NBER WORKING PAPER SERIES

FEDERAL DEDUCTIBILITY AND LOCAL PROPERTY TAX RATES

Douglas Holtz-Eakin

Harvey Rosen

Working Paper No. 2427

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
November 1987

We thank Ralph Braid, Amy Ellen Schwartz, Ronnie Lowenstein, seminar participants at SUNY-Stony Brook and the University of Maryland, and a referee for valuable comments. Dan Edelstein provided valuable assistance with the computations. We are grateful to a grant from the Olin Foundation to Princeton University for financial support. Support from the Ford Foundation is gratefully acknowledged. The research reported here is part of the NBER's research program in Taxation. Any opinions expressed are those of the authors and not those of the National Bureau of Economic Research.

NBER Working Paper #2427
November 1987

Federal Deductibility and Local Property Tax Rates

ABSTRACT

In current discussions of tax reform in the United States, there is considerable controversy concerning the effects of allowing individuals to deduct state and local taxes when calculating their federal income tax liability. Recent econometric work has suggested that federal deductibility of state and local taxes has raised the proportion of these taxes -- especially property taxes -- in local budgets. This paper lends additional support to these earlier findings by showing that one channel through which deductibility leads to higher local property tax revenues is by increasing the rate of local property taxation. Specifically, we find that if deductibility were eliminated, the mean property tax rate in our sample of 82 communities would fall by 0.00715 ($7.15 per thousand dollars of assessed property), or 21.1 percent of the mean tax rate.

Douglas Holtz-Eakin
Department of Economics
Columbia University
New york, NY 10027

(212) 280-3685

Harvey S. Rosen
Department of Economics
Princeton University
Princeton, NJ 08544

(609) 452-4022

1. Introduction

Recent discussions of tax reform in the United States have focused attention upon the relationship between fiscal policies of the federal government and those of state and local governments. In particular, there has been considerable controversy concerning the effects of allowing individuals to deduct state and local taxes when calculating their federal income tax liability. Proponents of deductibility argue that it is an essential feature of the revenue system of sub-federal governments. Nevertheless, the U.S. Treasury [1984] proposed complete elimination of this deduction, and the Tax Reform Act of 1986 removed the deductibility of state sales taxes.

Does deductibility have an important impact on state and local taxes and expenditures? The evidence is mixed. Hettich and Winer [1984], Noto and Zimmerman [1984], and Inman [1985] found that deductibility has little influence. More recently, however, Feldstein and Metcalf [1986] estimated a large influence of federal deductibility on sub-federal government behavior. Their analysis of state-wide data for 1980 suggested that removing deductibility would greatly reduce reliance on deductible taxes, *inter alia*. However, this effect was measured imprecisely in the sense that the relevant elasticity was small relative to its standard error. Holtz-Eakin and Rosen [1987] examined the same issue using a panel data set of individual municipal governments over the period 1978-1980. They found that deductibility had a statistically significant impact on the amount of deductible taxes in the mix of local financing, although the point estimate of the effect was smaller than that suggested by Feldstein and Metcalf.[1]

One issue that has not received much attention in previous empirical studies is the mechanism by which deductibility affects reliance on various revenue sources. As noted above, the focus has been the impact of deductibility on tax revenues from various sources. Tax revenues are the product of a tax rate and a tax base. Do revenue adjustments in response to changes in deductibility rules work through changes in the rate or the base? This issue is particularly interesting in the case of the local property tax, where policymakers have direct control only over the statutory rate and the assessment ratio, not the base. It would be quite surprising if revenue adjustments were entirely the consequence of endogenous changes in the value of the tax base. Put another way, the credibility of the view that deductibility increases reliance on deductible revenue sources would be strengthened if there were empirical evidence linking deductibility with higher property tax <u>rates</u>.

This is the issue addressed in the present paper. The results suggest that federal deductibility of property tax payments does indeed have a positive impact on the property tax rate. Specifically, in our sample of municipalities deductibility increased the mean property tax rate $7.15 per thousand dollars of assessed property; a rise of 21.1 percent.

The next section presents a model of property tax rate determination. Section 3 discusses the data used to estimate the model and the econometric issues that arise in doing so. The results are contained in Section 4. The final section is a summary.

2. The Model

This section develops a model of the determination of the property tax rate in a community. We begin by considering the individual's choice of an optimal property tax rate and then turn to the question of how individual preferences are translated into a community decision. Below, the various comparative static results are motivated intuitively. See Holtz-Eakin [1987] for complete derivations.

Before proceeding, it is useful to define carefully several alternative notions of "the property tax rate". Let T be the property taxes owed on a property, A the assessed value of the property, b the market value of the property, and τ the individuals federal marginal tax rate. Then the ratio T/A will be called the statutory property tax rate. The pretax effective property tax rate, denote Θ, is T/b. Θ differs from the statutory rate if assessment is done at a rate different than 100%. Finally, for those who itemize deductions the after-tax effective property tax rate is the ratio $(1-\tau)T/b$.

2.1 The Individual Decision

A community consists of N individuals indexed by i=1,..,N.

Each individual seeks to maximize an identical utility function defined over a single private good, X, and a public service, S:

(2.1) $$U[X,S].$$

Where not needed for clarity, we suppress the index i. We assume that local financing of S is done entirely by taxing property at the effective tax rate Θ. Thus, the individual's property tax liability is Θb, where b is the market value of the individual's property. The supply of b is some function b[.] of the after-tax effective property tax rate. Let s denote the individual's share of the total community tax base, B. Holding federal marginal tax rates constant, each individual's b depends on the effective property rate. As a result, so does B; we denote this relationship by the function B[.]. The individual's budget constraint is then:

(2.2) $$\begin{aligned} X &= Y - \Theta s B[(1-\delta\tau)\Theta] - \tau(Y-\delta\Theta s B[(1-\delta\tau)\Theta]) \\ &= Y(1-\tau) - \Theta s B[(1-\delta\tau)\Theta](1-\delta\tau) \end{aligned}$$

where Y is gross income, τ is the marginal federal income tax rate, and $\delta=1$ if the individual is an itemizer and otherwise $\delta=0$.[2]

Service flows to the individual, S, depend on total municipal spending, E, and the degree to which the service is subject to congestion. Specifically, following Bergstrom and Goodman [1973], if the population is N, we posit a "congestion function" C(N), and assume that $S \equiv C(N)E$. If the service is a pure public good, C(N)=1 at every population level and S=E. On the other hand, if S has the characteristics of a pure private good C(N)=1/N and S=E/N.[3] Finally, expenditures are the sum of property taxes and lump-sum grants from outside sources, G:[4]

$$(2.3) \qquad S = C(N)E = C(N)(\Theta B + G)$$

or

$$(2.3') \qquad \Theta B = (S/C(N)) - G$$

Substituting (2.3') into (2.2), the individual's budget constraint can be written:

$$(2.4) \qquad Y(1-\tau) + s(1-\delta\tau)G = X + [s(1-\delta\tau)/C(N)]S.$$

Maximization of (2.1) subject to (2.4) leads to optimal values of X and S; the property tax rate is then determined via the budget constraint. Alternatively, we can define the individual's problem so that Θ is the choice variable. This problem is to maximize:

$$(2.5) \qquad V(\Theta) \equiv U[Y(1-\tau) - \Theta sB[.](1-\delta\tau), C(N)(\Theta B[.] + G)]$$

for fixed values of Y, τ, δ, N, G, and (B-b).[5] The optimal Θ sets the individual's marginal rate of substitution between public expenditure and the private good equal to the congestion-adjusted "tax price" of the public service:

$$(2.6) \qquad U_S/U_X = s(1-\delta\tau)/C(N)$$

where subscripts denote partial derivatives.[6] Assuming that this first order condition can be solved for Θ, it yields an expression for the optimal property tax rate of the form:

$$(2.7) \qquad \Theta = \Theta[(1-\delta\tau), Y(1-\tau), G, \{b_j\}, N]$$

where $\{b_j\}$ denotes the vector of property values of all other individuals.

From our point of view the key question is how Θ responds to changes in τ. It is straightforward to show that the sign of the derivative $d\Theta/d\tau$ is ambiguous. This ambiguity arises because changing τ creates both an income effect and a substitution effect. For example, raising τ lowers disposable income, which tends to reduce the desired amount of S (assuming S is a normal good), and hence to lower Θ. At this same time, a higher τ lowers the relative price of S, which tends to raise the desired amount, and hence to increase the preferred level of Θ.

The other method by which federal fiscal policy affects localities is via grant distributions, G. From the individual perspective, lump sum increases in G are increases in total resources out of which to finance X and S. Hence, only an income effect is present and $d\Theta/dG$ is positive.

2.2 The Community Decision

We now turn to the question of how communities select tax rates given the underlying preferences of their members. As is well known, there is no definitive theoretical solution to this problem. (See Inman [forthcoming].) The model developed here is simple and provides a convenient basis for empirical work. The basic assumption is that the property tax rate is set by a local official who lacks perfect information about individual tastes in the community. In order to maximize the possibility of re-election, the official sets the property tax rate to maximize expected votes:[7]

$$\text{Max } E\{\sum_{i=1}^{N} v_i\} \tag{2.8}$$

where $v_i=1$ is a vote for the official and $v_i=0$ is a vote against the official. Individual voting behavior is given by:

$$v_i = \begin{cases} 1, & \text{if } V(\Theta_i)-V(\Theta) \leq R_i \\ 0, & \text{if otherwise} \end{cases} \tag{2.9}$$

where $V(\Theta_i)$ is the utility of individual i at his preferred tax rate, $V(\Theta)$ is utility at the tax rate selected by the official, and R_i is the "reservation utility loss" for individual i.[8] This specification reflects the assumption that individuals reward officials whose decisions are not "too far" from their own choices. Otherwise people either vote for an opposing candidate in the subsequent election or run for office themselves.

As suggested earlier, the incumbent does not know the actual pattern of R_i in the municipality. Instead, he maximizes expected votes given his subjective distribution of the R_i. Letting f(R) and F(R) be the density and cumulative distribution function, respectively, the official's objective is to:

$$(2.10) \qquad \text{Max} \sum_{i=1}^{N} \Pr(v_i=1)$$

$$= \sum_{i=1}^{N} [1 - F(V(\Theta_i)-V(\Theta))]$$

The optimal community property tax rate is found by solving the associated first order condition,

$$(2.11) \qquad \sum_{i=1}^{N} f(V(\Theta_i)-V(\Theta))(dV/d\Theta) = 0.$$

Note that this is simply a weighted average of individual first order conditions (such as those which give the solution to equation (2.5)) evaluated at a common Θ.

The important implication of equation (2.11) is that the official's decision depends upon the tax price of each member of the community. There is no single "decisive voter" as in the median voter model.[9] Unfortunately, equation (2.11) does not provide much guidance with respect to just how the individuals' tax prices should be weighted. The weights depend on the form of the individuals' utility functions as well as the values of the other variables that enter the first order conditions. For convenience, we assume that each citizen's tax price receives an equal weight. Hence, the community tax price is simply the arithmetic average of the individuals' tax prices.[10] Under the additional assumption that the community is composed of only two types of individuals -- itemizers and non-itemizers -- the community tax price is given by:

$$P = \sigma(1-\tau) + (1-\sigma) \tag{2.12}$$

where σ is the proportion of itemizers in the population.

A key empirical issue to be explored below is the effect on the community property tax rate, Θ, of an increase in the community tax price, P. Notice that P may increase for two reasons. First, the income tax rate may fall. How does this affect Θ? As shown in Holtz-Eakin [1987], an increase in τ has an ambiguous effect. For non-itemizers, there is a pure income effect which lowers the demand for public services and, hence, the property tax rate. Itemizers, on the other hand, have both an income effect and an offsetting reduction in the price of public services. The net result depends on the composition of the population and the relative sizes of the income and substitution effects.

Changes in P may also be induced by changes in the proportion of itemizers in the population, σ. When σ decreases, <u>ceteris paribus</u>, P increases, which lowers the demand for public services, and lowers Θ. The upshot is that the relationship between P and Θ is ultimately an empirical issue.

Our model also allows us to investigate how Θ responds to other changes in the economic environment. Assuming that S is a normal good, the property tax rate rises with a uniform increase in individuals' incomes because greater income increases the demand for public spending and, hence, the property tax rate. On the other hand, an increase in grants results in a lower rate of property taxation as outside resources are substituted for internal resources in the financing of public spending. An increase in the population of the jurisdiction has an ambiguous effect. On one hand, the ability to spread costs over a larger population lowers individuals' price of public services, but the increased congestion tends to raise the price. Since price movements will be reflected in changes in the desired level of S, Θ will be affected accordingly.

We now turn to the construction of an econometric model that can be used to estimate the sizes of the various effects.

2.3 The Estimating Equation

The discussion leading up to equation (2.11) suggests that a community's effective property tax rate (Θ) depends upon its average tax price (P), per capita income (Y), grants from other levels of governments (G), population (N), and other variables that might affect community tastes for public goods and the resources available to purchase these goods (a k-dimensional vector X). Assuming a log-linear specification, we have:

$$(2.13) \qquad \ln\Theta_{it} = \beta_0 + \beta_1 \ln P_{ct} + \beta_2 \ln Y_{ct} + \beta_3 \ln G_{ct} + \beta_4 \ln N_{ct} + \sum_{j=1}^{k} \varphi_j X_{jct} + f_c + \varepsilon_{ct}$$

where the β's and φ's are parameters, c indexes communities, t indexes years, and f_c is an "individual effect". The individual effect controls for unchanging characteristics of the community that may affect its fiscal decisions. Examples include the "political make-up", form of government, climate, etc..

In order to estimate equation (2.13), take first differences to eliminate f_c:

$$(2.14) \qquad D\ln\Theta_{it} = \beta_1 D\ln P_{ct} + \beta_2 D\ln Y_{ct} + \beta_3 D\ln G_{ct} + \beta_4 D\ln N_{ct} + \sum_{j=1}^{k} \varphi_j DX_{jct} + D\varepsilon_{ct}$$

where the operator D denotes taking the first-difference, i.e., $DZ_{ct} \equiv Z_{ct} - Z_{ct-1}$ for any variable Z.

The first problem in implementing this framework is constructing P_{ct}. Clearly it would be desirable to compute the tax price for each community on the basis of the tax situations of its members. Data limitations preclude us from doing this in a convincing way. Instead, we construct P_{ct} from data for the state in which the community is located. Specifically, let P^S_{ct} be the average tax price of the state in which community c is located. P^S_{ct} is computed as a weighted average of 1 (one) and $(1-\tau^S_c)$, where τ^S_c is the marginal federal income tax rate applicable to average taxable income per itemized return in the state. In general, we do not expect P_{ct} and P^S_{ct} to be equal. We assume that the discrepancy between these two tax prices depends primarily on the difference between the community's income, Y_{ct}, and the statewide income, Y^S_{ct}. Then we can write:

$$(2.15) \qquad \ln P_{ct} = \ln P^{S}_{ct} + \pi(\ln Y_{ct} - \ln Y^{S}_{ct}) + g_c$$

where g_c is an individual effect that controls for the presence of slow-changing characteristics of the community that might affect its tax price. Since higher incomes are expected to lead to a lower tax price, we expect $\pi < 0$.

Taking first differences of equation (2.15) and substituting into equation (2.14) yields:

$$(2.16) \qquad D\ln\Theta_{it} = \beta_1 D\ln P^{S}_{ct} + (\beta_2+\beta_1\pi)D\ln Y_{ct} + \beta_3 D\ln G_{ct} + \beta_4 D\ln N_{ct} - \beta_1\pi D\ln Y^{S}_{ct} + \sum_{j=1}^{k} \varphi_j DX_{jct} + D\varepsilon_{ct}.$$

In short, our use of the state tax price to "proxy" for the community tax price requires that we include mean state income on the right side of the equation and reinterpret the coefficient on $D\ln Y_{ct}$.

We next turn to the vector of variables, X. These are:

SHARE = the state government's spending as a proportion of the total state and local government spending in the state;

ASSETS = per capita real market value of beginning of fiscal year holdings of financial assets. These include federal securities, mortgages, bonds, cash, sinking funds, bond funds, etc.;

DEBTS = per capita real market value of beginning of fiscal year long and short term debt outstanding.

SHARE is included to reflect the fact that states differ in the division of taxing and spending decisions between the state government and communities. SHARE is a simple way suggested by

Oates [1975] of controlling for such institutional differences. ASSETS and DEBTS allow for intertemporal aspects of community decision making. Communities can finance current expenditures by drawing down accumulated assets or by borrowing, although the capacity to do so may be limited by institutional constraints.

3. Estimating the Model

3.1 Data

The empirical investigation is based on data for a sample of municipal governments over the years 1976 to 1980.[11] The primary data source is the Finance files of the Bureau of the Census' Census of Governments in 1980 and the similar Annual Survey of Governments for 1976 to 1979.[12] A random sample was selected for 1979 and the records for each community matched for the other years. Communities with missing or anomalous data for any year were dropped. In addition, communities in the state of Massachusetts were excluded because Massachusetts severely limits the ability of local governments to enact changes in their property tax rates. Finally, some communities were eliminated because they experienced a general property reassessment during the sample period. (The reasons for this exclusion are discussed below.) Eighty two communities were included in the final sample.

The Census files provide comprehensive data on the amounts and sources of revenue, expenditures by type and function, and asset and debt holdings and transactions. However, they provide no information on the economic and demographic characteristics of the communities or on key "prices" such as property tax rates. To obtain these variables, other sources were used.

The statutory property tax rate (defined as dollars per thousand dollars of assessed value) is computed as the ratio of property taxes collected to assessed value, both taken from Moody's Municipal and Government Manual. The statutory property tax rate, of course, differs from the theoretically required effective property tax rate, Θ_{ct}, by the ratio of assessed to market value of the tax base. However, assessment ratios are not available in the data. Are problems caused by the use of the statutory rate in place of Θ_{ct}? To examine this question, let Φ_{ct} be the statutory tax rate in community c during year t and α_{ct} the associated assessment ratio. Then by definition:

$$\ln\Theta_{ct} = \ln\alpha_{ct} + \ln\Phi_{ct} \tag{3.1}$$

Recall from equation (2.16) that the property tax rate equation is estimated in first differences. Hence the dependent variable is:

$$\ln\Theta_{ct}-\ln\Theta_{ct-1} = \ln\alpha_{ct}-\ln\alpha_{ct-1} + \ln\Phi_{ct}-\ln\Phi_{ct-1} \tag{3.2}$$

Thus, if α_{ct} is time invariant (i.e. $\ln\alpha_{ct}-\ln\alpha_{ct-1}=0$), changes in Φ_{ct} mirror changes in Θ_{ct} and the use of statutory property tax rates is acceptable. Notice that α_c may vary across communities in any fashion. With our estimating procedure, variation across communities in the assessment ratio is included in the "individual effect" for each community; hence there is no need to measure it.

Obviously, difficulties arise to the extent that the assessment ratio changes over time. Two factors reduce problems of this type. First, information on general reassessments is contained in the Moody's document referred to above, and those communities that experienced a general reassessment were excluded from the analysis.

For the remaining communities, short run changes in the assessment ratio will largely result from changes in the market value of properties. Fortunately, changes in market values may be accurately proxied by changes in community income levels. Since income changes are already included on the right hand side of equation (2.16), our procedure will control for these fluctuations in the assessment ratio. Of course, the interpretation of the income coefficient is complicated by this observation.

We turn next to the construction of the state tax price, P_{ct}^{s}. As noted above, it is a weighted average:

$$P_{ct}^{s} = \sigma_{c}^{s}(1-\tau_{c}^{s}) + (1-\sigma_{c}^{s}) \tag{3.3}$$

where σ_{c}^{s} is the proportion of itemizers in the state and τ_{c}^{s} is the marginal federal tax rate for the average taxable income per itemized return in the state. These are computed from the Internal Revenue Service publication Statistics of Income.

Our measure of community income is median "effective buying income" taken from Sales & Marketing Management magazine's Survey of Buying Power and deflated to real (1977) dollars. This is the only source of municipal data on income available on an annual basis. For state income, we use per capita income converted to 1977 dollars.

Grants are measured as real (1977) dollars per capita received from federal, state, and other local governments. Information on the mix of matching and non-matching grants in the total is not available. However, as noted below, an instrumental variables approach is used to control for endogeneity in the determination of grants.

Means of the data are shown in Table 1. The figures indicate that the average value of $\ln(P^S)$ in our sample is –0.083; implying that property tax deductibility on average lowered the after-tax effective price of property tax finance by about eight percent. A general feature of the table worth noting is the substantial across community variation in both the fiscal and demographic data. The standard deviations of the means of the logarithms imply large variations in the levels.

Table 2 shows the means of the first differences of the variables for 1979-1980. During this period, the statutory property tax rate rose by about 0.35 percent and the real tax price fell by about 0.52 percent. Note, however, the relatively large standard deviations. As in the case of the levels, there is substantial variation across jurisdictions, so one must be cautious in thinking about the mean values as being "typical".

3.2 Econometric Issues

Several important econometric issues arise in connection with the estimation of equation (2.16). First, the tax price may be correlated with the error term. Imagine that community c has an "unexpectedly high" preference for public spending which results in a higher property tax rate. To the econometrician this appears as a positive ε_{ct} in equation (2.13). This positive residual will be associated with both a greater propensity to itemize deductions in community c and a lower federal marginal tax rate (conditional on itemizing). Hence, there is probably a correlation between P_{ct} and ε_{ct}.[13] When estimating the parameters using a single cross section of data, this is likely to be a serious problem. However, in the individual effects model its severity is probably attenuated because the presence of the individual effect, f_c in equation (2.13), controls for the unobserved community preferences. Still, some correlation may remain so we estimate the equation with two stage least squares, using lagged values of the change in the tax price as instrumental variables.

Grant receipts may also be correlated with the error term due to either matching rate provisions in the grant distribution formulae or the possibility that communities with a preference for larger public spending may be skilled at "grantsmanship". Thus, we also treat the change in grants as endogenous and employ lagged values of the change in grants as instrumental variables.

Another set of issues arises in connection with the econometric treatment of the individual effect, f_c, in the equation. If an individual effect is present, then to the extent that it is correlated with right side variables, failure to control for it will result in inconsistent parameter estimates. As noted above, we deal with this problem by first-differencing the data. First-differencing has several other advantages. First, as mentioned above, it may help to control for measurement problems with the effective tax rate, Θ. Second, with first-differencing the parameters are estimated by examining changes in the property tax rate in response to changes in the tax price. This type of variation corresponds more closely to the type of variation produced by changes in federal deductibility rules than does cross-community variation. As a result, the estimated parameters are more likely to be reliable predictors of community responses to tax reforms that affect deductibility.

First differencing has drawbacks as well. To the extent that measurement error is present in the right side variables, the first-difference estimates will contain a larger bias toward zero and will have larger standard errors than the corresponding estimates using the data in levels. Thus, there is a tradeoff between the advantage of controlling for individual effects and the effects of measurement error.

4. Results

The results for the first differenced specification of the model, equation (2.16), are presented in Table 3.[14] Our main concern is the coefficient on the tax price. However, before considering this, we briefly discuss some of the other parameter estimates. Perhaps the most striking fact is that except for the tax price, none of the coefficients is statistically significant at conventional levels. Nevertheless, it is interesting to examine the point estimates. As predicted in the theoretical model, the coefficients of the income and assets variables are positive, indicating that greater resources increase the demand for public spending and, hence, the property tax rate.[15] For the same reason, the negative coefficient on the debt variable is expected. The coefficient on state income is $-\beta_1\pi$ (see equation (2.16)), where β_1 is the coefficient on the tax price and π is the negative parameter from equation (2.15). Since β_1 is negative, we expect the coefficient of state income also to be negative; which it is. Finally, the negative coefficients on SHARE and population indicate that to the extent that states have a greater responsibility for spending or there is a greater population across which to spread costs, the property tax falls. Only the coefficient on the change in grants, again insignificant, is incorrectly signed.

We now turn to our main concern: the coefficient on the tax price variable. The coefficient estimate is -2.67 and it exceeds its estimated standard error by a factor of about 2.1. In this context it is important to emphasize that the first differences specification provides a stringent test of the importance of deductibility. Because of its focus on changes in variables over time, this procedure reduces the possibility that the negative coefficient is a consequence of unobserved cross-sectional differences in preferences. Moreover, as noted above, one expects that the standard errors will be biased upward as the result of measurement error. The fact that a statistically significant coefficient nevertheless emerges seems strong evidence that an effect is truly present.

To assess the quantitative significance of this estimate, consider it in the context of the debate over deductibility. The mean tax price in the sample is 0.921; in the absence of deductibility it would be 1.00. Using the fact that the estimated coefficient of -2.67 is an elasticity, this percentage change (-7.9%) induces local property tax rates to rise by roughly 21.1%, or $7.15 dollars per $1000 dollars in assessed value. Put differently, the presence of deductibility of municipal property taxes raises the mean property tax rate from .03389 to .04104, a substantial impact.

Of course, no individual resident conforms to this average and there are interesting distributional implications of this result. Deductibility raises the average property tax rate, local revenues, and presumably the level of services. For itemizers, the net cost of property taxes falls and they consume the higher level of services. For non-itemizers, however, taxes and services are both increased, with unclear effects on welfare. While these distributional concerns are important, our data do not permit explicit calculation of the distributional effects of changes in the property tax rate.

It is useful to explore the implications of our results for the relationship between property tax rates and property tax revenues. This is especially important in light of Inman's [1985] recent finding that increases in local tax rates may actually reduce revenues. To begin, note that revenues and rates are linked by the identity:

$$T(P) \equiv \Theta(P)B[\Theta(P)] \tag{4.1}$$

where T is total property tax revenue, Θ is the property tax rate, and B is the property tax base. Equation (4.1) is written to reflect that fact the property tax base depends on the rate of property taxation, which in turn depends on the tax price. Converting to elasticities, equation (4.1) implies:

$$\Omega_T \equiv \Omega_\Theta(\Omega_B + 1) \tag{4.2}$$

where Ω_T is the elasticity of property tax revenues with respect the tax price, Ω_Θ is the elasticity of the property tax rate with respect to the tax price, and Ω_B is the elasticity of the property tax base with respect to the property tax rate. In previous research, Holtz-Eakin and Rosen [1987] estimated Ω_T to be -1.24, and from Table 3, $\Omega_\Theta = -2.666$.[16] Substituting these values into equation (4.2) yields $\Omega_B = -0.53$. An implication of this is that increases in Θ will reduce the local property tax base, but not enough to actually reduce property tax revenues.

Thus, in contrast to the Inman results, we find that the communities in our sample appear to be operating on the "right side" of the Laffer curve.

5. Summary

Recent econometric work has suggested that federal deductibility of state and local taxes has raised the proportion of these taxes -- especially property taxes -- in local budgets. This paper lends additional support to these earlier findings by showing that one channel through which deductibility leads to higher local property tax revenues is by increasing the rate of local property taxation. Specifically, we find that if deductibility were eliminated, the mean property tax rate in our sample would fall by 0.00715 ($7.15 per thousand dollars of assessed property), or 21.1 percent of the mean tax rate.

Table 1

Means of the Variables 1978-1980*

Variable	Mean
ln(Θ) (Property Tax Rate)	3.7145 (0.5490)
$\ln(P^S)$ (Tax Price)	-0.0828 (0.0282)
ln(Y) (Median Family Income)	9.5767 (0.2165)
$\ln(Y^S)$ (State Per Capita Income)	1.9945 (0.1480)
ln(G) (Per Capita Grants)	5.3659 (0.5498)
ln(N) (Population)	10.5841 (1.1070)
ln(Per Capita ASSETS)	4.9877 (0.9531)
ln(Per Capita DEBTS)	6.1173 (0.5913)
SHARE	44.3111 (7.3296)

* The standard error of each variable is shown in parentheses.

Table 2

Means of the First Differences 1979-1980*

Variable	Mean
$Dln(\Theta)$	0.0035 (0.1226)
$Dln(P^S)$	-0.0052 (0.0227)
Dln(Y)	-0.0283 (0.0389)
$Dln(Y^S)$	-0.0125 (0.0292)
Dln(N)	0.0006 (0.0391)
Dln(GRANTS)	-0.0825 (0.2775)
Dln(ASSETS)	-0.0883 (0.6260)
Dln(DEBTS)	-0.1268 (0.2240)
D(SHARE)	0.0233 (0.0448)

* The standard error of each variable is shown in parentheses.

Table 3

Parameter Estimates: First-Differences Specification*

Variable	Parameter Estimate
Intercept	-0.0024 (0.0238)
$Dln(P^S)$	-2.6660 (1.2422)
Dln(Y)	0.0615 (0.3955)
$Dln(Y^S)$	-0.1918 (0.6902)
Dln(G)	0.1429 (0.1906)
Dln(N)	-0.1456 (0.2920)
Dln(ASSETS)	0.0039 (0.0191)
Dln(DEBTS)	-0.0420 (0.0533)
SHARE	-0.0779 (0.3693)

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

References

Bergstrom, T. and R. Goodman, "Private Demands for Public Goods," American Economic Review, June 1973, pp. 280-296.

Edwards, J. "Congestion Function Specification and the 'Publicness' of Local Public Goods," unpublished, Tulane University, 1985.

Feldstein, M. and G. Metcalf, "The Effect of Federal Tax Deductibility on State and Local Taxes and Spending," National Bureau of Economic Research, Working Paper No. 1791, January 1986.

Fisher, R. "Intergovernmental Tax Incentives and Local Fiscal Behavior," mimeo, Michigan State University, April 1986.

Hettich, W. and S. Winer, "A Positive Model of Tax Structure," Journal of Public Economics, 24, 1984, pp. 67-87.

Holtz-Eakin, D. "Unobserved Tastes and the Determination of Municipal Services," National Tax Journal, December 1986, pp. 527-532.

Holtz-Eakin, D. "Vote-Maximization and the Provision of Local Services," mimeo, Columbia University, May 1987.

Holtz-Eakin, D. and H. Rosen, "Tax Deductibility and Municipal Budget Structure," National Bureau of Economic Research, Working Paper No. 2224, 1987.

Inman, R. "Does Deductibility Influence Local Taxation?" National Bureau of Economic Research, Working Paper No. 1714, October 1985.

Inman, R. "Markets, Government, and the 'New' Political Economy," in A. Auerbach and M. Feldstein (eds.), The Handbook of Public Economics, Volume 2, Amsterdam: North-Holland Publishing Company, forthcoming.

Noto, N. and D. Zimmerman, "Limiting State-Local Tax Deductibility: Effects Among the States," National Tax Journal, December 1984, pp. 539-550.

U.S. Department of the Treasury, Tax Reform for Fairness, Simplicity, and Economic Growth, Vol. 2, November 1984.

</ref_section>

Notes

1. Feldstein and Metcalf's estimate of the elasticity of deductible taxes with respect to the tax price was -2.36, while Holtz-Eakin and Rosen found a value of -1.55.

2. For simplicity, we assume that the marginal tax rate is constant within the relevant range. Also, we ignore the fact that in some states "circuit breakers" and related state tax policies may also influence the effective cost of property tax finance. See Fisher [1986].

3. See Edwards [1985] for an empirical investigation of the implications of a variety of specifications of C(.).

4. This assumption is for simplicity only and can be relaxed to accommodate both other revenue sources and grants with matching components.

5. We hold population constant as a reasonable approximation to reality in the short run. Clearly, long run population mobility would alter the nature of the equilibrium described below.

6. It is straightforward to verify that $V(\Theta)$ is has a unique maximum.

7. If the official does not seek re-election, we assume that he sets the property tax rate in order to aid the success of his political party.

8. Although we assume that all individuals share a common V(.) function, heterogeneity is nevertheless present because of the differing R_i.

9. However, the median voter model is a special case in which the median voter is identifiable to the official and carries the <u>only</u> positive weight in equation (2.11).

10. Holtz-Eakin [1987] contains conditions under which exact aggregation is possible.

11. Holtz-Eakin [1986] provides a careful description of the data set from which the sample is drawn.

12. Early years in the panel are used in first differencing and as instrumental variables.

13. Note that the first effect tends to lower P_{ct}, while the latter tends to raise it. The sign of the bias is unclear.

14. As noted in Section 3.2, it is possible that first differencing the data is not necessary and that the influence of any measurement error is magnified in the process. To check for this possibility, we also estimated equation (2.13) using cross sectional data. Specifically, we pooled the data for 1979 and 1980 and then estimated the parameters using instrumental variables. Of course, in such a model, one cannot rely on the individual effect to control for slow-changing variables that may affect the property tax rate. Therefore, we augmented the X vector to include variables that accounted for: the number of individuals aged 3 and older enrolled in school per capita; the number of individuals below the poverty line per capita; the number of individuals aged 65 or older per capita; the proportion of the population that is non-white; the proportion of occupied housing that is owner-occupied; and the proportions of families with incomes in various ranges of the income distribution. We found that such cross-sectional estimation led to implausible results. The estimated coefficient on the tax price variable was positive and significant. Further, income, grants, assets, and debts had coefficients of the "wrong" sign and the latter two were precisely estimated. We conclude that in our data failure to account for individual effects can lead to serious biases.

15. As mentioned above, interpretation of the coefficient on the income variable is complicated by the fact that income serves also to control for short run variations in the assessment ratio.

16. Essentially the same data was used in both studies. The samples differ only in that the current analysis excludes: i) municipalities in Massachusetts and ii) municipalities that underwent a general reassessment during the sample period.