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The effects of local taxes on economic behavior in the housing market

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THE EFFECTS OF LOCAL TAXES ON ECONOMIC BEHAVIOR

IN THE HOUSING MARKET

by

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

INTRODUCTION

Overview

The last two decades represent a watershed for local government provision of public services and the tax policies designed to pay for these services. For the first time, federal aid to state and local governments fell precipitously. Steven Gold [1991] reports that, from 1978 to 1989, federal aid to states decreased by 15 percent. Federal payments to counties also declined by 47 percent and payments to municipalities decreased 33 percent. Less financial support to local areas did not, however, alter the federal government's expectations of the role local governments should fulfill. In fact, federal mandates compelled greater expenditures by lower governments to comply with new legislative initiatives.

Local jurisdictions were required to increase revenues from local sources merely to maintain goods and services at previous levels. From 1980 to 1988, city tax collections increased 92 percent. The resulting higher taxes and charges by these subnational governments have led to popular tax limitation revolts in many areas. As local taxes rise and the quality of government services is questioned, both taxpayers and tax collectors are growing more mindful of the

benefits public goods provide and the burdens government taxes impose.

In addition to the obvious implications, this increasing tax obligation may affect taxpayers in more ways than many of them realize. Taxpayers easily understand the financial burden of taxes that are paid directly to the government. However, taxes can exact an indirect cost from citizens when they do not deal with the taxing authorities firsthand. For example, all types of taxes incurred as a result of purchases are part of the price paid by purchasers. The tax cost of any purchase, though an expense to the purchaser, represents proceeds eventually paid to a government and never realized by the seller. Probably the largest item sold by the average person in his or her lifetime is a home. Homeowners, then, should be actively concerned about the effects state and local taxes may have on the value of their most valuable asset.

Tax collectors also appreciate the influences of taxes. Government officials are well aware that tax levels may affect the amount of economic activity generated within their borders. Governors and mayors know they must compete for businesses and residents. Like their constituents, politicians are interested in the optimal combination of taxes and services necessary to maximize constituent welfare and government revenue.

Apart from the personal and governmental finances at stake, issues of state and local taxation more broadly involve questions that address the very methods by which Americans can best govern themselves. What services are taxpayers willing to pay their government to perform? How much will they pay the government to perform them? Which level of government can most efficiently provide the services demanded? Such questions can be answered only with an understanding of how local taxes and services affect economic behavior.

A Theory of Local Taxes and Expenditures

Economists have tried to model economic behavior in the public good arena just as they have in the private good sector. The market for public goods presents a special set of modeling problems, however. In 1954, economist Paul Samuelson argued in The Review of Economics and Statistics that the efficient level of public good production was indeterminate. He asserted that no mechanism existed which prompted taxpayers to reveal their preference for pure public goods. A competitive pricing system was not available to determine the optimal levels of collective consumption.

Two years later, Charles Tiebout [1956] responded with his dissent from Samuelson's opinion. Although Tiebout

endorsed Samuelson's conclusion about services provided at a national level, he believed a mechanism existed at the subnational level that allowed an accurate reading of consumer preferences. As competition determined preference for products sold by private firms, Tiebout thought competing jurisdictions offered unique bundles of goods at tax prices that allowed taxpayers to "vote with their feet" for their favorite bundle.

Given an opportunity for choice in the local public good market, consumers would choose the government-supplied goods they wanted and pay the market-bearing price just like they satisfied their private good preferences. Individuals could accurately register their preference by moving to the community providing a bundle most desirable for them. Tiebout believed taxpayers with homogeneous tastes for government revenues and services would congregate within the community that caters best to those tastes.

Realistically, however, the Tiebout theoretical analysis may have practical limitations. Clotfelter [1992] contends that, though community choice is certainly one mechanism through which preferences are revealed, it is only one of several such mechanisms and the Tiebout model is therefore less generally applicable than its originator hypothesized. Clotfelter maintains that a Tiebout mechanism cannot operate universally because there are too few

jurisdictions from which to choose in most urban areas. He suggests this is why most researchers do not observe much homogeniety within communities. Lack of homogeniety is an indication that other methods exist by which consumers can reveal their preferences.

So, although consumer homogeneity within communities is possible in Tiebout's theoretical environment, the limited number of available jurisdictions may prevent perfect homogeneity in the real world where Tiebout's strict assumptions do not hold. However, multiple jurisdictions are available which permit at least a limited choice of domicile. With inelastic community supply, this choice may not manifest itself in noticeable uniformity of residents within communities. Still, sorting by public good preferences may be sufficient to produce a heterogeneity of revenues and expenditures between communities that supports the Tiebout view of public choice.

As Clotfelter notes, alternative mechanisms may be utilized by citizens to register their vote for public services. If some choice between various goods/tax bundles is available, then the difference in bundles among communities may be reflected in the price that a person is willing to pay to join a community. The most obvious price of settling in or joining a community is the cost of living accommodations. In an atmosphere where choice exists, to

the extent a public good/tax bundle does not perfectly satisfy a consumer's preference, the consumer may bid lower for a house to reflect his or her reduced benefit from the suboptimal bundle.

This pricing phenomenon is known as tax capitalization (and, for that matter, public service capitalization). The cost of taxes and the value of public services are capitalized into the value of houses in the jurisdiction providing the capitalized tax/good bundle. Other things equal, an increase in the tax cost of living in a jurisdiction will reduce the value of homes in that jurisdiction. Similarly, other things equal, an increase in the amount of public services in a jurisdiction will increase home values within that jurisdiction.

The Research Questions

Previous research has examined supply and demand for local public services under the Tiebout model. These papers are typically econometric analyses that test for efficient outcome properties of a Tiebout equilibrium. Few researchers have tested for the existence of a sorting of homogeneous consumers within heterogeneous communities.

The tax capitalization issue has also been considered by researchers. Their work usually involved cross-sectional analysis of capitalization rates in fairly limited

geographic areas. Though the results in most studies consistently find some degree of capitalization, the actual extent of the valuation response cannot be determined given the diverse rates that have been estimated.

In a framework that incorporates a dynamic analysis of the capitalization process over time and that encompasses a nationwide sample, this study addresses the following research questions:

1. Do individuals sort themselves into communities based upon their preference for a given set of government services and taxes?

2. How do changes in the level of local taxation affect the price of houses in one locality relative to house prices in neighboring communities over time?

The Research Method

Evidence about these two questions will be obtained by examining taxes and house values from groups of cities located throughout the continental United States. The city groupings are determined by geographical proximity of the cities in relation to each other. Comparison of city means for government expenditure and demographic variables are used to suggest an answer to research question one. A differenced model is estimated to address question two. The model attempts to explain intra-group house value

differences with intra-group differences in various taxes and public services over time.

This study employs data aggregated at the city level in its statistical tests. Data for investigating the questions is drawn primarily from Bureau of Census sources: Census of the Population, Census of Governments, and Annual Survey of Governments. Other government documents are also consulted for information as statistical analysis indicates is necessary.

Summary and Organization

The concept of government federalism in the United States places the responsibility for providing many goods and services upon local governmental entities. The manner in which local governments produce these services and obtain revenue to pay for them may have a dramatic impact on the citizenry and on the government unit itself. In particular, economic theory suggests that the type of resident attracted to a particular jurisdiction and the economic well being of existing residents may depend upon these factors. This research investigates the extent to which local taxes affect residential choice and residential house value.

A review of Tiebout hypothesis and tax capitalization literature is presented in Chapter II. A theoretical foundation for the specific hypotheses tested is developed

in Chapter III. Tiebout's theory and capitalization theory are explained separately and then the nature of their interrelationship is proffered. Chapter IV contains a more detailed description of the research design and the statistical methods used in making inferences about the hypotheses. Finally, results from the empirical tests of hypotheses are interpreted in Chapter V.

CHAPTER II

REVIEW OF THE LITERATURE

Introduction

As explained in Chapter I, Tiebout's hypothesis suggests two questions that may be empirically examined. First, people sort themselves by preference for public good/tax bundles and like-minded individuals with similar preferences will choose to live in homogeneous communities with others who have the same preferences. Second, to the extent choice of homogeneous communities may be limited, the public goods/tax package of a jurisdiction should still be a factor considered by individuals when making decisions about residence.

Accordingly, the literature has examined both the degree to which sorting occurs and the degree to which particular levels of public goods/taxes influence the price of houses in a community. Table 1 at the end of this chapter summarizes all articles reviewed here. Sorting behavior research is digested first. Capitalization research is then summarized. The capitalization research is presented according to the following taxonomy: those studies analyzing aggregate macro data versus studies using micro-level data from both general settings and tax law change events.

The Sorting Issue

Public goods can be provided at an efficient level only if consumers are forced to reveal their preferences for these goods. A special mechanism for eliciting demand is necessary since rational consumers of these goods will understate their actual demand for them and still hope to enjoy the truly desired level at a lower tax cost. To the extent goods are provided at the local level, Tiebout maintains this mechanism exists. The consumer is faced with a market of different communities providing various levels of local public goods. Consequently, says Tiebout, mobile consumers will move to the community that best satisfies their public good preferences. If this occurs, then people with similar preferences will congregate in the same community and systematic consistencies in characteristics of residents within communities should be observed.

Pack and Pack [1977] were among the first to empirically examine this sorting question. They chose a sample of thirteen SMSAs in Pennsylvania and obtained data for the year 1970. Pack and Pack attempted to investigate the degree of sorting by observing intra-jurisdiction variation in certain variables. They assumed that if the variance within a jurisdiction was greater than an arbitrarily chosen number, then Tiebout's sorting theory did not accurately describe the population.

First, they tested the variation in residents' income and house values within each of the Pennsylvania SMSAs. The authors found a coefficient of variation greater than .5 in most areas and concluded that this degree of heterogeneity in income and house values within communities was too large to support the Tiebout model as generally interpreted.

Next, the authors estimated a demand equation for various public goods within each community using income and house values. They also estimated an intra-city income elasticity of demand for housing. Pack and Pack suggested that the income elasticities of demand for public goods and housing should be nearly equal for all residents in a community if the community exhibited the requisite degree of homogeneity. This specification assumed that sorting on a household income basis was equivalent to sorting by public good demand.

Their results indicated a wide range of incomes and presumably, therefore, a disparity in desired expenditures for public goods within each SMSA. Based on these findings of citizen disagreement about the desired level of public goods to produce within communities, Pack and Pack concluded that a more complex decision framework for choosing residence location must exist than that envisioned by Tiebout.

Given the difficulty in estimating the public good demand equations and the restrictive assumptions Pack and Pack used to do so, Gramlich and Rubinfeld [1982] took advantage of a 1978 Michigan tax limitation ballot initiative to attempt to more accurately portray the extent of intra-jurisdictional differences. A survey of the Michigan population was taken by the University of Michigan's Institute for Social Research shortly after the 1978 Michigan vote. The survey included 2,001 randomly selected households and asked voters why they voted for or against the various tax limitation amendments. Gramlich and Rubinfeld used responses to questions about the desired change in spending for all budgetary categories to estimate demand for public goods.

The authors computed the variance in local spending demand for several cities in Michigan as well as an overall variance in demand for the entire state of Michigan. They hypothesized that the intra-community variance in demand should be smaller than for the statewide sample if a Tiebout mechanism truly served to sort residents based on fiscal variable preferences. Indeed, results indicated that residuals from each set of observations within urban communities had a significantly smaller variance than the whole sample in most cases. Gramlich and Rubinfeld

concluded that some degree of grouping by public spending demand was present.

Gramlich and Rubinfeld's study left unanswered questions, however. Results for smaller communities were not as consistent. In addition, the findings may have been affected by special circumstances surrounding this particular tax revolt atmosphere in Michigan. Finally, inherent limitations existed in the survey instrument data. The very impetus for this research derived from the problem that taxpayers may not truthfully reveal their demand for public goods.

Stein [1987] returned to the methodology employed by Pack and Pack to determine the existence of homogeneity within communities. However, in addition to using income as a characteristic that differentiates people, Stein also considers age, house value, occupation, education and race as surrogates of preferences for community services. In a separate phase of the study, he calculated an index for each sample SMSA that summarized the level of expenditures for various public services in each community.

On both counts, no evidence of a strong Tiebout mechanism emerged. The residential composition of the sampled communities proved to be highly heterogeneous along home value, income, age, occupation, education and race lines, generally supporting the Pack and Pack findings.

Apparently, homogeneous sorting of households did not occur. Similarly, the public service indices did not vary significantly across SMSAs. Stein concluded that demand for public good bundles is similarly heterogeneous in all communities. Stein cautioned that a cross-sectional research design like his might not detect significant dynamics in the functional content of municipal governments, and suggested that further study was needed.

In summary, researchers do not provide strong evidence that like-minded individuals sort themselves into communities. Certainly, no evidence suggests that there is community-wide segregation on the basis of demographic characteristics. On the other hand, some results do indicate a tendency toward some homogeneity in demand for public goods and services. Whether Tiebout equilibrium is prevalent in actual settings is as yet unanswered. However, other studies furnish somewhat clearer answers about whether home buyers consider factors deemed important by Tiebout in buying a residence. The literature in which tests of the extent to which people weigh public good/tax bundles in making their residential purchase is reviewed next.

The Capitalization Issue

Although the literature in its current state does not emphatically support the sorting aspect of Tiebout's

hypothesis, most studies do confirm that individuals indeed consider the availability of local public goods and the level of taxation in their residential choice decision. The evidence for this conclusion is found in the capitalization ractors for local public goods and tax burdens that several studies compute. The capitalization factor measures the degree to which home buyers adjust the value of homes for the associated packages of local public goods and taxes. Though the magnitude of these factors varies widely in the literature, most studies conclude that both services and taxes are significant value determinants.

Researchers have typically approached this issue from two perspectives. In the first approach, aggregate data are used to compare community-level fiscal variables between jurisdictions. Other studies employ micro observations of actual sales transactions within communities to detect the intra-jurisdictional effect of public service and tax differentials. A summary of this research is presented next.

Aggregate Studies

Oates [1969] was the first to empirically examine the effects of property taxes and local public spending on property values. He constructed a cross-sectional analysis of fifty-three municipalities in New Jersey. He regressed

the median value of homes in each of these cities on a number of variables that were used to measure taxes, public services and house characteristics. An effective property tax rate for each community was obtained from an Urban Land Institute monograph on property in the region under study. The level of public goods was limited to one variable that was measured by computing government expenditures per pupil on educational services. Several median house features and median family income for each city were collected from census data to provide controls for house characteristics in the model.

Oates first estimated his equation with ordinary least squares regression. He then re-estimated all capitalization factors using two-stage least squares. The latter method was deemed necessary since property value determined the ad valorem tax burden of any property and the tax rate was hypothesized to simultaneously determine property value. Both estimation techniques produced similar results. In both cases, property values bore a significant negative relationship to the property tax rate and a significant positive association with expenditure per pupil.

Assuming a discount rate of 5 percent and a 40-year house life, ceteris paribus, an increase in the tax rate from 2 percent (approximately the mean rate) to 3 percent would reduce the market value of a house by about $1,500,

according to Oates. Coupled with a significant coefficient on the education expenditure variable, Oates believed that his results were consistent with the Tiebout model since consumers appeared to weigh the benefits from local public services against the tax cost of providing those benefits in choosing a residence.

Several authors used different models and the New Jersey data from Oates in an attempt to refine his results from 1969. Oates [1973] estimated further results with data from his 1969 study, and Rosen and Fullerton [1977] as well as King [1977] made changes to the original model that they felt would improve the reliability of results.

Oates suspected that residents of a community would also be concerned about the levels of public services other than education, so in 1973 he constructed another model which incorporated an additional variable that represented expenditures on all municipal services other than schools. Except for the addition of this variable, the second model was identical to his first one. The new public expenditure variable had a significant effect on property values and the absolute value of the school expenditure coefficient and the property tax rate coefficient increased from the 1969 study. Though Oates admitted that these findings suggested that results do exhibit sensitivity to the specification of the

equation, he noted that his earlier results were essentially confirmed by this second study.

King [1977] objected to the use of a tax rate to gauge the effect of taxes on property value. He maintained that the tax burden was capitalized into value and an equation which used tax rate was, therefore, misspecified. King suggested that the use of a rate did not allow the market value reduction from a tax increase to be independent of a dwelling's initial value. King replaced the tax rate variable for each city with an estimate of the total property tax payment for a median value house. He multiplied the Oates effective tax rate by the median property value in each community to obtain this tax variable. His substitution did not change any coefficients other than the tax variable coefficient, which indicated that tax capitalization was about 40 percent less than Oates originally estimated.

Rosen and Fullerton [1977] were concerned about the use of government expenditures to proxy for the quantity and quality of local public services. Consequently, they measured the output from public schools with a battery of student achievement test scores and used these scores instead of expenditure per pupil to measure the education public good. Their test score variable proved to be

significant and they estimated a tax capitalization rate that was greater than those in either study by Oates.

McDougall [1976] employed a different sample of communities from the Los Angeles area to derive the inter-jurisdictional effect of taxes and services on property values. McDougall's model was similar to Oates's model, except that McDougall incorporated separate measures for four different local public services and attempted to measure all of them with nonexpenditure qualitative values. Education services were measured by Iowa Test scores. Crime rates were used to reflect the effectiveness of police services. Index ratings measured the quality of fire protection services and the desirability of recreational parks.

McDougall determined that effective tax rate was a significant determinant of value. Further, all public service variables were significant. However, standardized regression coefficients revealed that higher value was placed on education and police services than on parks and fire protection.

Cushing [1984] appears to be the first to use value, tax and service differentials at jurisdictional borders to help control for certain amenity and environmental characteristics that are difficult to measure. He performed a cross-section analysis of communities within the Detroit,

Michigan SMSA. Median house value differentials between bordering cities were regressed on public service differentials and tax differentials. His results indicated a full capitalization of tax rate differentials into house values. Expenditures on education overwhelmed all other public good variables as the most important determinant of house value.

Most studies, including all those previously cited, investigated only the capitalization of property taxes into property values. Stull and Stull [1991] hypothesized that residential property value differences might arise when local jurisdictions levy income taxes at different rates as well. Their dependent variable was the median value of single family homes in communities near the Philadelphia area. Their results demonstrated that differences in income tax rates across local jurisdictions may be capitalized into residential property values to nearly the same extent as differences in property tax rates.

Micro Data Studies

The above research attempted to determine the effect of taxes and benefits on inter-jurisdictional differences in property value. One observation for value--typically median value--was used from each community. The studies in this section generally estimate intra-jurisdictional property tax

capitalization (and to a lesser extent inter-jurisdictional capitalization also) using individual house sales prices to obtain a measure for the "value" dependent variable.

In an early rudimentary study by Edelstein [1974], over 2,000 home sales transactions from 1968 contained in the Multiple Listing Service for suburban Philadelphia were utilized. Number of bedrooms proxied for the amount of public services consumed by each household. To estimate tax capitalization, Edelstein combined a property's tax liability and its public good proxy (number of bedrooms) into one variable. The resulting regression of individual home sale prices on this tax/public good variable yielded a significant negative coefficient for the capitalization rate. Interpretation of the rate was somewhat difficult, however, and not comparable to the results obtained in the aggregate data research.

Reinhard [1981] used actual sales price data from 1,453 home sales in San Mateo County, California. In addition, Reinhard was able to gather detailed information from county records which identified with each house the quality of schools, the quality of police and fire protection, and expenditures for other public services. Micro-level data sources also allowed him to obtain very specific house characteristics, which permitted greater control over these determinants of value.

Reinhard's results provided evidence that a significant inverse relationship existed between property tax level and home sale price from an intra-jurisdictional perspective. Similarly, a positive association between public services and value was estimated. These results supported the idea that taxes and services are capitalized within communities as well as between communities.

Lea [1982] analyzed the strength of this within-city capitalization phenomenon by using survey data. He tested his hypotheses with the help of information from the University of Michigan's Panel Study of Income Dynamics. The survey provided Lea with nationwide data on housing, neighborhood and demographic characteristics. Though he could get detailed value and amenity descriptions at the household level from this survey, he had to merge these data with Census of Governments documents to obtain local tax receipts and public expenditures. Therefore, tax rate and expenditure data were county level aggregates. Such aggregation prevented any representation of the intra-community effects of tax or public good differences.

In his analysis, Lea postulated that property values and public service levels were simultaneously determined. Consequently, he independently estimated an instrument for the public good variable to use in the valuation equation. With this specification, the tax capitalization coefficient

was somewhat larger than the Oates benchmark, while the public service capitalization rate was estimated at the highest level to date.

Krantz, Weaver, and Alter [1982] studied inter-jurisdictional capitalization, employing individual house sales data from six Pennsylvania cities. These data made the effect of house characteristics on value easier to specity and control than in previous between-community studies. Otherwise, these authors' model was similar to the Oates model containing one variable for per pupil school expenditures and one variable for all other expenditures on a per capita basis. The authors found a capitalization rate very close to the Oates estimation, but their use of a different discount rate and time horizon than Oates limited possible comparison.

The final two studies reviewed here used micro-level data to explore changes in property values over time when major tax law events intervened during the valuation period. Rosen [1982] examined the impact of California's Proposition 13 tax limitation initiative on values in that state. Yinger, Bloom, Borsch-Supan and Ladd [1988] took advantage of court-ordered revaluation of all property in Massachusetts to conduct a natural experiment. By observing house sale prices both before and after the tax changing event (Proposition 13 enactment or revaluation), these

studies attempted to determine the extent to which a specific increase or decrease in property taxes caused a change in value. They could thereby analyze the capitalization effects of a specific exogenous tax burden change.

According to Rosen, Proposition 13 provided an exceptional opportunity to assess tax capitalization because it mandated different reductions in property taxes between jurisdictions. Furthermore, since the state compensated communities for lost revenue, public service levels remained essentially unchanged. Consequently, Rosen did not include variables representing government expenditures in his model. Methodologically, simultaneity bias should have been at a minimum because arguably most of any tax rate change during this period resulted from Proposition 13, not changing house values.

Rosen incorporated in his model detailed house characteristics as recorded by appraisers of the sold property. The equation was estimated with weighted OLS regression and provided strong evidence that larger tax savings produced greater value increases. Though the capitalization rate was somewhat less than the estimation of Oates, Rosen concluded that the different tax reductions in various California communities were capitalized into values during the year following Proposition 13.

Yinger et al. employed more sophisticated estimation techniques than did Rosen and analyzed the intra-jurisdictional effects of the Massachusetts tax change instead of Rosen's between-community analysis. Separate estimation of capitalization rates for each community in the study added significant impact to their otherwise familiar findings. With separate rates calculated for every community in the study, the authors concluded that the degree of tax capitalization varies between jurisdictions. They suggested that different factors may affect property values in different communities, and that a single, comprehensive tax capitalization rate may not exist.

Micro studies that gather data from individual sales transactions to use as a dependent variable are important research efforts. Tax capitalization within communities can not be investigated without these data. However, determining public good levels associated with unique properties within a community has been problematic. Moreover, although actual sales prices are likely the most precise gauge of value, such price information has been difficult and time consuming to procure. Due to problems in assembling these data, micro studies of tax capitalization are typically rather limited in scope.

Summary

Disagreement exists as to whether Tiebout's hypothesis with its restrictive assumptions is meaningful in application. Results from empirical analysis of the implications of Tiebout have not lessened the controversy. Some taxpayer sorting may occur, but the evidence is weak. The existence of tax capitalization into house values receives stronger support from the research, but its magnitude and pervasiveness are uncertain based upon the literature accumulated to date. This ambiguity demonstrates the need for further examination of the questions involved.

Table 1: Literature Taxonomy

Authors	Dependent Variable(s)	Primary Data Source	Estimation Procedure	Principal Conclusion(s)
I. Sorting				
1. Pack & Pack (1977)	Median Income Effective Tax Rate Population	Fed. Govt. Documents	OLS	Heterogeniety
2. Gramlich & Rubenfeld (1982)	Adjusted per Capita Govt. Spending	Survey	OLS	Some Grouping
3. Stein (1987)	Median Income	Fed. Govt.	Coef-ficients of Var., OLS	Heterogeniety
II. General Capitalization				
A. Macro				
4. Oates (1969)	Median House Value	Fed. Govt. Documents	OLS, 2 SLS	Significant Capitalization of Taxes & Expenditures
5. Oates (1973)	Median House Value	Fed. Govt. Documents	OLS, 2 SLS	Significant Capitalization of Taxes & Expenditures
6. Rosen & Fullerton (1977)	Median House Value	Fed. Govt. Documents,	OLS, 2 SLS Self-Collected Data	Significant Capitalization of Taxes, Test Scores & Demographics
7. King (1977)	Median House Value	Fed. Govt. Documents	2 SLS	Significant Captialization, though less than Oates
8. McDougall (1976)	Median House Value	Fed. & State Govt. Documents	OLS, 2 SLS	Significant Capitalization
9. Cushing (1984)	Mean House Value	Fed & State Govt.Doc.	2 SLS	Significant Capitalization

Table 1 (Continued)

Authors	Dependent Variable(s)	Primary Data Source	Estimation Procedure	Principal Conclusion(s)
10. Stull & Stull (1991)	Median House Value	Fed. & State Govt. Documents	OLS, 2 SLS	Significant Capitalization
B. Micro				
11. Edelstein (1974)	House Sales Prices	Multiple Listing Service	2 SLS	Significant Capitalization
12. Reinhard (1981)	House Sales Prices	Privately Collected Data Univ. of California-Santa Barbara	2 SLS	Significant Capitalization
13. Lea (1982)	House Sales Prices	Survey	OLS 2 SLS	Significant Capitalization
14. Krantz, et al. (1982)	House Sales Prices	Multiple Listing Service Govt. Documents	OLS, MLE	Significant Capitalization
III. Tax Change Capitalization				
15. Rosen (1982)	House Sales Prices Before/ After Prop. 13	Real Estate Appraisers' Documents	Weighted OLS	Significant Capitalization
16. Yinger, et al. (1988)	House Sales Prices Before/ After Revaluation	Dept. of Revenue Assessors, Mortgage Bureau Records, Sales Listing Services	2 SLS	Significant Capitalization

CHAPTER III

THEORY OF PUBLIC GOOD SUPPLY AND DEMAND

Introduction

Markets for goods and services furnished by governments can be analyzed with models similar to those used to study private markets. In these models, demand and supply equations are estimated to determine the efficient output and price for each product. Estimating the equations is an imprecise science for any consumer good; the difficulties are compounded when these goods are public goods supplied by the public sector. With government-supplied goods, suppliers are not constrained to earn a profit and buyers do not often have a choice about paying the prices.

Several economists have attempted to equilibrate public sector supply and demand. After summarizing the economic theory they have developed, my hypotheses that are derived from those theories are presented.

Public Sector Equilibrium

Samuelson [1954] has mathematically defined the optimal conditions for the supply of pure public goods and services that efficiently satisfy consumer demand. Though Samuelson agrees that optimizing equations are handily determinable, he also asserts that their solution is virtually impossible.

The conditions for optimal production are readily definable, he notes, but solutions to the equations do not represent a meaningful equilibrium because no equilibrating force exists to move the economy toward this solution.

According to Samuelson, no pricing system is available that requires consumers to reveal their marginal valuation of public goods. By definition, supply of a public good to one person implies that an amount is simultaneously supplied to other consumers as well. Consequently, consumers have no incentive to reveal their preferences or signal their demand in response to price parameters. They may admit to value from only a fraction of their desired consumption, but be able to consume at higher levels from the externalities of others' demand. Non-paying consumers can "free ride" on the purchases of others. Ultimately, then, Samuelson contends that a tractable competitive market solution to public expenditures does not exist.

Harold Demsetz [1964] does not believe that market failure in the case of public goods necessarily leads to a sub-optimal allocation of resources. In Demsetz's view, absence of a medium for exchange of priced goods does not preclude an efficient result. A marketplace will not emerge when the cost to provide a market or an enforcement procedure for the rights exchanged on that market exceed the benefits of the market and the policing. Providing

marketplaces requires resources. So does policing the marketplace. When the resources necessary to provide markets for public goods exceed the benefits from market exchange, failure of these markets may lead to an efficient outcome.

Though perhaps efficient, will non-priced goods produce a potentially inequitable advantage for non-paying public good beneficiaries? Demsetz does not think so. He argues that differences in the way side effects (externalities) enhance or burden property will be compensated by differential land rent from affected properties. Any advantages or disadvantages to land will be capitalized into the rental value of the land. As a result of this process, resources will be efficiently allocated among goods and a stable competitive equilibrium can be achieved.

In summary, Demsetz asserts that the absence of a separate market for pricing public goods is not necessarily inconsistent with an efficient allocation of resources or a competitive equilibrium. This result occurs because the cost of a marketplace is a factor in the efficiency equation. Further, other markets are available that circumvent the preference revelation problem in the public good arena.

Two alternative markets that provide solutions for the public good dilemma have been propounded. These

alternatives to the traditional Samuelson analysis suggest that mechanisms do exist through which local public good consumers can indicate the value of government services. First, the "Tiebout mechanism" proposes a solution for goods and services provided by local governments. Tiebout maintains that a competitive market of communities allows the solution. Second, a tax capitalization mechanism for property within communities can serve as a facilitator for price revelation. There may be no cost-effective market in which preferences for local public goods are revealed directly, but other existing markets may offer an indirect substitute. Demand and prices in these other markets may adjust for public good costs and benefits.

The Tiebout Mechanism

Charles Tiebout believes that a competitive market equilibrium is possible, depending upon the market considered. Tiebout agrees with Samuelson that an efficient equilibrium level of federal expenditures cannot be determined with traditional models. Tiebout models local government activity, however, and argues that an equilibrating mechanism is indeed at work in this arena.

Tiebout recognizes that Samuelson's analysis applies to pure public goods. The purity implies that no one can easily be excluded from enjoyment of the goods and that one

user's utilization does not detract from other users' enjoyment.

Local governments provide many impure public goods to their citizens. These impure public goods are often called club goods or local public goods. Common examples are schools and police protection. Though multiple users can simultaneously benefit from the same school or police force, at some utilization level the quality of benefits begins to decrease. Incentives arise for excluding non-payers. Local governmental units are therefore granted the power to exclude those who do not pay.

For a city with well-defined borders and benefit districts, an exclusion mechanism for education and protection is probably not too costly. Individuals must become tax paying members of a city before they are allowed to benefit from that city's local public goods. According to Tiebout, people are thereby induced to consider the value of those benefits and reveal their preference for benefits since the right to enjoy them is not free.

Tiebout argues, then, that at the local level, consumers register their preference for public goods. When they do, demand equations can be estimated and a competitive price, as well as efficient output levels for these goods, can be determined. Local governments can supply goods and levy taxes at the optimally determined levels.

A Tiebout equilibrium for local jurisdictions is theoretically possible since thousands of communities are accessible that provide consumers an opportunity for choice in the public good market. Tiebout contends that a wide array of available local governments each offer a unique, fixed set of revenue/expenditure patterns. Mobile consumers are aware of these choices, he says, and they disclose their preference for a desired tax/goods package by choosing a domicile. Preference revelation problems for local public goods are solved because these preferences are revealed by choice of a community in which to live.

Either local jurisdictions provide goods and services demanded by voters or the voters will move to other places that provide public good packages more in accord with their tastes. Just as competition for customers among private firms leads to efficient resource allocation, competition among communities for taxpayers will accomplish the same result. Tiebout's choice mechanism implies that all residents within one locale will be relatively homogeneous with respect to demand for public goods. A Tiebout equilibrium is characterized by all members in the community deriving equal utility from the government-supplied goods.

Tiebout painstakingly describes the mechanism through which demand preferences can be registered, but he comments very little about the pricing system (the tax system) in

this public economy. Hamilton [1976a] was the first to explicitly consider the proper tax revenue in a Tiebout community and his answer is the theoretically obvious one. For efficiency, consumers must receive the same quantities they would have demanded in a competitive market system and pay the same prices for those quantities they would have paid in an efficient private sector.

To achieve this, the Samuelson conditions must hold. Government should produce goods at a level where the marginal tax revenue received equals the marginal cost of production. Output is produced until the cost that the government must pay to produce the goods equals the total price that the sum of all taxpayers are willing to pay to consume the goods. Taxes in a Tiebout community will therefore be benefit taxes. The value or benefit that taxpayers receive from public goods will equal their tax cost. Taxpayers cannot increase their satisfaction from a goods/tax package by moving to another community. All residents will pay a tax equal to the price that everyone in the community would willingly pay for the package in a competitive market.

Several recent popular votes to forcibly limit taxation is at least anecdotal evidence that many communities are not inhabited by monolithic citizens universally happy with the government services provided at the price they are required

to pay. Though a Tiebout result is possible in theory, due to strict assumptions and other limitations, its literal application may be somewhat unrealistic. For equilibrium, Tiebout assumes that consumers' mobility is unrestricted and that a large number of communities are available from which to choose. In truth, however, several factors serve to constrain mobility and thereby limit the supply of accessible communities.

First, consumers have many motives other than the public good/tax package for choosing a residence. Mincer [1978] notes that the two foremost considerations in any migration decision are employment and family. Clearly, for example, a woman employed by the Alaska Railroad married to a husband with a job in Alaska is not easily able to move to a Florida city simply because it provides her ideal public service package. Consequently, the practical supply of places from which to choose is limited to cities within an area surrounding a consumer's workplace and family ties.

Further, even if dissatisfaction with a government becomes mutinously intense, costs of expanding the supply of communities within an area will make such expansion infeasible. Costs to newly produce and deliver the most basic public services would greatly exceed those costs in existing cities. Most people would probably not find the benefit of these essential services in new cities worth

their comparatively high cost. Costs of migration and imperfect information about cities' public service/tax packages also limit the exercise of community choice.

Clotfelter [1992] asserts that the general applicability of Tiebout to the average community has probably been overstated since many urban areas have relatively few jurisdictions from which to choose. He continues to recognize the impact of foot voting, however. The field of candidate communities may be too small to completely solve the free rider problem, but the process of residential choice is certainly one mechanism by which households are induced to reveal their preferences for local public goods.

Clotfelter thinks that the problem is best addressed by viewing the consumption of local public goods as part of a production process. Every household is a producer, employing various local public goods as inputs in a process that provides units of production to maximize household utility. In Clotfelter's analysis, the focus is not on the level of government services output, but on the value individual households place upon these services as input factors in the household production function. The availability of privately supplied alternatives to the public goods in certain localities may affect the value of the governmental inputs.

Clotfelter notes that residential choice is one mechanism that allows households to obtain local public good inputs at their value to the household. By itself, though, that mechanism is incapable of guaranteeing an efficient result. However, achieving Tiebout equilibrium is not a requirement for complete value revelation at the household level.

Nevertheless, the supply of habitable communities is limited and relatively inelastic. These considerations make reaching a Tiebout equilibrium unlikely in most situations. The limited "market of communities" may not offer adequate opportunities for preference revelation. However, a more traditional market within each community may allow consumers to consider the value of government inputs to the household and may thereby provide the means for a competitive result.

To the extent people can choose between cities, they may choose to vote with their feet for the public goods/tax bundle they most desire. Alternatively, as Demsetz envisioned, residents who settle for a community with an undesirable bundle may pay a reduced land rent due to the public service disadvantages of residing there. In addition to a market for communities, then, the market for housing may introduce a pricing mechanism for local public goods. Housing prices may reflect differences in local public goods and taxes between communities.

Tax Capitalization

As with all assets, the value of a house equals the present value of the net flow of services derived from owning it. Yinger, Bloom, Borsch-Supan and Ladd [1988] describe a home's market value as the present value of the home's rental value minus the present value of the property's tax flow. Rental value is the sum of the value of house structural characteristics, community amenities (hills, streams, trees, proximity to jobs, etc.), and public goods that may be utilized by residents in the community. In equation form, house value can be represented as follows:

$$HV = PC/i + A/i + PG/i - T/i$$

where,

HV = house value;

PC/i = the present value of house structural characteristics;

A/i = the present value of community amenities;

PG/i = the present value of a public goods package;

T/i = the present value of the tax liability incurred from living in a city; and

i = the discount rate.

Since housing has a relatively long expected life, i is deemed to be an infinite-horizon discount rate. Typically, PC and A are combined and jointly considered to be the value of a particular house on a unique parcel of land.

Based on this valuation model, a home's value is reduced by the full present value of the tax stream. As other factors remain equal, a home's value decreases as T/i increases. All else equal, taxpayers should be willing to pay more for homes in communities with relatively lower tax costs. Any tax savings from choosing a low tax community will be offset by higher house prices.

Marshall [1920] describes the relationship of PG and T as "onerous" versus "remunerative" taxes. An onerous tax is a cost that does not yield a compensating benefit to the taxpayer who pays it. Remunerative taxes are taxes spent on services that confer upon taxpayers a benefit commensurate with the burden incurred. Taxpayers who consider a tax to be onerous reduce the value of property by the onerous tax cost. This behavior is known as tax capitalization.

Taxes are capitalized into house values if, all else equal, higher tax liabilities result in lower house values. For example, assume Able and Baker own identical houses with the same property tax liability. If every factor that affects house value remains the same except that Baker's annual property tax cost increases $200 per year while Able's taxes stay the same, then Baker's house value will decrease relative to Able's. Assuming a 5 percent discount rate, Baker's house will fall $4,000 (200/.05) in value

compared to Able's house. The $4,000 present value of the tax increase is capitalized into the value of Baker's house.

The relationship between public services and taxes may not be constant between communities or over time. As Yinger [1982] noted, capitalization's existence requires that service/tax packages vary among communities. Only the relatively higher amount of a tax burden in a community is capitalized into house values. Any variation in taxes and public goods among cities ultimately results from diverse voting behavior.

Yinger, therefore, believes that a voting model should also be included in any capitalization analysis. After moving to a city and realizing that public goods and taxes influence home values, people may, via voting, attempt to change the tax/service package to maximize property values. Buyers, at the point of purchase, determine the effect of taxes on property value with their bids, while residents may accomplish the same result with their votes.

Though the taxes that affect property value can be changed at the ballot box, their level is fixed at any valuation point. Voters may indeed consider capitalization potential in their political decisions on taxation, but valuation transactions settle the effect these votes have. The static difference in tax levels at valuation points, not a dynamic combination of voting and bidding, is, therefore,

the focus of this study. Within this framework, several hypotheses can be developed from variable relationships suggested by Tiebout and tax capitalization.

Hypotheses

First, Tiebout implies that people sort themselves into communities based upon like-mindedness of preferences for public services. In equilibrium, a city will be inhabited by only those who have similar demand for public goods. A few studies have attempted to measure the degree of homogeneity within an area and generally concluded that cities do not have homogeneous residents. For supply inelasticity reasons discussed previously, these results are not surprising. Though sufficient numbers of cities do not exist to permit ideal matching and, therefore, homogeneity within them, people may still prefer the public service package in one city to that in another and select a city accordingly. Opportunities for sorting may not be adequately plentiful to result in homogeneity within a city, but enough sorting may occur to manifest itself in the form of differences between neighboring cities. Residents with similar preferences may sufficiently congregate to produce differences between available communities. In alternative form, the first three hypotheses investigated in this study are:

HA_1: Taxes devoted to school expenditures differ among cities within close geographical proximity.

HA_2: Median household income differs among cities within close geographical proximity.

HA_3: The percentage of households with school age children differs among cities within close geographical proximity.

As limited supply restricts sorting, then the effects of what may become onerous taxation must be considered. Previous work in this area has examined only overall tax liability considered as a single burden. However, the tolerable cost of a public good depends on the good's value. Since each public good has a different value, the tax cost of each good must be considered separately.

Particularly in recent years, the perceived need for upgrading educational services has become acute. In general, Americans view education as the most valuable government service and accept a greater tax cost as reasonable for this service. However, taxes collected for other outputs in a non-equilibrium setting are more likely to be viewed as onerous and thus capitalized into house values. The next two hypotheses test these propositions.

HA_4: Taxes collected for the purpose of educational expenditures will be viewed as benefit taxes

by taxpayers and not significantly reduce relative house values.

HA_5: Taxes collected for purposes other than educational expenditures will be capitalized into the value of homes burdened by the taxes.

Of course, the amount spent on education within a jurisdiction is not confined to locally collected taxes. Inter-governmental grant money may also be expended by a city on education and proportionally increase the value of school services in that jurisdiction. Only intra-jurisdictionally collected taxes can be avoided by residing elsewhere and are, therefore, the only taxes represented by T in the home value equation.

Taxes imposed upon all relevant jurisdictions will not affect the relative values in those areas since one city's T does not change in relation to all other cities in the array of available domiciles. But, certain cities may receive a comparative benefit from relatively larger redistributions of those taxes (PG receives a relative increase in this case). For instance, inter-governmental grants may equalize school expenditure shortfalls in poor communities unable to collect much tax revenue from their own citizens. Such grants allow PG to increase without an attendant increase in T locally. Accordingly, taxes perceived as collected from outsiders and spent locally will enhance property values

unlike taxes collected directly within a community. This proposition for educational expenditures is tested with the next hypothesis.

HA_6: Taxes collected from others and redistributed through inter-governmental grants for education will increase house values.

As Tiebout noted, individuals sort themselves because different people do not value the same public good equally. Consequently, in a disequilibrious community, some residents will value educational services more than others. Those likely to value school expenditures most are households with school age children. House values for school children households will receive a relatively larger boost from any educational expenditure PG. As the number of households with school age children grows within a city, house values in that city should experience an increase for any given level of education expenditures per household. The following hypothesis addresses this expectation.

HA_7: School expenditures will increase property values more in cities where more inhabitants have school age children.

Finally, to the extent previous research has examined these relationships, it has considered the effect of taxes on values within only one large metropolitan area, like northeastern New Jersey or Los Angeles. Further, usually

only cross-sectional analyses of data are performed in assessing these relationships. Though theory does not furnish an explicit foundation for judging the external validity of these results, capitalization may not operate consistently over different time periods or in different regions of the nation.

Capitalization is a local phenomenon, and location may affect the process. Larger numbers of communities from which to choose, greater employment options, and more chance for intercity externalities (all of which severely affect Tiebout's set of assumptions) change the degree to which capitalization is possible. All these factors vary by location.

Time may also alter the extent to which capitalization occurs. Present values fluctuate dramatically with minor shifts in the discount rate. Estimates of the discount rate have varied widely in the past twenty years. In addition, sensitivity to the burden taxes impose and concern for the quality of return on those tax dollars may rise and subside over time. Any response that involves human judgment is subject to change. Therefore, the last two hypotheses deal with the impact that time and location may have on capitalization behavior.

HA_8: The relationships among taxes, services and house value will vary by region of the nation.

HA_9: The relationships among taxes, services and house value will vary over time.

Summary

According to many economists, a market solution for the efficient production of local public goods exists in local jurisdictions. Consumers can choose their favorite public goods package at the best tax price by moving to the least expensive community that supplies that package. However, supply inelasticity in the market for communities inhibits choice. The market for houses may then assist with a solution. House values may fluctuate to neutralize the effect of tax burdens exceeding public service benefits. This study attempts to analyze the extent to which consumers choose between various public goods packages and then reduce their valuation of houses in a community that fails to supply the ideal package.

CHAPTER IV

RESEARCH METHOD

Introduction

Many factors influence house values. Taxes are only one determinant in a pricing model that is fairly complex. Consequently, to assess the response of house values to a tax factor, several other variables must be controlled. Such control is problematic, particularly since some variables affecting value are not precisely measurable. A major goal of this research is to develop a model that reduces bias from omitted variables.

In addition, this study models the valuation process in a tax context. Economists have done the previous work on this issue and they have spotlighted efficient output levels for public goods. A single comprehensive tax variable has been specified to measure tax capitalization. Using a tax perspective, this research specifies the model with measures of taxation that more closely quantify the tax effects on home valuation.

Data

This study uses data retrieved predominantly from government document archives. Bureau of Census publications contain most of the information needed for measuring

variables. These publications include Census of Population, Census of Population and Housing, Census of Housing, Census of Governments, and the City and County Data Book. Census data are collected only periodically, so information is not available for every year. However, when applicable, annual data are obtained from the Annual Survey of Governments, Municipal Yearbook and various state statistical abstracts. One model is estimated using real dollar values adjusted with a consumer price index deflator. The indices are obtained from CPI Detailed Reports for December 1970, 1980 and 1990. The CPI Detailed Report is a publication of the Bureau of Labor Statistics. A detailed listing of data sources for each model variable is provided in Table 2 at the end of this chapter.

The Sample

This study models house value differences between cities during two decades to analyze variation in the values. That is, differences in values between cities over time are explained by differences in the taxes, public goods and demographics of those cities over time. Since a national sample of cities is drawn, targeted differencing is necessary.

The differencing technique permits control of valuation determinants that the by do not require modeling. Of

course, only arguments of the valuation function that are constant between the differenced cities are controlled. As a result, not all city comparisons impart the desired control. As previously noted, employment and family considerations are paramount in a decision to migrate. A job location substantially limits the practical choice for a residence. Local tax disparities between San Diego, California, and Bangor, Maine, will not likely change anyone's decision about those two alternative domiciles. Consequently, sample data are collected in a manner that yields meaningful differences for a model estimation unbiased by omitted variables. A sampling procedure that contains proximity selection criteria is used in this study to produce the meaningful differences.

Though physical contiguity is necessary, broadly valid estimations of the tax effects on house values are desirable. A nationwide set of observations is required to allow such generalization. Every continental United States city is therefore included in the population from which a sample is drawn. From these communities, all cities with a population of 50,000 or more in any two of the years 1970, 1980, and 1990, are selected. Next, any city in this set that is not situated within approximately 25 miles of another city in the set is removed from the sample. These

criteria assemble a series of cities with 50,000+ population in clusters around the United States.

Cities are then grouped according to the following criteria. Cities within approximately 25 miles of each other are designated as a separate group. Cities within 25 miles of any city in the group are still members of that group even if they are farther than 25 miles from other cities in the group. No city can qualify for more than one group. Essentially, then, each group is an assemblage of cities that are clustered in close proximity to one another.

Four exceptions to these rules are made. First, California is deleted from the sample. Using the above criteria, California cities would constitute nearly one-fourth of the sample. Such domination by California is not suitable, particularly since unique events like Proposition 13 occurred in this state during the sampling period.

Second, cities in some locations are further sub-grouped because choice of domiciles among all cities within a group may be limited by financial considerations. Lower income individuals will not likely have an opportunity to reside in wealthy neighborhoods. Likewise, most high income buyers will not seek homes in lower-priced housing districts. Therefore, cities within some groups are further grouped according to the median house value of the community.

Next, since education expenditures are the major part of most local budgets and represent a focus of this study, if all cities in a group are within the same school district and therefore spend equal amounts on education, those cities are removed from the sample. This adjustment eliminates 24 cities (5 groups of 2 cities, 3 groups of 3 cities and 1 group of 5 cities) from the sample.

Finally, certain outliers are deleted from the sample. A few cities collected only minimal taxes in 1970. In a few locations, school districts received only token grants for education. In cases where a city in the first reporting period exhibits inconsequential dollar amounts, even a small increase in the subsequent period results in a substantial percentage change. In particular, the percentage changes over a decade for these cities are often several times larger than the changes for other cities in their group. Due to the minimal values in the initial period, a percentage change does not provide a meaningful, comparable measure of tax collections and expenditures.

Consequently, cities with unusually large percentage swings in variable values because of notably small nominal values are removed from the sample. The cities removed for this reason are Westminster, Colorado, Nashua, New Hampshire, Malden, Massachusetts, Mount Vernon, New York, Schenectady, New York, and Odessa, Texas. As a result, the

sample contains 169 cities from 26 states in 50 groups. Table 3 presents a complete listing of cities and groups.

The Model and Variables

The Differenced Model

The tax capitalization model in this study utilizes a form of double differencing to accomplish the desired control. First, every variable represents the difference in that variable's value for each possible pair of cities within a group. For example, the dependent variable for the first observation is a difference between home median value in Phoenix, Arizona, and Mesa, Arizona. This differencing insures that only relevant comparisons between cities within close proximity are made. Uncontrollable variation in factors for cities in different parts of the country do not become part of the estimation process.

All possible pairings within groups are exploited as observations. In a group with only two cities, there is but one comparison available. In larger groups, multiple comparisons can be made. With the group configuration found in Table 3, 474 pairings over two decades are possible.

A comparison of values from different time periods is also incorporated into each variable. In their specification, all variables use proportions computed by dividing the observed value for one decade by the value for

the previous decade. In other words, for all variables that increase over time, this time "differencing" is a measure of the percentage change in a variable's value, plus one, over a decade.

Two decades are analyzed in this paper: 1970-1980 and 1980-1990. All variables in the capitalization model are in the general form:

$X_{1980(Cityi)}/X_{1970(Cityi)} - X_{1980(Cityj)}/X_{1970(Cityj)}$.

Proportions of 1990 values to 1980 values for all cities are also included as observations. These variables represent the difference in the percentage change in value over a decade for each pair of cities. For example, assume the ratio of 1980 median house value to 1970 median value in Phoenix, Arizona, is 1.75 and the same ratio is 1.60 for Mesa, Arizona. In this example, house value increases 15 percentage points more in Phoenix than in Mesa. The value of the dependent variable for the first observation, then, is .15, the difference in the change in median value between Phoenix and Mesa. Since all variables are similarly defined, the model attempts to explain any difference in the ten year change in median value between two cities by the difference in the ten year change in taxes collected in the same two jurisdictions, among other factors.

Though care is required to properly interpret the meaning of these variables, this approach offers valuable

control of variation that is otherwise difficult to model. The differencing technique obviates the need for many factors in the model that attempt to explain variability in the dependent variable. Each differencing is designed to complement and correct for the other. Theoretically, the time differencing should control for inherent differences between cities in a pairing while the differencing of cities should control for factors that vary over time. Time differencing in effect serves to hold constant any differences between two paired cities that do not change over time. The differencing of cities, on the other hand, holds constant all factors that change similarly over time in the two paired communities.

A differencing between cities is necessary to target the comparisons that are relevant. However, many dissimilarities between cities exist that may affect home value. Natural amenities, for example, may create dissimilar environments among communities. Likewise, one city may be a predominantly wealthy suburb while its paired counterpart consists of mostly middle class neighborhoods. These differences have previously proven very difficult to model. However, such differences will not change dramatically in one decade. Analyzing changes over a decade in the same city should allow unique city characteristics to remain fairly constant.

Of course, using data collected in different time periods does introduce variability as a result of factors that do change over time. Inflation, interest rates, and general economic conditions were much different in 1990 than they were in 1980. However, proximal city pairing should help alleviate the variation with time. Likely, these conditions will change almost identically in neighboring cities. The dual differencing technique, then, ameliorates bias that can occur from misspecifying or omitting uncontrollable variables.

The differencing approach also helps mitigate another problem common to studies of this issue: simultaneity bias in the tax variable parameter estimate. Capitalized taxes are hypothesized to affect the value of the encumbered home. But, since property taxes are ad valorem, a home's value also simultaneously determines the amount of the tax liability. Increases in property taxes reduce value while reductions in value reduce the property tax base.

From a practical standpoint, the only scenario in which simultaneity becomes a significant consideration for coefficient estimation is when the tax base varies widely for communities in the sample. For example, if the median home value in City 1 is $80,000 and the median home value in City 2 is $40,000, then a 5 percent tax rate in City 1 will generate approximately the same revenue as a 10 percent rate

in City 2. Tax rates are lower and values are higher in City 1, but the higher values determine the lower tax rate as much as the lower tax rates lead to higher value.

Modeling the tax and value variables as time-sequenced proportions standardizes these variables for differences in cities' tax bases. Cities with disparate median house values become comparable with this variable specification. Complicated and sometimes unreliable estimation procedures like two or three stage least squares are not necessary to circumvent the bi-directional influence of values and taxes on one another.

The Model Variables

The dependent variable is a differenced form of median home value in the paired cities. A formula description of the dependent variable is as follows:

$$\frac{\text{1980(90) Y-City i}}{\text{1970(80) Y-City i}} - \frac{\text{1980(90) Y-City j}}{\text{1970(80) Y-City j}} .$$

Independent variables included in the model and their formula specifications are as follows:

$$\frac{\text{1980(90)X1-City i/80(90)\#HH}}{\text{1970(80)X1-City i/70(80)\#HH}} - \frac{\text{1980(90)X1-City j/80(90)\#HH}}{\text{1970(80)X1-City j/70(80)\#HH}}$$

$$\frac{\text{1980(90)X2-City i/80(90)\#HH}}{\text{1970(80)X2-City i/70(80)\#HH}} - \frac{\text{1980(90)X2-City j/80(90)\#HH}}{\text{1970(80)X2-City j/70(80)\#HH}}$$

$$\frac{\text{1980(90)X3-City i/80(90)\#HH}}{\text{1970(80)X3-City i/70(80)\#HH}} - \frac{\text{1980(90)X3-City j/80(90)\#HH}}{\text{1970(80)X3-City j/70(80)\#HH}}$$

$$\frac{1980(90)X4\text{-City i}/80(90)\#HH}{1970(80)X4\text{-City i}/80(90)\#HH} - \frac{1980(90)X4\text{-City j}/80(90)\#HH}{1970(80)X4\text{-City j}/70(80)\#HH}$$

$$\frac{1980(90)\ X5\text{-City i}}{1970(80)\ X5\text{-City i}} - \frac{1980(90)\ X5\text{-City j}}{1970(80)\ X5\text{-City j}}$$

$$\frac{1980(90)\ X6\text{-City i}}{1970(80)\ X6\text{-City i}} - \frac{1980(90)\ X6\text{-City j}}{1970(80)\ X6\text{-City j}}$$

$$\frac{1980(90)\ X7\text{-City i}}{1970(80)\ X7\text{-City i}} - \frac{1980(90)\ X7\text{-City j}}{1970(80)\ X7\text{-City j}}$$

$$\frac{1980(90)\ X8\text{-City i}}{1970(80)\ X8\text{-City i}} - \frac{1980(90)\ X8\text{-City j}}{1970(80)\ X8\text{-City j}}$$

where #HH is the number of households within a community.

Model variables are defined in the following list.

Y: Median value of all homes within a city.

X_1: Property taxes paid excluding taxes devoted to school expenditures.

X_2: Other taxes paid.

X_3: Taxes devoted to school expenditures.

X_4: Redistributed taxes received from other sources and devoted to school expenditures.

X_5: Crime rate.

X_6: Population growth rate.

X_7: Median household income.

X_8: School-age children population growth rate.

$X_3 * X_8$: Interaction of school taxes and school children households.

$X_4 * X_8$: Interaction of school taxes from outside sources and school children households.

A theoretical model containing these variables is presented in Figure 1. The specific variables used to test hypotheses from Chapter III are summarized in Table 4.

Variables X_1 and X_2 are included to test the extent of tax capitalization. Since expenditures on education are used to measure the benefit of schools, the local tax and public service factors regarding education are represented as one variable. Additional education expenditures are almost solely dependent upon a concurrent collection of additional tax revenue. As a result, any change in expenditures must necessarily be accompanied by a change in taxes collected and vice versa. Separate measurement of the effect on value of taxes and expenditures for education purposes is therefore meaningless. X_3, representing a combination of taxes collected for schools and expenditures on schools, will determine whether school taxes are benefit taxes. The value-augmenting potential of outside revenue for schools is examined with X_4.

X_5, X_6 and X_7 are control variables. Crime control, X_5, is an important non-tax factor in the residence selection process. Unlike education, where quality is often judged by monies spent, crime prevention effectiveness is typically measured by the area crime rate. X_5 allows any association between this effectiveness and property value to be evaluated. X_6, population growth rate, attempts to

measure the effect on value that can result from varying economic and social conditions that may befall the different cities in each group. Presumably, those cities within a group that experience deteriorating conditions will have slower growth rates while cities with relatively improved social and economic situations will grow at a faster pace.

X_7 controls for noise introduced into the 1970-1980-1990 serial data analysis that may not otherwise be captured with differencing. First, changing characteristics of the median house must be tracked. The dependent variable is derived from median home value in a city. The nature of the median house in one city may evolve differently than that of a median house in the community with which it is paired. For example, a two bedroom, one bath configuration may be the median house from both cities in 1970. Then in 1980, one city's median house may become a three bedroom, two bath structure, while its paired city does not change. Certainly, this variation will affect relative median values. Such a change can be detected by observing whether the relationship between community incomes shifts dramatically during the sample period.

Second, median income is also a good indicator of general economic conditions within a community. If the economy of a city does not develop similarly to its neighbors, then the median income of its citizens will

reflect the difference. Incorporating shifts in a community's median income should serve as a proxy for changes in the economic climate.

The higher order terms are included to reveal interaction between school taxes and the concentration of school children within a city. These variables portray any interrelationship between the school age population and amounts expended on education.

Variations on the Model Theme

Since observations are taken over a twenty year period, during which extraneous variability could impact the dependent variable, other modeling approaches that might provide additional explanatory power have merit. In particular, data gathered for the two decades of 1970-1980 and 1980-1990 are easily segregated and blocked for estimation. This analysis is sensible because economic conditions were different during the two decades under study.

Further, regional differences in economic development during the two eras make region of the country a logical factor by which to classify the determinants of home value. Accordingly, each city group is designated by a region indicator variable. All groups are placed into one of three

regions: northeast, midwest or south. Groups are regionally placed by the classifications in Table 5.

Another factor, city size, cannot be ignored in any effort to control social and economic conditions that might cause different behavior in home values between contiguous cities. The determinants of home value may not uniformly predict values in groups of cities that consist of both major metropolitan areas (inner cities that likely contain the central business district) and smaller suburban bedroom communities.

The distinction between inner city and suburbia can probably be captured by city population. Consequently, any city with a 1980 population of less than 125,000 people is classified as "small," while a city with a 1980 population of 125,000 or more is deemed to be "large." Three categories of differences emerge with this classification. Paired differences of two small cities, one small and one large city, and two large cities are distinguished.

With a model designed for factoring decade, region and city size, the sample is configured into the cells displayed in Table 6. Since groups seldom contain multiple large cities and since the comparison of large cities is arguably similar in all regions, the large versus large category is not analyzed by region.

A modification of this model is estimated to determine if inflation might affect the relationship of the variables. As specified, home value and other monetary variables are stated in nominal dollars. Any proportion of 1980 dollars to 1970 dollars or 1990 dollars to 1980 dollars is certainly influenced by the effects of inflation. Since closely neighboring cities are differenced in the model, inflationary dollar devaluation should have no effect on the analysis of variables measured in monetary terms. A dollar is devalued by an equal amount in both cities of every pair, leaving unchanged the relationship of variables measured in dollars.

However, the model contains both monetary and non-monetary variables. Deflating nominal dollars reduces the magnitude of the monetary variables relative to non-monetary variables like crime rate and population. Restatement to real dollars, then, may affect the relationship between those variables expressed as dollars and those which are not.

Regional consumer price indices are used to deflate dollar differences. Where 1967 is the base year equal to 100, the regional indices for 1970, 1980 and 1990 are:

	1970	1980	1990
Northeast	121	247	397
Midwest	119	258	384
South	119	270	393

Therefore, the fractions necessary to deflate 1980/1970 proportions are 121/247 for the northeast, 119/258 for the midwest and 119/270 for the south. The 1990/1980 deflators are 247/397 in the northeast, 258/384 in the midwest and 270/393 in the south.

One further model is estimated as a part of this study and it involves a respecification of the dependent variable. A theory that suggests home values respond to changes in taxes and government services presupposes that home buyers have an opportunity to register their evaluation of taxes and services. Such an opportunity may not be equally available to all people. The wealthy, who are society's most mobile members, may more frequently participate in the home purchase/foot voting process. To capture this possibility, another capitalization model is estimated using 75 percent quartile home value as the dependent variable in place of median value.

The Statistical Techniques

Statistically, the hypotheses are addressed by considering them as two different sets. Hypotheses one

through three are the first subset and four through nine are the second. The first three hypotheses are analyzed with descriptive statistics. The variables used represent the difference between observations in two cities at a stationary point in time and do not incoporate the timing difference.

Hypotheses four through nine are statistically tested in an ordinary least squares regression model. Three models are estimated. First, a regression that includes an indicator for the two decades is performed. Next, a model with both decade and region indicator variables is estimated. The third estimation contains dummy variables for decade, region and city size.

Summary

A model is required that will emphasize the effects of taxes on property value. A method is required that will control for all non-tax factors that affect value. Satisfying these two requirements is a primary goal of this research. With data from government sources, the described model can detect any association between local taxes and residential property values.

Table 2: Sources of Data

Variable	Data Source
House Median Value	Census of Housing
Local tax liabilities	Census of Governments, Annual Survey of Governments
School Expenditures	Census of Governments, Annual Survey of Governments
Intergovernmental Grants	Census of Governments
Crime Rate	Uniform Crime Reports
Population	Census of Population
Median Income	Census of Population
School Age Population	Census of Population
Number of Households	Census of Housing

Table 3: City Groupings

Group Number	Location
1	Arizona - Phoenix Mesa Scottsdale Tempe Glendale
2	Arkansas - Little Rock North Little Rock
3	Colorado - Denver Aurora Lakewood Arvada Westminster
4	Connecticut - Norwalk Stamford
5	Connecticut - New Haven West Haven
6	Connecticut - Hartford New Britain
7	Florida - Tampa St. Petersburg Clearwater Largo
8	Illinois - Skokie Schaumburg Oak Park Aurora Oak Lawn
9	Illinois - Waukegan Arlington Heights Mount Prospect Evanston Des Plaines

Table 3 (Continued)

Group Number	Location
10	Illinois - Chicago Cicero Joliet Hammond, Indiana Gary, Indiana
11	Indiana - Muncie Anderson
12	Iowa - Council Bluffs Omaha, Nebraska
13	Kansas - Kansas City Overland Park Kansas City, Missouri Independence, Missouri
14	Louisiana - Shreveport Bossier City
15	Louisiana - New Orleans Kenner
16	Massachusetts - Springfield Chicopee
17	Massachusetts - New Bedford Fall River
18	Massachusetts - Lawrence Lowell Nashua, New Hampshire
19	Massachusetts - Medford Waltham Newton Quincy
20	Massachusetts - Boston Lynn Malden Somerville Cambridge

Table 3 (Continued)

Group Number	Location
21	Michigan - Wyoming Grand Rapids
22	Michigan - Sterling Heights Royal Oak Farmington Hills St. Clair Shores Taylor
23	Michigan - Warren Livonia Westland Dearborn Dearborn Heights
24	Michigan - Detroit Pontiac Troy Roseville Southfield
25	Minnesota - Minneapolis St. Paul Bloomington
26	Missouri - St. Louis Florissant
27	New Jersey/New York - New York Yonkers New Rochelle Mt. Vernon
28	New Jersey/New York - Elizabeth Union City Bayonne Passaic Clifton
29	New Jersey/New York - Jersey City Patterson East Orange Irvington Newark

Table 3 (Continued)

Group Number	Location
30	New York - Albany Troy Schenectady
31	New York - Buffalo Niagra Falls
32	North Carolina - Winston-Salem Highpoint Greensboro
33	North Carolina - Raleigh Durham
34	Ohio - Youngstown Warren
35	Ohio - Cleveland Parma Cleveland Heights Euclid Lakewood
36	Ohio - Dayton Kettering
37	Ohio - Cincinnati Hamilton
38	Oklahoma - Oklahoma City Norman
39	Pennsylvania - Allentown Bethlehem
40	Pennsylvania - Philadelphia Camden, New Jersey Trenton, New Jersey Wilmington, Delaware

Table 3 (Continued)

Group Number	Location
41	Rhode Island - Providence Cranston Warwick East Providence Pawtucket
42	Texas - Beaumont Port Arthur
43	Texas - Houston Baytown Pasadena
44	Texas - Dallas Plano Arlington Irving Richardson
45	Texas - Fort Worth Grand Prairie Garland Mesquite
46	Virginia - Hampton Newport News Norfolk Portsmouth Chesapeake Virginia Beach
47	Washington - Seattle Tacoma Bellevue Everett
48	Wisconsin - Oshkosh Appleton
49	Wisconsin - Racine Kenosha
50	Wisconsin - Milwaukee West Allis Waukesha

Table 4: List of Variables Associated with Each Hypothesis

Hypothesis No.	Testing Factor	Variable/Coefficient Hypothesis
1	X_3, X_4	Descriptive statistics
2	X_7	of the relevant
3	X_8	variables.
4	X_3	H_0: $B_3<0$ H_a: $B_3\geq 0$
5	X_1, X_2	H_0: $B_1\geq 0$; $B_2\geq 0$ H_a: $B_1<0$; $B_2<0$
6	X_4	H_0: $B_4\leq 0$ H_a: $B_4>0$
7	X_3*X_8 X_4*X_8	H_0: $B_9\leq 0$; $B_{10}\leq 0$ H_a: $B_9>0$; $B_{10}>0$
8	All Variables	H_0: $B_{j(i,k)} = B_{j(i,k)}$ H_a: $B_{j(i,k)} \neq B_{j(i,k)}$ where j=coefficients 1 to 10, i=decades 1 to 2, and k=regions 1 to 3.
9	All Variables	H_0: $B_{j(i)} = B_{j(i)}$ H_a: $B_{j(i)} \neq B_{j(i)}$ where j=coefficients 1 to 10 and i=decades 1 to 2.

Table 5: Regional Classifications

Group	States	Region
1	Arizona	South
2	Arkansas	South
3	Colorado	Midwest
4,5,6	Connecticut	Northeast
7	Florida	South
8,9,10	Illinois, Indiana	Midwest
11	Indiana	Midwest
12	Iowa, Nebraska	Midwest
13	Kansas, Missouri	South
14,15	Louisiana	South
16-20	Massachusetts	Northeast
21-24	Michigan	Midwest
25	Minnesota	Midwest
26	Missouri	South
27-31	New Jersey, New York	Northeast
32,33	North Carolina	South
34-37	Ohio	Midwest
38	Oklahoma	South
39,40	Pennsylvania, Delaware	Northeast
41	Rhode Island	Northeast
42-45	Texas	South
46	Virginia	South
47	Washington	Midwest
48-50	Wisconsin	Midwest

Table 6: Sample Cell Sizes
of Comprehensive Model

Region & City Size	70-80 Decade	80-90 Decade
South Small vs. Small	14	14
South Small vs. Large	42	42
Midwest Small vs. Small	59	59
Midwest Small vs. Large	39	39
Northeast Small vs. Small	42	42
Northeast Small vs. Large	25	25
Large vs. Large	16	16
	237	237

Decade Model

$$Y = \sum_{i=1}^{2} [\beta_{0(i)} + \beta_{1(i)}X_{1(i)} + \beta_{2(i)}X_{2(i)} + \beta_{3(i)}X_{3(i)} + \beta_{4(i)}X_{4(i)} + \beta_{5(i)}X_{5(i)} + \beta_{6(i)}X_{6(i)} + \beta_{7(i)}X_{7(i)} + \beta_{8(i)}X_{8(i)} + \beta_{9(i)}X_{3(i)}*X_{8(i)} + \beta_{10(i)}X_{4(i)}*X_{8(i)}]$$

Regional Model

$$Y = \sum_{i=1}^{2}\sum_{j=1}^{3} [\beta_{0(i,j)} + \beta_{1(i,j)}X_{1(i,j)} + \beta_{2(i,j)}X_{2(i,j)} + \beta_{3(i,j)}X_{3(i,j)} + \beta_{4(i,j)}X_{4(i,j)} + \beta_{5(i,j)}X_{5(i,j)} + \beta_{6(i,j)}X_{6(i,j)} + \beta_{7(i,j)}X_{7(i,j)} + \beta_{8(i,j)}X_{8(i,j)} + \beta_{9(i,j)}X_{3(i,j)}*X_{8(i,j)} + \beta_{10(i,j)}X_{4(i,j)}*X_{8(i,j)}]$$

Region/City Size Model

$$Y = \sum_{i=1}^{2}\sum_{j=1}^{7} [\beta_{0(i,j)} + \beta_{1(i,j)}X_{1(i,j)} + \beta_{2(i,j)}X_{2(i,j)} + \beta_{3(i,j)}X_{3(i,j)} + \beta_{4(i,j)}X_{4(i,j)} + \beta_{5(i,j)}X_{5(i,j)} + \beta_{6(i,j)}X_{6(i,j)} + \beta_{7(i,j)}X_{7(i,j)} + \beta_{8(i,j)}X_{8(i,j)} + \beta_{9(i,j)}X_{3(i,j)}*X_{8(i,j)} + \beta_{10(i,j)}X_{4(i,j)}*X_{8(i,j)}]$$

Figure 1: Capitalization Models

CHAPTER V

EMPIRICAL RESULTS

Introduction

As explained in Chapter I, the research questions of interest are (1) whether people with different preferences for taxes and local public goods sort themselves into different communities, and (2) whether median home values respond to changes in various local taxes. Question 1 is analyzed first and is addressed with descriptive statistical calculations presented in Tables 7-10. Question 2 is then considered by assessing the regression results found in Tables 11, 12, 13 and 14.

The Sorting Issue

The sorting issue is explored by examining the differences in median income, school-age population, school taxes and school grants between pairs of cities. Income differences between cities are described in Table 7. Table 8 contains the same information about differences in the percentage of a city's population that is under 18 years of age (school age). Tables 9 and 10 present the statistical descriptions of differences in taxes collected by school districts and in school grants, respectively.

There is some evidence that sorting occurs on the basis of income differences at the city-wide level. Average differences in median income between cities are $1,496 for 1970, $3,647 for 1980 and $7,786 for 1990 (Table 7). Given that overall means of median income for this sample in those years are approximately $11,000, $22,000 and $38,000, these differences represent substantial disparities in income relative to the benchmark averages: 13.6 percent of 1970 median income, 16.6 percent of 1980 median income and 20.5 percent of 1990 median income. While some variability in the differences is apparent, 50 percent of the sampled cities exhibit income differences of $1,200, $2,700 and $5,900 or more in 1970, 1980 and 1990. These numbers suggest a systematic tendency to select a city of residence based upon residents' income.

Table 8 implies that families with school children may have a preference for certain cities within each group as well. Mean differences between cities in the percentage of a city's population under age 18 are 4.77, 3.96 and 3.46 percentage points for the three years. Since the overall average minor population percentages for those years are 28 percent, 26 percent and 24 percent, these mean differences indicate that a 15 percent variation in school-age population among paired cities is typical. Variation of

this magnitude seems sufficient to conclude that families with children migrate toward certain cities.

However, there may not be much evidence that school expenditures prompt the migration patterns. Tables 9 and 10 show the extent of differences in tax collected by local school districts (Table 9) and differences in education grants received by those districts (Table 10). The numbers represent taxes and grants on a per household basis.

Practically, these differences are small. Half of the sampled communities exhibited differences in school taxes of $39, $77 and $120 or less in 1970, 1980 and 1990, respectively. The median differences in school grants for those years are also modest: $26, $78 and $119. Further, the magnitude of these differences between cities exhibits substantial variability. The coefficient of variation for both school taxes and grants is nearly 150 percent in 1980 and 1990, while it approaches 200 percent or more in 1970. Fairly large differences exist in a few pairs, but most communities do not manifest enough dissimilarity from paired counterparts to offer residents an unambiguous choice or to persuade migrants to choose a residence based upon school expenditures. These results do not provide compelling evidence that the school expenditures citizens demand and/or receive are noticeably disparate.

Perhaps the construct ambiguity inherent in the school tax variable is responsible for these results. As previously explained, one variable is used in the model to explain both the tax cost of schools and the school expenditure benefit provided to each household with students. Since attention in this research focusses on the effects of tax costs, the taxpaying unit (a household) is used to standardize the school tax measurement. If the tax cost/benefit expenditure were instead measured on a per pupil basis, the test might more closely estimate the effect of quantitative benefit differences between schools.

Previous studies that use an expenditure measure of school services have performed a per pupil analysis. Results from these other studies are mixed, suggesting that per pupil expenditures may not vary greatly between districts. Statutory requirements for equalized expenditures in different school districts may dictate these results, allowing parents little alternative among districts in terms of school spending.

The descriptive statistics reveal that individuals may consciously segregate into different cities based upon criteria like income and family status. Such segregation might be an expression of diverse preferences for taxes and local public services. However, the existence of any

motivation for sorting due to school taxes and expenditures is disputable, at least on a city-wide scale.

The Tax Capitalization Model

An ordinary least squares estimation procedure is performed to gauge the relationship between home value and taxes collected to provide various services to taxpayers. A test of OLS assumptions indicates that the residuals are not correlated with each other or over time, and are not unduly skewed in their distribution. Further, no independent variables are sufficiently correlated with one another to mask the significance of other important predictors. The largest variance inflation factor, a multicolinearity indicator, is less than three, well within the acceptable range.

As explained in Chapter IV, several alternative specifications are estimated for this study. Since some alternatives proved unsatisfactory and presentation of every model would be largely redundant, only selected results appear on the following pages.

In this study, only the median value models are presented. No results using a 75 percent quartile value as dependent variable are given. Two reasons prompted this decision. First, by all indications, the results are not appreciably different from the median value model and no

adjustments would have altered this conclusion. The same predictor variables are significant in both models, though the 75 percent value model is less explanatory overall. The variables also provide somewhat less significant explanations of the 75 percent quartile value.

However, these estimations may be unreliable due to the second reason that the upper quartile results are not evaluated here. A true 75 percent quartile observation is not obtainable from any available data base. Mean and median values are easily found, but the 75 percent observation can only be obtained through estimation. A distribution of houses within certain dollar value intervals is the format usually presented. A typical value distribution looks like this:

Value	# of Houses
90,000 - 99,999	485
80,000 - 89,999	892
70,000 - 79,999	1,234

Clearly, the value interval in which the 75 percent quartile house lies can be determined. However, the exact location of the value for the 75 percent house within such an interval is incalculable. To derive a number, one must assume that the appropriate value in an interval is the value which occupies the same proportional position within the dollar interval as the 75 percent house occupies within

the house count interval. For example, if the 75 percent house is number 223 within the 892 interval, then its value is calculated as 80,000 + (223/892 x (89,999-80,000)) = $82,500. Of course, since the house values may not be proportionately distributed throughout the dollar interval, that calulation may not represent the actual 75 percent quartile value.

Consequently, the non-median value results are not discussed. Though the integrity of the 75 percent data is questionable, the evidence suggests that any defects are not major and do not distort the findings. Descriptive statistics on both dependent variables indicate that they are similarly distributed and that proportional differences of 75 percent quartile values and median values are nearly equal.

In addition to the duplicate estimations using two dependent variable definitions, all models are also estimated in both nominal dollars and inflation-adjusted real dollars. Since both nominal and real dollar models provide substantially identical results, only real dollar coefficients are presented here. Though the overall significance of the real dollar models are slightly lower and the R^2 minimally reduced, the basic relationship among the variables does not change. To eliminate concern about

the influence of dollar devaluation, the real dollar results are used for analysis.

Following the initial estimation of these models, plots were examined to determine if a few observations might overly influence the fitting of the regression line. As a result, potentially misleading observations were removed from the sample and the models re-estimated. Coefficient estimates did not change significantly from the initial models, so results from the full sample are used.

Coefficients from the three models--with decade, decade/region, and decade/region/city size indicators-- are displayed in Tables 11, 12 and 13. Table 11 displays the results from tests of hypotheses 4, 5, 6, 7 and 9.

The Basic Overall Model

In both decades, changes in property taxes have a statistically significant inverse relationship with changes in home values. Hypothesis 5 is validated. The 95 percent confidence interval for the property tax coefficient in the 1970-1980 decade is $-.083 \pm .062$ ($-.021$ to $-.145$) and $-.090 \pm .067$ ($-.023$ to $-.157$) in the 1980-1990 decade. If property taxes increased 200 percent in City A and 100 per cent in City B during the 1970's (1980's), then with 95 percent confidence, on average the growth in median home value is expected to be between 2.1

percent (2.3 percent) and 14.5 percent (15.7 percent) less in City A than in City B.

The results suggest that taxes other than property taxes may also be capitalized into home values. Statistically significant negative coefficients are estimated for the other tax variable in both decades. Its influence appears to be less dramatic than for property taxes, but a conclusion of no effect can be rejected.

Taxes collected by school districts seem to have a different impact on value. As expected from an explanatory variable with limited dispersion, the results do not permit a determination that the effect of these taxes on value is zero or positive. However, that conclusion cannot be rejected either. Since no evidence exists that the school tax coefficient is other than zero, the effect of school taxes on value is different from the effect on value of all other non-school taxes. The findings in this model are therefore consistent with the hypothesized relationship of taxes and value in hypothesis 4. Unfortunately, because differentials in school taxes are small, lack of meaningful choice may explain these results, not a theoretical relationship between school taxes and property value.

In general, the response of home value to changes in school expenditures is ambiguous. Like school taxes, the coefficient on the variable representing school grant money

awarded to a city is not significantly different from zero. Perhaps people view grants as their own tax dollars returning to the community. Alternatively, grant money may be disproportionately channeled to impoverished communities where its impact on value is diminished. The distribution of grants may also be misdirected. A correlation analysis reveals that shifts in grant payments are not highly correlated with shifts in the student population. In any case, citizens apparently do not view school grants as a windfall to their community. Hypothesis 6 is not supported by these results.

Since education grants and taxes collected by school districts are not significant determinants of value, the hypothesized interactions of these factors with the school children population are not sustained in this study. There is no evidence that, as suggested by hypothesis 7, school expenditures from taxes or grants have a more positive effect on home value as the school-age population increases. Taken as a whole, the results do not provide any evidence that amounts spent on schools, regardless of source, are related to home values within a city. This result is not suprising given the findings in the previous sorting issue analysis. The choice among districts for different taxing policies and different grant receipts appears to be limited.

In addition to variables testing hypotheses, control factors in the model add explanatory power. Not suprisingly, changes in community income are strongly related to changes in home values. As expected, the economy of a city is probably the most significant determinant of home values. As economic conditions improve, the more rapidly residents' income will grow and enhance their ability to purchase higher value housing.

The income variable also likely captures any wealth migration to affluent suburbs. Wealthy, high income individuals will move to neighborhoods with more expensive homes. As this influx occurs and average neighborhood incomes increase, the immigrating affluent will demand higher value homes.

Though taxes have the expected inverse relationship to value, general economic considerations and wealth shifts are the major determinants of changes in house prices within a city. The overwhelming influence of the income variable is logical and understandable.

Population growth is also a significant predictor of value, though the relationship switches from positive to negative as the decades change. In other words, faster population growth rates are associated with higher home values in the 1970's, while slower growth rates are associated with higher home values in the 1980's. A

positive correlation between population growth and value is probably most logical since more residents are presumably attracted to cities where conditions are superior. Such immigration should increase relative demand for housing.

The negative coefficient for the 1980's derives almost exclusively from the comparison of large and small cities in the south. See Table 12G and Figure 18. The large/small population size difference may be partly responsible for the inverse relationship. Growth rates are dependent upon the base population of a city. Growth rates may be lower in larger cities than in smaller ones even though more people choose to live in large cities during the period under scrutiny.

In summary, beyond the strong influence of economic and income factors, the explanatory power of property taxes and population growth is similar in intensity. Non-property taxes also manifest a significant inverse relationship with property values, though the coefficients are lower than for the other significant variables.

Changes in wealth characteristics closely parallel movement in housing prices because wealth is an easily discernible factor within the personal knowledge of everyone who earns it. Though individuals may be generally aware of tax levels and are herein hypothesized to make valuation decisions on that basis, taxes are more difficult to observe

and compare than income streams. These findings suggest that taxes indeed influence valuation but, that, not suprisingly, taxes are not homeowners' foremost consideration in pricing a residence.

Though statistically significant, non-property taxes have a weaker association with values than property taxes. This result may follow from a still more difficult task of determining the magnitude and incidence of these other taxes. Direct taxes on property may be verified and reckoned with some certainty. Income, sales and user taxes are less predictable and can be circumvented by incurring the taxes in other jurisdictions. Overall, variables with significant explanatory power generally have coefficients in the predicted direction and bear a relationship to each other that is not surprising.

The Decade Difference (Hypothesis 9)

By itself, the decade dummy variable is not significant. Overall, the model does not explain home value in the 1970's differently from the 1980's. Clearly, however, not all coefficients are equal across decades. Certain variables affect value differently from one time period to the other. Population growth has a significantly positive relationship with value in the 1970's and significantly negative association during the 1980's.

Nevertheless, the tax variables of primary interest have a uniform correlation with the dependent variable in both decades. Consequently, decade of the observation is not considered influential in determining the home value response.

The Regional Difference (Hypothesis 8)

Like the decade dummy, the region indicator variable is not itself statistically significant. However, some regional idiosyncrasies are worth noting. Regional coefficients are found in Table 12. Regional comparisons are also graphically observable in Figures 2 through 11. Each figure represents one model variable for every region in both decades. Point estimates of variables' coefficients are designated on the graph and 95 percent confidence interval bars are extended from these points indicating the significance of any difference from zero. The Y-axis is the coefficient value and the X-axis depicts region and decade: 70801 = 1970/1980 - South; 70802 = 1970/1980 - Midwest; 70803 = 1970/1980 - Northeast; 80901 = 1980/1990 - South; 80902 = 1980/1990 - Midwest; 80903 = 1980/1990 - Northeast.

The graphs emphasize details that should be formally recognized. Figure 2 assures that the influence of property taxes is consistent. Most point estimates are negative and all significant coefficients are negative. Though the

effect is less vivid, the same is true for other taxes in Figure 3. Figure 4, school taxes, illustrates potentially distinctive behavior in the northeast during the 1980's. Unlike all other categories, taxes collected by school districts in the northeast appear to emphatically represent benefit taxes. Taxpayers believe they are more than obtaining their money's worth from school expenditures.

This one occurrence could be an anomalous result, particularly since education grants are not significantly associated with value in the northeast (see Figure 5, suggesting that school expenditures are not valuable to northeasterners). However, this exceptional outcome may be reliable given the city size analysis findings as well as the consonant reaction of other variables in the northeast. An atypical pattern is discernable in the northeast region for crime rate, median income and population growth rate, also (see Figures 6, 7 and 8). Home values in the northeast may respond uniquely in some particulars, but otherwise the overall results are persistently observed in all areas of the country.

The City Size Difference

No hypotheses about population size have been formulated. But incorporating a size factor into the model increases explanatory power and uncovers some notable

patterns of significance in the data. Table 13 details the coefficients for this extensive model. Table 14 catalogues the results by decades, regions and city sizes for each variable. A graphical display of significance similar to that included for regional results is located in Figures 12 through 21. On this graph, variable coefficients are on the vertical axis and the X-axis is used for decade, region, and city size. 1 = small versus small - south; 2 = small versus large - south; 3 = small versus small - midwest; 4 = small versus large - midwest; 5 = small versus small - northeast; 6 = small versus large - northeast; 7 = large versus large - all regions.

Caution must be exercised in interpreting significance. With 140 tests, rejection of several is expected merely by random chance. Accordingly, individual instances of statistical significance are not analyzed; only systematic significances are investigated. Such systematic significance patterns emerge in two or three cases. Most prominently it is found in large city pairs from all regions for 1980/1990 (class 7). To a lesser extent, small city pairings in the south for 1970/1980 (class 1) and small versus large comparisons from the northeast for 1980/1990 (class 6) exhibit these indicia. In this comprehensive model, the aforementioned region/population combinations usually manifest the strongest significance and are the most

consistently significant for all the variables. Class 1 and class 7 are the smallest cells, so both cases were carefully screened for overly influential observations.

Generally, all classifications for the property tax and other tax variables appear as either significantly negative or gravitating in that direction (see Figures 12 and 13). Nonetheless, 7080 class 1 and 8090 class 7 are the most conspicuous. Non-education taxes exert more dominant negative pressure on home values in these instances than in any others. Perhaps taxpayers in large cities (8090 class 7), where high taxes already prevailed, felt particularly overburdened by additional levies. Small town southerners may have strongly mistrusted government and/or felt alienated, stimulating a frustration with all taxes. Indeed, in small southern cities even taxes targeted for education are inversely correlated with values (see Figure 14). Conversely, large city dwellers placed a high value on school taxes in the 1980's. This disparity may result from a difference in the method of allocating school benefits. In the southern states, school expenditures may be disproportionately allotted to poorer districts that are not liable for most of the taxes.

The interactions of school taxes and grants with school children become significant for these cases, especially the 8090 class 7 situation (see Figures 20 and 21). This unique

result is tenable since school taxes, school grants and school children are all positively significant in the 8090 class 7 case (see Figures 14, 15 and 19). The interaction coefficient is opposite in direction from that originally hypothesized. In retrospect, however, the inverse association with value is sensible. School taxes and grants have a significantly positive influence on value, but that influence is lessened as the school-age population increases at any given level of taxes and grants, diluting the effectiveness of both to improve the educational experience of each student.

The cause of the distinctive effects in these situations is, of course, unknown. Distinctiveness notwithstanding, there is no reason to suspect that these cases are solely responsible for any results. First, they were scrutinized for outliers and re-estimated omitting any questionable observations. Remote data points are not responsible for the results in these region/population categories. Further, the category 1 and 7 cells are small relative to other cells. They alone cannot dominate the overall results unless other cases trend in the same direction. The insignificance of school-age population and interaction variables in the decade and regional models is evidence of this.

Summary

Results of the investigation of Tiebout's hypothesis with descriptive statistics corroborate the findings in most other studies. Some evidence of sorting is detected, but the specific criteria along which segregation occurs is difficult to identify. Whether preferences for taxes and local services play a major role is not clear.

The tax capitalization regression model estimates that property tax levels are a determinant of home value. Likewise, other taxes have a negative impact on the dependent variable. However, taxes collected for expenditure on education, property-based or otherwise, do not exert the same negative influence. Though such results prevail generally, they may deviate occasionally depending on region of the country and city population size.

Table 7: Statistical Description of Median Income Differences (Stated in Nominal Dollars)

	1970 Median Income Diff.	1980 Median Income Diff.	1990 Median Income Diff.
Mean	1496	3647	7786
Std. Dev.	1216	2923	6399
Coeff. Var.	81%	80%	82%
100% Max	5900	12600	30100
90% Qui	3300	8500	17300
75% Qua 3	2200	5400	11400
50% Median	1200	2700	5900
25% Qua 1	600	1500	2900
10% Qui	200	200	1300
0% Min	0	0	100

Table 8: Statistical Description of School Children Population Differences (Stated in Percentage of Total Population)

	1970 School Children Pop. Difference	1980 School Children Pop. Difference	1990 School Children Pop. Difference
Mean	4.77	3.96	3.46
Std. Dev.	3.91	2.92	2.66
Coeff. Var.	82%	74%	77%
100% Max	16.6	13.7	12.3
90% Qui	10.1	8.2	7.4
75% Qua 3	7.4	5.9	4.9
50% Median	4.0	3.4	2.9
25% Qua 1	1.5	1.5	1.4
10% Qui	0.6	0.6	0.5
0% Min	0	0	0

Table 9: Statistical Description of Differences in School Taxes Per Household (Stated in Nominal Dollars)

	1970 School Tax Diff.	1970 School Tax Diff.	1970 School Tax Diff.
Mean	91	136	234
Std. Dev.	178	198	340
Coeff. Var.	196%	145%	145%
100% Max	1454	1189	2330
90% Qui	169	303	509
75% Qua 3	80	138	260
50% Median	39	77	120
25% Qua 1	16	30	49
10% Qui	6	10	18
0% Min	0	1	1

Table 10: Statisical Description of Differences in School Grants Per Household (Stated in Nominal Dollars)

	1970 School Grant Diff.	1980 School Grant Diff.	1990 School Grant Diff.
Mean	76	128	203
Std. Dev.	176	191	289
Coeff. Var.	230%	149%	142%
100% Max	1446	1491	2158
90% Qui	165	237	412
75% Qua 3	61	159	249
50% Median	26	78	119
25% Qua 1	10	26	39
10% Qui	4	5	13
0% Min	0	2	1

Table 11: Results From Overall Model

Coefficients by Decade

Variable	1970/1980	P Value	1980/1990	P Value
1. Prop. Tax	−.083+	.0097	−.091+	.0086
2. Other Tax	−.045+	.0323	−.046+	.0161
3. School Tax	.001	.9880	.047	.2773
4. School Grant	.007	.7393	−.005	.8696
5. Crime Rate	.023	.0799	−.011	.5326
6. Median Income	1.022+	.0001	.370+	.0016
7. Population Growth	.068+	.0005	−.173+	.0035
8. School Children	−.050	.5012	.118	.1073
9. Tax * Children	.015	.8717	.099	.3595
10. Grant * Children	−.023	.5989	.073	.1166

$r^2 = .295$

+ Designates Significance at the .05 level

Table 12: Results by Region

Var.	1970/1980			1980/1990		
	1	2	3	1	2	3
1	−.089	−.049	−.196+	−.205+	.026	−.175+
2	−.051	−.024	−.005	−.008	−.014	−.109+
3	.061	−.058	−.090	−.088	−.062	.461+
4	.015	−.004	−.002	.075	.019	−.028
5	−.023	.056+	.024	.058	.009	−.245+
6	1.585+	.912+	.666+	.301	.725+	−.404
7	.024	.053	.651+	−.208+	−.151	.828+
8	−.256	.082	−.034	.418+	−.008	.056
9	.112	.082	−.287	.167	.597	−.045
10	−.280	−.066	.032	−.231	.041	.092

r^2 = .471

1=South, 2=Midwest, 3=Northeast

+ Designates Significance at the .05 level

Table 13: Results by Region and City Size

1970/1980

Variable	1	2	3	4	5	6	7
1	-.712+	-.114	-.052	.035	-.192+	-.224	-.099
2	-1.018+	-.057	-.036	-.036	.045	-.015	.040
3	-3.387	.104	-.087	.087	.065	-.396	-.252
4	3.097+	.100	-.008	-.063	-.005	.023	.297
5	.094	-.041	.025	.121+	.036	.030	-.147
6	2.750	1.60+	.853+	.280	.267	1.547	1.262+
7	-.087	.010	.065+	-.002	.618	.670	.110
8	1.338	-.361	-.019	.155	-.255	.077	.306
9	6.531+	.256	.173	-.175	-.267	-.227	-1.357
10	-8.635	-1.145	-.050	-.105	-.085	-.053	1.107

1980/1990

Variable	1	2	3	4	5	6	7
1	-.465	-.225+	.137+	-.019	-.068	-.458	-1.667+
2	.084	.063	-.032	-.020	-.057	0	-.380+
3	.445	-.154	-.011	-.100	.278+	.418+	2.480+
4	-.339	.232+	-.043	.003	.039	.029	1.360+
5	.205	.073	.101	.008	-.316+	-.244+	-.151+
6	-.427	.481	.750+	.554+	-.574+	1.294+	-3.649+
7	.230	-.212+	-.114	-.183	.189	2.840+	1.091+
8	.911	.235	0	-.003	-.024	.034	6.684
9	-.846	.061	.362	.998	-.195	1.716+	-12.639+
10	-1.301	-.165	-.001	.188	.210+	-.252+	-20.866+

r^2 = .642

1=South, Small vs. Small; 2=South, Small vs. Large;
3=Midwest, Small vs. Small; 4=Midwest, Small vs. Large;
5=Notheast, Small vs. Small; 6=Northeast, Small vs. Large;
7=All Regions, Large vs. Large

+ Designates Significance at the .05 level

Table 14: Results From Comprehensive Model

A. Variable: Property Tax

Region/ City Size	1970/1980 Coefficient	1970/1980 Std. Error	1970/1980 P Value	1980/1990 Coefficient	1980/1990 Std. Error	1980/1990 P Value
1	−.712+	.294	.0161	−.465	.320	.1470
2	−.115	.074	.1253	−.226+	.073	.0023
3	−.053	.055	.3440	.137+	.067	.0414
4	.035	.083	.6669	−.019	.072	.7876
5	−.192	.101	.0587	−.068	.075	.3655
6	−.225	.142	.1166	−.458	.245	.0630
7	−.099	.371	.7900	−1.667+	.361	.0001

B. Variable: Other Taxes

Region/ City Size	1970/1980 Coefficient	1970/1980 Std. Error	1970/1980 P Value	1980/1990 Coefficient	1980/1990 Std. Error	1980/1990 P Value
1	−1.018+	.421	.0163	.084	.293	.7738
2	−.058	.060	.3386	.063	.064	.3255
3	−.036	.032	.2709	−.032	.040	.4234
4	−.036	.041	.3914	−.020	.037	.5837
5	.045	.070	.5218	−.057	.036	.1164
6	−.015	.095	.8681	0	.099	.9996
7	.040	.246	.8685	−.380+	.164	.0212

C. Variable: School Taxes

Region/ City Size	1970/1980 Coefficient	1970/1980 Std. Error	1970/1980 P Value	1980/1990 Coefficient	1980/1990 Std. Error	1980/1990 P Value
1	−3.388+	1.165	.0039	.445	.542	.4124
2	.104	.130	.4224	−.154	.083	.0659
3	−.087	.065	.1627	−.011	.118	.9224
4	.087	.142	.5383	−.100	.144	.4887
5	.065	.104	.5301	.278+	.136	.0427
6	−.396	.217	.0698	.418+	.127	.0012
7	−.252	.304	.4087	2.482+	.564	.0001

D. Variable: School Grants

Region/ City Size	1970/1980 Coefficient	1970/1980 Std. Error	1970/1980 P Value	1980/1990 Coefficient	1980/1990 Std. Error	1980/1990 P Value
1	3.097+	1.119	.0060	−.339	.252	.1799
2	.100	.142	.4801	.232+	.099	.0204
3	−.008	.041	.8300	−.044	.093	.6401
4	−.063	.053	.2289	.003	.110	.9755
5	−.005	.056	.9237	.039	.069	.5722
6	.023	.055	.6697	.029	.079	.7083
7	.297	.208	.1547	1.362+	.506	.0076

Table 14 (Continued)

E. Variable: Crime Rate

Region/ City Size	1970/1980 Coefficient	Std. Error	P Value	1980/1990 Coefficient	Std. Error	P Value
1	.094	.089	.2908	.205	.412	.6191
2	−.041	.031	.1878	.074	.083	.3744
3	.025	.022	.2466	.101	.073	.1686
4	.121+	.030	.0001	.008	.017	.6172
5	.036	.036	.3211	−.316+	.092	.0007
6	.030	.055	.5871	−.244	.126	.0546
7	−.147	.120	.2228	−.515+	.251	.0412

F. Variable: Median Income

Region/ City Size	1970/1980 Coefficient	Std. Error	P Value	1980/1990 Coefficient	Std. Error	P Value
1	−2.751	2.053	.1813	−.427	.971	.6605
2	1.607+	.461	.0006	.481	.302	.1119
3	.853+	.348	.0148	.750+	.266	.0051
4	.280	.517	.5885	.554+	.248	.0264
5	.267	.427	.5321	−.574+	.291	.0497
6	1.547+	.638	.0159	1.294+	.441	.0036
7	1.262	2.220	.5701	−3.649+	.993	.0003

G. Variable: Population Growth

Region/ City Size	1970/1980 Coefficient	Std. Error	P Value	1980/1990 Coefficient	Std. Error	P Value
1	−.087	.083	.2961	.230	.586	.6945
2	.010	.040	.7935	−.212+	.098	.0314
3	.065	.034	.0540	−.114	.168	.4973
4	−.002	.060	.9722	−.183	.160	.2545
5	.618	.359	.0862	.189	.475	.6909
6	.670	.464	.1494	2.840+	.549	.0001
7	.110	.253	.6625	1.091+	.318	.0007

H. Variable: School Children

Region/ City Size	1970/1980 Coefficient	Std. Error	P Value	1980/1990 Coefficient	Std. Error	P Value
1	1.338	.795	.0934	.911	.731	.2135
2	−.361	.225	.1105	.235	.263	.3718
3	−.019	.137	.8886	0	.201	.9987
4	.155	.246	.5275	−.003	.228	.9874
5	−.255	.175	.1469	−.024	.172	.8892
6	.077	.263	.7674	.034	.216	.8741
7	.306	.542	.5728	6.684+	1.539	.0001

Table 14 (Continued)

I. Variable: Tax * School Children

Region/ City Size	1970/1980 Coefficient	Std. Error	P Value	1980/1990 Coefficient	Std. Error	P Value
1	6.531+	3.187	.0412	−.846	1.434	.5559
2	.256	.546	.6393	.061	.241	.7996
3	.173	.125	.1681	.362	.373	.3324
4	−.175	.426	.6811	.998	.648	.1249
5	−.267	.260	.3051	−.195	.183	.2874
6	−.227	.415	.5847	1.716+	.555	.0022
7	−1.357	2.542	.5938	−12.639+	3.090	.0001

J. Variable: Grants * School Children

Region/ City Size	1970/1980 Coefficient	Std. Error	P Value	1980/1990 Coefficient	Std. Error	P Value
1	−8.635	4.624	.0628	−1.301	1.174	.2688
2	−1.145	.703	.1046	−.165	.274	.5473
3	−.050	.093	.5905	−.001	.156	.9922
4	−.105	.120	.3822	.188	.197	.3399
5	−.085	.090	.3408	.210+	.088	.0178
6	−.053	.126	.6706	−.252+	.102	.0141
7	1.107	1.693	.5136	−20.866+	6.400	.0012

$r^2 = .642$

1=South, Small vs. Small; 2=South, Small vs. Large;
3=Midwest, Small vs. Small; 4=Midwest, Small vs. Large;
5=Northeast, Small vs. Small; 6=Northeast, Small vs. Large;
7=All Regions, Large vs. Large;

+ Designates Significance at the .05 level

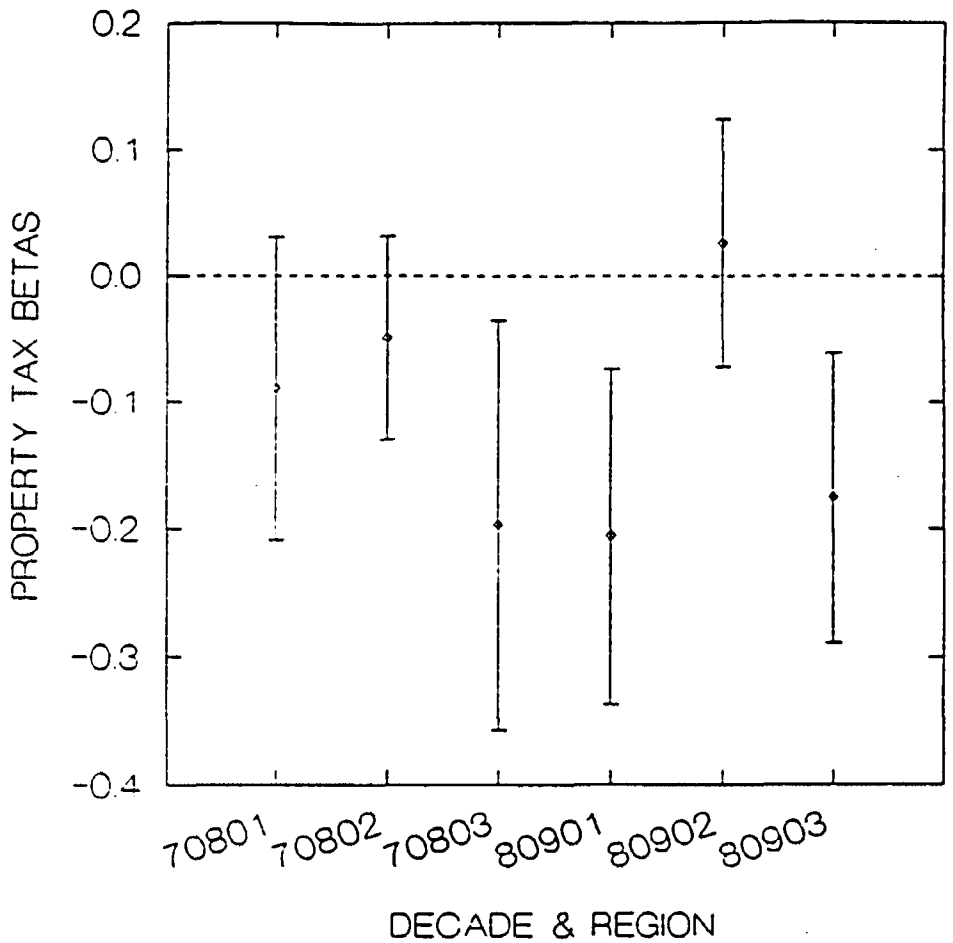

Figure 2: Property Taxes By Region

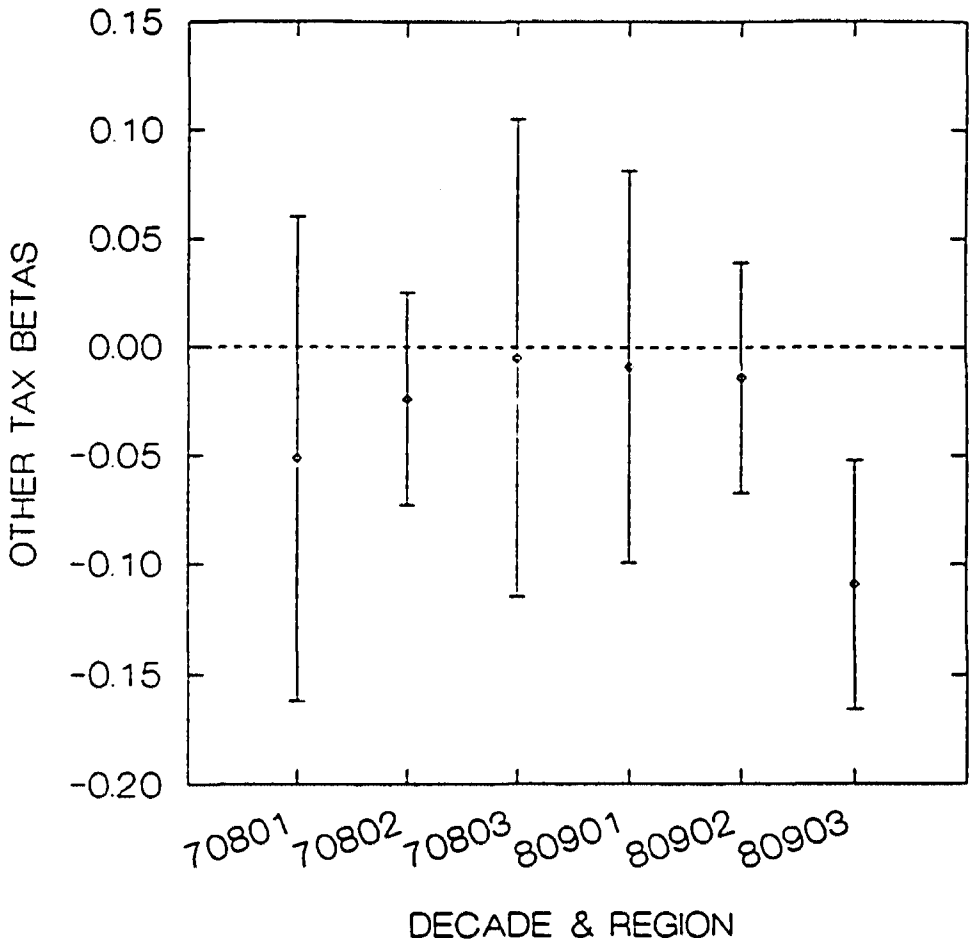

Figure 3: Other Taxes By Region

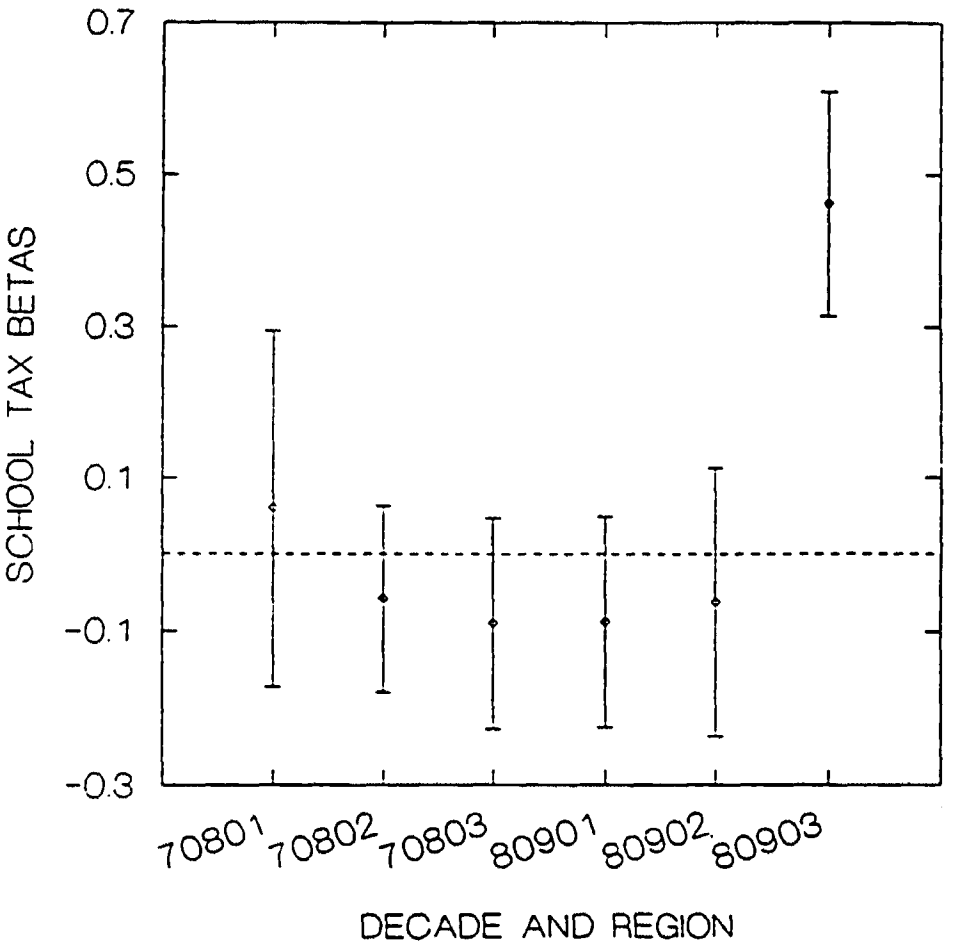

Figure 4: School Taxes By Region

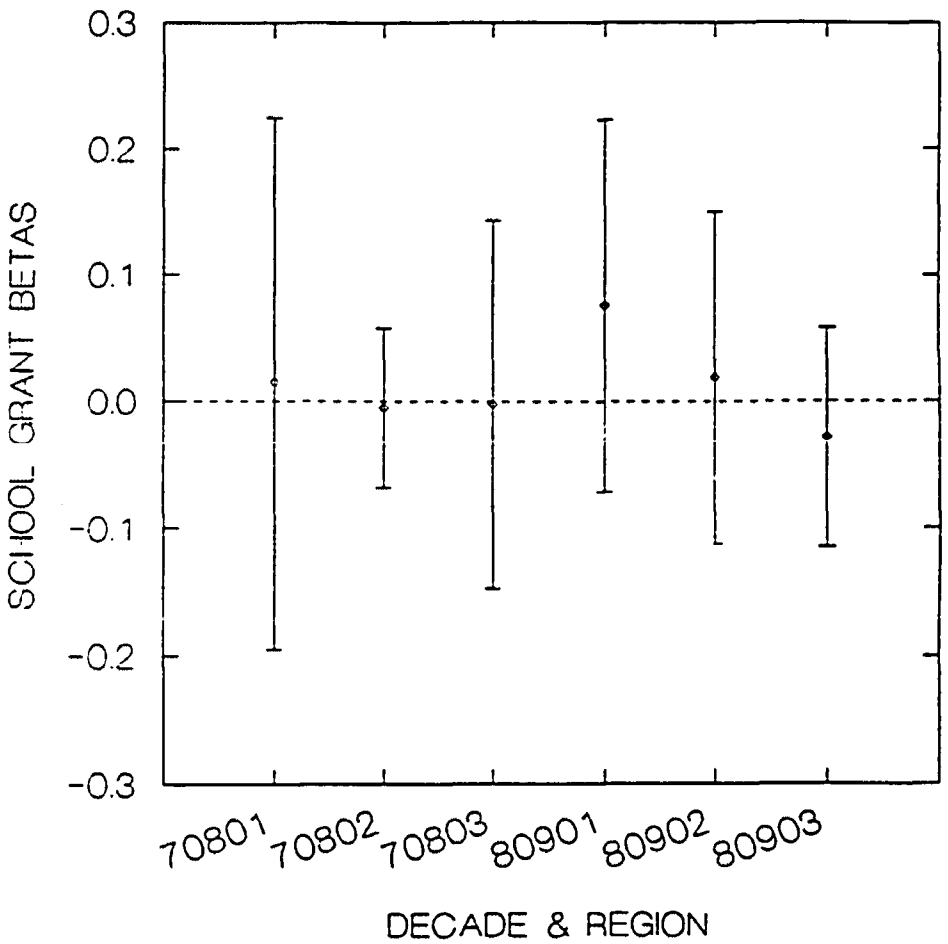

Figure 5: School Grants By Region

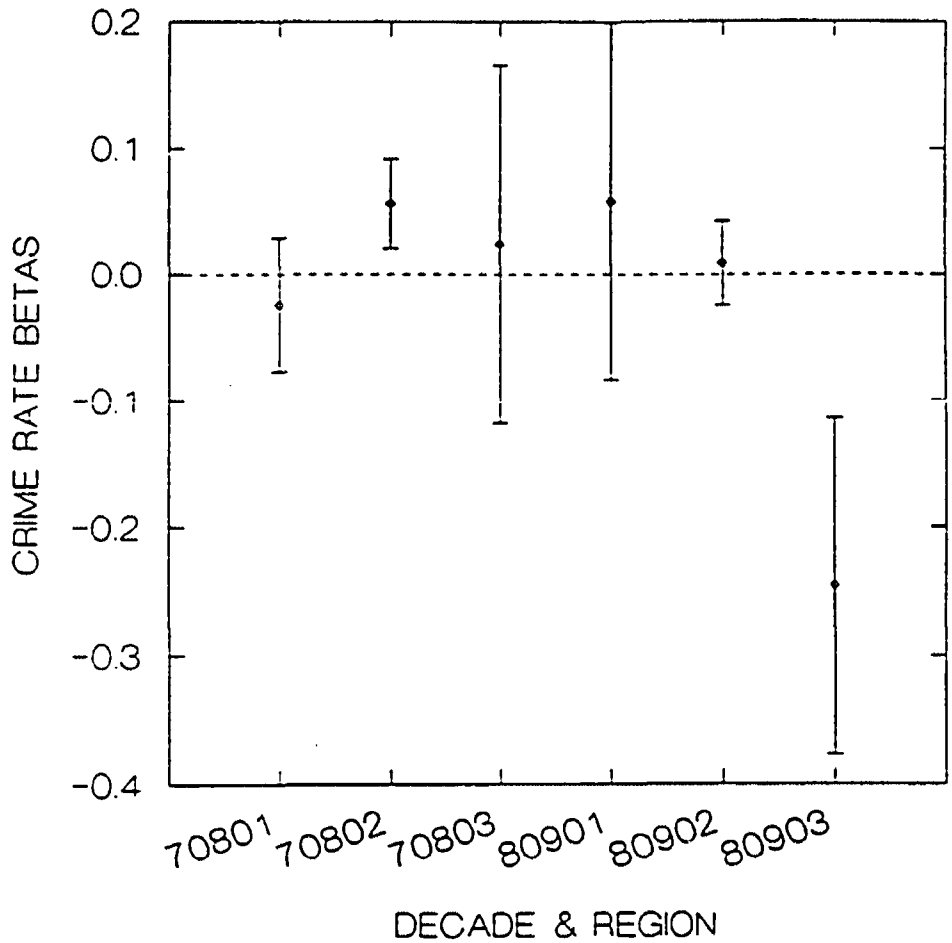

Figure 6: Crime Rate By Region

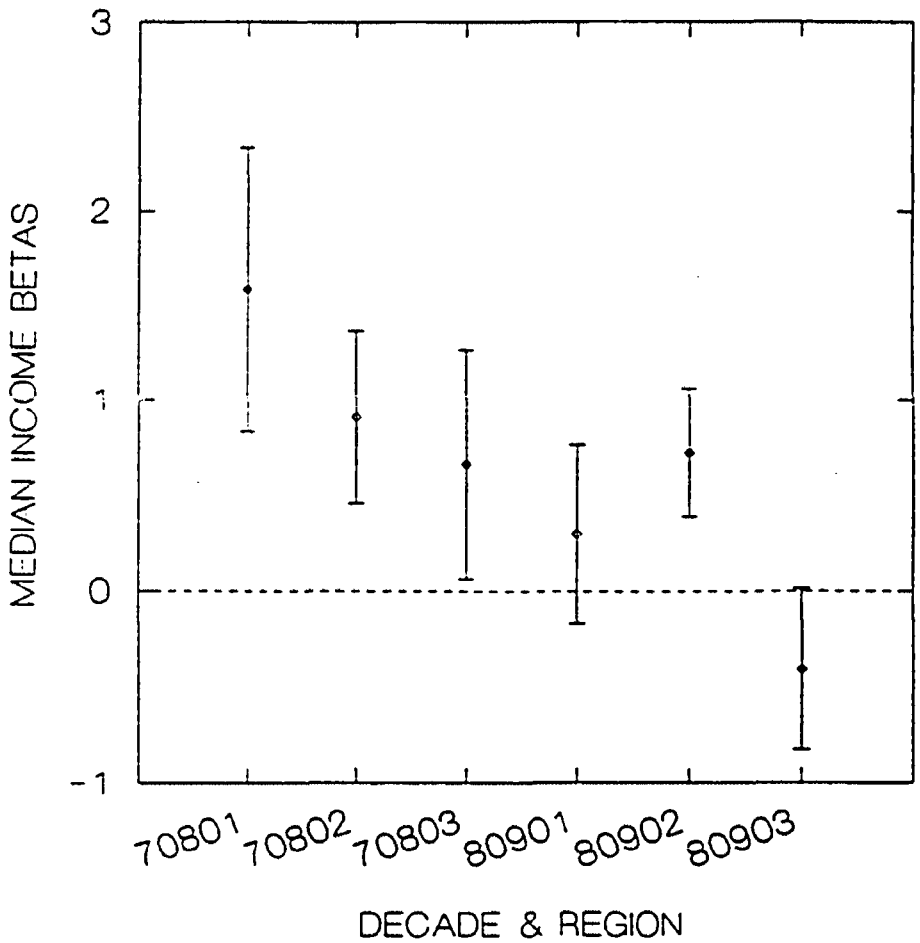

Figure 7: Median Income By Region

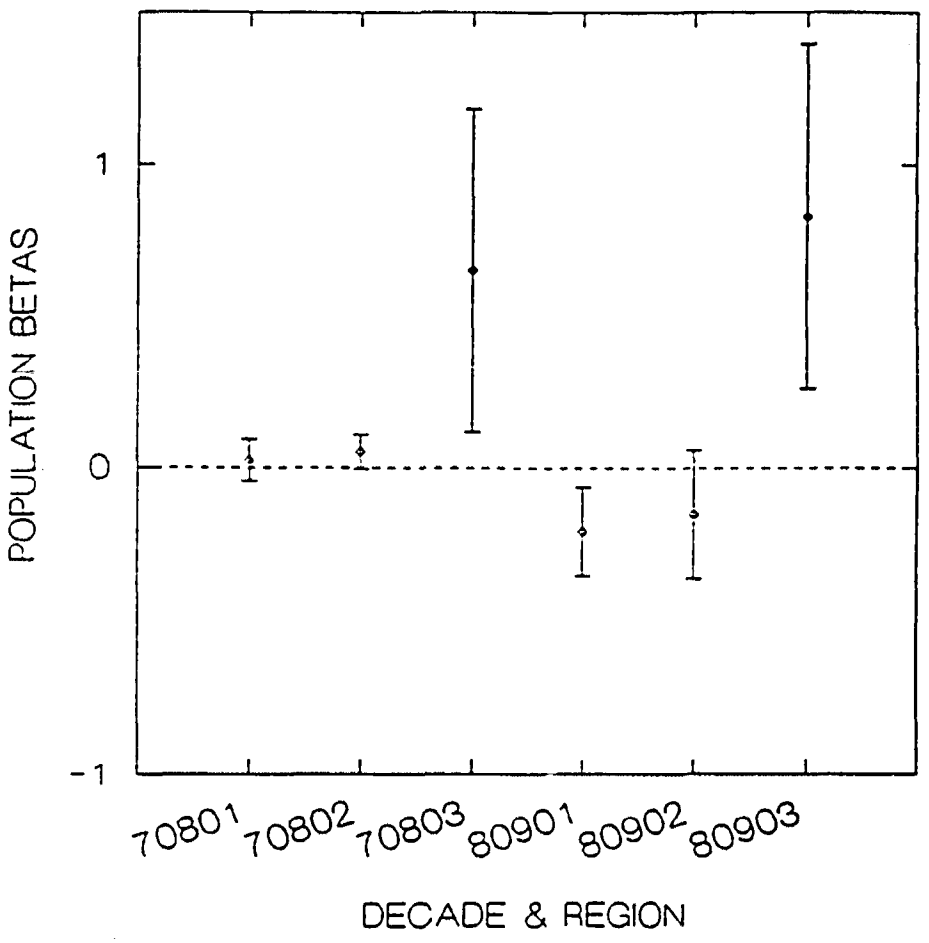

Figure 8: Population Growth By Region

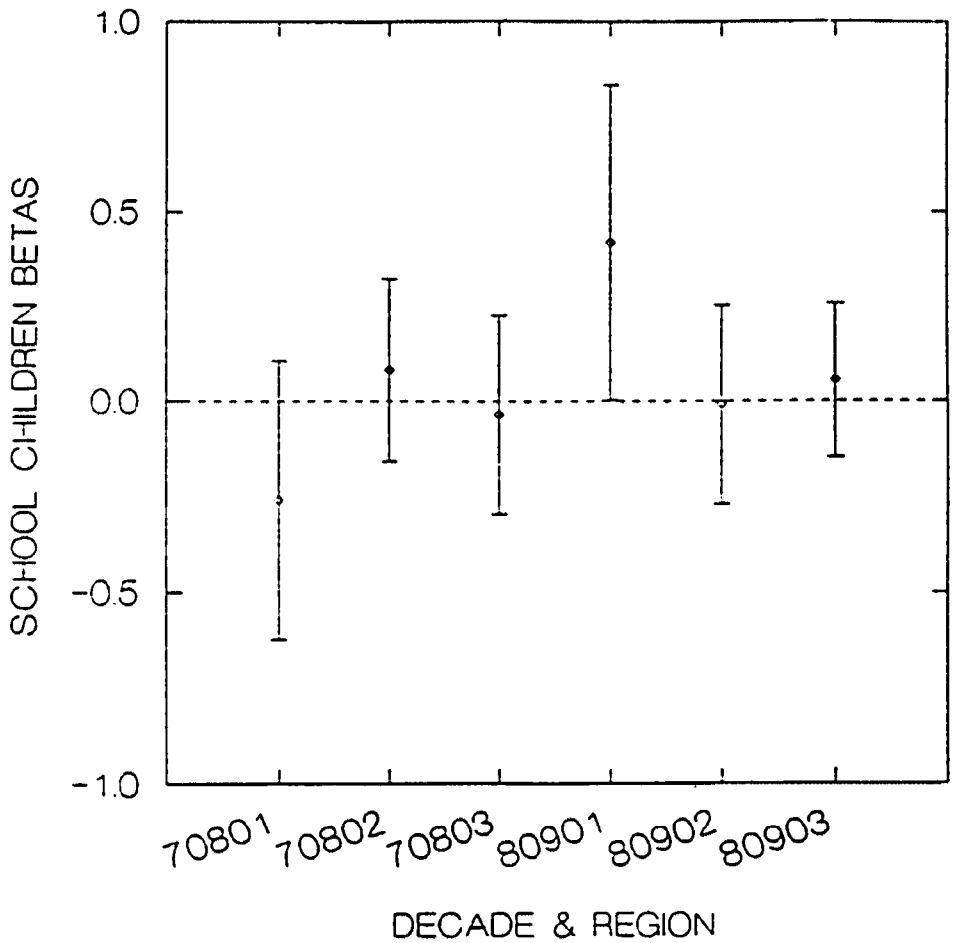

Figure 9: School Children By Region

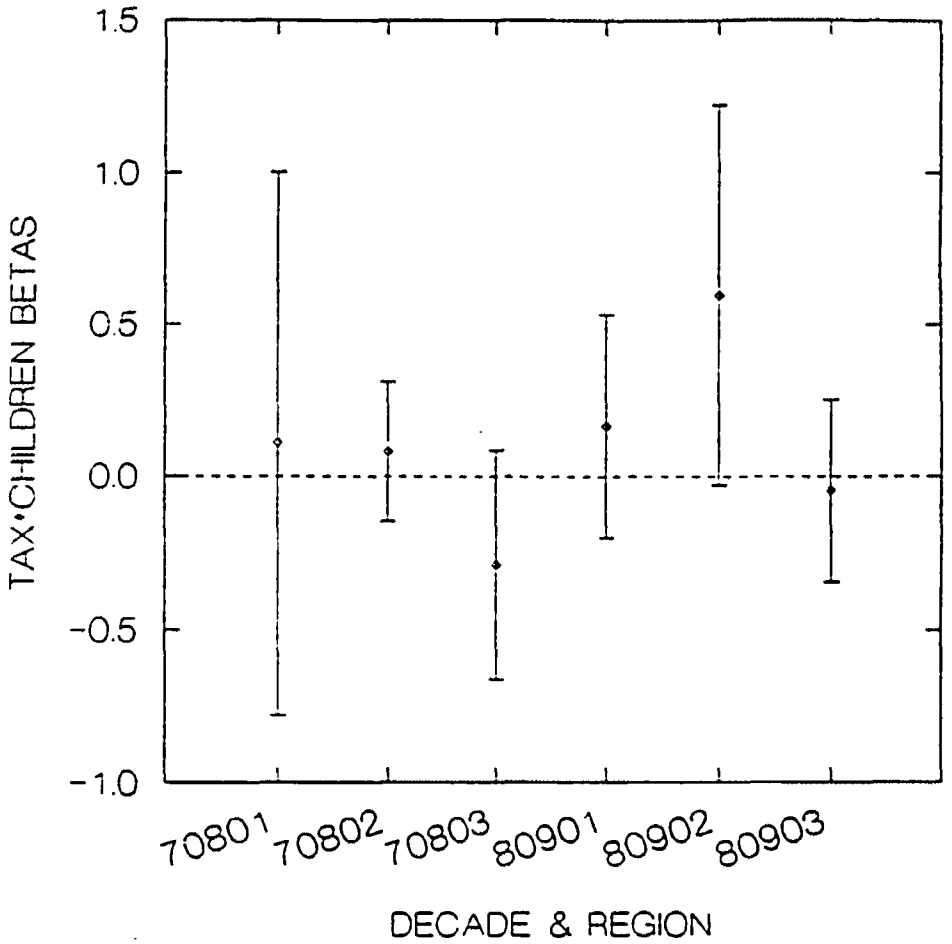

Figure 10: Tax/Children Interaction By Region

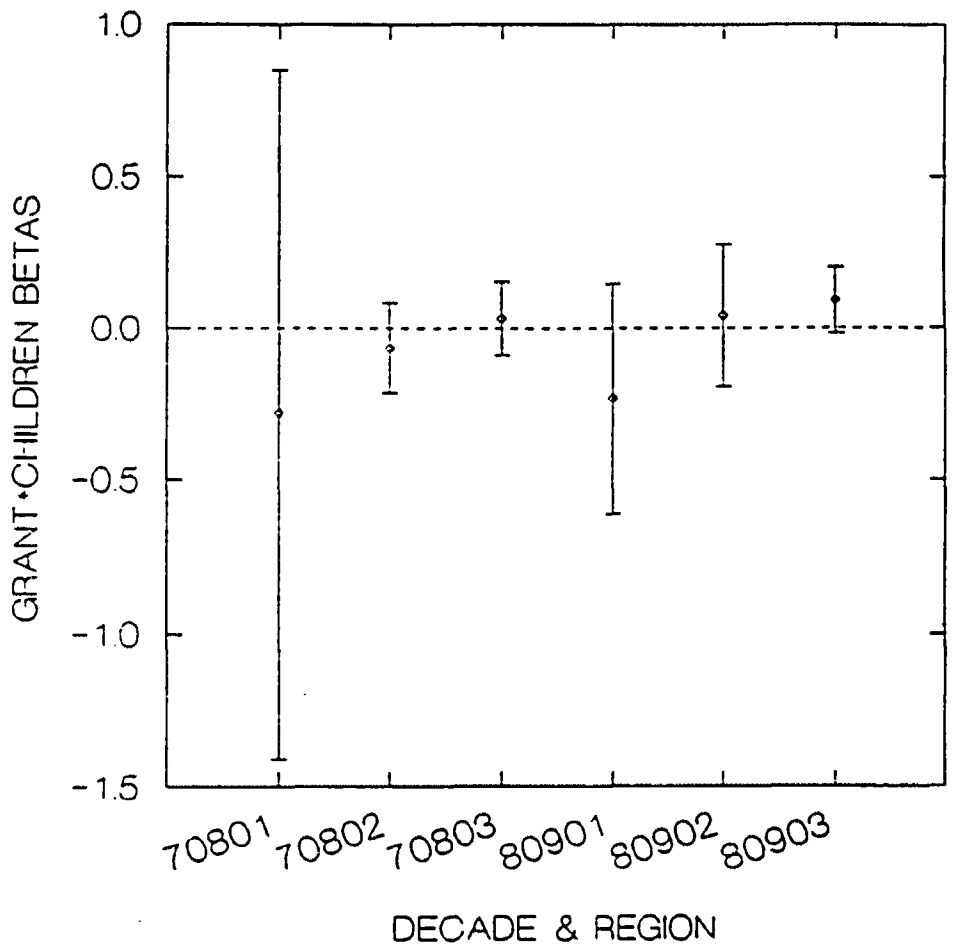

Figure 11: . Grant/Children Interaction By Region

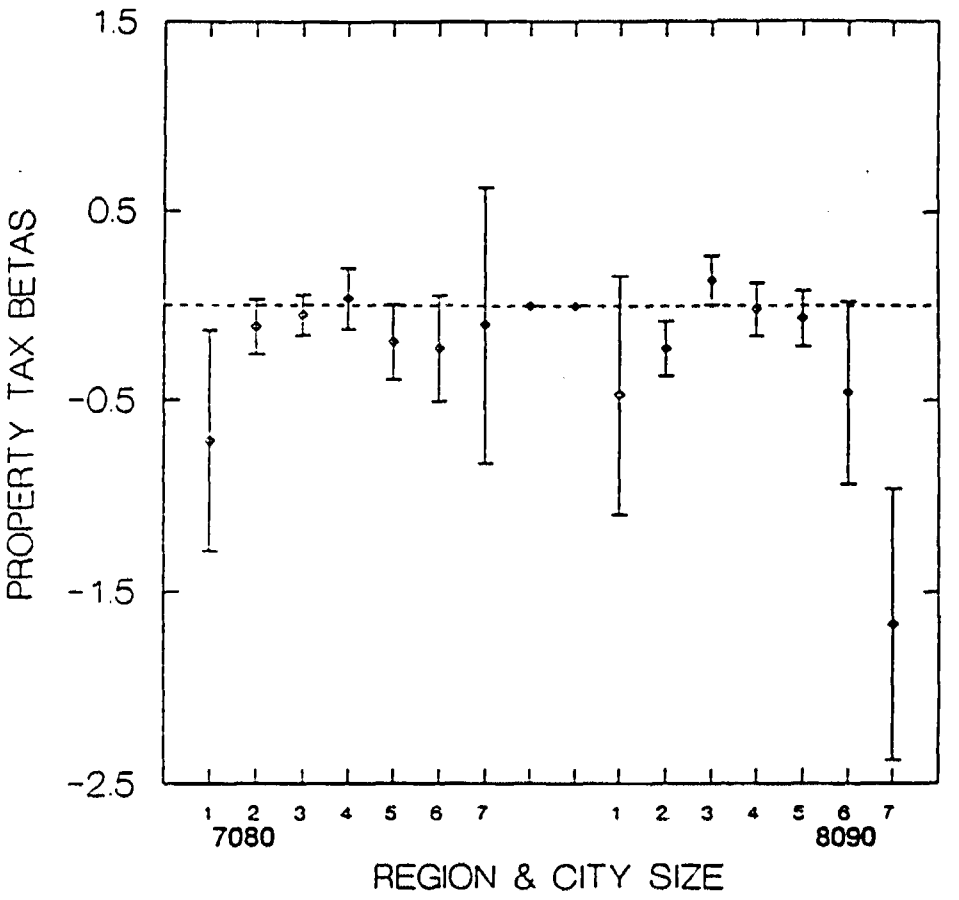

Figure 12: Property Taxes By Region and City Size

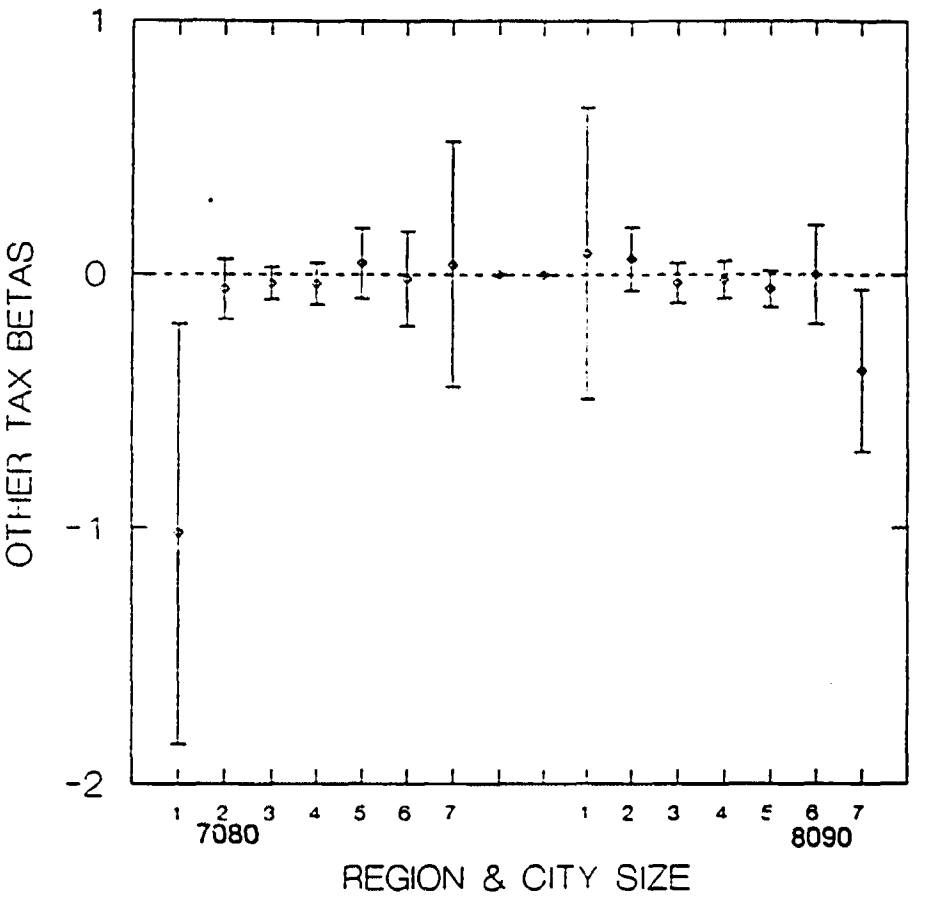

Figure 13: Other Taxes By Region and City Size

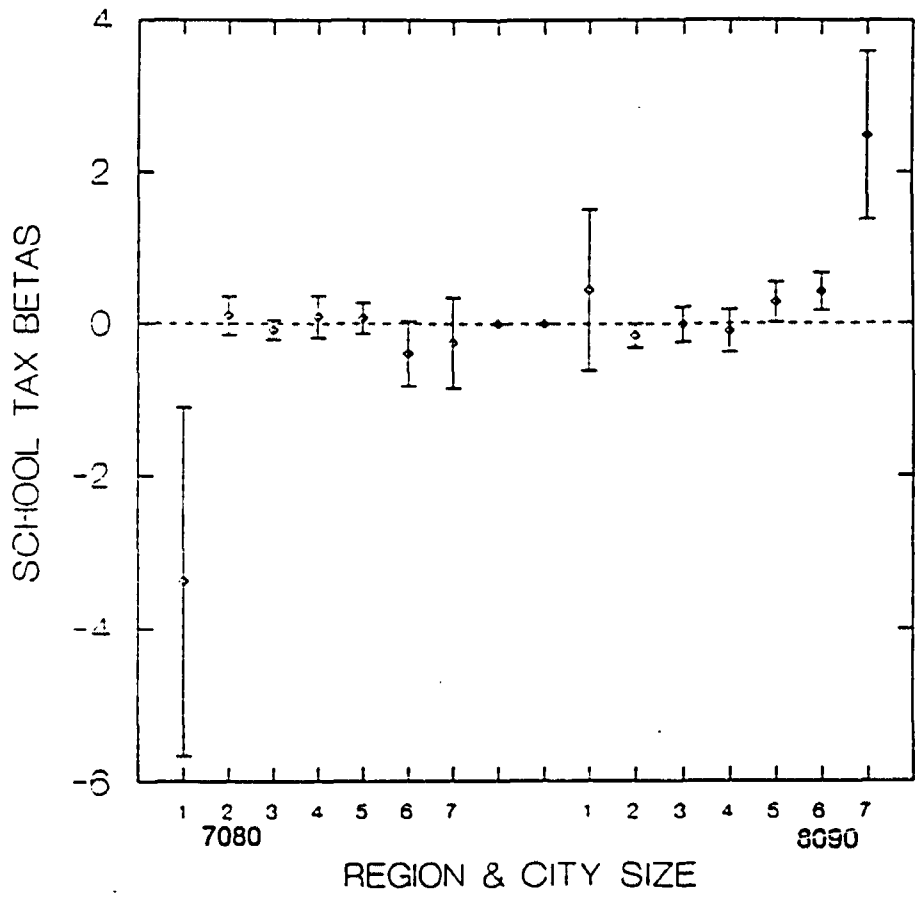

Figure 14: School Taxes By Region and City Size

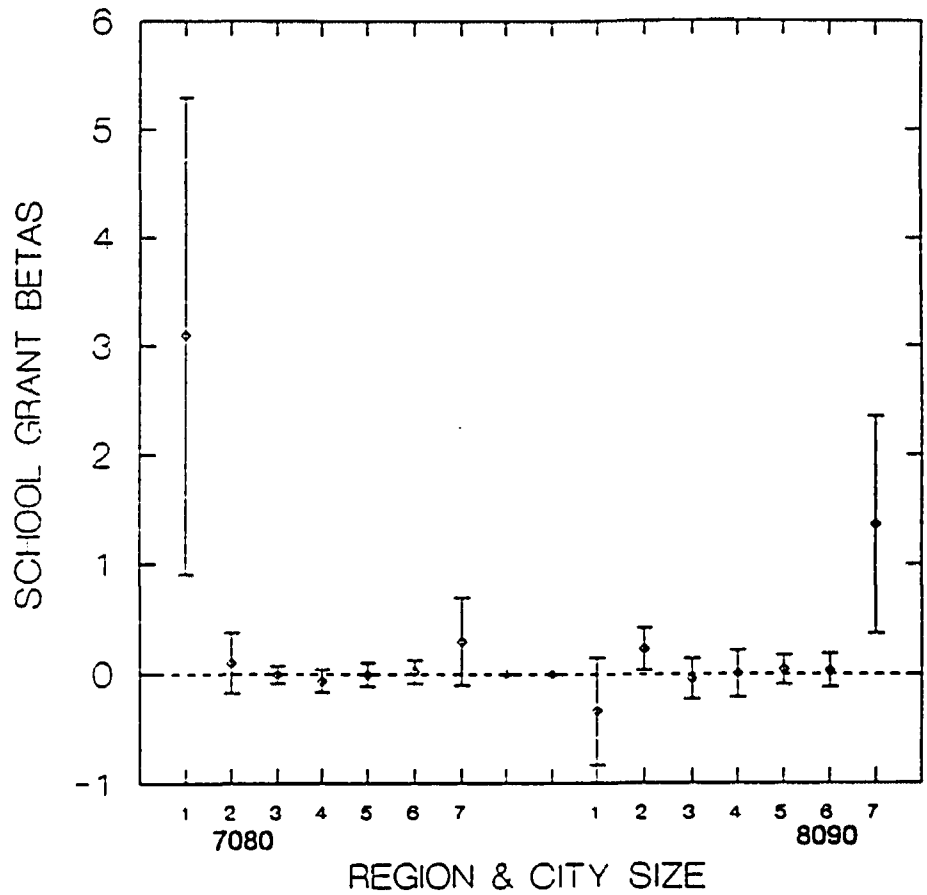

Figure 15: School Grants By Region and City Size

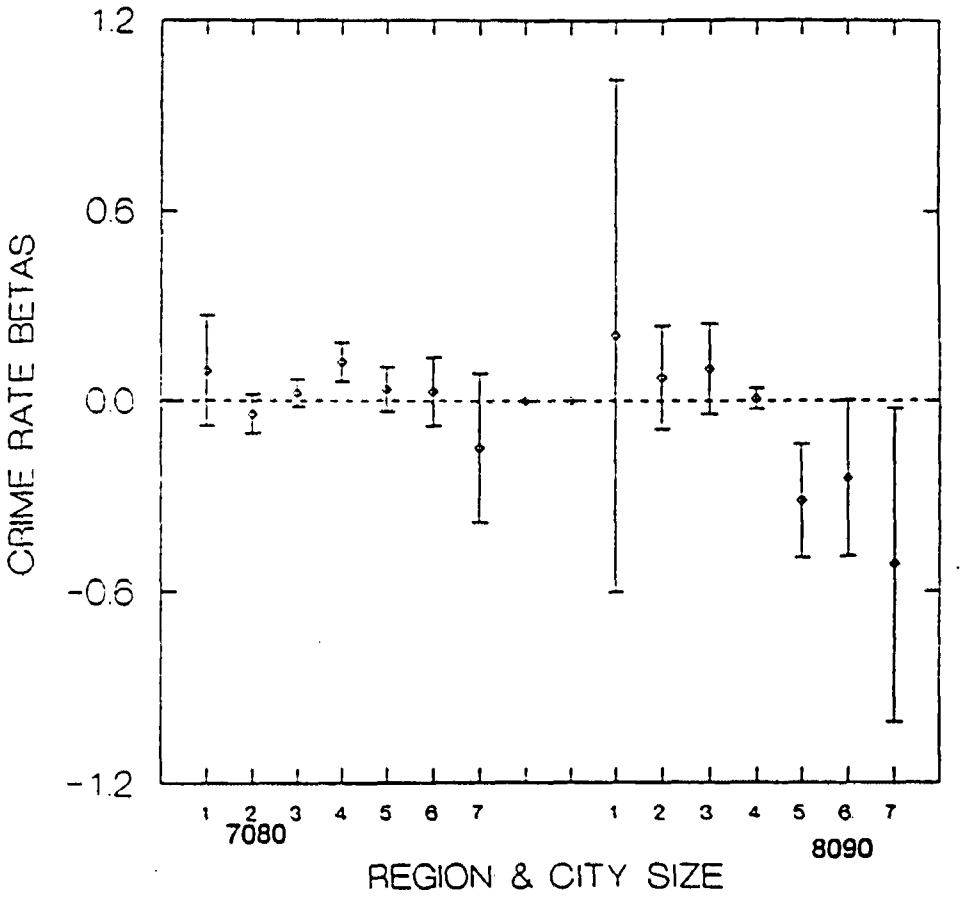

Figure 16: Crime Rate By Region and City Size

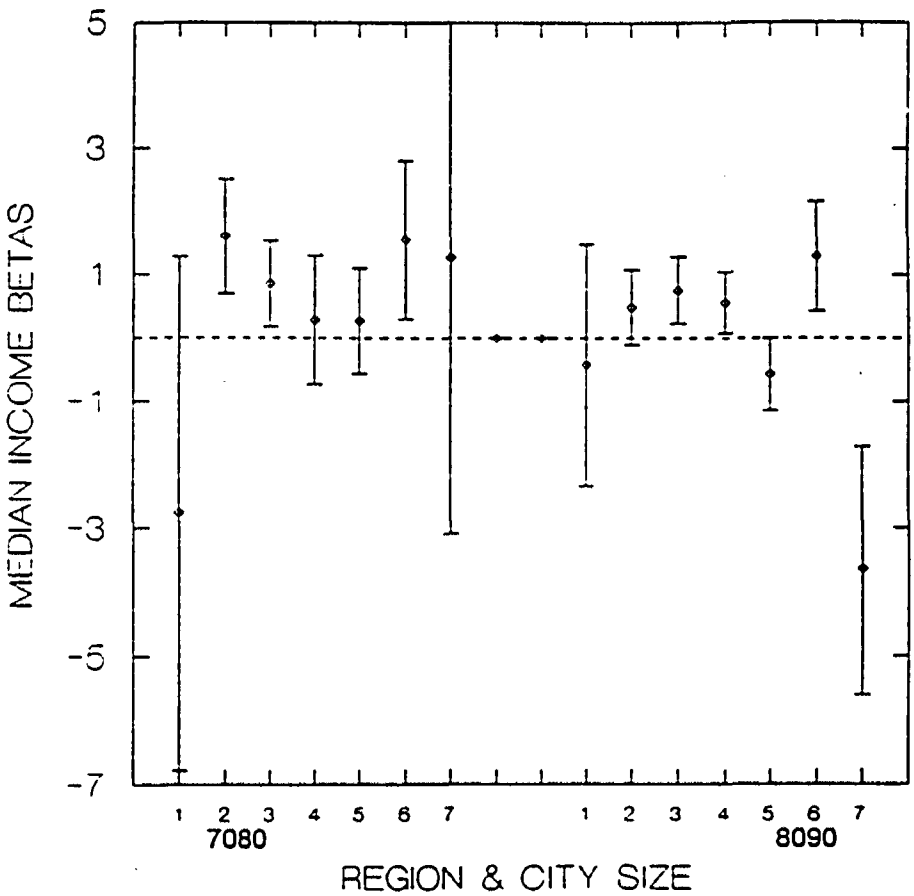

Figure 17: Median Income By Region and City Size

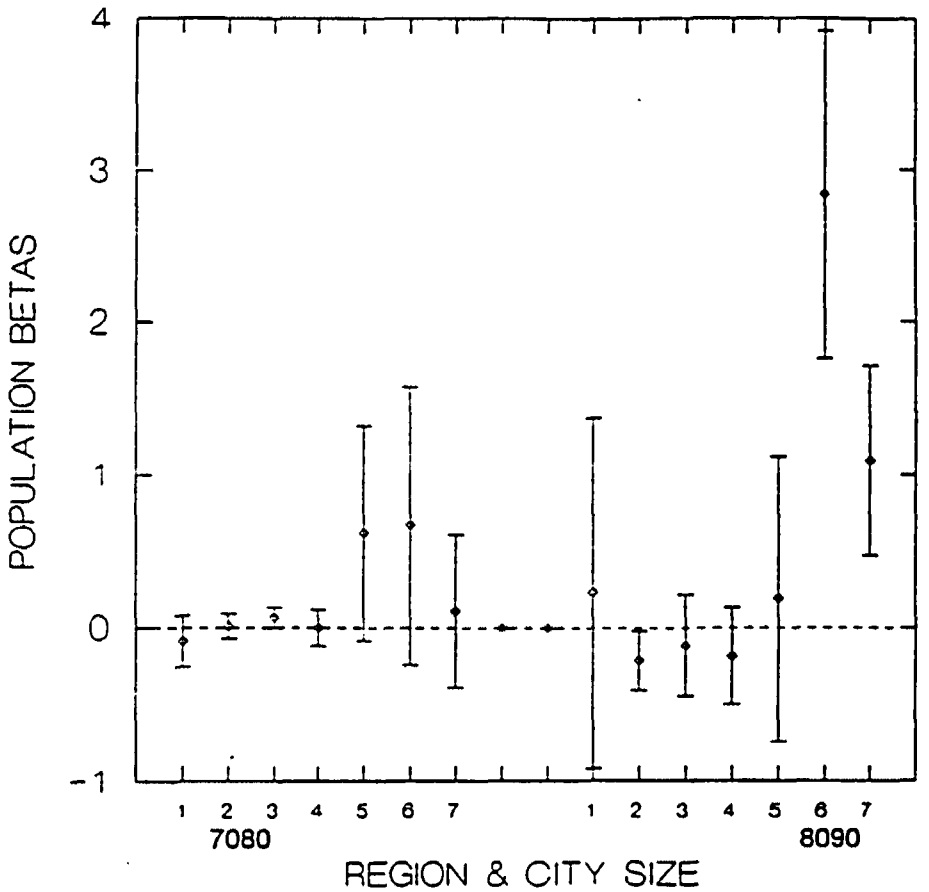

Figure 18: Population Growth By Region and City Size

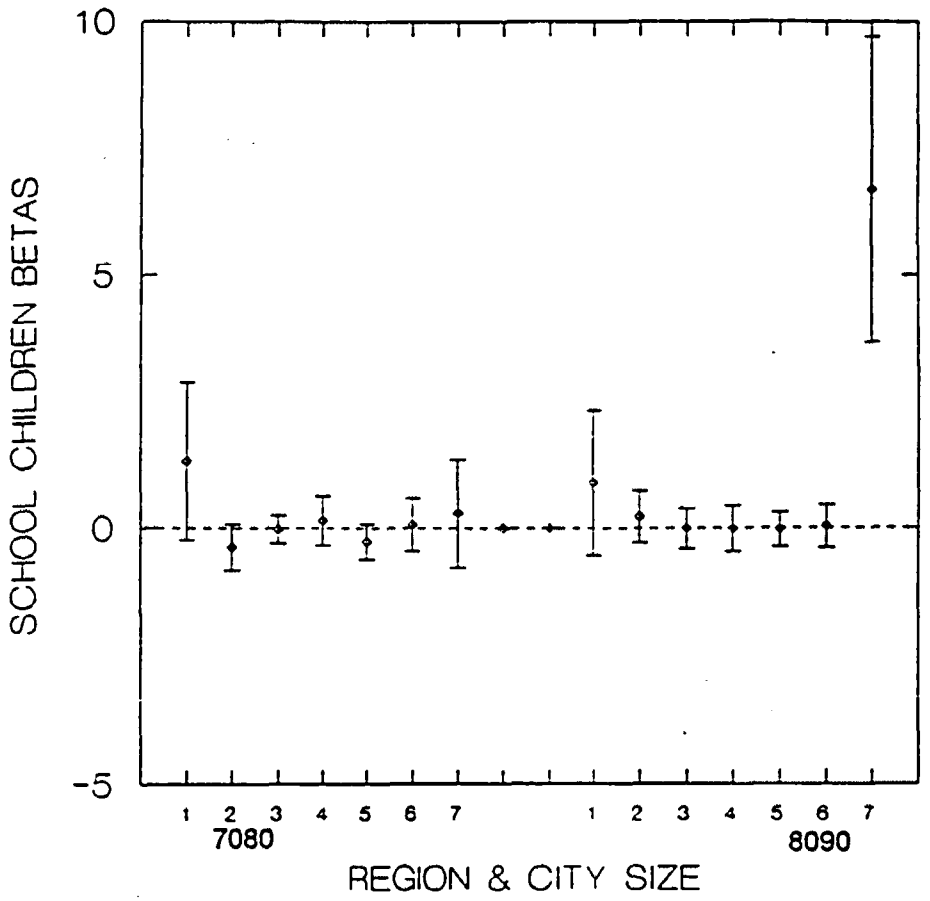

Figure 19: School Children By Region and City Size

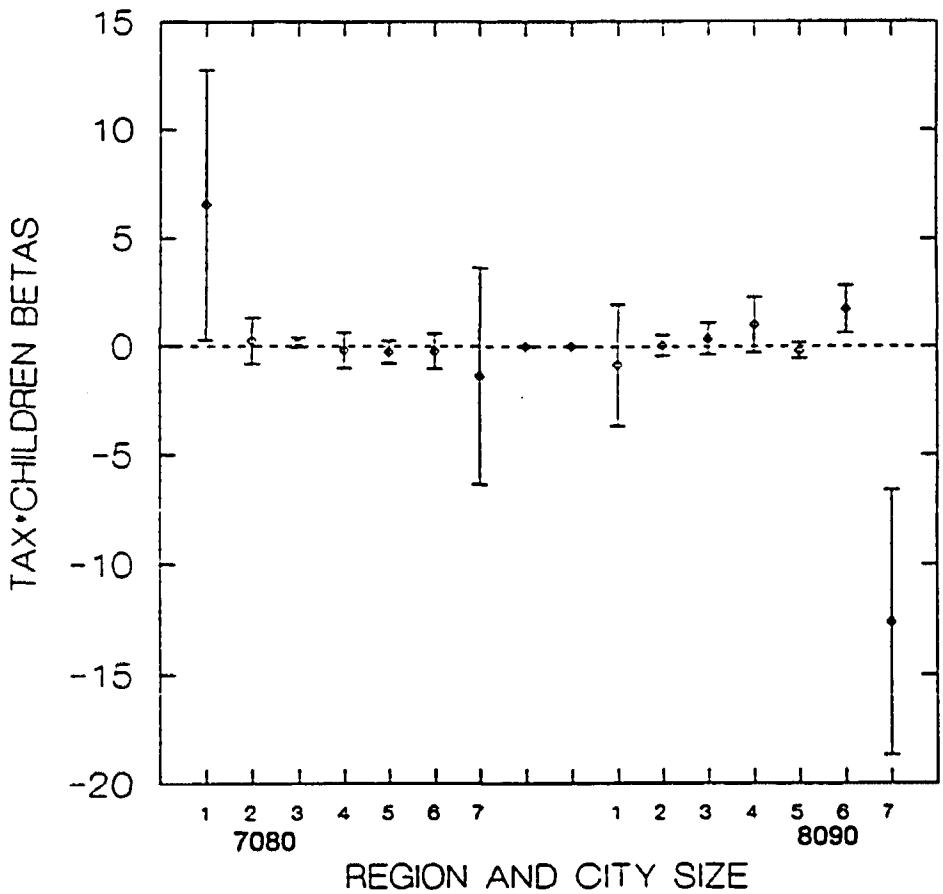

Figure 20: Tax/Children Interaction By Region and City Size

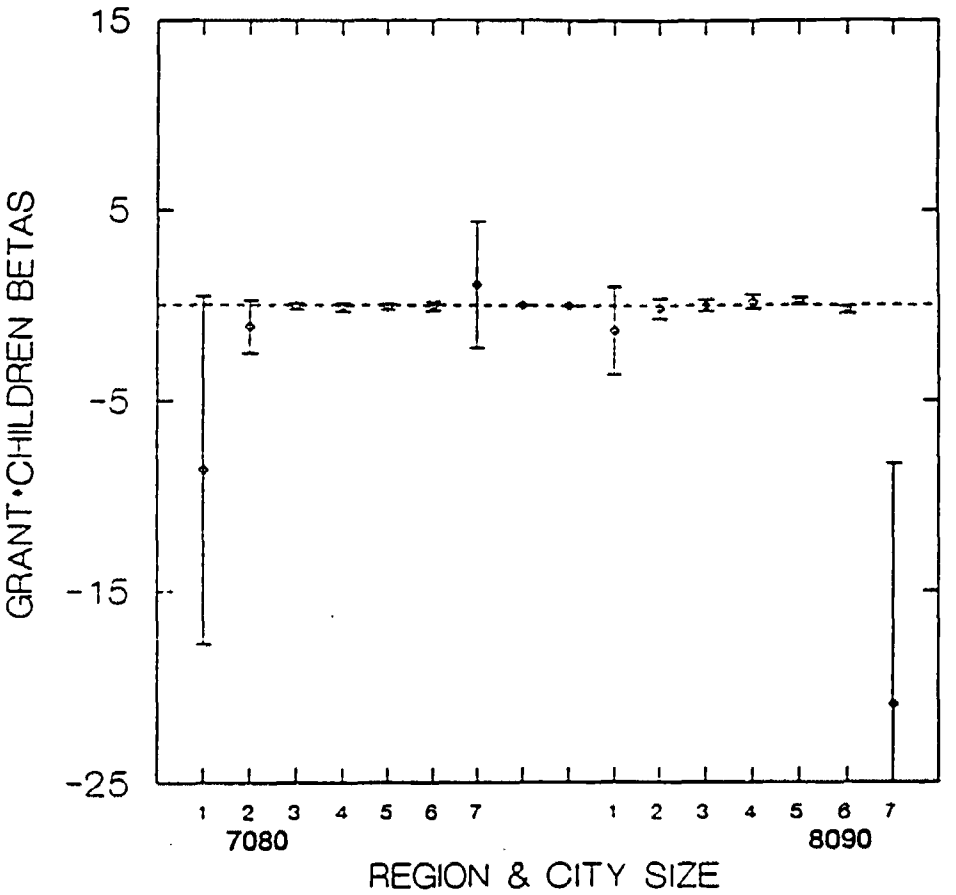

Figure 21: Grant/Children Interaction By Region and City Size

CHAPTER VI

CONCLUSION

Tax policy analysts have speculated about the manner in which taxpayers register their preference for local taxes and public services. Economist Charles Tiebout suggests that taxpaying consumers can choose an ideal tax/goods package by moving to the community that best meets their preference. Competing communities will assemble efficient packages to attract residents to them.

Though multiple jurisdictions are available in most urban areas, a limited supply of communities may hamper citizens' ability to accurately express their inclinations. Tax capitalization theorists opine that Tiebout equilibrium is not necessary for a competitive result. Taxpayers can evaluate a public goods package along with its tax cost by adjusting the price they pay for living in a community. Taxes exceeding the worth of tax-financed local public goods reduce the value of residences within the taxing jurisdiction.

To investigate the extent to which local taxes affect taxpayer behavior, this study addresses two major questions. First, the question of whether people sort themselves into communities based upon their preference for government services and taxes is addressed. Next, the study considers

how changes in the level of various local taxes affect the value of homes in the community.

An analysis examining heterogeniety of citizens' attributes in different cities is rendered to answer the first inquiry. The results indicate that systematic diversity occurs in some citizen characteristics, which makes individual cities unique from their neighbors. Disparities in income and in the extent of the school-age population may denote a demand preference for a particular tax/service package provided by some cities within a group. On the other hand, evidence is much weaker that different cities' inhabitants are demanding and/or actually receiving more school expenditures for a larger child population. The satisfaction of taxpayer demand for schools through migration is questionable.

A regression of median home value on several tax variables furnishes evidence about question two. The regression indicates that all non-education sponsored taxes have a negative association with value. The inverse relationship is especially prominent with property taxes. Conversely, there is no evidence that the effect of all forms of taxes collected by school districts is other than zero. These relationships do not appear to vary with the concentration of school-age children in a community.

However, the relationships are not uniform in all regions of the country or in cities of different sizes.

The findings in this study largely confirm much of the previous research on this issue, while adding detail to the understanding of tax capitalization and extending the results as earlier understood. Coefficients from this study's model are not expressly comparable with those in prior studies. Previous work used cross sectional analyses to calculate capitalization rates for property taxes. Based on a regression of several cities within an area, these models produced a money estimate of the change in property values for every dollar change in taxes within that area.

In this study, the regression utilizes a differencing technique over time. The tax coefficients represent percentage changes in property value during a ten year period as a result of particular percentage changes in taxes over that same time. The relative advantage of the capitalization rate approach is its more straightforward interpretation. The relative advantage of the differencing technique is its superior control over extraneous variation. The two approaches provide benefits distinctive to each method. These distinctions hinder any specific comparison of coefficients, however.

Nevertheless, a general examination of results in this study vis-a-vis previous research does not reveal any

unexpected relationship between values and property taxes. The negative correlation between property taxes and values is significant, but substantial variation in values remains to be explained by other factors. Though a statistical relationship is consistently found, the effect on value of differences in tax levels may be somewhat tenuous, from a practical viewpoint.

This study also provides some new evidence beyond the corroboration of prior property tax capitalization research. First, a variable for taxes other than ad valorem property tax has significant explanatory power. Though not as influential, sales tax, income tax and user fees may also be considered by taxpayers buying a home. In other words, taxes of many kinds may affect economic decisions about valuation.

Further, this study suggests that taxpayers may trace the use of their tax dollars to some extent. Though the evidence is not conclusive, taxes expended on schools may not affect home values in the same manner as other levies.

Thirdly, the findings here strongly indicate that taxes influence valuation decisions differently depending upon the region of the nation and the type of city analyzed. The external validity of all previous work on this issue that scrutinized only limited geographic areas is suspect. This

study supports the notion that tax politics, like all other politics, is indeed local.

Inconsistencies due to regional and population size motivate further research of this topic. Obviously, region and city size are not drivers of value. Rather, the stimuli are characteristics of the regions and the cities of various sizes that distinguish them from others. A search for the regional and size factors that determine the differences is necessary. Empirical tests of these underlying factors will provide valuable insight into the effect of taxes on homeowner behavior.

Data limitations set the stage for other future study. This research uses aggregate data compiled from observations on an entire city. Such data are not ideal for drawing conclusions about individual taxpayer behavior. Community-wide observations also do not permit an analysis of sorting and capitalization within communities, which is the level where much of these phenomena may occur. A data base that includes observations of individual transactions can provide valuable evidence about these issues. Obtaining these data will require the development of data bases that are not readily available.

Further, most data for this study are obtained from census publications. That is, the data are self-reported. Observations of the dependent variable, median value of

homes, are estimations made by homeowners who may not have the expertise to appraise this number accurately. Estimating similar models with other value measures will be helpful to determine the robustness of the reported results.

Another requisite for powerful conclusions, internal validity, is a concern in this study as it is in most archival research. Establishing directional causation is difficult. Though efforts are made to control for extraneous factors, ten years is a lengthy period during which many events may encroach upon the valuation process. Obtaining data for future research that will permit shorter differencing cycles can strengthen the validity of results reported here.

Though future enhancements are certainly possible, this research augments current literature about the sorting and tax capitalization issues. The unique differencing method provides superior control of extrinsic variability and eliminates the need to use more complicated, more controversial estimation techniques. Also, external validity from a rich nationwide data set surpasses that achieved in previous work. Nuances of results from different times and situations are exposed as part of this study. Finally, this research is distinctive because it focuses on the tax policy perspective. Taxes received from various sources and used for assorted purposes are examined

separately to best discern the ways in which taxes and local public goods influence residential property value.

BIBLIOGRAPHY

Anas, Alex, "Hedonic Analysis of a Housing Market in Disequilibrium," Journal of Urban Economics (1984), 15, pp. 87-106.

Bahl, Roy and David L. Sjoquist, "The State and Local Fiscal Outlook: What Have We Learned and Where Are We Headed?" National Tax Journal (1990), pp. 321-342.

Beck, John H., "Nonmonotonic Demand For Municipal Services: Variation Among Communities," National Tax Journal (1984), pp. 55-67.

Bogart, William T., "Observable Heterogeneity and the Demand For Local Public Spending," National Tax Journal (1991), pp. 213-223.

Brigham, Eugene F., "The Determinants of Residential Land Values," Land Economics (1964), 40, pp. 325-334.

Brueckner, Jan K., "Property Values, Local Public Expenditure and Economic Efficiency," Journal of Public Economics (1979), 11, pp. 223-245.

Brueckner, Jan K., "A Test For Allocative Efficiency in the Local Public Sector," Journal of Public Economics (1982), 19, pp. 311-331.

Butler, Richard V., "The Specification of Hedonic Indexes for Urban Housing," Land Economics (1982), 58, pp. 96-108.

Chaudry-Shah, Anwar M., "A Capitalization Approach to Fiscal Incidence at the Local Level," Land Economics (1989), 65, pp. 359-375.

Clotfelter, Charles T., "The Private Life of Public Economics," Proceedings of the Southern Economic Association (1992), pp. 579-596.

Cushing, Brian J., "Capitalization of Interjurisdictional Fiscal Differentials: An Alternative Approach," Journal of Urban Economics (1984), 15, pp. 317-326.

Deacon, Robert T., "Private Choice and Collective Outcomes: Evidence From Public Sector Demand Analysis," National Tax Journal (1977), pp. 371-386.

Demsetz, Harold, "Toward A Theory of Property Rights," American Economic Review (1967), 57, pp. 347-359.

Demsetz, Harold, "The Exchange and Enforcement of Property Rights," Journal of Law and Economics (1964), 7, pp. 11-26.

Dragun, Andrew K., "Externalities, Property Rights, and Power," Journal of Economic Issues (1983), 17, pp. 667-680.

Edel, Matthew and Elliott Sclar, "Taxes, Spending, and Property Values: Supply Adjustment in a Tiebout-Oates Model," Journal of Political Economy (1974), pp.941-955.

Edelstein, Robert, "The Determinants of Value in the Philadelphia Housing Market: A Case Study of the Main Line 1967-1969," The Review of Economics and Statistics (1974), pp. 319-328.

Ellickson, Bryan, "An Alternative Test of the Hedonic Theory of Housing Markets," Journal of Urban Economics (1981), 9, pp. 56-79.

Epple, Dennis and Allan Zelenitz and Michael Visscher, "A Search for Testable Implications of the Tiebout Hypothesis," Journal of Political Economy (1978), 86 pp. 405-425.

Fox, William F., "Tax Structure and the Location of Economic Activity Along State Borders," National Tax Journal (1986), pp. 387-401.

Gold, Steven D., "Changes in State Government Finances in the 1980's," National Tax Journal (1991), pp. 1-19.

Goldberg, Kalman and Robert C. Scott, "Intrametropolitan Fiscal Relations: Special Taxing Districts," Journal of Urban Economics (1986), 20, pp. 341-355.

Gramlich, Edward M., and Daniel L. Rubinfeld, "Micro Estimates of Public Spending Demand Functions and Tests of the Tiebout and Median-Voter Hypotheses," Journal of Political Economy (1982), 90, pp. 536-560.

Greenwood, Michael J. and Gary L. Hunt, "Jobs Versus Amenities in the Analysis of Metropolitan Migration," Journal of Urban Economics (1989), 25, pp. 1-16.

Hamilton, Bruce W., "Capitalization of Intrajurisdictional Differences in Local Tax Prices," American Economic Review (1976), 86, pp. 743-753.

Hamilton, Bruce W., "The Effects of Property Taxes and Local Public Spending on Property Values: A Theoretical Comment," Journal of Political Economy (1976), 84, pp. 647-650.

Helms, L. Jay, "The Effect of State and Local Taxes on Economic Growth: A Time Series-Cross Section Approach," The Review of Economics and Statistics (1985), pp. 574-582.

Herzog, Henry W. and Alan M. Schlottmann, "State and Local Tax Deductibility and Metropolitan Migration," National Tax Journal (1986), pp. 189-200.

Hewett, Roger S. and Susan C. Stephenson, "State Tax Revenues Under Competition," National Tax Journal (1983), pp. 95-101.

Holcombe, Randall G., "Concepts of Public Sector Equilibrium," National Tax Journal (1980), pp. 77-88.

Holtz-Eakin, Douglas and Harvey Rosen, "Federal Deductibility and Local Property Tax Rates," Journal of Urban Economics (1990), 27, pp. 269-284.

Ihlanfeldt, Keith and Jrge Martinez-Vazquez, "Alternative Value Estimates of Owner-Occupied Housing: Evidence on Sample Selection Bias and Systematic Errors," Journal of Urban Economics (1986), 20, pp. 356-369.

Izraeli, Oded, "The Effect of Environmental Attributes on Earnings and Housing Values Across SMSAs," Journal of Urban Economics (1987), 22, pp. 361-376.

Johnson, Michael S. and Michael J. Lea, "Differential Capitalization of Local Public Service Characteristics," Land Economics (1982), 22, pp. 189-203.

King, A. Thomas, "Estimating Property Tax Capitalization: A Critical Comment," Journal of Political Economy (1977), 85, pp. 425-431.

Krantz, Diane P. and Robert Weaver and Theodore Alter, "Residential Property Tax Capitalization: Consistent Estimates Using Micro-Level Data," Land Economics (1982), 58, pp. 488-496.

Krantz, Diane P. and Robert Weaver and Theodore Alter, "Residential Property Tax Capitalization: Consistent Estimates Using Micro-Level Data," Land Economics (1982), 58, pp. 488-496.

Ladd, Helen F. and Katharine Bradbury, "City Taxes and Property Tax Bases," National Tax Journal (1988), pp. 503-523.

Lankford, R. Hamilton, "Efficiency and Equity in the Provision of Public Education," The Review of Economics and Statistics (1984), pp. 70-80.

Lea, Michael J., "Local Tax and Expenditure Capitalization: Integrating Evidence From the Market and Political Processes," Public Finance Quarterly (1982), 10, pp. 95-117.

Levin, Sharon G., "Capitalization of Local Fiscal Differentials: Inferences From a Disequilibrium Market Model," Journal of Urban Economics (1982), 11, pp. 180-189.

Lewis, W. Cris and Paul J. McNutt, "The Incidence of Property Taxes On Single-Family Housing," Journal of American Real Estate and Urban Economics Association, Fall 1979, pp. 344-361.

Linneman, Peter, "The Capitalization of Local Taxes: A Note on Specification," Journal of Political Economy (1978), 86, pp. 535-538.

Loehman, Edna and Robert Emerson, "A Simultaneous Equation Model of Local Government Expenditure Decisions," Land Economics (1985), 61, pp. 419-430.

Marshall, Alfred, Principles of Economics (8th ed.), Riverside, NJ: The Macmillan Company (1920).

McDougall, Gerald S., "Local Public Goods and Residential Property Values: Some Insights and Extensions," National Tax Journal (1976), pp. 436-447.

Meadows, George Richard, "Taxes, Spending, and Property Values: A Comment and Further Results," Journal of Political Economy (1976), 84, pp. 869-880.

Mincer, Jacob, "Family Migration Decisions," Journal of Political Economy (1978), 86, pp. 749-773.

Oates, Wallace E., "The Effects of Property Taxes and Local Public Spending on Property Values: A Reply and Yet Further Results," Journal of Political Economy (1973), 81, pp. 1004-1008.

Oates, Wallace E., "On Local Finance and the Tiebout Model," American Economic Review Papers and Proceedings (May 1981), pp. 93-103.

Pack, Howard, and Janet Pack, "Metropolitan Fragmentation and Local Public Expenditures," National Tax Journal (1977), pp. 349-362.

Pogodzinski, J. M., "Amenities in an Urban General Equilibrium Model," Journal of Urban Economics (1988), 24, pp. 260-278.

Polinsky, A. Mitchell and David Ellwood, "An Empirical Reconciliation of Micro and Grouped Estimates of the Demand For Housing," The Review of Economics and Statistics (1978), pp. 199-205.

Pollankowski, Henry O., "The Effects of Property Taxes and Local Public Spending on Property Values: A Comment and Further Results," Journal of Political Economy (1973), 81, pp. 994-1003.

Preston, Anne E. and Casey Ichniowski, "A National Perspective on the Nature and Effects of the Local Property Tax Revolt, 1976-1986," National Tax Journal (1991), pp. 123-145.

Reinhard, Raymond M., "Estimating Property Tax Capitalization: A Further Comment," Journal of Political Economy (1981), 91, pp. 1251-1260.

Reschovsky, Andrew, "Residential Choice and the Local Public Sector: An Alternative Test of the Tiebout Hypothesis," Journal of Urban Economics (1979), 6, pp. 501-520.

Rosen, Harvey S. and David Fullerton, "A Note on Local Tax Rates, Public Benefit Levels, and Property Values," Journal of Political Economy (1977), 85, pp. 433-440.

Rosen, Kenneth T., "The Impact of Proposition 13 on House Prices in Northern California: A Test of the Interjurisdictional Capitalization Hypothesis," Journal of Political Economy (1982), 90, pp. 191-200.

Rosen, Harvey S. and David Fullerton, "A Note on Local Tax Rates, Public Benefit Levels, and Property Values," Journal of Political Economy (1977), 85, pp. 433-440.

Rosen, Kenneth T., "The Impact of Proposition 13 on House Prices in Northern California: A Test of the Inter-jurisdictional Capitalization Hypothesis," Journal of Political Economy (1982), 90, pp. 191-200.

Rosen, Sherwin, "Hedonic Prices and Implicit Markets: Product Differentiation in Pure Competition," Journal of Political Economy (1973), 81, pp. 34-55.

Samuelson, Paul A., "The Pure Theory of Public Expenditure," The Review of Economics and Statistics (1954), pp. 387-389.

Samuelson, Paul A., "Diagrammatic Exposition of a Theory of Public Expenditure," The Review of Economics and Statistics (1956), pp. 350-356.

Sjoquist, David L., "The Effect of the Number of Local Governments on Central City Expenditures," National Tax Journal (1981), pp. 79-87.

Sonstelie, Jon C. and Paul Portney, "Profit Maximizing Communities and the Theory of Local Public Expenditures," Journal of Urban Economics (1978), 5, pp. 263-277.

Starrett, David A., "Land Value Capitalization in Local Public Finance," Journal of Political Economy (1981), 89, pp. 306-327.

Stein, Robert M., "Tiebout's Sorting Hypothesis," Urban Affairs Quarterly (1987), 23, pp. 140-160.

Stephenson, Susan C. and Roger Hewett, "Strategies For States in Fiscal Competition," National Tax Journal (1984), pp. 219-226.

Stull, William J. and Judith Stull, "Capitalization of Local Income Taxes," Journal of Urban Economics (1991), 29, pp. 182-190.

Tiebout, Charles M., "A Pure Theory of Local Expenditures," Journal of Political Economy (1956), 64, pp. 416-424.

United States Department of Commerce, Bureau of the Census Annual Survey of Governments. Washington, D.C.: Government Printing Office. Various issues.

United States Department of Commerce, Bureau of the Census Census of Governments. Washington, D.C.: Government Printing Office. Various issues.

United States Department of Commerce, Bureau of the Census Census of Housing. Washington, D.C.: Government Printing Office. Various issues.

United States Department of Commerce, Bureau of the Census Census of Population. Washington, D.C.: Government Printing Office. Various issues.

United States Department of Commerce, Bureau of Labor Statistics Consumer Price Index Detailed Report. Washington, D.C.: Government Printing Office. Various issues.

United States Department of Justice, Federal Bureau of Investigation Uniform Crime Reports. Washington, D.C.: Government Printing Office. Various issues.

Walsh, Michael J. and Jonathan Jones, "More Evidence on the 'Border Tax' Effect: The Case of West Virginia, 1979-84," National Tax Journal (1988), pp. 261-265.

Yinger, John, "Capitalization and the Theory of Local Public Finance," Journal of Political Economy (1982), 90, pp. 917-943.

Yinger, John and Howard Bloom and Axel Borsch-Supan and Helen Ladd, Property Taxes and House Values. San Diego, CA: Academic Press, San Diego, CA (1988).

Zodrow, George R., Local Provision of Public Services: The Tiebout Model After Twenty-Five Years. San Diego, CA: Academic Press, San Diego, CA (1983).

Zorn, Peter M., "Capitalization, Population Movement, and the Local Public Sector: A Probabilistic Analysis," Journal of Urban Economics (1985), 17, pp. 189-207.