 1980 data suggested that if deductibility were removed: (i) state and local use of deductible taxes would decline; (ii) use of other revenue sources would increase; and (iii) net expenditures from local funds would stay about the same. Moreover, because some of the revenue sources that are nondeductible to individuals <u>are</u> deductible to businesses, eliminating deductibility on personal tax returns would not increase federal revenues as much as one would expect if one ignored revenue instrument substitution effects. Indeed, federal tax collections might even decrease. Unfortunately, the regression coefficients which form the basis for all these conclusions are estimated imprecisely in the sense that the coefficients are small relative to their standard errors.

At the moment, then, economists' understanding of the empirical impact of deductibility seems to be a bit murky. In this paper we present new evidence based on a rich set of data which tracks the fiscal behavior of 172 local governments from 1978 to 1980. Our goal is to find the effects of deductibility on the mix between deductible and non-deductible revenue sources, and on expenditures. The use of panel data allows us to control for the existence of "individual effects" in our equations for the various fiscal spending decisions, and hence to obtain more convincing estimates of the effects of deductibility. Our main findings are that: (i) the elasticity of deductible taxes with respect to their tax price is in the range -1.2 to -1.6; (ii) the tax price has no statistically significant effect on the use of non-deductible revenue sources; and (iii) the elasticity of local expenditures with respect to the tax price is about -1.8.

The estimating models are specified in Section II. Section III describes the data. Section IV discusses the econometric issues, and presents the results. Section V concludes with a summary.

II. The Model

A. Preliminaries

Analysis of the effects of deductibility on community decision-making is complicated by the fact that it leads to different voters having different effective prices of local public spending. For a non-itemizer, the effective price of a dollar of local spending is just a dollar. For an itemizer, the effective price is one minus the marginal tax rate, and among itemizers, marginal tax rates differ across people. Which tax price is relevant for understanding community decisions?

One possible approach is to appeal to the median voter model, and argue that the median of the community's tax prices is the relevant figure. However, the person with the median tax price is not necessarily the person with the median demand for public goods. More fundamentally, the median voter model has a number of well-known deficiencies--it ignores such potentially important effects on fiscal decisions as logrolling, coalition formation, and bureaucratic power. (See Inman [forthcoming].)

In the absence of a generally accepted model of community decision making to serve as a framework for our analysis, some sensible and convenient ad hoc formulation is required. We follow Feldstein and Metcalf and assume that the community's decision depends upon its average tax price. That is, if the average marginal federal tax rate for itemizers is τ and the proportion of itemizers is m, then we assume that the price that is relevant for community decision making is $(1-m)1 + m(1-\tau)$.[4]

B. Estimating Equations

1. The Basic Model

Our goal is to estimate the impact of the tax price on a community's deductible taxes per capita (T_D), non-deductible own sources of revenue per capita (T_N), and expenditures per capita, (E). Earlier empirical work suggests that each of these varibles will depend upon the community's tax price (P), family income (Y), and other economic and demographic variables that might affect the community's budget constraint and/or preferences (a k-dimensional vector X). Employing the convenient constant elasticity specification, the estimating equation for (say) T_D is

$$(2.1)\qquad \ell nT_{Dit} = \alpha_0 + \alpha_1 \ell n\, P_{it} + \alpha_2 \ell n\, Y_{it} + \sum_{j=1}^{k} \alpha_{2+j} X_{jit} + f_i + \mu_{it},$$

where i indexes communities, t indexes years, the α's are parameters, μ_{it} is a random error term, and f_i is an "individual effect" for community i -- a composite of those characteristics of the community that affect its fiscal decisions and do not change over time. (Examples might be "political make-up," climate, etc.)[5] Importantly, it is quite likely that f_i is correlated with the right hand side variables, with the result that OLS leads to inconsistent estimates of the parameters. The equations for ℓnT_{Nit} and ℓnE_{it} take the same form.

In order to estimate equation (2.1), take first differences in order to eliminate f_i:

$$(2.2) \qquad \ln T_{Dit} - \ln T_{Dit-1} = \alpha_1(\ln P_{it} - \ln P_{it-1}) + \alpha_2(\ln Y_{it} - \ln Y_{it-1}) + \sum_{j=1}^{k} \alpha_{2+j}(X_{jit}-X_{jit-1}) + (\mu_{it}-\mu_{it-1}) .$$

Again, the equations for $(\ln T_{Nit}-\ln T_{Nit-1})$ and $(\ln E_{it}-\ln E_{it-1})$ take the same form.

The first problem one faces in implementing this framework is construction of the average tax price. It would clearly be desirable to compute P separately for each community on the basis of its taxable income. However, data limitations make it difficult to do this in a convincing way.[6] Instead, we form P using data for the state in which the community is located. Specifically, denote by P^s_{it} the statewide average tax price of the state in which community i is located. Suppose that the discrepancy between P^s_{it} and P_{it} depends on the differences between the community's values of certain variables and their state-wide counterparts. For example, if a community's income exceeds state income, we expect that its tax price will be lower, cet. par. Similarly, a community with a homeownership rate higher than the state average will have a lower tax price, cet. par. Suppose that we denote all variables that affect the tax price in this way by an n-dimensional vector z . Then we can write

$$(2.3) \qquad \ln P_{it} = \ln P^s_{it} + \sum_{j=i}^{n} \gamma_j \, (z_{jit}-z^s_{jit}) + g_i ,$$

where the superscript s indicates a statewide value, and g_i is an individual effect.

Recall now that our basic estimating equation is in first-differences. Therefore, when $(z_{jit}-z^{s}_{jit})$ does not change much over time, its effect on the tax price can be ignored. This is likely to be true of most candidates for inclusion in the z vector. For example, one does not expect the difference between a community's proportion of homeowners and the state wide average to change much from year to year. We assume that income is the only variable in the z-vector for which the difference between state and community values might change substantially over time. Under this condition, taking first differences of equation (2.3) yields

$$(2.4) \qquad \ell n\ P_{it}-\ell n\ P_{it-1} = (\ell n\ P^{s}_{it}-\ell n\ P^{s}_{it-1}) + \gamma_1 \times \left[(\ell n\ Y_{it}-\ell n\ Y^{s}_{it}) - (\ell n\ Y_{it-1}-\ell n\ Y^{s}_{it-1})\right] ,$$

where Y^{s}_{it} is per capita income in commmunity i's state during year t. Provided that the tax price goes down as income goes up, we expect $\gamma_1 < 0$. Substituting into equation (2.2) gives us

$$(2.5) \quad \ell n\ T_{Dit}-\ell n\ T_{Dit-1} = \alpha_1(\ell n\ P^{s}_{it}-\ell n\ P^{s}_{it-1}) + (\alpha_2+ \alpha_1\gamma_1) \times (\ell n\ Y_{it}-\ell n\ Y_{it-1}) + \sum_{j=1}^{k} \alpha_{2+j}(X_{jit}-X_{jit-1}) - \alpha_1\gamma_1(\ell n Y^{s}_{it}-\ell n Y^{s}_{it-1}) + (\mu_{it}-\mu_{it-1}) .$$

The same logic can be applied to the estimating equations for $(\ell n\ T_{Nit} -\ell n\ T_{Nit-1})$ and $(\ell n\ E_t-\ell n\ E_{t-1})$.

In short, our use of the state tax price to "proxy" for the community tax price requires that we include state income on the right side of each equation. In doing so, notice that each of the three equations-- ℓnT_D , ℓnT_N , ℓnE -- incorporates equation (2.4). As a result, the system of equations is subject to a nonlinear constraint: the ratio of the coefficient on (the change in) state income to the coefficient on (the change in) the tax price is identical in all three equations. In the empirical work below, we test this constraint as a check on our specification of the estimating equations.

Another issue related to P_{it} is its possible endogeneity. Imagine that community i has an "unexpectedly high" preference for using deductible sources of revenue, i.e., a positive μ_{it} . This positive μ_{it} will be associated with a relatively high propensity to itemize in community i , and, conditional on itemizing, with a relatively low federal marginal tax rate. Both of these tendencies will affect the value of P_{it} . Hence, there is probably some correlation between P_{it} and μ_{it} . When estimating the parameters from a single cross section of data, this may be quite a serious problem. However, its severity is likely to be attenuated in an individual effects model. This is because the presence of f_i in (2.1) better "controls" for the unobserved preferences determining the left hand side variables. Still, some correlation between the price variable and the error term may remain, so we employ an instrumental variables estimation technique, as described below.

We now turn to the variables in the X-vector. These include:

SHARE = state government spending as a percentage of the state and local total for that state;

GRANTS = sum of federal and state grants, per capita;

ASSETS = per capita market value at the beginning of the fiscal year of holdings of federal securities, mortgages, bonds, cash, sinking funds, bond funds, etc.;

DEBTS = market value of outstanding long and short term debt per capita;

POP = population.

The inclusion of most of these variables is routine, but a few require some comment. The presence of the SHARE variable is in response to the fact that states differ in the division of taxing and expenditure decisions between states and communities. SHARE is a simple way, suggested by Oates [1975], of controlling for such institutional differences. The ASSETS and DEBTS variables are present to allow for intertemporal aspects of community decision making. Communities can finance current expenditures by drawing down their assets or by borrowing, even though these activities are sometimes subject to institutional constraints.

2. Alternative Specifications.

We also consider a number of departures from the basic model. The purposes of analyzing these variants are to assess the robustness of our results, and to facilitate comparisons with earlier work.

First, we estimated a group of regressions leaving out the ASSETS, GRANTS, and DEBTS variables from the right hand side. Feldstein and Metcalf excluded these variables from their models. Doing likewise can help us determine whether discrepancies between our substantive results and theirs depend on this difference in specification.

A second set of variations is suggested by the fact that most of the earlier work on the impact of deductibility on local public finance has used single cross sections rather than panel data. Our individual effects model analyzes the changes in budget structure in response to changes in the tax price. This corresponds more closely to the proposed policy intervention than cross-community variation. Nevertheless, it is interesting to compare the results when the same data are used to estimate both an individual effects model and a series of cross-sectional models. Of course, in cross-sectional models one must include slow changing factors that are differenced out of the individual effects specification. Accordingly, we augment the X vector with a number of such variables:

PUPILS = individuals aged 3 and older enrolled in school per capita;

POOR = individuals below the poverty line per capita;

OLD = individuals aged 65 and above per capita;

OWN = proportion of occupied housing units that are owner occupied;

NONWHITE = proportion of population that is not white;

PCT810, PCT1015, PCT1525, PCT25 = proportion of families with incomes in the ranges \$8,000 - \$9,999, \$10,000 - \$14,999, \$15,000 - \$24,999, and above \$25,000, respectively.

C. Localities vs. States as Observations

In all the models we estimate, the observations are individual localities. In contrast, Feldstein and Metcalf employ state and local totals by state.[7] Thus, while one of our observations is Bridgeport, Connecticut, F&M would use the sum of all communities in Connecticut plus the state government itself. F&M argue emphatically that analyzing community budgets is not a good way to learn about the effects of deductibility. They note that the division of taxing and spending responsibilities between state and local governments varies enormously among the states. Moreover, some communities are under institutional constraints with respect to the kind of tax instruments they can employ. Finally, they observe that it is virtually impossible to get good tax price data on a community level.

It seems to us that F&M overstate their case. To be sure, some communities may be legally constrained in their choice of tax instruments, but within these constraints, there may be scope for choice between deductible and non-deductible revenue sources. In any case, to the extent that these constraints can be viewed as individual effects, our econometric procedure "controls" for them. Similarly, we can control at least crudely for across state differences in the state-local division of responsibilities by including our SHARE variable, the share of state expenditures in the state and local total.

As noted above, we agree with F&M that the inability to compute a tax price for each community is a major problem. However, F&M's procedure does not really solve this problem; in effect they circumvent it by assuming that the state and all localities make their decisions on the basis of the statewide average tax price. This does not seem too much different from our procedure of approximating the community tax price as the state tax price plus a correction factor.

Lest this all sounds too defensive, we should emphasize that there are several real advantages to using local data. First, communities and states do not act in concert to set state and local totals; rather, the totals are the aggregate of each jurisdiction's decisions. What one gets by lumping all communities together and then combining them with the state government is unclear. In short, the underlying model purports to describe the behavior of decision-making units; these units are the jurisdictions themselves. A second advantage of using local data is that there are a lot of communities, and they differ substantially in their fiscal practices. As an econometric matter, greater sample size and variation are aids to obtaining precise parameter estimates.

We conclude that neither type of data is obviously superior. They both have advantages and disadvantages. We view analyses of the two types of data as complementary--each can shed light on the problem.

III. Data[8]

Our budgetary data are drawn from the Census of Governments for 1977 and the Annual Survey of Governments for 1976 and 1978-1980. A random sample of municipal governments was selected from the data tape for 1979 (the year with the least coverage), and these same governments were selected for the remaining years when possible.[9] There was usable information on 172 municipal governments.

In each year, the record for each government provides information on the revenues, expenditures, assets, debts, and grant receipts for each government. Par values of all outstanding debt and holdings of financial assets are converted to market values using the indices provided by Eisner and Pieper [1984]. Finally, budgetary variables are converted to real dollars using a region-specific CPI and then deflated to per capita terms.

We divide real per capita revenues into deductible taxes and non-deductible revenues. The former is composed of (with means in parentheses) property taxes ($281.76), general sales taxes ($12.62), and income taxes ($3.69). Clearly the property tax is dominant. Indeed, of the 172 governments in the sample, only 39 used a general sales tax, 37 used a selective sales tax, and only 3 had an income tax.[10] Unfortunately, the Census data do not allow us to distinguish between property taxes from residential and nonresidential sources; the implications of this problem are discussed in Section IV below.

Non-deductible revenues are simply the difference between total revenues from own sources and deductible taxes. These revenues display considerable diversity in the sample, but all communities rely heavily on taxes and charges for water supply, utilities, and sewerage and sanitation. The mean per capita value of non-deductible revenue sources was $187.28.

As noted above, each community's tax price is assumed to be a function of the tax price of its state. The latter is calculated in the following fashion. For each state in every year under consideration, the average taxable income per itemized return is computed from the IRS's Statistics of Income and the corresponding marginal federal income tax rate (τ) determined. In addition, the proportion (m) of itemized returns for each state is calculated. The state's tax price, P^s, is then $P^s \equiv (1-m)+m(1-\tau)$.[11]

Population characteristics such as the proportion of homeowners, proportion below the poverty line, etc., are taken from the County and City Data Book for 1983, which contains data for 1980. Because these variables change relatively slowly, we use the 1980 values in the cross sectional regressions for 1978 and 1979 as well. In some cases, data for a municipality were not available from the County and City Data Book. In these cases, data for the county in which the municipality is located are used.

The final data issue is the measurement of income. Yearly observations, needed to complete the panel data set, are not available from Census sources. Instead, we use median family "effective buying income" taken from Sales Management magazine as published in the Annual Survey of Buying Power. In effect, this variable is the predicted value of an hedonic disposable income equation based on the characteristics of the area. Data on the income distribution within each community are taken from the same source. Because "effective buying income" is a disposable income concept, it does not conform exactly to the Census measure of income used by F&M. Nonetheless, it is quite similar. For 1980 (when both are available), the simple correlation between this measure and Census median family income is 0.828; the correlation with Census per capita income is 0.772.

Table 3.1 lists the means of each variable for 1980. The figures indicate that our communities relied more on deductible than nondeductible forms of revenue; the difference between the means of $\ell n\ T_D$ and $\ell n\ T_N$ was 0.507. The other general feature worth noting is the large amount of across community variation. The standard deviations of the means of the logarithms imply large variations in the levels.

Table 3.2 shows the means of the first differences of the variables during 1978-1980. During this period, in real terms collections of deductible taxes per capita fell by about 4.7 percent annually, while non-deductible revenue sources increased by about 1.7 percent a year. Real expenditures per capita fell about 1.8 percent annually. Note, however, the relatively large standard deviations. As in the case of the levels figures reported in Table 3.1, there is substantial variability across jurisdictions, so one must be cautious in thinking about the mean values as being "typical."

IV. Estimating the Model

A. Econometric Issues

There are several general issues in estimation. First is the potential endogeneity of the tax price. As noted above, there are good reasons to believe that in a cross sectional regression the tax price will be correlated with the error term. Similarly, it has been long recognized that grant receipts are endogenously determined. In the individual effects model, the

Table 3.1

Means of the Variables in 1980*

$\ln T_D$	5.443 (0.609)	OLD	0.128 (0.0247)
$\ln T_N$	4.936 (1.147)	OWN	0.561 (0.147)
$\ln E$	6.564 (0.382)	PCT810	5.221 (1.455)
$\ln P^S$	-0.110 (0.0287)	PCT1015	14.312 (3.216)
$\ln$ GRANTS	5.345 (0.543)	PCT1525	29.58 (3.522)
$\ln Y$	9.542 (0.218)	PCT25	30.58 (11.33)
$\ln$ ASSETS	4.811 (1.003)	POOR	0.126 (0.0512)
$\ln$ DEBT	5.930 (0.591)	$\ln$ POP	10.58 (1.15)
$\ln$ PUPILS	-1.319 (0.134)		
SHARE	45.59 (6.315)		
NONWHITE	0.139 (0.164)		

*Standard deviations of each variable are in parentheses.

Table 3.2

Means of the First Differences, 1978-1980*

$\ell nT_{Dt} - \ell nT_{Dt-1}$	-0.0473 (0.130)
$\ell nT_{Nt} - \ell nT_{Nt-1}$	0.0165 (0.281)
$\ell nE_t - \ell nE_{t-1}$	-0.0181 (0.164)
$\ell nP^s_t - \ell nP^s_{t-1}$	-0.0119 (0.0184)
$\ell nGRANTS_t - \ell nGRANTS_{t-1}$	-0.0286 (0.327)
$\ell nY_t - \ell nY_{t-1}$	-0.0156 (0.0393)
$\ell nASSETS_t - \ell nASSETS_{t-1}$	-0.0710 (0.585)
$\ell nDEBT_t - \ell nDEBT_{t-1}$	-0.105 (0.280)
$SHARE_t - SHARE_{t-1}$	1.131 (1.792)
$\ell n\ POP_t - \ell n\ POP_{t-1}$	0.00068 (0.04229)

*Standard deviations of each variable are in parentheses.

correlation between the tax price term and the error is likely to be less pronounced because one controls for the potential presence of unobserved taste differences. Still, such a correlation remains a possibility, and we therefore use lagged values of the changes in the tax price and grants as instrumental variables. Note that although we start out with five years of data, one is used up due to differencing, and another because lagged variables are used as instrumental variables. Hence, our estimates are based on three years, or equivalently, two first differences.

A second econometric issue is that the error terms may be heteroskedastic. To check this, in each case we compute White's [1980] heteroskedasticity test. In no case is there even weak evidence of heteroskedasticity. As pointed out in White [1982], this test is biased toward rejection of homoskedasticity in the instrumental variables context, so the failure to reject is even more striking.

A final issue is a measurement problem associated with the dependent variable in the deductible taxes equation. Only <u>residential</u> property taxes are deductible on personal tax returns, and, hence, belong in T_D. As noted above, the Census data used do not permit us to identify residential versus nonresidential property taxes. To gauge the impact of this, notice that the log of residential property taxes (T_R) is related to the log of total property taxes (T_P) by the identity: $\ln T_{Rit} = \ln\psi_{it} + \ln T_{pit}$, where ψ_{it} is the ratio of residential to total property taxes.[12] Viewed in this way, and ignoring income and sales taxes,[12] the error term in our equation for T_{Dit} contains the component $-\ln\psi_{it}$.

If ψ_{it} is time invariant, no problem arises. However, ψ_{it} may fall as the tax price rises. This will induce a positive correlation between the tax price and the error term. Other things equal, this will bias upward (toward zero) the estimated coefficient on the tax price.[13] Moreover, the standard errors of our coefficients will be larger than they would have been in the absence of this measurement problem. In short, our coefficient will understate the "importance" of the tax price, both quantitatively and from the point of view of statistical significance. In the same way, the coefficient on the tax price in the equation for nondeductible revenues will be biased downward toward zero.

B. Results

The estimates of the basic model, equation (2.5), are in Table 4.1. From the coefficient of $(\ln P^S_t - \ln P^S_{t-1})$ in column (1), the elasticity of deductible taxes with respect to the tax price is about -1.55. This elasticity is quite precisely estimated; the coefficient exceeds its standard error by a factor of about 3.1. In this context it is important to emphasize that the first differences specification provides a very stringent test of the importance of deductibility because it focuses on the effect of <u>changes</u> in the tax price on <u>changes</u> in deductible taxes. The fact that the coefficient from the first differences specification is significant at conventional levels seems strong evidence that an effect really is present.

From the second column in Table 4.1, the elasticity of nondeductible revenues with respect to the tax price is -0.787, but it is imprecisely estimated. This is similar to Feldstein and Metcalf's finding that one cannot reject the hypothesis that the tax price has no effect on the use of non-deductible revenue sources.

The coefficient on the tax price variable in the third column of the table suggests that the impact of deductibility on local expenditures is

Table 4.1*

Individual Effects Model: Basic Results

	(1) $\ell nT_{Dt}-\ell nT_{Dt-1}$	(2) $\ell nT_{Nt}-\ell nT_{Nt-1}$	(3) $\ell nE_t-\ell nE_{t-1}$
INTERCEPT	-0.0940 (0.0125)	-0.0324 (0.0330)	-0.0522 (0.0171)
$\ell nP^S_t-\ell nP^S_{t-1}$	-1.553 (0.490)	-0.787 (1.291)	-1.833 (0.669)
$\ell nY_t-\ell nY_{t-1}$	0.00142 (0.233)	-0.495 (0.613)	0.154 (0.318)
$\ell nGRANTS_t-\ell nGRANTS_{t-1}$	-0.0185 (0.0613)	0.0646 (0.161)	0.0889 (0.0837)
$\ell nASSETS_t-\ell nASSETS_{t-1}$	-0.00787 (0.0118)	0.000794 (0.0310)	-0.00234 (0.0161)
$\ell nDEBT_t-\ell nDEBT_{t-1}$	-0.00362 (0.0284)	0.0274 (0.0747)	-0.0890 (0.0388)
$SHARE_t-SHARE_{t-1}$	-0.00345 (0.00483)	0.00820 (0.0127)	-0.00659 (0.00659)
$\ell n\ POP_t - \ell n\ POP_{t-1}$	-0.759 (0.155)	-0.808 (0.407)	-0.988 (0.211)
$\ell n\ Y^S_t - \ell n\ Y^S_{t-1}$	-1.26 (0.410)	-1.16 (1.080)	-1.649 (0.560)

*Estimation is by instrumental variables. Numbers in parentheses are standard errors.

substantial. The elasticity with respect to the tax price is -1.83, and the coefficient exceeds its standard error by a factor of 2.7. This figure is considerably larger than most estimates of individual price elasticities of demand for public goods and services. However, as Feldstein and Metcalf emphasize, it is quite possible that the aggregate response to a change in the tax price will exceed the individual response. This follows directly from the fact that any given percentage change in an itemizer's tax price produces a much smaller percentage change in the community tax price. For any observed variation in expenditure, the elasticity computed with respect to the community tax price will exceed that computed with respect to the itemizer's tax price.

Most of the other coefficients in the table are imprecisely estimated. One interesting finding is that increases in population are associated with statistically significant decreases in per capita expenditures and per capita collections of both deductible and non-deductible revenue sources. One possible explanation is the existence of scale economies in the provision of public goods and services. Another possibility is that this effect is due to sluggish adjustment to population changes. That is, when population increases, communities are slow to change their behavior, so per capita magnitudes fall. To examine the second possibility, we estimated a simple stock adjustment version of model (2.5). This amounts to including the lagged dependent variable (DEP_{t-1}) in each of the equations in Table 4.1. These results, which are reported in Table 4.2, suggest that one cannot reject the hypothesis that the coefficient on the lagged dependent variable is zero. Thus, slow adjustment does not appear to be a major factor in our data. Moreoever, in each equation inclusion of the lagged dependent variable

Table 4.2*

Individual Effects Model With Slow Adjustment

	(1) $\ell nT_{Dt}-\ell nT_{Dt-1}$	(2) $\ell nT_{Nt}-\ell nT_{nt-1}$	(3) $\ell nE_t-\ell nE_{t-1}$
INTERCEPT	-0.0916 (0.0137)	-0.0420 (0.0571)	-0.0521 (0.0174)
$\ell nP^s_t-\ell nP^s_{t-1}$	-1.575 (0.504)	-0.442 (2.230)	-1.843 (0.685)
$\ell nY_t-\ell nY_{t-1}$	0.00703 (0.239)	-0.441 (1.052)	0.154 (0.324)
$\ell nGRANTS_t-\ell nGRANTS_{t-1}$	-0.0233 (0.0635)	0.117 (0.280)	0.0882 (0.0854)
$\ell nASSETS_t-\ell nASSETS_{t-1}$	-0.00731 (0.0121)	-0.000256 (0.0532)	-0.00246 (0.0164)
$\ell nDEBT_t-\ell nDEBT_{t-1}$	-0.00278 (0.0291)	0.0220 (0.128)	-0.0889 (0.0395)
$SHARE_t-SHARE_{t-1}$	-0.00350 (0.00494)	0.00695 (0.0218)	-0.00654 (0.00671)
$\ell nPOP_t-\ell nPOP_{t-1}$	-0.763 (0.159)	-0.791 (0.699)	-0.988 (0.215)
$\ell nY^s_t-\ell nY^s_{t-1}$	-1.261 (0.420)	-1.231 (1.852)	-1.649 (0.570)
DEP_{t-1}	0.0862 (0.173)	1.207 (0.954)	0.0349 (0.247)

*Estimation is by instrumental variables. Numbers in parentheses are standard errors. DEP_{t-1} is treated as endogenous and DEP_{t-2} included as an instrumental variable.

leaves the other variables basically unchanged. While we do not interpret these results as "proof" that past decisions have no effect on current tax and expenditure patterns, they do indicate that allowing for dynamics, at least in a simple way, appears to have no impact on our results about the effects of deductibility.[14]

As noted above, the use of equation (2.4) imposes a constraint across equations of our model; namely, that the ratio of the coefficient on the state income variable to the coefficient on the tax price variable should be identical in each of the equations. This ratio is our estimate of $-\gamma_1$. Imposing this constraint on the estimated coefficients does not alter any of the qualitative results of the model. A test of the null hypothesis that the data satisfy the constraint yields a statistic of 0.158 which is distributed as a chi square with 2 degrees of freedom. The null hypothesis is not rejected at conventional levels of significance.[15] Further, the estimated value of γ_1 is -.972 (with a standard error of .286). Thus, as expected, the community tax price falls relative to the state tax price as community income rises relative to state income.[16]

In our next set of experiments, we deleted ASSETS, DEBTS, and GRANTS from the set of right hand side variables. As mentioned earlier, although we think that a good case can be made for including these variables, they were omitted from Feldstein and Metcalf's specification. Hence, it is interesting to see whether their omission induces any substantive changes. Note that because grants are excluded from consideration, it makes sense for the dependent variable in the "expenditures" equation to be expenditures from own sources only. In terms of our notation, the appropriate variable is $\ell n\ (T_D+T_N)$ rather than $\ell n\ E$.

The results are reported in Table 4.3. A comparison with Table 4.1

indicates that all of the substantive results are basically unchanged. Thus, while we prefer the specification in Table 4.1 on theoretical grounds, use of the Feldstein-Metcalf set-up does not affect our conclusions. In particular, we still find no evidence that a higher tax price leads to greater reliance on non-deductible sources of revenue.

Our last set of results consists of the basic specification estimated for individual cross sections. As emphasized above, we think the individual effects model is more suitable. It is therefore of some interest to see how the results would have differed if we had used a cross section instead.

The cross-sectional results for 1980 are reported in Table 4.4. From the first column, we see that contrary to what one would expect, increases in the tax price <u>increase</u> the reliance on deductible sources of revenue. However, this coefficient is imprecisely estimated. Moreover, from the second column, increases in the tax price decrease reliance on non-deductible revenue sources by a huge amount (the elasticity is minus 15), and this coefficient is more than twice its standard error.

What accounts for these peculiar results? One possibility is that the year 1980 was "atypical" for the communities in our sample. We therefore estimated the cross-sectional equations for the years 1978 and 1979 as well. The results are reported in the top portion of Table 4.5. (To conserve space, we report only the coefficients on the tax price and income coefficients.) A glance at the figures in the table suggests that the point estimates vary considerably from year to year. Indeed, the elasticities of T_N and E with respect to P^s flip signs from year to year.

Thus, we cannot "blame" the implausible results of Table 4.3 on the choice of year. An alternative possibility is that the cross sectional

Table 4.3*

Omitting GRANTS, ASSETS and DEBTS from the X-Vector

	$\ell n\ T_{Dt} - \ell n\ T_{Dt-1}$	$\ell n\ T_{Nt} - \ell n\ T_{Nt-1}$	$[\ell n\ (T_{Dt}+T_{Nt}) - \ell n\ (T_{Dt-1}+T_{Nt-1})]$
INTERCEPT	-0.0922 (0.0107)	-0.0380 (0.0283)	-0.0912 (0.0140)
$\ell n\ P_t - \ell n\ P_{t-1}$	-1.525 (0.457)	-0.869 (1.210)	-1.724 (0.598)
$\ell n\ Y_t - \ell n\ Y_{t-1}$	-0.0328 (0.224)	-0.548 (0.592)	-0.706 (0.292)
$SHARE_t - SHARE_{t-1}$	-0.00298 (0.00469)	0.00740 (0.0124)	0.00384 (0.00614)
$POP_t - POP_{t-1}$	-0.746 (0.151)	-0.785 (0.401)	-0.916 (0.198)
$Y^S_t - Y^S_{t-1}$	-1.218 (0.401)	-1.142 (1.062)	-0.583 (0.524)

*Estimation is by instrumental variables. Numbers in parentheses are standard errors.

Table 4.4

Cross-Sectional Results for 1980*

	(1) ℓnT_D	(2) ℓnT_N	(3) ℓnE
INTERCEPT	-14.88 (10.68)	65.06 (21.50)	26.16 (7.329)
ℓnP^S	4.051 (3.786)	-15.16 (7.62)	0.451 (2.598)
ℓnY	1.631 (1.294)	-6.011 (2.604)	-2.314 (0.888)
ℓnGRANTS	0.0487 (0.0880)	-0.0141 (0.177)	0.317 (0.0604)
ℓnASSETS	-0.0420 (0.0342)	0.303 (0.0689)	0.0895 (0.0235)
ℓnDEBT	0.0974 (0.0582)	0.419 (0.117)	0.164 (0.0400)
ℓnPUPILS	0.199 (0.279)	0.286 (0.562)	0.0942 (0.192)
SHARE	0.0164 (0.00623)	-0.0391 (0.0125)	-0.0150 (0.00427)
NONWHITE	0.114 (0.309)	-0.447 (0.622)	-0.289 (0.212)
POOR	-5.586 (1.314)	5.778 (2.646)	1.101 (0.902)
OLD	3.932 (1.610)	0.615 (3.242)	0.966 (1.105)
POWN	-1.316 (0.317)	0.841 (0.638)	0.0338 (0.217)
PCT810	0.0336 (0.0806)	-0.212 (0.162)	-0.0372 (0.0553)
PCT1015	0.0479 (0.0348)	0.0678 (0.0701)	0.00855 (0.0239)
PCT1525	-0.0228 (0.0225)	0.0322 (0.0452)	0.0107 (0.0154)
PCT25	-0.0112 (0.0300)	0.112 (0.0605)	0.0447 (0.0206

(Table 4.4 Continued)

ℓn POP	0.114 (0.0382)	-0.126 (0.0770)	-0.0556 (0.0262)
$\ell n\ Y^S$	1.948 (0.638)	-5.002 (1.284)	-0.518 (0.438)

*Estimation is by instrumental variables. Numbers in parentheses are standard errors.

equations are estimated with inappropriate instruments. The estimates presented so far use lagged tax price as an instrument. If: (a) the primary source of endogeneity in the cross section arises from the fact that unobserved tastes for spending induce correlation between P_{it} and the error term, and (b) these unobserved taste differences persist over time; then lagged price will do little to purge the correlation between P_{it} and the the error term.

Fortunately, for the year 1980 we have available an alternative set of instrumental variables suggested by Feldstein and Metcalf. These are: i) the proportion of taxpayers in the state who would be expected to itemize if each taxpayer's probability of itemizing were equal to the national average for his or her adjusted gross income class; ii) the marginal tax rate on the first dollar of state and local tax deductions; and iii) the average tax rate on state and local tax deductions. These variables are expected to be correlated with the state tax price, but uncorrelated with the error term in the regression. (See Feldstein and Metcalf [1986] for further details.) The estimates that are obtained with this alternative set of instrumental variables are reported at the bottom of Table 4.5. A comparison of those elasticities with those reported in Table 4.4 indicates that the "wrong" signs are still present. We conclude that the use of single cross sections to estimate the fiscal response of communities to changes in their economic environments can produce quite misleading results.

Nevertheless, we think that cross-sectional data may help shed some light on a measurement problem that was discussed above. Namely, our property tax data include payments from both residential and nonresidential sources, which in theory can bias toward zero the tax price coefficients in the T_{Dit}

Table 4.5*

Additional Cross Sectional Results

	(1) ℓnT_D	(2) ℓnT_N	(3) ℓnE
<u>1978</u>			
ℓnP^s	-11.76	-0.0334	-4.138
	(4.452)	(7.817)	2.655
ℓnY	2.172	-5.707	0.198
	(1.851)	(3.251)	(0.104)
<u>1979</u>			
ℓnP^s	3.053	-21.90	-4.393
	(3.660)	(7.530)	(2.678)
ℓnY	1.491	-5.550	-1.105
	(1.541)	(3.172)	(1.128)
<u>1980</u> (F&M's Instruments)			
ℓnP^s	7.898	-8.750	3.289
	(3.356)	(6.217)	(2.140)
ℓnY	1.192	-6.764	-2.691
	(1.361)	(2.520)	(0.867)

*Estimation is by instrumental variables. Numbers in parentheses are standard errors.

and T_{Nit} equations. For a subset of our communities, we obtained 1980 data on the proportion of the property tax base that was residential. (Such data were not available for other years.) Assuming that residents paid property taxes in proportion to their share in the tax base, we were able to estimate residential and nonresidential property taxes paid. For this subsample, the cross-sectional equations for T_{Nit} and T_{Dit} were then estimated both with and without nonresidential property taxes included in the respective left hand side variables. The results with and without the adjustment were essentially the same for both the T_{Dit} and T_{Nit} equations. This suggests that in our sample, the share of nonresidential property taxes is sufficiently small that only an inconsequential bias is induced by lumping residential and nonresidential property taxes together. Of course, we recognize the tenuous nature of this exercise. It is no substitute for an analysis of longitudinal data with information on the mix of property tax receipts.

V. Conclusion

We have examined fiscal data on 172 communities over the period 1978 to 1980 in order to estimate the effects of deductibility on local taxing and spending behavior. From a methodological point of view, our first main result is that local data provide a fruitful source of information on the impact of deductibility on fiscal decisions. Difficulties in defining tax prices and accounting for differences in institutional structures across states do not seem to prevent us from obtaining sensible and useful results. The second methodological result is that parameters estimated from a single cross section of fiscal data must be interpreted with care. Such parameters may depend upon the particular year chosen, and may be inconsistent due to the failure to account for individual effects.

Our main substantive findings are:

1) Deductibility does affect the choice of revenue sources. The elasticity of deductible taxes with respect to the tax price is in the range -1.2 to -1.6. In our sample, the mean value of the logarithm of the tax price in 1980 was -0.110. Thus, if deductibility were removed, i.e., if ℓn P became zero, then collections of deductible taxes would fall by more than 13 percent.

2) However, we have not been able to find any evidence that removing deductibility would increase reliance on nondeductible sources of finance. Indeed, the point estimates of these elasticities are negative, although they are imprecisely estimated. Thus, there is no reason to think that tax substitutions at the local level would mitigate against increased federal tax revenues if deductibility were removed.

3) Local spending is quite responsive to changes in the tax price, with an elasticity of about -1.8. Thus, removing deductibility could have major effects on local spending.

Footnotes

[1] See U.S. Department of the Treasury [1984] and President's Tax Proposals to the Congress for Fairness, Growth and Simplicity [1985].

[2] There are also claims that removing deductibility would lead to an unfair increase in the tax burden on middle class taxpayers. The distributional implications of deductibility, both across states and across income classes, are discussed in Feenberg and Rosen [1986] and Kenyon [1986].

[3] "What Happens if Washington Changes the Rules?" New York Times, June 23, 1985, p. E5.

[4] As Fisher [1986] has noted, another factor that might affect the tax price is the fact that some state income taxes allow credits and deductions for local property tax payments. To examine this possibility, we computed the state income tax liability of a household that had the average taxable income on all itemized returns in its state. In every case, if this household paid the average property tax in its community, then the credit or deduction had no marginal effect on the tax price of local spending. This is because the credits and deductions are capped at a sufficiently low level that the household with the average property tax is not affected on the margin.

[5] Note that specification (2.1) ignores differences in the (quality adjusted) resource cost of public sector inputs across communities. Implicitly, this assumes a national market for such inputs. Alternatively, input costs may vary across communities, but if they do not change over time, they are included in the individual effect. Holtz-Eakin [1985] tests for the presence of individual effects in these data and finds that they are present. In addition, this specification does not allow for year effects. In some preliminary experiments, we included year effects, and found that they did not change any of the substantive results.

[6] Inman [1985] provides an interesting attempt along these lines.

[7] Hettich and Winer [1984] employ state data without including figures from localities in the totals.

[8] A more complete description of the data set from which this sample is drawn is contained in Holtz-Eakin, Newey and Rosen [1985].

[9] To remain in the sample, communities had to report positive school expenditures.

[10] Indeed, the econometric results below are unchanged when income and sales taxes are excluded in the computation of deductible taxes.

[11] This procedure differs substantially from that used by F&M, who took advantage of data from individual tax returns. Nevertheless, the two methods yield quite similar results. In 1980, F&M calculate the mean tax price as 0.92 with a standard deviation of 0.02; the range is from 0.87 to 0.96. In comparison, our statewide tax prices for 1980 have an average value of 0.90, a standard deviation of 0.03, a minimum of 0.86, and a maximum of 0.94.

[12] Allowing for income and sales taxes would introduce some nonlinearity into the problem, but not change the qualitative results.

[13] Of course, a general analysis of the bias requires consideration of the complete set of covariances among the right side variables and the vector of covariances between each of these variables and ψ_{it}. We think that in this particular case, these other covariances are unlikely to change our conclusion.

[14] Holtz-Eakin, Newey and Rosen [1985] discuss dyamic aspects of local government taxing and spending behavior.

[15] The test is computed by estimating the three equations as a system using three-stage least squares both with and without imposing the constraint. The covariance matrix from the unconstrained estimation is used in both cases. The test statistic is the difference between the constrained and unconstrained weighted sum of squared errors for the system.

[16] With an estimate of γ_1, one can use equation (2.5) to work backward from the coefficients on $\ell n(P^s_{it}-\ell nP^s_{it-1})$ and $(\ell nY_{it}-\ell nY_{it-1})$ to solve for α_2, the effect of community income on the left hand side variable. In the expenditures equation, this turns out to be negative, a result counter to a number of previous studies. However, the estimate is statistically insignificant. We conjecture that mismeasurement of the income variable may be the cause of this result.

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