The Effects of Property Taxes and Local Public Services Upon Residential Property Values in Small Wisconsin Cities

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Several papers have appeared recently reporting on studies of the effect of local property taxes and public expenditures on residential property values.[1] Typically, these investigations are conducted in metropolitan areas and, although the situation, model specification and results vary, they usually present some evidence that property taxes and public services are capitalized into local property values. An exception to this occurs in the work of Hyman and Pasour (1973) who studied 106 towns throughout North Carolina and found little evidence of capitalization in that nonmetropolitan context.[2] Because of the unusual importance of state funds to local finances in North Carolina, these results may be unique to that situation and may not represent the effects occurring elsewhere.[3] In order to test whether significant capitalization exists where local governments must rely more heavily upon local sources of revenue, a study of taxes, services, and property values in small Wisconsin cities was undertaken. This paper reports the results of that investigation.

Assuming that public services and taxes are uniform throughout the community, the extent to which capitalization occurs depends upon the incidence of the tax between suppliers and demanders of residences and the degree to which differences in taxes and services are recognized and individuals can respond to them. Increased property taxes without a commensurate improvement in public services (i.e., the tax effect alone) will tend to depress property values. Residential property taxes fall upon both land and improvements. Higher taxes on improvements reduce the return on capital invested in residential structures and make alternative uses of capital more attractive. Although the short-run

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supply of improvements is likely to be quite inelastic and the price of existing units sensitive to tax rates, the long-run supply of structures to residential housing is generally believed to be quite elastic.[4] As a result, increased property taxes, if borne by capital, discourage construction which reduces the supply of homes and increases prices thereby shifting the burden to consumers. Even if prices do not escalate, capital will not bear the tax if, as is often assumed, the supply of land is perfectly inelastic. In that case, land bears the full amount of the tax capitalized into lower property values. It is unlikely, however, that in most instances the long-run supply of land for development is completely inelastic.[5] An exception occurs in central urban areas where the amount of land available for development is relatively small and its alternative uses limited. The supply of improvements and the supply of development land make up the supply of housing, which is expected to be more inelastic in metropolitan areas where the supply of developable land is more restricted and the value of land to residential improvements is greater than in small urban centers. Because of the more inelastic housing supply expected in metropolitan areas, capitalization of the tax is more likely to be in evidence there.

The metropolitan environment also affords greater opportunity for home buyers to react to differences in property tax rates and public services among jurisdictions. Because of the multiplicity of municipalities within close proximity to one another, individuals are not restricted by time and distance to living and working in the same jurisdiction. In fact, a person may find numerous municipalities suitable logistically and be able to select among them on the basis of his or her tastes and preferences, including those for public goods and services. That consumers of housing respond to local fiscal considerations (outputs and costs) in selecting their community of residence, was

postulated by Tiebout (1956). Tiebout recognized that while residents dissatisfied with federally provided services and taxes usually reconcile themselves to "make do," this was not necessary at the local level. There, even though the individual's influence on public decisions may not be much greater, if a resident is not satisfied with public good production, he or she can migrate to another community which, ceteris paribus, had a tax expenditure more to his or her liking.[6] Differences in tastes and interjurisdictional migration lead to variety in public goods offerings among communities. Local communities are like firms among which the housing consumer shops.[7] Although alternatives and mobility are less perfect than Tiebout assumed, metropolitan areas do provide a reasonable approximation of the basic features of the model. While it is unreasonable to expect that each individual or family locates where, given its budget constraint, it receives its preferred combination of local public output at least cost, so long as an adequate number take into account fiscal differentials, interjurisdictional differences in property values can be expected as people compete for the preferred sites in the metropolitan area.

In nonmetropolitan areas, location alternatives are more restricted. The location of employment opportunities are much more influencial in determining an individual's place of residence. Although a person may not regard the pattern of local public services as ideal, he or she may have little choice but to live there. Communities with preferred tax-expenditure combinations may exist, but they are likely to be too far removed to warrant the additional travel costs. Because, unlike Tiebout's model, individuals' incomes are to some extent location specific, particularly in rural areas, people weigh both private and public costs and benefits in residential location decisions.[8] Within the immediate vicinity the choices may be quite limited. In many rural localities,

if one wishes the benefits of basic urban services (e.g., water, sewer, fire and police protection, garbage pick up), these may be available from only one municipality and tend to make demand inelastic. As a result, the individual's ability to express his or her satisfaction with the public sector, or even to realize the range of alternatives available is constrained, thus making remote the likelihood that differentials in the quality of service, particularly moderate ones, will be reflected in local property values. Furthermore, in rural areas communities displaying superior public sector performance may be characterized by more rapid growth rather than by higher property values.[9] Although growth often enhances property values, at moderate rates the effect need not be large when the supply of residences in nonmetropolitan areas is quite elastic.

This discussion has indicated that conditions conducive to capitalization of property taxes and public service benefits into property values are more nearly achieved in metropolitan than nonmetropolitan environments. This difference would appear to be an important reason for the contrasting results of the Oates and the Hyman and Pasour studies. In a cross-sectional study of fifty-three residential communities in northeastern New Jersey, all located within the New York metropolitan region, Oates (1969) concluded that residential property values indicate a significant positive correlation with both school expenditures per pupil and all nonschool expenditures per capita. He also found a significant negative relationship with the effective property tax rate. The coefficients of his tax and spending variables indicate approximately full capitalization for each at average levels. Hyman and Pasour (1973), however, in a cross-sectional study of 106 incorporated towns over 2,500 population in North Carolina, found that neither taxes nor expenditures significantly affected

the median value of owner-occupied homes, although the signs of the variables were in the right direction.[10] They concluded that in North Carolina, unlike metropolitan areas in the Northeast, changes in property taxes are largely shifted forward.

These contradictory results can be attributed to the differences in interjurisdictional mobility and elasticity of supply of residential land between the two regions.[11] The relative importance of these two factors cannot be distinguished, however. Because of the substantial state support to local government and the resulting low property tax rates in North Carolina, residential demand is likely to be less sensitive to tax-expenditure differentials even if spatial mobility is not different. A significant coefficient for the tax and/or expenditure variable, even if small (i.e., an elastic supply function), is more likely to be achieved if property taxes are a more important source of local finance and interjurisdictional differences are greater. Wisconsin, where the average effective local property tax rate is approximately twice that found in North Carolina, offers the setting for such a study. Furthermore, another study of capitalization in rural communities affords some insight as to the generality of the Hyman and Pasour results.

The Model

The relation between local property taxes, public services and residential property values was estimated using a linear regression equation presumed to represent the reduced form of the underlying supply-demand relationships. Since factors other than those representing taxes and the provision of government services influence property values, several other variables are included in the attempt to hold the attributes of the house and community constant.

One of the important determinants of residential property values is the quality of the housing units. Unfortunately, no single measure of this factor is available. One indication of quality, however, is size, although this is only approximated by the use of median number of rooms rather than a more precise measure such as floor area.[12] Quality is also likely to be closely related to the age of the structure. Homes of recent vintage are believed to be of better quality, and worth more, than those of considerable age. As an index of the soundness of residential property in a community, the percent of homes built since 1950 was included. Unlike median number of rooms, for which there was little variation, the percent of homes built since 1950 varied widely, from 14 to 51 percent. Although other variables could be employed as indicators of housing quality (e.g., numberof bathrooms), no others were used or considered.

The location of a city with respect to a larger metropolitan area is expected to affect residential property values. Proximity to a metropolitan area provides greater access to employment and recreational opportunities and additional retail and service outlets than are available to more isolated communities. The influence of proximity depends not only upon distance but also upon the metropolitan population. The extent of opportunities and variety of services found in each increase with population. But large concentrations of population also imply greater costs as well as greater benefits. Hence, nearby small communities may appear more attractive as places of residence to metropolitan workers as the size of the metropolitan area increases. Even if the preference for small town life does not become more intense with larger population, the larger size means there will be a greater absolute number seeking locations outside the metropolitan area. That the numbers

involved in this quest are substantial is indicated by the fact that about 28 percent of Wisconsin residents surveyed reported they would prefer to live in a smaller city within commuting distance of a major urban area.[13] Only 12 percent now live in such cities. To test the importance of proximity to metropolitan areas a proxy variable, the population of the nearest SMSA divided by the distance to its principal population center, was used. In some cases Minneapolis-St. Paul was the nearest metropolitan area. Although out of state, where this occurred, that center was used.

Home values are affected by the character of the community which is influenced by numerous and often intangible and unquantifiable variables (e.g., style, beauty and maintenance of homes, types and uses of neighboring properties, extent of local organizations and community activities, and crime rate). Since the effects of many of these may be positively related to income, two income variables are employed as surrogates for "quality of life" or community character--median family income and percent of families with incomes below the official poverty level. Although there is apt to be high collinearity between these two variables, the percent of low-income families is also included for two reasons. First, it serves as a parameter of the variance or distribution of income whereas median income per family is only a measure of central tendency. Secondly, a high degree of collinearity between these two variables is unimportant here since we are primarily interested in estimating the effects of the fiscal variables.[14]

The percent of homes owner-occupied may also reflect community character. Including this variable should account for this and any associated institutional and behavioral factors which prevent the same rate of capitalization from applying to both owner and renter-occupied homes. In addition, it should eliminate

the bias caused by the dependent variable referring only to owner-occupied homes while the income variables are not characteristic of homeowners alone but also includes renters.[15]

Having controlled for the influence of various other factors affecting the value of owner-occupied homes, the significance of the fiscal variables can then be isolated. The effective full value local property tax rate as a measure of local tax cost is expected to be of prime importance. This rate not only adjusts the nominal local rate which diverges from the market value rate due to varying assessment practices, but also adjusts for the tax credit paid by the state to those tax districts whose full value rate exceeds one-half the statewide average. By incorporating these adjustments this rate reflects fairly accurately the tax cost per (as specified here) hundred dollars of property value. Some variation can still occur if the amount of real estate in each class (e.g., mercantile, manufacturing and residential) and the assessment ratios applied to them vary among tax districts. In such cases the actual tax rate applying to homes in two tax districts could vary somewhat although the composite effective full value tax rate is the same in each jurisdiction.

Indexes of the output of local public services are more difficult to acquire. Although attempts have been made to devise such indexes, researchers have often had to resort to using expenditures as a measure of output particularly when considering the aggregate public service bundle.[16] This procedure has serious drawbacks if economies of scale exist, production technologies differ and/or resources are not homogeneous. Despite these possible shortcomings, there is little choice in this, as in most such studies, but to accept expenditures as a proxy for public output while recognizing its deficiencies. Two expenditure variables are used as output proxies in this

study: school operating expenditures per pupil and nonschool expenditures (excluding debt service) per capita. School expenditure is expected to be the more significant since it represents the larger portion of total local expenditures and people readily perceive the benefits school expenditures provide. Although school expenditures can sometimes serve as a proxy for the output of other local public services, it would be a poor index here as there is little relation between school and nonschool expenditures in these cities.[17] Including nonschool expenditures per capita will account separately for benefits derived from nonschool services. Furthermore, it could correct for any bias in the estimation of the effect of the tax rate due to a positive association between nonschool expenditures and tax rates although that does not appear to be a problem in this instance.[18]

The empirical specification of the model is

$$V = f(T, S, N, R, B, Y, L, \emptyset, U) \qquad (I)$$

utilizing the notation defined in Table 1. The model was tested on data for 65 incorporated Wisconsin cities with high schools, lying outside SMSAs, and between 2,500 and 25,000 population. The model was estimated using ordinary least squares (OLS) regression. For comparative purposes the Oates' model (the 1973 version suitably adopted for a rural situation), and the Hyman and Pasour model were both estimated by OLS on the same data.

OLS estimates may incorporate some amount of simultaneous equation bias since the independent variables of concern (tax rate, school expenditure, and nonschool expenditure) depend to some extent upon the dependent variable, property value. Higher valued property can finance a given local contribution to expenditure with a lower tax rate, or a greater expenditure at a given tax

TABLE 1

Variable Symbols, Units, and Expected Signs

Symbol		Variable	Units	Expected Sign
Variables appearing in equation I.				
V	=	Median value of owner-occupied homes, 1970	$100	
T	=	Effective general property tax rate, 1970	.01	-
S	=	School expenditures per pupil, 1969-70	$	+
N	=	Nonschool expenditures per capita, 1969-70	$	+
R	=	Median number of rooms per owner-occupied unit, 1970		+
B	=	Percent of homes built since 1950, 1970		+
Y	=	Median family income, 1970	$1,000	+
L	=	Percent of families with income less than the 1970 poverty level, 1970		-
Ø	=	Percent of homes owner-occupied, 1970		?
U	=	Population of nearest SMSA divided by distance to nearest principal population center in the SMSA (includes SMSAs in other states if closest), 1970	1,000/Miles	+
Additional variables appearing in equations II and III (Oates, and Hyman and Pasour versions of the model).				
D	=	Percent change in number of owner-occupied units, 1960-70		?
E	=	Local property taxes per capita, 1970	$	+
M	=	Distance to nearest principal city in nearest SMSA (includes SMSAs in other states if closest)	Miles	-
P	=	Population, 1970	1,000	+

rate. If the simultaneity is serious, the OLS estimates are not reliable. Although both Oates, and Hyman and Pasour found OLS estimates acceptable, two stage least squares (TSLS) procedures were applied to each of the equations estimated by OLS to check on their reliability.

Empirical Results and Analysis

A. Ordinary Least Squares Estimates

The results of the OLS estimates are displayed in Table 2. The specification of the model for this study is equation I. (The Oates and the Hyman and Pasour version are II and III respectively.) Of the predetermined variables in equation I, the coefficients of the distance to the nearest SMSA divided into its population, the percent of owner-occupied homes, and the percent of new homes are all very significant--each surpassing the .99 level of confidence. The assumed signs did, in fact, appear in the results. The percent of owner-occupied units, which did not have a sign specified in the model, has a negative sign. This indicates that the presence of renter-occupied units biases the median value of owner-occupied units upwards, likely because renting is more important in larger and growing cities where home values tend to be higher.

The coefficients of the median number of rooms, median family income, and the percent of families with income less than the poverty level are all insignificant. However, a substantial amount of collinearity exists between income and poor ($\rho = -.808$).[19] Omitting the percent poor variable from equation I causes median income to become significant near the .90 level when using the two-sided t-test. And the omission of the median income variable from the equation makes the poverty variable significant at close to the .95

TABLE 2

Summary of Ordinary Least Squares Regression Results*

I. $V = 165.0 - 17.28T + .0485S + .0257N + 5.103R + 1.571B + 2.010Y - .9679L + .3132U - 1.311Ø$
(2.73) (-3.58) (2.24) (0.41) (0.65) (5.56) (0.66) (-1.19) (3.10) (-4.89)

$N = 65 \qquad R^2 = .85$

II. $V = -290.4 - 49.11(\ln T) + 51.24(\ln S) - 1.275(\ln N) + 11.90R + 1.999B + 3.312Y - .5211L$
(-2.17) (-2.44) (2.89) (-0.18) (1.09) (5.54) (0.86) (-0.51)

$+ 2.193(\ln M)$
(0.46)

$N = 65 \qquad R^2 = .76$

III. $V = 214.3 - 17.01T + .04583E - 6.115R + 12.09Y + .4984U - 1.646Ø - .06716P + .1430D$
(3.25) (-2.77) (1.18) (-0.67) (5.05) (4.15) (-4.71) (-0.15) (1.20)

$N = 65 \qquad R^2 = .76$

* Numbers in parentheses below the coefficients are the t-statistics.

level of confidence. There is clearly justification for leaving these two variables in the equation. The median number of rooms is somewhat correlated with several of the other measures, but its low coefficient is most likely to be a result of little spread in the data. The minimum observation is 5.3 rooms and the maximum 6.2. This does not warrant removing rooms from the equation, however, especially since we are not principally concerned with estimating the coefficients of the predetermined variables for the purpose of this study.

The results of the fiscal variables are mixed. Using a one-sided t-test for their coefficients is justified on the basis of the hypotheses and previous evidence. We find the coefficient of the tax variable significant at the .99 level, and the coefficient of school expenditures is significant near the .95 level of confidence. The coefficient of nonschool expenditures is insignificant at any reasonable level of confidence, however. There could be any number of reasons for this empirical result. Nonschool expenditures may not be closely correlated with the benefits of public services, or residents may have a highly elastic demand curve for nonschool public services, for example.

The fiscal variables seem to be quite robust with respect to changes in specification of the predetermined variables. Substitutions, additions, and deletions among the original vector of predetermined variables all had little impact on the value of the coefficients of the fiscal variables. This implies that multicollinearity between the fiscal and predetermined variables is not a problem in this particular sample.

Multicollinearity among the fiscal variables themselves could be a problem if it was the cause for declaring nonschool expenditures to be insignificant. A check of the simple correlations gives some evidence to reject this point of

view since none are significantly different from zero at the .95 level ($\rho_{T,S} = -.171$, $\rho_{T,N} = -.049$, and $\rho_{S,N} = .076$). It should be noted that this does not mean a significant interrelation does not exist since some linear combination of the variables could conceivably produce a high degree of multicollinearity.

The size and significance of the coefficient of the tax rate variable indicates that differences in the tax rate, all else the same, have a substantial effect upon home values. A 7.5 mill difference in tax rates implies a $1,296 difference in value.[20] Although estimates of the degree of capitalization this implies are sensitive to the rate of interest and property life chosen as "typical," full capitalization is consistent here with a rate of interest of about five percent and property life of 45 years.[21,22] If property taxes were increased by $100 to finance an additional $100 of school expenditures the net effect would be a reduction in average home value of $811.[23] The extra school aid which the additional $100 of local funds might attract would likely be insufficient to maintain property values. Apparently, tax dollars are valued more highly than public expenditure dollars.

A current policy implication of this is that reductions in the property tax due to shifting school financing to other revenue sources would yield substantial capital gains to owners of property. If school taxes were shifted from property to income the effect of reduced real income (using the income coefficient of equation III as a crude proxy of this change) would have little effect in moderating the gains.

The revised Oates model [Oates (1973)] fitted to the same data as above is shown in equation II of Table 2. Oates assumed that the tax rate, the spending variables, and the distance to the metropolitan center would all be

of an exponential nature and, therefore, used a logarithmic transformation of these four variables which did improve explanatory power. Both fiscal variables found significant in equation I, tax rate and school expenditure, were also significant in their logarithmic form. Converting any combinations of these four variables in equation I to logarithmic form led to a slight decrease in R^2 in all cases using the same data as before. This is not a justification for the use of a linear forumulation here though. The reason a linear combination of variables is chosen is that for this type of data, whereby individual family and home data are aggregated into a single observation for each community and the level of the fiscal variables does not differ by much due to institutional rigidities, the spread of the data is not great.[24] Thus, over the range of data likely to be encountered, logarithmic and linear functions will not result in much difference between their sum of squared residuals. Hence, a linear function is chosen because of its simplicity and the lack of theoretical or empirical evidence of the superiority of a logarithmic function.

Oates did not include the percent of owner-occupied housing in his model. This is the only major discrepency between the variables in equation I and the Oates' version, equation II.[25] In addition, Oates uses distance alone rather than population divided by distance as his variable of accessibility to urban areas. But this is due to the difference in data: Oates' study only included those residential communities surrounding one SMSA, whereas this study encompasses five SMSAs of varying size and composition. As expected, the distance variable did not perform well in the nonmetropolitan situation. The major difference in the R^2 of equation I and that of equation II is due to the inclusion of the additional variable, percent of homes owner-occupied, in the former. Omitting this variable from equation I also gives an R^2 of .76.

Equation III is the Hyman-Pasour model fitted to the Wisconsin data. Different predetermined variables are the population of the community and the percent change in the number of owner-occupied homes from 1960 to 1970. Hyman and Pasour hypothesized and found that population was positively related to home values. Such was not the case here; the t-statistic for the coefficient of population was found to be insignificant at any reasonable level of confidence. This discrepency could result from population being a measure of many intangibles which tend to be offsetting; that is, when both the benefits and costs of living in urban centers increase with population. Since they were unable to obtain census data on the percent of homes built since 1950 at the time of their study, Hyman and Pasour used the change in the number of owner-occupied homes from 1960 to 1970 as a second-best measure of the average age of homes. Correlation between these two variables (ρ = .263) indicates that, for Wisconsin data at least, it is not a particularly good substitute.

After testing several alternative measures of government output, Hyman and Pasour let the data choose the variable to be included in their final equation, local property taxes. They are rightfully concerned with the difficulties inherent in employing any measure of public services, but this does not justify abandoning what little theory is available when encountering such difficulties. Since expenditures are one step closer to the benefits obtained by public services, these measures would seem more appropriate. As a measure of public output, local property taxes per capita was not significant for the Wisconsin data. The other fiscal variable, tax rate, was significant, however, having almost the same coefficient as in equation I. Median family income and the percent of units owner-occupied were also significant.

Although equation I is preferred theoretically and predicts better than the other two models or variations of them, in general, the performance of the three models is consistent and much as predicted. The tax rate always is an important determinant of home values. School expenditures are also a major influence. However, public output as measured by nonschool expenditures or local taxes per capita failed to be significant. The percent of homes owner occupied, the SMSA influence (as population/distance), and the percent of homes built since 1950 are significant and of similar influence in each of the two equations in which they each appear.

B. Two Stage Least Squares Estimates

The substantial capitalization of property taxes suggested in the OLS estimates was both unexpected and contrary to the Hyman-Pasour results for a somewhat similar situation. This suggests that simultaneous equation bias may be causing spurious results. To test this, two stage least squares procedures were used to predict values for the fiscal variables which, purged of their correlation with the error term, could be used to obtain an unbiased estimate. In the calculation of estimated values of the choice (fiscal) variables several additional predetermined variables were used: (1) the percent change in population from 1960 to 1970, (2) the assessed valuation of mercantile and manufacturing property, (3) the average number of years of education of adults 25 years of age and over, and (4) the proportion of the total population attending either primary or secondary school. The Oates' model also included the proportion of owner-occupied units of all units since this variable was not contained in his model's initial specification.

A summary of the results obtained by TSLS is shown in Table 3. A comparison of coefficients and t values can be made with the OLS results in

TABLE 3

Summary of Two Stage Least Squares Regression Results

I. $V = \underset{(0.95)}{225.5} - \underset{(-0.80)}{26.65}\hat{T} + \underset{(0.45)}{.0862}\hat{S} - \underset{(-0.49)}{.0899}\hat{N} + \underset{(0.04)}{.695}R + \underset{(3.21)}{1.443}B + \underset{(0.10)}{.560}Y - \underset{(-0.81)}{1.055}L + \underset{(1.86)}{.2555}U - \underset{(-1.75)}{1.310}\emptyset$

$R^2 = .83$

IIa. $V = \underset{(-2.05)}{-1589.5} + \underset{(0.61)}{85.66}(\ln\hat{T}) + \underset{(2.02)}{262.6}(\ln\hat{S}) - \underset{(-0.64)}{19.62}(\ln\hat{N}) - \underset{(-0.77)}{23.24}R + \underset{(2.39)}{2.077}B + \underset{(0.81)}{8.500}Y + \underset{(0.44)}{1.018}L$

$+ \underset{(0.08)}{.961}(\ln M) \qquad R^2 = -.08$

IIb. $V = \underset{(0.26)}{-271.9} - \underset{(-0.40)}{47.11}(\ln\hat{T}) + \underset{(0.48)}{74.01}(\ln\hat{S}) - \underset{(-0.32)}{5.44}(\ln\hat{N}) + \underset{(0.17)}{4.03}R + \underset{(4.25)}{1.810}B + \underset{(0.33)}{2.177}Y - \underset{(-0.44)}{.733}L + \underset{(0.25)}{1.353}(\ln M)$

$- \underset{(-1.32)}{1.173}\emptyset \qquad R^2 = .80$

III. $V = \underset{(1.23)}{215.6} - \underset{(-0.41)}{13.13}\hat{T} - \underset{(-0.30)}{.0313}\hat{E} - \underset{(-1.01)}{9.717}R + \underset{(3.08)}{14.13}Y + \underset{(3.31)}{.4684}U - \underset{(-4.24)}{1.555}\emptyset - \underset{(-0.18)}{.0953}P + \underset{(0.48)}{.0950}D \qquad R^2 = .74$

Table 2. The most startling comparison is that for the three original equations only one of the fiscal variables in one equation was significant at any reasonable level.[26] This indicates that differences in taxes and school expenditures among small Wisconsin cities have no significant effect upon the median value of owner-occupied homes. These results differ substantially from the calculations made by Oates which indicated no significant difference in the value of estimated coefficients by the two methods. They also vary from the analysis of Hyman and Pasour which concluded that all estimated coefficients obtained by TSLS were unsatisfactory because of a lack of variation in the predicted value of the effective property tax rate, which resulted in a near singular matrix. Fortunately, these results are more consistent with theory and previous evidence for nonmetropolitan areas than the OLS estimates.

An interesting point arises in the case of the TSLS estimate of the Oates' model. Model IIa in Table 3 corresponds to Model II of Table 2. By TSLS the R^2 is only -.08 while it is .76 by OLS. Since the other two models contain the additional variable, percent of all units owner-occupied, this variable was added to Oates' original specification in model IIb of Table 3. With the inclusion of this variable R^2 jumped to .80. While the R^2 of TSLS equations must always be viewed with caution, the results observed here deserve some explanation. As Tomek (1973) points out, when residuals are properly computed the R^2 of TSLS are in the range $(-\infty, 1)$. Although R^2 in TSLS models usually appear between zero and one, zero or negative values are possible and need not indicate that the results should be discarded.

Summary and Conclusions

Local fiscal factors do not appear to significantly influence the median value of owner-occupied homes in small Wisconsin cities. Although OLS estimates indicated significant capitalization of taxes and school and nonschool public expenditures, the TSLS model showed this result was spurious. The failure of intercity fiscal differences to be reflected in property values is evidence that the supply of residences in nonmetropolitan areas is highly elastic. Furthermore, noncapitalization does not indicate that the Tiebout process does not operate to some degree among nonmetropolitan cities although it is not expected to be as pronounced as with the metro areas. People may still prefer and seek out those communities offering greater net fiscal benefits, but because of the high elasticity of housing supply the impact is more upon those communities' growth rates than their property values. Because the number of sites in a specific jurisdiction may be limited in metropolitan areas the impact upon property values is greater. In a time when a reduction in the dependence of local school finance upon the property tax is sought, the major implication of the results of this study is that property tax decreases will likely not lead to sizable capital gains for owners of residential property in small cities. Some increase could arise due to capitalization in markets where the supply of housing is less elastic, depending upon the degree of substitutability of property among the elastic and inelastic markets.

Footnotes

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1. King (1973), Oates (1969) (1973), Orr (1968), Pollackowski (1973) and Smith (1970).

2. Even in metropolitan areas capitalization is not always found. In a study of residential property in one municipality, Wales and Wiens (1974) found that after correcting for spurious correlation there was no support for the capitalization thesis. Also see Heinberg and Oates (1970).

3. Because of the substantial state support of local government (e.g., North Carolina finances 70 percent of school districts' current operating costs), local effective tax rates were low, averaging $1.58 per $100 assessed value. Hyman and Pasour (1972, pp. 604-05). This compares to $3.25 in Wisconsin where, on average, the State contributed only about 30 percent to school district current operating costs.

4. For example, see Muth (1968).

5. See McMillan (1975).

6. Tiebout's work did much to emphasize that public services, as well as taxes, affect property value--a point neglected in much of the traditional literature. According to his model, it is the present value of the future flow of public services relative to the present value of future tax payments which is important to the consumer. Better public services, taxes constant, will be reflected in higher property values providing that people place some positive value on government expenditures and do not view it as just "money down the drain." If people placed an equal value on the last dollar spent on both private and public good consumption, the absolute amount of capitalization of either a one percent change in taxes or government services would be the same.

7. That multiple sources of public good supply improve welfare when tastes differ is illustrated by Oates (1972, Chapter 2).

8. See Buchanan and Goetz (1972) for a discussion of this and other limitations of the Tiebout model.

9. Weaver and McMillan (1975) found that during the 1960's manufacturing employment grew most rapidly in those cities believed to offer a higher quality of public service. Higher local tax rates detracted from local growth, but had a very small effect.

10. Nine of the largest cities were omitted, thus making the sample fairly homogeneous with respect to all observations being nonmetropolitan.

11. For three reasons Hyman and Pasour assumed the long-run supply of housing to be considerably more elastic in North Carolina than in the large SMSA which Oates studied. First, there is a large amount of undeveloped land surrounding the nonurban communities in their study. Second, entry into the construction industry is believed to be freer in North Carolina than in the area Oates studied. And third, the ratio of land value to the total value of residential property is expected to be lower in North Carolina than in SMSAs.

12. Data sources are listed in Appendix A.

13. Zuiches and Fuguitt (1973).

14. Median family incomes may also reflect more traditional demand and supply effects. Higher incomes generally mean larger expenditures on housing but may also imply higher costs of construction where incomes and wage rates are closely related.

15. Oates (1969) uses the percent of poor as an adjustment to the assumed bias in the income variable. As the percent owner-occupied serves that function here, the percent in poverty can be interpreted as an indicator of community character independent of the homeownership pattern. Besides, because the poor are more likely to own their own homes in small than large urban centers, use of the percent poor as an income adjuster is less appropriate here than in Oates' study.

16. For a discussion of this problem see Hirsch (1970, Chapter 7).

17. The correlation between the two is only .076. This low value may be due in part to the fact that school expenditures are on a per pupil basis while the other is per capita.

18. The correlation between the effective tax rates and nonschool expenditures is -.049.

19. Income is also closely correlated to the percent of homes built since 1950 (ρ = .643) and the tax rate variable (ρ = .504).

20. For each one percent change in tax rate, property values change .4 percent.

21. The increase in property value of a $13,700 home (the mean value in the sample was $13,715) resulting from a tax reduction of 7.5 mills ranges from $902.67 to $1484.79 if rates of interest between four and eight percent are used in combination with property lives between 30 and 60 years.

22. This result contrasts with those of Hyman and Pasour, who found no evidence of tax capitalization in small cities, and of Oates, who found slightly less than full capitalization under similar assumptions.

23. The effect of the increased property taxes alone would be to decrease home value $1,296 while the effect of the additional school expenditure alone is to increase values $485.

24. While tax rates range between 26.15 and 40.23 mills, they have a standard deviation of 3.278 about a mean of 32.45 mills. School expenditures vary from $513 to $836 per pupil with a standard deviation of $70.53 about the mean of $656.02.

25. Percent of housing owner occupied was included by Oates in the first stage of his TSLS estimate.

26. The sole exception, school expenditures per pupil, which had a t-statistic of 2.02 in Oates' original model dropped to insignificance when the new variable, $\emptyset$, was included.

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APPENDIX A

Sources of Data

Symbol	Source
V	1970 Census of Housing (U.S. Dept. of Commerce, Bureau of the Census)
T	Town, Village, and City Taxes, 1970 (Wisconsin Dept. of Revenue)
S	Mimeo (Wisconsin Dept. of Public Instruction, State Aids Division) March 26, 1970
N	State Bureau of Municipal Audit for Fiscal Year Ending March, 1970 (Wisconsin Dept. of Administration)
E	Town, Village, and City Taxes
R	1970 Census of Housing
B	1970 Census of Housing
Y	1970 Census of Population (U.S. Dept. of Commerce, Bureau of the Census)
L	1970 Census of Population
Ø	1970 Census of Housing
U	1970 Census of Population and distance was measured on a Rand-McNally map of Wisconsin
M	Measured on a Rand-McNally map of Wisconsin
P	Census of Population
D	Census of Housing

APPENDIX B

Towns Included in the Sample

Algoma
Altoona
Antigo
Ashland
Baraboo
Beaver Dam
Berlin
Boscobel
Brodhead
Chippewa Falls
Clintonville
Columbus
Delavan
Dodgeville
Edgerton
Elkhorn
Evansville
Fort Atkinson
Horicon
Hudson
Jefferson
Kewanee
Ladysmith
Lake Geneva
Lake Mills
Lancaster
Marinette
Marshfield
Mauston
Mayville
Medford
Menominee
Merrill
Milton
Monroe
Neilsville
New Richmond
Oconto
Oconto Falls
Park Falls
Pestigo
Platteville
Plymouth
Portage
Prairie du Chien
Reedsburg
Rhinelander
Rice Lake
Richland Center
Ripon
River Falls
Shawano
Sheboygan Falls
Sparta
Stevens Point
Sturgeon Bay
Tomah
Tomahawk
Two Rivers
Viroqua
Watertown
Waupaca
Waupun
Whitewater
Wisconsin Rapids