SIMULATED EFFECTS OF USE VALUE ASSESSMENT ON PROPERTY TAX RATES

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PROBLEM AND OBJECTIVE

Because of the awareness of the importance of non-urban land uses, many States have turned to use value assessment (as opposed to assessment at market value) as one method of maintaining open space. For example, see "Taxation of Farmland in the Rural-Urban Fringe" by Thomas F. Hady and Thomas F. Stinson, U. S. Dept. of Agriculture, A. E. Report No. 119, 1967. In response to such actions, many researchers have addressed themselves to the effectiveness of use value assessment in maintaining open space. The effectiveness of use value assessment in keeping land open is not in question in this discussion. Suffice to say that the effectiveness of use value assessment in maintaining open space is a highly debatable issue on both economic and political grounds.

Instead of effectiveness, we are concerned with the effect of use value assessment on the tax rate of a State. We are also concerned with the shift in the tax incidence among participating and non-participating landowners when use value assessment is implemented. These objectives are important for at least two reasons. First, for States considering the implementation of use value assessment, the impact on the tax rate is one critical type of information required for a "rational" decision. Second, only a limited amount of research has been directed towards an analysis of the effect of use value assessment on the tax rate of a State.

Accordingly, the specific objective of this paper is to analyze the impact of use value assessment on the tax rates of a State. Although the analysis will apply specifically to the State of New Hampshire, the approach is sufficiently general to be applicable to other States.

PROPERTY TAX RATE IMPACT MODEL

The following model was formulated to estimate the effect of use value assessment on the aggregate of the 231 towns and cities in the State of New Hampshire:[1]

$$T = j'T_o - apK\ T_o = (j' - apk')T_o \qquad (1)$$

$$S = (j'X)/T \qquad (2)$$

where

T = a scalar quantity representing the adjusted valuation for the 231 towns in New Hampshire

T_o = 231 x 1 vector of assessed valuation for the 231 towns prior to the implementation of use value assessment

j' = 231 x 1 sum vector

a = a scalar quantity representing rural valuation abatement percentage, expressed as a decimal (the abatement percentage may be defined as the rate at which the assessed valuation is reduced when a use value assessment law is implemented

p = a scalar quantity representing the rural valuation enrollment or participation percentage, expressed as a decimal (the participation percentage, p, may be defined as the proportion of

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[1] Three "unincorporated places," Ellsworth, Waterville, and Harts Location, were excluded from the analysis–leaving 231 towns. Hence, future references to the State of New Hampshire refers specifically to these 231 towns.

rural valuation enrolled in the use value assessment program)

K = 231 x 1 vector representing the percent of each town's valuation (expressed as a decimal) which is rural[2]

S = a scalar quantity representing the adjusted tax rate for the 231 towns taken as an aggregate

X = 231 x 1 vector representing property tax revenue collected by the 231 towns in the State of New Hampshire

The basic model expressed by equations (1) and (2) also may be used to determine the effects of use value assessment on a subset or subsets of the 231 towns. For example, the town data may be sorted by size of resident population and the adjusted valuations and tax rates may be estimated for specific subsets of the towns so arranged. Thus, to determine the adjusted valuation and tax rates for the 60 smallest towns in New Hampshire, the variables in equations (1) and (2) would be modified as follows:

T^* = a scalar quantity representing the adjusted valuation for the 60 smallest towns in New Hampshire

T_o^* = 60 x 1 vector of valuations for the 60 smallest towns prior to the implementation of use value assessments

j^* = 60 x 1 sum vector

K^* = 60 x 1 vector representing the rural valuation percentages for the 60 smallest towns

S^* = a scalar quantity representing the adjusted tax rate for the 60 smallest towns taken as an aggregate

X^* = 231 x 1 vector representing the property tax revenue collected by the 60 smallest towns in New Hampshire

In addition, each town may be thought of as a subset of the 231 towns and adjusted valuations and tax rates may be determined through the use of equations (1) and (2). Of course, in this case all variables are scalar quantities and represent specific information for the town in question.

DATA REQUIRED FOR IMPLEMENTING THE MODEL

Basically, three types of data are required for implementing the model described by equations (1) and (2). First, equalized valuation, T_o, and tax revenues, X, are needed for each of the political units (towns in this case) to be analyzed. These data are readily available in reports published biennially by the New Hampshire State Tax Commission. The 1966 data were used in this analysis.

Second, the rural valuation abatement percentage, a, and the participation percentage, p, are parameters necessary for the implementation of the model. However, in New Hampshire, and in any other State considering use value assessment, the values of these parameters are usually not known. Accordingly, they are varied parametrically in this study. In combination, they are intended to represent the relevant range of abatement and participation that might occur. Specifically, the values of "a" and "p" to be used in the analysis are:

$a = 0.30, 0.50, 0.75$

$p = 0.10, 0.30, 0.50, 0.70, 0.90$

Thus, there are 15 combinations of abatement and participation which will be evaluated in equations (1) and (2).

Third, the percentage of each town's valuation which is rural must be specified. Necessarily, these parameters are somewhat inexact, due to the lack of a universally accepted definition of rural as opposed to urban. Even if such a definition did exist, this type of information is not usually known by town officials and is definitely not reported in town or State Tax Commission reports. Further, if this percent were to be accurately estimated for each town, it would be expensive and time consuming. For these reasons, a sampling and estimating procedure for determining the percentage of a town's equalized valuation, which is rural, was used.

The sampling and estimating procedure consisted of estimating the rural valuation for a sample of towns and projecting the results of the sample to all towns in the State.[3] Eleven towns were sampled. The number of acres of rural land by type and the corresponding valuation per acre were estimated for each

[2]The rural component of a town's valuation was defined as the value of those properties lying outside of the urban sector of a town. Only the rural component of valuation potentially qualifies for use value assessment.

[3]In the survey, rural lands were assumed to include those lands which appeared to potentially qualify for use value assessment and in some instances, town tax maps delineated rural as opposed to urban lands.

town. Based on these observations, the percentage of each town's equalized valuation, which could be classed as rural, was estimated. This percentage will hereafter be referred to as percent rural valuation.

Estimates of the percent rural valuation for all towns in the State were obtained by examining the relationship between the percent rural valuation of the eleven sample towns and selected variables from secondary sources. In this regard, two hypotheses were studied. First, a town's rural valuation is inversely proportional to its population density—where density is defined as the ratio of resident population to the total area of the town. Second, a town's rural valuation is inversely proportional to the size of the resident population. Both hypothesized relationships were examined statistically by regressing percent rural valuation first against population density and then against population for the eleven sample towns. Both linear and power functions were considered as possible algebraic forms of the relationships in question.

The equation selected to estimate percent rural valuation for each town in the State was:[4]

$$\hat{K} = 9012.88\, P^{-0.99} \qquad (3)$$

$$(0.09)$$

$$(10.46) \qquad R^2 = 0.92$$

where

$\hat{K}$ = estimated percent rural valuation

P = population

R^2 = coefficient of determination

This equation was selected over other equations, mainly on the basis of the test statistics, t and R^2, associated with the estimated equations. For nine degrees of freedom, the slope coefficient of equation (3) was significantly different from zero at the 1 percent level. The coefficient of determination indicates that 92 percent of the variation in the rural valuation percentage was explained by variations in resident population. Utilizing population estimates for each town in New Hampshire, percent rural valuations were estimated by using equation (3). The sample towns contained resident populations ranging from 248 to 19,000 people while percent rural valuation estimates were needed for towns ranging in population from 33 to 90,000 people. Extrapolation beyond 19,000 people was reasonable since rural valuation percentages are expected to approach zero as population becomes very large. Equation (3) does approach the population axis asymptotically. However, extrapolation in the 33 to 268 range resulted in estimated rural valuations exceeding 100 percent in those towns with populations less than 100. To remedy this, an interpolating polynomial was fitted through the points (275, 35), (200, 48), and (0, 100). The equation assumed to be relevant for populations ranging from zero to 200 was: $R = 100.0 - 0.324 + .00032P^2$. This equation is consistent with the second hypothesis tested, and utilizes some of the information contained in equation (3). The interpolating polynomial will be applied to 18 towns which account for only 0.7 percent of the total valuation of the State.

Empirical Results

The estimates of percent rural valuation generated by equation (3), the assumed participation and abatement percentages, and the secondary data on valuations and tax revenues were used to evaluate the model described by equations (1) and (2). First, equation (1) was evaluated to determine the adjusted equalized valuation resulting from use value assessments. These adjusted valuations were then used to compute the tax rate necessary to raise the required level of tax revenue, equation (2). It was assumed that tax revenue needs are identical, with or without use value assessments. Computations were performed for each individual town, towns grouped by size of population, and for the State as a whole.

Impact on a Sample Town

In 1966, the total equalized valuation of the Town of Piermont (resident population 428) was \$3,430,177 and total tax revenue was \$77,380 with a tax rate of \$22.56 per \$1,000. If, as a result of use value assessment, valuation on rural properties were abated by 30 percent and 10 percent of the rural valuation participated, it was estimated that the equalized assessed valuation would be reduced by 0.7 percent or \$23,162. The tax rate was estimated to increase by 0.7 percent or by \$0.15 per \$1,000. At the other extreme, if valuations on rural properties were abated by 75 percent and 90 percent of the rural valuation participated, it was estimated that the equalized assessed valuation would be reduced by 15.2 percent or \$521,146. The tax rate was estimated to increase by 17.9 percent or \$4.04 per \$1,000 (Table 1).

Aggregate Impact on Towns Grouped by Population Size

The 231 towns studied were divided into eight

[4]The first figure in parentheses is the standard error of the regression coefficient, and the second figure in parentheses is the computed t statistic.

groups on the basis of population size. Adjusted valuations and tax rates were estimated for each group. The percentage change in tax rate, for a given combination of abatement and participation, declined as population size increased. More specifically, use value assessment, at 50 percent abatement and 50 percent participation, increased tax rates in 42 towns with a resident population of more than 3,000 by less than 1 percent. These 42 towns contained about 464,000 people, or 71 percent of the population of the State. Under identical levels of abatement and participation, tax rates increased by less than 4 percent for those 129 towns with resident populations ranging from 500 to 3,000 people. These 129 towns contained approximately 174,000 people, or 26 percent of the population of the State. The remaining 60 towns, with 500 or fewer people, experienced an 8 percent increase in tax rate which was the highest for the groups considered. These 60 towns contained only 18,000 people or 3 percent of the population of the State (Table 2).

Aggregate Impact on the State

In 1966, the aggregate tax rate for the 231 towns studied was $26.54 per $1,000 equalized assessed

TABLE 1. TOWN OF PIERMONT, 1966

Population	428
Equalized Assessed Valuation	$3,430,117
Tax Revenue	$ 77,380
Tax Rate	$ 22.56 per $1,000 equalized assessed valuation

Abatement	Participation	Equalized Assessed Valuation			Tax Rate in Dollars per $1,000 Equalized Assessed Valuation		
		Amount	Change		Amount	Change	
(percent)	(percent)	(dollars)	(dollars)	(percent)	(dollars)	(dollars)	(percent)
30	10	3,407,015	– 23,162	– 0.7	22.71	+ .15	+ 0.7
	30	3,360,691	– 69,486	– 2.0	23.03	+ .47	+ 2.1
	50	3,314,367	–115,810	– 3.4	23.35	+ .79	+ 3.5
	70	3,268,043	–162,134	– 4.7	23.68	+1.12	+ 5.0
	90	3,211,719	–208,458	– 6.1	24.02	+1.46	+ 6.5
50	10	3,391,574	– 38,603	– 1.1	22.82	+ .26	+ 1.2
	30	3,314,367	–115,810	– 3.4	23.55	+ .99	+ 4.4
	50	3,237,160	–193,017	– 5.6	23.90	+1.34	+ 5.9
	70	3,159,953	–270,224	– 7.9	24.49	+1.93	+ 8.6
	90	3,082,746	–347,431	–10.1	25.10	+2.54	+11.3
75	10	3,372,272	– 57,905	– 1.7	22.95	+ .39	+ 1.7
	30	3,256,462	–173,715	– 5.1	23.76	+1.20	+ 5.3
	50	3,140,651	–289,526	– 8.4	24.64	+2.08	+ 9.2
	70	3,024,841	–405,336	–11.8	25.58	+3.02	+13.4
	90	2,909,031	–521,146	–15.2	26.60	+4.04	+17.9

TABLE 2. SUMMARY OF IMPACT OF USE VALUE ASSESSMENT, 1966 EQUALIZED TOWN ASSESSMENTS

Size Class	Number of Towns	Original Valuation	Adjusted Valuation 50/50	Original Tax Rate	Adjusted Tax Rate at 50/50	Percent Change in Tax Rate	Population Affected	Percent Total Population Affected
33–499	60	177,292,408	163,677,657	19.84	21.49	8.32	18,311	2.8
Subtotal 33–499	60	177,292,408	163,677,657	19.84	21.49	8.32	18,311	2.8
500–999	55	333,484,046	322,683,867	20.51	21.19	3.32	40,178	6.1
1,000–1,499	29	231,863,352	227,362,711	24.30	24.78	1.98	36.094	5.5
1,500–2,999	45	646,146,364	638,818,611	24.32	24.60	1.15	97,291	14.8
Subtotal 500–2,999	129	1,211,493,762	1,188,865,189	23.26	23.71	1.93	173,563	26.4
3,000–4,999	16	334,046,005	331,831,189	25.88	26.05	0.66	59,257	9.0
5,000–9,999	14	558,319,796	556,199,200	26.47	26.57	0.38	95,465	14.6
10,000–29,999	10	957,597,092	956,245,948	30.59	30.63	0.13	176,992	27.0
30,000–100,000	2	692,360,775	692,091,552	28.76	28.77	0.03	132,169	20.2
Subtotal 3,000–100,000	42	2,542,323,668	2,536,367,889	28.56	28.63	0.24	463,883	70.8
Total State	231	3,931,109,838	3,888,910,735	26.54	26.83	1.09	655,757	100.00

valuation. At 50 percent abatement and 50 percent participation, it was estimated that the State tax rate would increase by $0.30 per $1,000 or about 1 percent (Table 2).

Tax Incidence on Individual Property Taxpayers

The change from ad valorem to use value taxation also involves a shift in the tax incidence. That is, there is a redistribution of taxes paid by participating and nonparticipating property owners. Assuming the 50/50 abatement and participation percentages, tax payments were estimated for both participants and nonparticipants with an assumed property value of $20,000. This was done for small, medium, and large towns for both ad valorem and use value tax programs (Table 3).

Since the provision of public services varies among towns in the State, tax rates are inversely related to the size of a town. Accordingly, for a given level of assessed property value, an individual landowner pays more taxes in large towns than in small towns. Therefore, the participant in the small group would enjoy a reduction of $181.90 in taxes compared to $305.50 in the large group. However, on a percentage basis, the reduction in taxes paid was 45.8 percent for the small group and 49.9 percent for the large group. Participants in all size groups receive approximately the same percentage reduction in taxes paid.

Nonparticipants pay more in small than in large towns. The nonparticipating landowner in the small group pays an additional $33.00 in taxes while the nonparticipating landowner only pays an additional $0.80 in taxes. As a percentage change, nonparticipants pay an increase of about 8 percent in taxes in the small group compared to 0.1 percent in the large group. Thus, in the large towns the participant receives the largest absolute as well as percentage reduction in taxes paid. Also, in the large towns, the nonparticipant is required to assume the smallest additional tax burden.

CONCLUSIONS

The tax base and tax rate change resulting from a shift from ad valorem taxation to a use value tax policy is determined by the rural valuation percentage, the abatement percentage, and the participation percentage. For the State of New Hampshire, the rural valuation percentage was estimated to be approximately 4 percent. This means that only 4 percent of the total valuation of the State potentially qualifies for participation in the use value assessment program. Assuming a use value assessment program with a 50 percent abatement and assuming 50 percent participation, the tax rate increased form $26.54 to $26.83 per $1,000 of equalized valuation. This amounts to about a 1 percent increase in the tax rate. This level of participation and abatement removed approximately $42 million of valuation. Thus, at the State level, the change in the tax rate seems negligible.

Although there is little change in the tax rate associated with a shift to a use value tax program at the State level, such a program causes sharp increases in tax rates for small towns relative to large towns. This results from the fact that the rural valuation percentage is inversely related to population. Assuming 50 percent abatement and 50 percent participation, the tax rate increased by 8.3 percent in the group of smallest towns (less than 500 people). In the group of largest towns (80,000 to 100,000 people), the tax rate increased by only 0.03 percent.

The redistribution of taxes paid by participating and nonparticipating property owners varies with size of town. Participants in small towns enjoy a slightly smaller percentage reduction in taxes paid than do participants in large towns. Nonparticipants in the small sample town were estimated to pay about 8 percent more in taxes. Nonparticipants in the large sample town were estimated to pay about one-tenth of 1 percent more in taxes. These estimates were based on abatement and participation percentages of 50 percent.

The above analysis suggest a conclusion concerning use value legislation. Since participants in all sizes of towns receive about the same proportional reduction in taxes paid, the important consideration is the nonparticipant and his tax load. Due to the rural-urban valuation mix, nonparticipants in the larger towns are required to make only nominal additional tax payments under a use value assessment program. In contrast, nonparticipants in the smaller rural towns are required to make relatively larger additional tax payments. Thus, it would be easier to absorb the shift in the tax incidence in the more urban towns than in the more rural towns. This conclusion also could be extended to an easier absorption of the tax incidence in more urban States than in more rural States. For States with a wide variation in rural-urban communities, the adoption of use value assessment would be more equitable if administered on a State or regional basis rather than a municipal basis. This is based on the premise that the benefits accruing from use value assessment are state-wide or regional in scope rather than municipally oriented.

TABLE 3. CHANGE IN TAX LIABILITY FOR INDIVIDUAL TAXPAYERS IN DIFFERENT SIZE TOWNS ASSUMING 50/50 AND $20,000 ASSESSED VALUATION

Type of Taxpayer	Small Municipality (0–499)				Medium Municipality (1,500–2,999)				Large Municipality (10,000–29,999)			
	Taxes Paid				Taxes Paid				Taxes Paid			
	Ad Valorem Taxation	Use Value Taxation	Net Change		Ad Valorem Taxation	Use Value Taxation	Net Change		Ad Valorem Taxation	Use Value Taxation	Net Change	
	($)	($)	($)	(%)	($)	($)	($)	(%)	($)	($)	($)	(%)
Participating	396.80	214.90	−181.90	−45.8	486.40	246.00	−240.40	−49.4	611.80	306.30	−305.50	−49.9
Nonparticipating	396.80	429.80	+ 33.00	+ 8.3	486.40	492.00	+ 5.60	+ 1.2	611.80	612.60	+ .80	+ 0.13