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Capitalization Effects of Property Tax Differentials

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CAPITALIZATION EFFECTS OF PROPERTY TAX DIFFERENTIALS

by

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Paul McNutt

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ABSTRACT

Capitalization Effect Due to Property

Tax Differentials

by

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The capitalization effect of property tax differentials for the four market quarters in 1976 was studied in the Logan, Utah market area. A secondary aspect of the study was to assess the variations in the assessed to market value ratio.

107 observed sales were used for the data set. Age of structure, square feet in structure, quality of neighborhood, and property tax were noted for each property sold.

From the regression analysis it was found that there was a significant capitalization of the tax differentials. The results indicate that a one-percent change in the property tax will result in a 0.4 percent change in property value. Also observed was the assessed to market value ratio. Results indicate that the actual ratio is about 12.5 percent not 20 percent, as is required by state law. The range in the ratio was from about 4 percent to 20 percent.

(71 pages)

INTRODUCTION

Review of the Property Tax

The property tax, yielding over $47 billion in 1973, maintains its position as the major source of revenue for most local governments. Property taxation is not used by the federal government, and the few states that have such a tax do not depend on it heavily. It is estimated that more than 82,000 local governments rely at least partially on the property tax. Each of these localities has its own distinct tax base and tax rate.[1]

The property tax generally applies to real property which includes land and buildings and, in most states, machinery and business inventories. In most cases, it does not include tangible personal property (except for machinery and inventory) or intangible personal property.

Table 1 shows the change from 1956 to 1973 in assessed value and also the heavy reliance on real property. Reliance on personal property dropped from 18.7 percent to 13.4 percent during that 17-year span, while dependence on real property rose from 81.3 percent to 86.6 percent. In four states, Hawaii, Delaware, Pennsylvania, and New York, tangible personal property are exempt from the property tax. The most important part of the personal property tax is the commercial and industrial

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[1]The tax base is the percent of market value that is taxed (or the assessed value). The tax rate is the percent of the base taken for taxes (or the mill levy).

property tax. This property includes machinery, equipment, and inventory. As of 1973, 47 states had legal provisions to tax such property. Intangible personal property is taxed in only 15 states, and the portion of total assessed personal property in these states is insignificantly small.

TABLE 1.--Assessed Value by Property Type, 1956 and 1973

Type of Property	Assessed Value[a] (Billions) 1956	1973	Percentage Of Total 1956	1973
Real[b]	209.8	704.6	81.3	86.6
Personal[c]	48.3	108.7	18.7	13.4
TOTAL	258.0	813.2	100.0	100.0

[a]The value before exemptions.

[b]The most important category is residential (nonfarm) property.

[c]The most important category is commercial and industrial tangible property.

Source: Maxwell and Aronson, 1977, p. 143.

Table 2 provides a more detailed breakdown of real and personal local property tax collections for 1972. Nonfarm residential real estate paid the largest share, over 19 billion, which was 47.3 percent of total revenues collected.

The amount of revenue collected by different state and local government differs from state to state, also from one locality to the next.

TABLE 2.--Estimated Local Property Tax Collections by Source, 1972

Source	Amount (millions)	Percentage Distribution
NONBUSINESS		
Nonfarm residential realty[a]	$19,023	47.3
Farm realty	817	2.0
Vacant lots	320	0.8
TOTAL nonbusiness realty	$20,160	50.1
Nonfarm personalty	657	1.6
Farm personalty	113	0.3
TOTAL nonbusiness personalty	$770	1.9
TOTAL NONBUSINESS	$20,930	52.1
BUSINESS		
Farm realty	$1,860	4.6
Vacant lots	480	1.2
Other realty	9,170	22.8
TOTAL business realty	$11,510	28.6
Farm personalty	454	1.1
Other personalty	4,287	10.1
TOTAL business personalty	$4,741	11.8
Public utilities	$3,019	7.5
TOTAL BUSINESS	$19,270	47.9
TOTAL	$40,200[b]	100.0

[a]Includes both single-family dwelling units and apartments. An estimated $14 billion, or 36 percent of all local property taxes, was derived from single-family houses; about $5 billion or 12 percent of property tax revenue came from multifamily units.

[b]This is the estimated grand total for local property tax receipts. In addition, there is an estimated $1.3 billion in state property taxes. The data needed for a similar distribution of state receipts are not available.

Source: Harriss, 1974, p. 15.

For example, the highest percentages of total revenues collected from the property tax are in New Hampshire, New Jersey, and South Dakota with 58, 56, and 54 percent, respectively. At the opposite extreme Alabama only derives 14 percent of state and local revenues from the property tax. Table 3 shows, by states, the property tax per capita, per $1,000 of personal income, and as a percent of state and local taxes.

Not only do total taxes and taxes per capita vary among states, but also the ratio of assessed value to market value also differs from state to state. Table 4 gives the number of states that have assessment to market value ratios in a given category.[2] For the most recent year listed, 1971, five of the states had assessments as nine percent or less of the market value. At the opposite extreme, three states had assessments that were greater than 70 percent of the market value. The national average in 1971 was 32.7 percent compared to 32.8 percent in 1966 and 30 percent in 1956. Assessment to market value ratios for each state are given in Table 5.

Table 6 brings out another important variation between state and local uses of the property tax. Inequalities are created within and between communities due to the nonuniformity in the assessed to market value ratios. The intra-area dispersion describes the variation within a community. The interarea dispersion describes the variation between communities in the assessment to market value ratio. A low coefficient

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[2]This ratio is simply the assessed value divided by the selling price. For example, if a property has a market value of $50,000 and has an assessed value of $10,000, the assessment to sales ratio would be 20 percent.

TABLE 3.--State and Local Property Tax Collections by State, Fiscal Year 1972

State	Property Taxes Per Capita	Property Taxes Per $1,000 of Personal Income	Property Taxes as Percent of State-Local Taxes
U. S. Average	$202	$49	39
Alabama	43	14	14
Alaska	107	23	23
Arizona	196	52	39
Arkansas	75	25	24
California	327	71	48
Colorado	204	51	41
Connecticut	308	62	49
Delaware	99	21	17
Florida	143	38	33
Georgia	120	34	31
Hawaii	121	27	19
Idaho	142	43	35
Illinois	237	50	41
Indiana	220	55	50
Iowa	229	59	46
Kansas	225	54	49
Kentucky	74	23	21
Louisiana	77	24	18
Maine	204	61	43
Maryland	175	39	32
Massachusetts	324	71	51
Michigan	223	51	39
Minnesota	232	58	40
Mississippi	78	28	23
Missouri	158	40	37
Montana	257	72	50
Nebraska	228	57	50
Nevada	210	45	35
New Hampshire	248	66	58
New Jersey	310	65	56
New Mexico	86	27	21
New York	290	58	37
North Carolina	94	28	25
North Dakota	177	50	41
Ohio	180	43	43
Oklahoma	100	29	27
Oregon	223	57	48
Pennsylvania	145	35	28
Rhode Island	201	49	39
South Carolina	79	25	23
South Dakota	248	73	54
Tennessee	94	29	27
Texas	147	40	38
Utah	149	44	35
Vermont	215	60	38
Virginia	118	31	28
Washington	193	47	36
West Virginia	82	25	21
Wisconsin	258	67	43
Wyoming	252	65	49
District of Columbia	189	32	31

Source: Harriss, 1974, p. 13.

TABLE 4.--Distribution of States by Ratios of Assessed Value to Sales Price of Real Property, 1956, 1966, and 1971

Assessments as a Percentage of Sales	Number of States		
	1956	1966	1971
0-9	2	1	5
10-19	16	17	11
20-29	16	10	9
30-39	4	7	10
40-49	7	6[a]	8[a]
50-59	2	6	4
60-69	1	2	1
Over 70	0	2	3
Average Percentage	30.0	32.8	32.7

[a]Includes the District of Columbia.

Source: Maxwell and Aronson, 1977, p. 146.

TABLE 5.--Percentage of Assessed Value to Sales Price of Sold Properties, Single-Family Nonfarm Houses, Selected States, 1971

State	Ratio (percent)
United States:	
Mean	34.0
Median	32.6
Oregon	87.1
Kentucky	83.8
New Jersey	58.3
Massachusetts	49.3
District of Columbia	47.5
Wisconsin	46.7
Michigan	41.5
Illinois	37.8
Ohio	36.9
Washington	36.1
Virginia	34.8
Tennessee	32.6
Pennsylvania	26.6
New York	25.8
Indiana	23.5
Colorado	20.7
California	20.0
Oklahoma	18.2
Texas	18.0
North Dakota	15.1
Louisiana	13.1
Minnesota	8.5
South Carolina	4.0

Source: Harriss, 1974, p. 28.

TABLE 6.--Assessment Uniformity, Single-Family Nonfarm Houses, Selected States, 1971

Composite Coefficient of Intra-Area Dispersion		Coefficient of Interarea Dispersion	
State	Percent	State	Percent
United States-Median	22.5	United States-Median	14
Kentucky	12.5	Utah	4
Michigan	14.6	Iowa	5
New Hampshire	15.0	Maryland	5
California	15.7	Oregon	5
Oregon	16.5	California	8
New Jersey	16.9	Ohio	8
Hawaii	17.2	Kentucky	9
Florida	18.1	Colorado	10
Massachusetts	18.2	Illinois	10
Ohio	19.5	Michigan	11
Vermont	21.2	Kansas	13
Tennessee	21.4	Delaware	14
Minnesota	22.2	Minnesota	14
North Carolina	22.5	Connecticut	16
Illinois	23.0	Missouri	17
Indiana	23.1	New Jersey	21
Georgia	23.6	Washington	21
Washington	23.9	North Carolina	22
Arizona	24.7	Maine	24
Louisiana	25.1	Wisconsin	24
Texas	25.7	South Carolina	25
West Virginia	25.7	Alabama	26
Missouri	26.5	Pennsylvania	26
New York	26.8	New York	32
South Carolina	27.9	Mississippi	33
Alabama	28.1	Massachusetts	40
Pennsylvania	30.0	Louisiana	42

Source: Harriss, 1974, p. 30.

indicates relative uniformity within or between communities. For the selected states listed, Utah had the lowest coefficient of interarea dispersion; the coefficient was only four compared to the United States' median of 14. The interarea variations have equity implications when applied to a state property tax. In Utah, the state collects revenue from the communities and then returns the revenue on a per capita (student) basis to the local school districts. Given a set mill levy for this tax, a community with an assessed to market value of 10 percent would be paying less than a community with a 20 percent ratio.

Differences in the property tax from locality to locality, in most cases, are due to fiscal choice. The amount of revenue and how the revenue is derived are choices that each community makes. In some instances, however, these decisions are made on the state level and govern local choice. For example, the state of Utah dictates that all assessment to market value ratios must be 20 percent.[3]

Advantages and Disadvantages of the Property Tax

Harriss (1974) offers an overview of the advantages and disadvantages of the property tax system. The positive features include: local taxes are spent on local goods; the consumer of local goods can choose between communities for the community which best meets his demands;[4] generally, those who pay the tax receive the services; and to the extent the tax is

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[3]Actual assessment to market value ratios in Logan, Utah are discussed in Chapter IV.

[4]The Tiebout hypothesis rests on this assumption, and it is discussed in Chapter II.

capitalized into lower market price, it is no real burden on future consumers.[5]

That local taxes are expended to provide services to local residents is considered a favorable feature of the tax because it allows the consumers choice. With this choice consumers will better maximize his own utility. That those who pay also receive the benefits is considered to be advantageous since it too helps consumers best maximize their utility. The capitalization feature of the property tax limits the future burden of the tax. With the limiting of the future burden socially optimal allocation of that resource can better be met.

Among the negative aspects are the following: resource allocation is distorted (although this is characteristic of any tax); the tax is often regressive, thus, violating the concept of vertical equity; and as administrated in most localities, it violates the concept of horizontal equity. Resources are misallocated even though part of the tax is capitalized. As is discussed in more depth in the next section, capitalization is nearly complete on land with an inelastic supply function and very slight on capital goods with an elastic supply function. Thus, the part of the tax that is on capital goods (equipment, inventory, and other personal goods) is shifted onto the consumer and distorts his decisions. It has been hypothesized that a poorer person spends a greater percentage of his permanent income on housing than does a richer person. Thus, the tax is regressive relative to income which must be considered an unfavorable aspect of the tax. The other criticism, that

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[5]This concept of capitalization will be further discussed in the next part of this chapter.

of its present manner of administration, is due mainly to the inconsistencies in the assessment process. This mainly relates back to the assessment to market value ratio discussed above. According to the concept of horizontal equity, equals should be treated equally. When two pieces of property of equal value are assessed at significantly different amounts, equals are not being treated equally. Other criticisms of the administration of the tax are: payments are due in lump sums once or twice a year, this can be a great burden to some individuals; and, the appeals system is often so costly that only the rich have the resources to afford an effective appeal hearing.

Harriss (1974), Becker (1969), Lynn (1969), Rasmussen (1959), Ladd (1973), and others who have studied property taxes and their economic effects have suggested the following reforms: centralization and professionalization of the assessment process; adjustments of the base and rate (e.g., minimizing tax exemptions and switching from high tax rates on manmade capital and low rates on land to low rates on manmade capital and high rates on land); and relief for special hardship cases (e.g., aged and/or poor persons).

Centralization and professionalizing of the administration of the property tax, particularly the assessment process, is a step toward correcting assessment inequities. Currently, properties of equal value often have different assessed values and, thus, different taxes; this violates the principle of horizontal equity. Most localities cannot afford or fail to obtain professional staffing to utilize modern computer systems or to provide effective means for appeal. By centralizing the administration of the tax (e.g. state control), many of these goals could be efficiently financed.

However, with state control there are several disadvantages. There is a loss of the local autonomy, which is a positive feature of the tax. In addition, there would be a tendency for communities to adopt similar fiscal policies, thus, reducing the range of consumer choice. Although these criticisms have merit, it is also true that most proposed state controls would be limited to the assessment process and not the decision on the tax rate to be used. Thus, if a community wants little or no revenue from the property tax, it needs only to lower its mill levy.

Adjustments in the property tax base and rate would help alleviate many of the resource allocation problems caused by the tax. In particular, minimizing tax exemptions and changing the emphasis from a tax on manmade capital to a heavier tax on land would be effective changes. With the increasing numbers of exemptions, the rates must be increased to obtain the same amount of revenue. This means higher taxes for nonexempt property.

The other reform, shifting of the tax from manmade capital to land, would limit the misallocation of manmade capital. Currently, with high tax rates on structures and machinery, there is a tendency to avoid improvements, utilize obsolete machinery, and build structures smaller than optimal. Given the lower rates on land, there is a tendency to maximize the use of land while minimizing the use of capital, adding to the pressure for urban sprawl and central city decay. With a reversal of this tax situation, use of manmade capital would be closer to optimal and land would be used more intensively. If land is fixed in supply, a tax, high or low, will have no effect on the quantity produced; it will only effect the amount of rent derived from the land.

The final reform measure, adoption of relief of hardship cases, would reduce part of the regressivity in the property tax. The tax is regressive because, in general, low income individuals spend a larger percentage of his disposable income on property taxes than does his high income counterpart. By allowing for some tax relief for the poor and aged, the tax system would be more equitable.

The Incidence of the Property Tax

Shifting of property taxes, as with all taxes, is dependent on the elasticities of the supply and demand functions. The price elasticity of demand (η) is defined as the percentage change in quantity (Q) due to a unit percent change in price (P).[6] The demand elasticity can be written as:

$$\eta = \frac{\Delta Q}{\Delta P} \cdot \frac{P}{Q} .$$

The demand for a commodity is elastic if the elasticity is greater than one. It is inelastic if the elasticity is less than one and unitary elasticity if the elasticity of demand is equal to one.

Figure 1 shows a relatively elastic demand function (D) and a relatively inelastic demand function (D'). A price change from P_0 to P_1 would result in a small change in quantity demanded from Q_0 to Q_1, with the relatively inelastic demand function. However, with the relatively elastic demand function (D), the same change in price would result in a relatively large change in quantity demanded, from Q_0 to Q_2.

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[6]For example, if a one percent decrease in price results in a two percent increase in the quantity demanded, the demand elasticity is two.

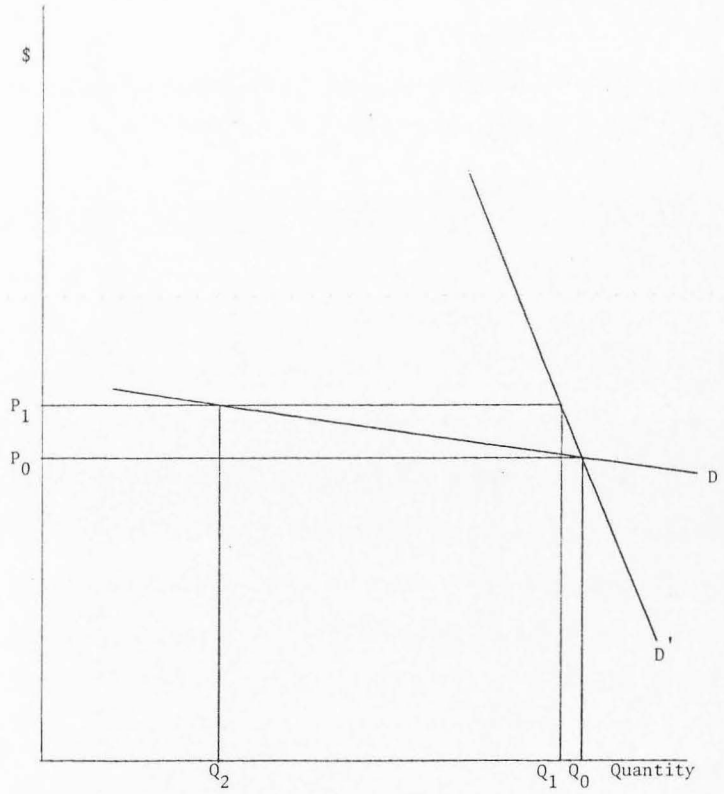

Fig. 1. Price quantity combinations for demand functions having different elasticities.

Like demand elasticity, elasticity of supply (ε) is defined as the percentage change in quantity supplied due to a one percent change in price.[7] Mathematically, supply elasticity is written:

$$\varepsilon = \frac{\Delta Q}{\Delta P} \cdot \frac{P}{Q} .$$

Figure 2 shows a relatively elastic supply curve (S) and a relatively inelastic supply curve (S'). A price change from P_0 to P_1 will result in a relatively large change in quantity supplied, from Q_0 to Q_2, with a relatively elastic supply curve. Conversely, the existence of a relatively inelastic supply function would result in a relatively small change in quantity supplied, from Q_0 to Q_1.

The introduction of a property tax or an increased tax will cause a leftward shift in the demand function. At any price, less will be demanded because of the tax. This shift should be equal to the present value of all the future taxes on a given property.

One extreme example of market conditions in the real estate market is a completely elastic supply function. For this example, the shift in the demand function would not result in any change in price; the total effect would be accounted for by a reduction in quantity from Q_0 to Q_1 in Figure 3. In this situation, the property owner is able to shift the entire tax onto the consumers of real estate.

The other extreme would be a perfectly inelastic supply of real estate. In this case, the introduction of a property tax or an increased tax will be completely capitalized into the market value (Figure 4).

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[7] It should be noted elasticities are not constant over time. In the long run most elasticities are higher than in the short run.

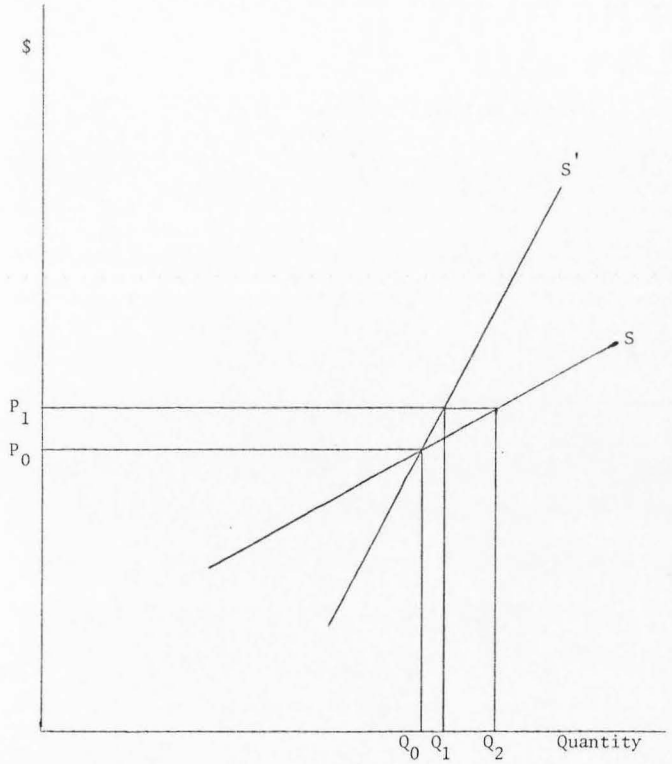

Fig. 2. Price quantities combinations for supply functions having different elasticities.

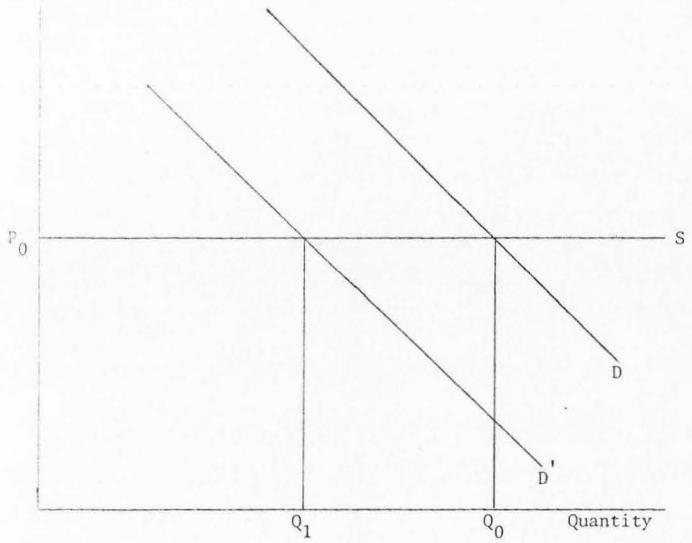

Fig. 3. Price quantity combinations for demand shifts assuming perfectly elastic supply.

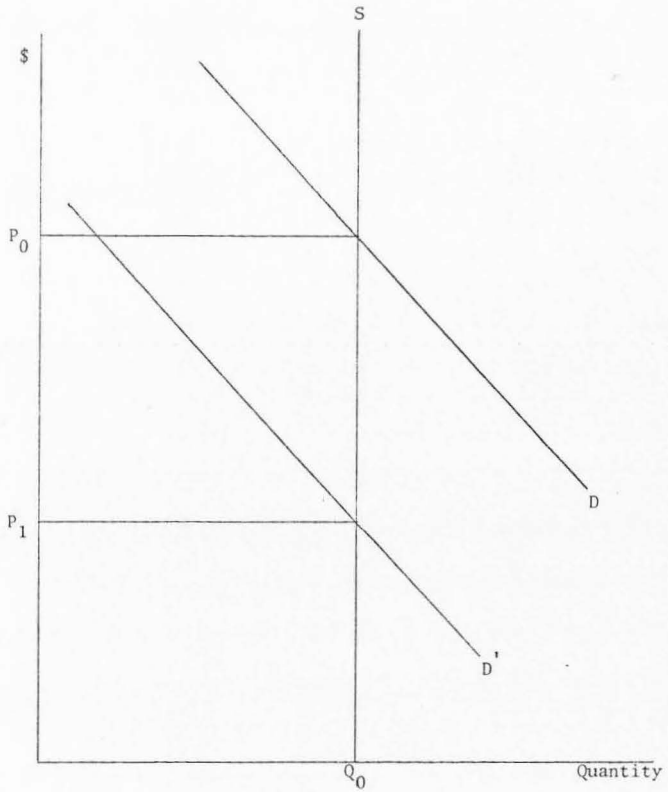

Fig. 4. Price quantity combinations for demand shifts assuming perfectly inelastic supply.

Quantity supplied will not change with the total effect of the introduction of a property tax or an increased tax would be accounted for by a reduction in the market value from P_0 to P_1.

Figures 3 and 4 show the two extremes, where supply is either perfectly elastic or inelastic. Figure 5, however, shows a more realistic view of actual market conditions; a supply function that is somewhere between the two extremes. No consensus has been reached as to the elasticity of the supply function, but most of empirical work fails to support the notion of a perfectly elastic or inelastic supply function.

An implicit assumption underlying these hypotheses is a shifting of the demand function. This assumes a rational individual will offer less for a given land or land/capital parcel by the amount of the present value of the property tax increase expected to exist for a given number of years.

For example, the present value (PV) of a tax change can be approximated by:

$$PV = \sum_{t=1}^{n} \frac{(T_1 - T_0)}{(1+i)^t}$$

where

n = time horizon

t = time index

i = discount rate

T_0 = original tax in dollars per year

T_1 = new tax in dollars per year.

Theoretically, the present value would be identically equal to the reduction in the market price.

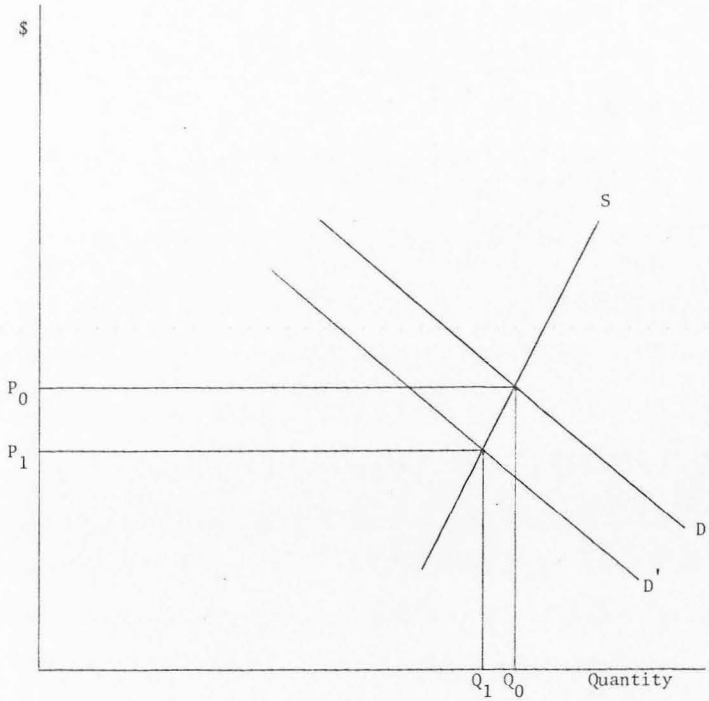

Fig. 5. Price quantity combinations for demand shifts assuming a positively sloping supply function.

Because both the time horizon and implicit discount rate can differ, two individuals could have demand shifts of different magnitudes as a result of a given tax change (Figure 6). The time horizon is the length of time the tax is expected to remain unchanged. This expectation may vary from one individual to the next. However, more important in explaining differences in individual demand shifts is the discount rate. The implicit discount rate shows the individual's time preference. For example, one individual may be very present oriented--desire a good now rather than in the future--while another individual may have no time preference for present or future goods and would thus have a discount rate of zero percent.

Another problem in generalizing about capitalization effects is that it is necessary to distinguish between the supply and demand for land and the supply and demand for capital (buildings, and other improvements). When we speak of the supply and demand for real estate with a house on it, the supply and demand for land and capital are both present and indistinguishable.

A third problem is that the short and long run functions may have different elasticities. In the short run, the supply of real estate is almost perfectly inelastic, but in the long run, the supply becomes more elastic.[8] With a perfectly inelastic function, capitalization of any tax is complete. With a more elastic function, there is only partial capitalization.

However, short of a perfectly elastic supply function or no change in demand (implying irrational land consumers), any of the above

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[8]This raises the question of a changing capitalization over time on a given property.

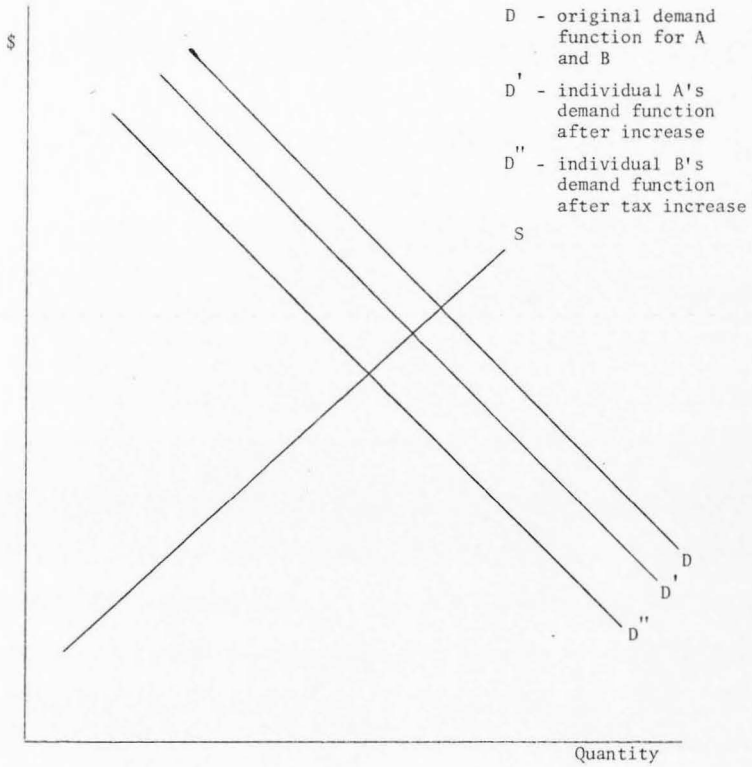

Fig. 6. Hypothetical demand function shifts as a result of a property tax increase.

hypotheses would indicate at least a partial capitalization of any property tax change into market value.

Thesis Objectives

The primary objective of this work is to estimate the extent of property tax capitalization in one taxing jurisdiction (Logan, Utah) in 1976. Logan is a small community with a 1976 population of about 27,000 compared to 22,600 in 1970. Virtually all public services: water, electricity, police and fire protection, and other social services are provided by the city, and for the purpose of this study can be assumed to be equal for all citizens. Public schools consist of six elementary, one junior high school, and one high school, all under the direction of the Logan Board of Education. Some of the theoretical and empirical difficulties associated with the use of data from more than one city have been avoided by concentrating on this one area.[9]

Previous tax capitalization studies are reviewed in Chapter II. The next chapter presents the theoretical and empirical model to be used in this study. The data and statistical results of the analysis are discussed in Chapter IV.

In addition to determining the extent of capitalization, two related questions are addressed: Is the ratio of assessed valuation to market price highly variable among parcels?; If so, is the variation systematic?[10]

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[9]A review of the previous studies and weaknesses in them is covered in the next chapter, and the model is discussed in Chapter III.

[10]For example, it might be the case th-t the ratio of assessed to market value is consistently higher (lower) for homes in a particular price range.

Official policy is that all properties in this community are to be assessed at 20 percent of the market value. The fact is, the average ratio of assessed to market value is closer to 13 percent and the variation about this average is substantial.

REVIEW OF LITERATURE

There have been a number of recent studies oif the effect of the property tax on the market price of real property. Some have determined that any property tax is immediately capitalized into lower property value. Others have found that the property tax has little or no effect on the market price of the property.

Among the economic theorists (e.g., Mering, 1942), it was generally accepted that a property tax on real estate was capitalized into lower real estate values. However, early empirical research on the question was very limited. Jensen (1933), in one of the earliest studies, found a significant capitalization effect. He observed that the net after-tax rent on farmland was constant at 2.3 percent for his observations in 1919 and in 1924. He also noted that market price for farmland had fallen from 1919 to 1924 and that the property taxes had risen during the period. Critics of the study have pointed out that Jensen failed to control other factors that would have an effect on the market price. He acknowledged this weakness but contended that the evidence pointed towards the absorption of the property tax into a lower market value.

Since the late 1950s, this "established" theory has been subject to question. Daicoff (1961) studied the relationship between property taxes and property value in rural and urban areas during 1951-1957 and concluded that "all tests of the usually accepted capitalization doctriate produced

results that were inconsistent with that doctrine." (Daicoff, p. 112) His explanation for these results are that any decrease in market value due to a tax increase is offset by increased value due to corresponding public expenditure increase.

Orr (1968) investigated the incidence of property taxes on capital improvements, by comparing residential rents in 31 communities in the Boston area. The traditional theory held that property taxes on capital improvements are shifted onto renters. One reason for this is the assumption that the supply of capital in housing is perfectly elastic (Figure 7). Before any property tax on improvements is levied, the market is in equilibrium with rent (R_0) and quantity (Q_0). As a result of the tax increase, the demand function (D) is shifted to the new schedule (D'). Rent will fall temporarily to R_1', but new investments will be discouraged, and quantity supplied will fall to Q_1. At Q_1, rent net of property taxes will be at R_0 again, and gross rent will be at R_1. This implies full shifting of the tax onto consumers.

Orr contended that the supply of capital is not completely elastic, and, correspondingly, the property owner shares the burden of the tax with the renter as long as the demand function is not perfectly elastic (Figure 8). The same initial conditions exist with equilibrium rent (R_0) and quantity (Q_0). When the property tax is included, the demand function falls and the (gross) rent becomes R_1. Under these conditions, the tax causes the net demand to fall from D to D'. With this shift, net rent falls to R_1' and equilibrium is again obtained. Using Orr's assumption of a relatively inelastic supply function, part of the higher tax is capitalized immediately into lower real estate values.

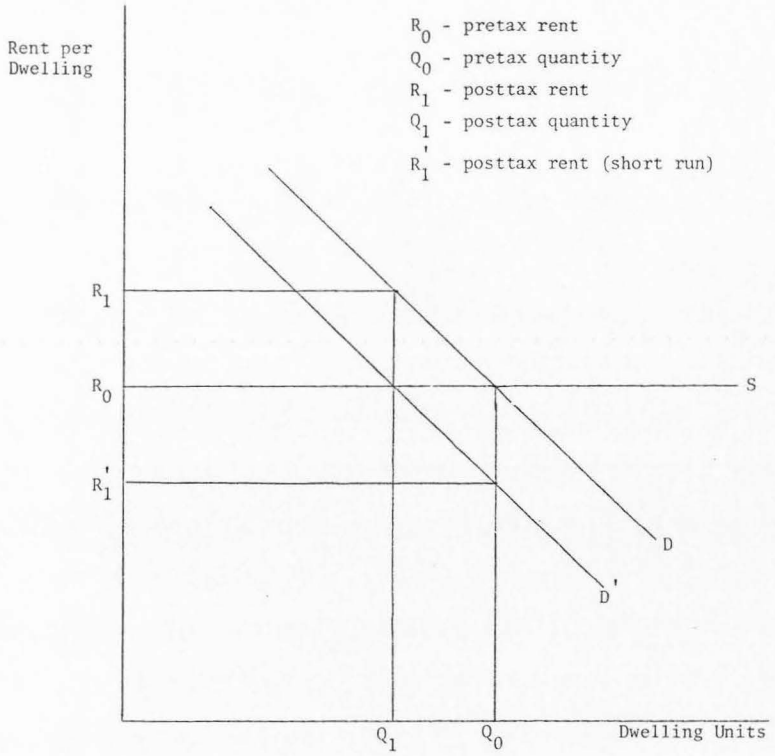

Fig. 7. Change in rent with a perfectly elastic supply function for manmade capital.

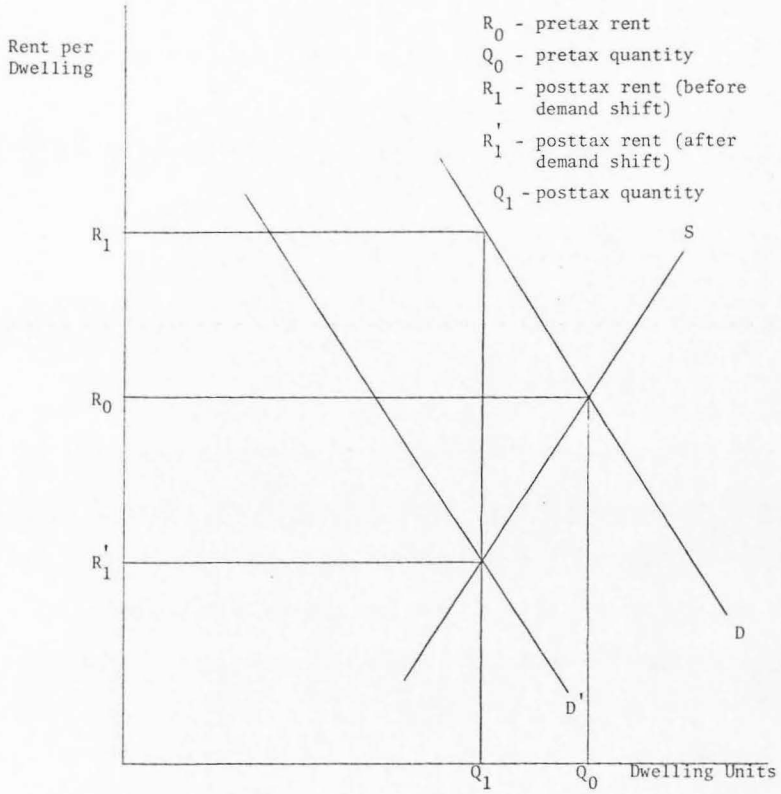

Fig. 8. Change in rent with a positively sloping supply function for manmade capital.

The empirical analysis supports this hypothesis as Orr found less than 30 percent of the tax is shifted from owner to renter. A weakness of the study (that Orr admits to) is that it tests the incidence of the difference in tax rates, not the shifting of the total tax. Thus, the portion of the tax which is common to the entire urban area may be borne by the occupants.

Woodard and Brady (1965) evaluated the capitalization of property tax on farm real estate in Ohio and Indiana in an attempt to establish "inductive evidence" on the capitalization theory. Their approach was to regress sale price on the present value of the future income stream and the present value of future taxes. A weakness of this method is that it depends upon federal land bank appraisals to determine market value. Also, the future income and taxes must be discounted to present value. Thus, an interest rate and time horizon must be selected which may or may not be appropriate. The results of the analysis were statistically significant and supported the capitalization hypothesis.

Wicks, Little, and Beck (1968) studied the effects of property tax changes on the selling price of residential, business, and farm property in Missoula County, Montana, during 1965. They collected data on 1965 taxes, 1964 taxes, 1965 sale value, and 1964 assessed value on all properties sold after the tax change. For residential property, they found capitalization ratios of 30:1, 5:1, and 23:1 depending on the amount of tax increase. The higher ratios are implausible. A capitalization ratio of 30:1 would mean for every dollar change in property tax, there would be a 30-dollar change in the selling price. They give several possible explanations for such high ratios. First, they suggest possible

estimation errors in the change of selling price. The other explanation could be that the large property tax change was a result of increases in assessed value rather than from yearly rate increases. A major weakness of this study is use of the 1964 assessed value as a proxy for the pretax market value. Certainly, assessed values and market values for two different dates are not comparable.

A similar study was carried out in the San Francisco area by Smith (1970). The objectives were to determine the extent to which change in property taxes were capitalized into the selling price. Price was regressed on dwelling age, change in taxes, and assessed value. He found capitalization ratios that ranged from 3.3:1 to 21.6:1 depending on whether the property was sold, 1) before the tax change; 2) after the change but before the amount of change was known; or 3) after the amount of change was known. In this way, he was able to observe the change in the capitalization of the tax. It was also observed "that as the tax increase on a property becomes larger, the fall in the price of that property becomes greater" (Smith, p. 192). However, the study can be criticized for several reasons. Smith uses assessed value as a proxy of the property's market value. Also the statistical results are only marginally significant by the conventional standards.

Predating much of this research were several theoretical studies on taxation, expenditure, and consumer preference. Musgrave (1939) and Samuelson (1954, 1955) developed models for analyzing consumer preference for taxes and public goods and the mechanism by which individuals voted. They argued that without the ability to force the voter to reveal his preferences, to be able to satisfy these demands, and to tax him

accordingly, the system will not produce public goods and services at the optimal level.

Tiebout (1956) contends that this analysis may be accurate for a central government but not for an analysis of local expenditures.

> The consumer-voter may be viewed as picking that community which best satisfies his preference pattern for public goods. This is a major difference between central and local provision of public goods. At the central level the preferences of the consumer-voter are given, and the government tries to adjust to the pattern of these preferences... The greater the number of communities and the greater the variance among them, the closer the consumer will come to fully realizing his preference position. (Tiebout, p. 418)

Tiebout concludes that given the institutional constraints, the allocation of public goods and services on the local level is done fairly efficiently.

Oates (1969) and Hyman and Pasour (1973) test the hypothesis set forth by Tiebout in empirical models. Both studies include a test of the capitalization of the property tax in market value. Oates observed 53 residential communities in New Jersey. His model defined property value as dependent upon a set of physical characteristics of the residences and the area (percentage of families with annual income less than $3,000, median number of rooms, percentage of houses built since 1950, and median family income), proximity to central city, property tax (average of the nominal rate times the assessment ratio), and public services (expenditures for education per pupil). The study supports the Tiebout hypothesis and suggests that both public services and property taxes are capitalized into the market value. The public services elasticity was 4.9 while the property tax elasticity was -3.6.

Hyman and Pasour (1973) made a similar study of 106 municipalities in North Carolina. They concluded that property taxes and public services differentials are not capitalized in market prices either in their sample area or in most of the United States. They point out that most other studies (Orr 1968, Smith 1970, and Oates 1969) looked at urban areas which are not descriptive of most of the United States. Hyman and Pasour contended that the long-run supply of housing in North Carolina is more elastic than in the large SMSAs.

Figure 9 shows the hypothesized supply-demand functions for large urban areas. Because of the highly inelastic supply function, a relatively large drop in rent is generated by the change in the property tax. However, for the North Carolina property market (Figure 10) the supply function is assumed more elastic. With a relatively flatter supply function, a given change in the property tax will only cause a small change in rent. Three reasons are offered for this:

1) the existence of large quantities of undeveloped land within close proximity of employment opportunities;
2) there are relatively few restraints on entering the construction industry; and
3) the ratio of land value to total residential real estate value is relatively low.

The authors further argue that with this relatively elastic supply curve, most of any increase in property taxes will be shifted not capitalized. Their empirical study supports this hypothesis. The coefficient for property tax was -4.37 but was not significat at the 0.05 probability level. The coefficient on the proxy variable for public services was only 0.21 but was significantly greater than zero.

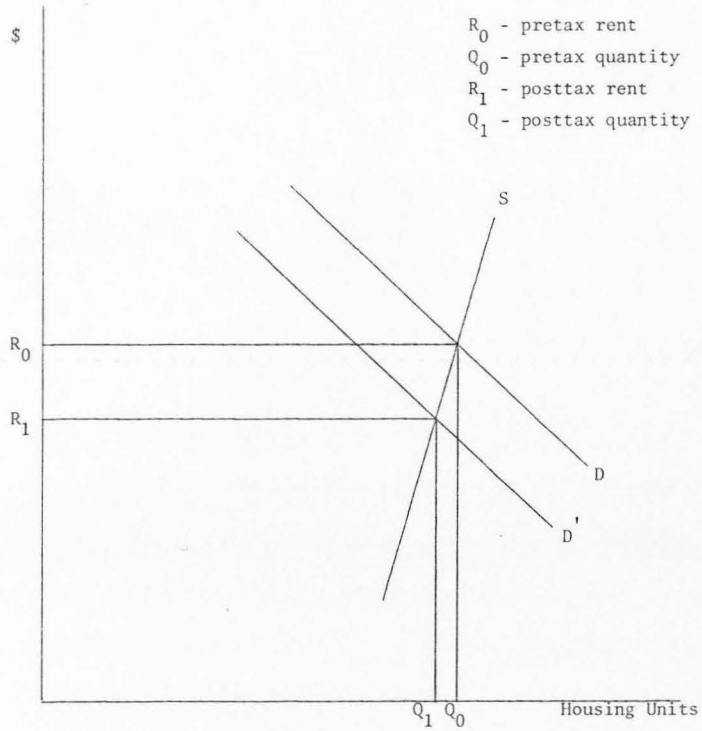

Fig. 9. Change in rent with a relatively inelastic supply function for real estate.

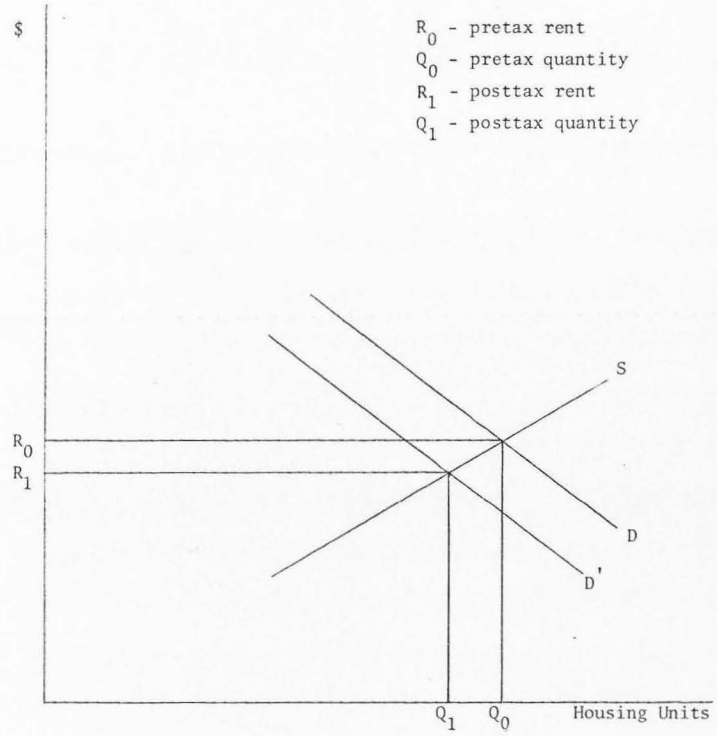

Fig. 10. Change in rent with a relatively elastic supply function for real estate.

The Hyman-Pasour study has been criticized by Cowing (1974) for being incomplete, misspecified, and having a significant bias. Hyman-Pasour argue that the supply of housing is more elastic in North Carolina than in the large SMSAs. However, it can also be argued that the demand for housing is also more elastic. Smaller communities in North Carolina are closer substitutes for each other than are the larger SMSAs. Cowing's revised supply-demand functions (Figure 11) shows a more elastic demand function. Thus, a change in the property tax will have a relatively larger impact on rent than that shown in Figure 10. Cowing's second criticism of their study is that an interurban effect was tested while the Tiebout hypothesis was aimed at the intraurban effect. A final criticism is that the Hyman-Pasour study excluded the nine largest cities in North Carolina from the sampled communities. This exclusion biases the results. These excluded observations are probably not randomly distributed with respect to several, if not all, of the independent variables (Figure 12). The relationship Hyman and Pasour found (R) would have a significant bias if the excluded observations are nonrandom. The revised relationship (R') would show the true relationship for a correctly specified model, because Cowing contends the highest property tax rates and the highest levels of public services are found in the largest cities of the state.

In one of the most recent studies, McMillan and Carlson (1977) found no evidence of the capitalization of property tax and public services into the market price. This study is essentially an extension of the Hyman-Pasour work. The criticisms that Cowing offered also hold for this case. The McMillan-Carlson study was focused on a number of small

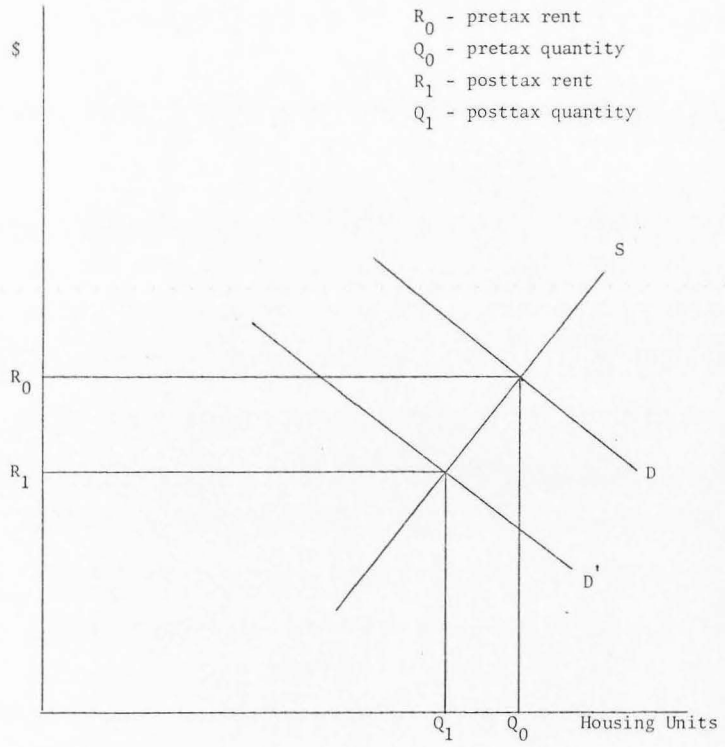

Fig. 11. Rent quantity combinations for changing demand and relatively elastic supply function.

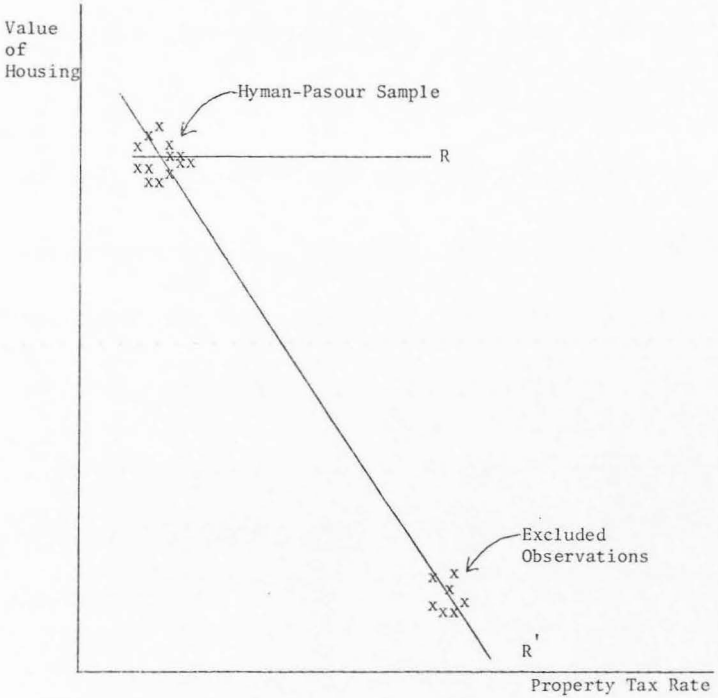

Fig. 12. Cowing's hypothesized data relationship.

cities in Wisconsin. Two-stage least-square techniques were used to regress market value on median number of rooms, percentage of homes built since 1950, median family income, percentage of families below the official poverty level, percentage of homes owner-occupied, distance to a large metropolitan area, full-value local property tax rate, school operating expenditures per pupil, and nonschool expenditures per capita. The authors explain the absence of capitalization effect in their study as a result of a relatively elastic supply of land and capital functions. They do admit, however, that the supply of land in the larger urban areas could be relatively inelastic and, thus, absorption of any property tax and public service into the market price is possible.

Another aspect of property tax that has come under close scrutiny is the administration of the tax. Questions have been raised about assessment inequities, tax regressiveness, and resource misallocation. Most of the work done concerning the administrative aspect, however, have been theoretical studies with very little empirical backing.

Lynn (1969), Ladd (1973), Johnson (1969), and Rasmussen (1959) all present reforms that they argue are needed to correct the inequities and allocation problems of the property tax. All cited assessment problems as a major weakness in the property tax system.

Black (1972) made a study of property tax rate variation in the city of Boston for the years 1950 and 1960. Using a sample size of 18,000 individual residential properties, he tested the hypothesis that variations in the ratio of assessed to market value were not random but systematic. Black regressed assessed to market value ratio on racial mix, extent of deterioration in the area, income level, property value, and number of

families per structure. He found a positive relationship between that ratio and number of families per structure, density of nonwhite population, and amount of deterioration in the area. He also found a negative relationship between the ratio and family income and property value. In summary, property owned by lower income individuals was assessed at a higher percentage of market value than was property owned by higher income families. Black concludes that "the property tax, as it is administered in Boston, has resulted in substantial inequality in effective tax rates" (Black, p. 209). He suggests that assessment values be a uniform fraction of market value, centralized control over the assessment process, improved methods of determining market value, and increasing the frequency of assessments are all measures that are needed.

This chapter has reviewed the important studies of the impact of the property tax on market value. Some found that increased property taxes were capitalized into market values; others did not. All the studies, however, suffered from some weakness, primarily in the data used. The studies that tested the Tiebout hypothesis used percentages, median, and average data to compare communities. This assumes that variation within a community is nonexistent or minimal, when in actuality, the intracommunity variation may be greater than the intercommunity variation. Other problems include: use of assessed value as a proxy for selling price; comparing different communities or cities (thus different public services); comparing different time periods; not compensating for other reasons for price changes; nonrandom data or deletion of nonrandom data; discounting to present value (thus, need to establish an interest rate and a time horizon); and using market price without compensating for

already existing capitalization (thus, testing a distorted change in capitalization not full capitalization effect). Any one of these problems could distort the results of an empirical study.

The following study overcomes most, if not all, of these problems. Data used is for individual properties sold within one community for the year 1976. All properties within the community were reassessed in 1975, thus, there is no problem with assessments made at different times. There is no significant variation in public services in this community. It may be argued that there are random neighborhood variations in public services, however, any variation ought to be minimal since all households receive their public services from one source.[11] Finally, due to the nature of the empirical model, the capitalization effect is netted out of the market price, leaving the "true" market value. Discounting is not necessary, thus, there is no need to pick an interest rate or the relevant time horizon. The model used is outlined in the following chapter.

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[11]For example, all students attend the same junior high school and high school.

THE MODEL

Theoretically, the capitalization effect (C) is the sum of the discounted differentials between the actual tax for each period (T_i) and the "true" tax (T_i^*) or that based on the real market value (M^*). That is,

$$C = \sum_{i=1}^{n} \frac{T_i^* - T_i}{(1+r)^i} \quad . \; . \; . \; . \; . \; . \; . \; . \; . \; . \; . \; . \; . \; . \quad (1)$$

where r is the appropriate discount rate and n is the horizon or length of time that buyers expect the differential to be maintained. The empirical problem is that of all the variables in the equation, only the actual tax level (T_i) is observable. The "true" tax is a linear function of the "true" market value of the property, but the latter is not directly observable because observed market prices include the capitalization effect. It is possible, however, to set up a system of simultaneous equations and use indirect least squares to estimate the capitalization effect.

Consider the following system. The observed market value price (M) is identically equal to the "true" market value (M^*) plus the capitalization effect,

$$M = M^* + C \quad . \; . \; . \; . \; . \; . \; . \; . \; . \; . \; . \; . \; . \; . \; . \; . \quad (2)$$

The capitalization effect is given by equation (1) but reduces to

$$C = (T_o^* - T_o) \sum_{i=1}^{n} \frac{1}{(1+r)^i}$$

if the "true" and actual tax levels are constant over time. Setting

$$b_{31} = \Sigma \frac{1}{(1+r)^i}$$

we have the linear function

$$C = b_{31} (T_o^* - T_o) \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (3)$$

Now the "true" tax is determined as the product of the mill levy (μ), the ratio of assessed to market valuation (δ), and the "true" market price, i.e.,

$$T^* = \mu\delta M^* \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (4)$$

Finally, the "true" market price is assumed to be a linear function of characteristics of the property itself independent of any capitalization effect,

$$M^* = b_{50} + b_{51} X_1 + \ldots + b_{5p} X_p \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (5)$$

where $X_1, \ldots, X_p$ represent those physical or aesthetic characteristics which include: age of structure, square feet of structure, and a dummy variable, quality of neighborhood.[12]

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[12]Selection of these characteristics is discussed in the next chapter.

The basic structural system consists of four equations (2) - (5) in four endogenous variables, M, C, T^*, and M^*, and P + 1 exogenous variables T, $X_1, \ldots, X_p$. This set of variables can be cross-classified in the following way:

	Endogenous	Exogenous
Observable	M	$T, X_1, \ldots, X_p$
Nonobservable	C, M^*, T^*	

Although three endogenous variables are not observable, the parameters of equations (3), (4), and (5) can be estimated using the indirect least-square technique. Derive a single reduced form equation by substituting (3), (4), and (5) into (2) which yields

$$M = \gamma_0 + \gamma_1 X_1 + \ldots + \gamma_p X_p + b_{31}(-T) \quad . \quad . \quad . \quad . \quad . \quad . \quad (6)$$

where

$$\gamma_0 = b_{50}(1+b_{31}\mu\delta),$$
$$\gamma_1 = b_{51}(1+b_{31}\mu\delta),$$
$$\vdots$$
$$\gamma_p = b_{5p}(1+b_{31}\mu\delta).$$

Because equation (6) has only one endogenous variable, the variables on the right hand side and the error term will be independent, and the function can be estimated using the ordinary least-squares method. Having estimated $\gamma_0, \gamma_1, \ldots, \gamma_p$, and b_{31}, and knowing the values of the parameters μ and δ, the other parameters can be determined as:

$$b_{5j} = \gamma_j/(1+b_{31}\mu\delta),\ j=1,\ldots,\ p$$

$$b_{50} = \gamma_0/(1+b_{31}\mu\delta)\ .$$

Once these parameters are obtained, the "true" market price, "true" property tax, and capitalization effect can be determined. The data and results from the model are discussed in the following chapter.

MODEL ESTIMATION

Data

The data used to estimate the parameters of the model are based on sales data for 107 residential properties in Logan, Utah during 1976. Sales prices and detailed property characteristics are reported for each in booklets published by the multiple listing service that is administered jointly by almost all local real estate firms.[13] Tax data for each parcel were obtained from the county assessor's office. Some characteristics were determined by direct observation. These included neighborhood quality, view, and quality of landscaping.

The specific data eventually used in the model was a result of both intuitive logic and empirical test results. The characteristics, age, square feet of structure, quality of neighborhood, and property tax, with the exception of quality of neighborhood, all are statistically significant at the 0.025 significance level. It is submitted that differences in these four characteristics should adequately explain differences in selling price. Age of structure serves as a proxy for quality (and quite often construction material); size characteristics such as number of

[13]This data was taken from the Logan Multiple Listing Exchange, Sold Properties Listing for each of the four quarters in 1976.

rooms, bathrooms, bedrooms largely are captured by the number of square feet in the structure. The quality of neighborhood variables is based on the author's judgement of different parts of the community. Finally, property tax enters the model to allow estimation of the net capitalization.

In addition, to the above parameters, the market quarter sold was used in some of the regressions to identify market cycles and conditions in the real estate market. These market conditions are important to the analysis of capitalization of the property tax into the market price. As identified in Chapter I, tax capitalization is dependent on the demand and supply elasticities; and these elasticities are an empirical measurement of the market conditions. In the short run, if the real estate market is characterized by excess supply of the going price, the supply should be relatively inelastic, and capitalization of the property tax into the market value will be extensive, if not complete. Actually, the use of these dummy variables did not materially affect the estimated coefficients on the tax variable nor the equational statistics, R^2 and F. However, it is the opinion of local real estate experts that during this period the market was oversupplied. The short time span covered by the study may be the reason that no empirical evidence was generated.

Statistical Results--The Capitalization Effect

The least-squares regressions were run using natural log and results reported in log form. Using log form makes sense for age of structure, square feet of structure, and property tax, since it is not expected the

market value to be linear with respect to the absolute value of these variables.[14]

Table 7 shows the regression coefficients and statistical results for the four estimated equations. Equation I regressed market price on a constant term, age of structure, square feet in structure, quality of neighborhood, and property tax. Market value was regressed on market quarter sold, age of structure, square feet in structure, quality of neighborhood, and property tax in equation II. The third equation regressed market value on a constant term, age of structure, age of structure squared, square feet in structure, quality of neighborhood, and property tax. Equation IV regressed market price on market quarter sold, age of structure, age of structure squared, square feet in structure, quality of neighborhood, and property tax. In all cases the coefficients had the correct signs under the null hypothesis; all but quality of neighborhood are statistically significant using conventional standards.

The property tax variable was found to have a significant negative relationship with market value. The coefficients for property tax, interpreted as elasticities, ranged from -0.4159 to -0.4539 and are significantly different from zero at the 0.005 probability level. These elasticities can be interpreted as percent changes. A one-percent change in the property tax will result in a 0.4 percent change in market value. For example, if an owner of a $50,000 house who pays $2,000 in property taxes has his taxes increased by one percent ($20), the market value of that house would decrease by $200 or 0.4 percent.

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[14] For example, the greater the square feet, the smaller would be the expected impact on the market value of a given absolute change in the square feet of the structure.

TABLE 7.--Regression Coefficients and Statistical Results from Equation 6

Equation	Dependant Variable	Constant	Sold 1st Quarter	Sold 2nd Quarter	Sold 3rd Quarter	Sold 4th Quarter	Age of Structure	Age of Structure Squared	Sq. feet in Str.	Quality of Nbd.	Property Tax	R-Squared	F-Statistic	Standard Error	Number of Observations
I	Market Price	5.1258 (10.77)*					-.0548 (-3.28)		.4506 (5.95)	.0122 (.25)	-.4159 (-7.75)	.7937	98.0892	.16449	107
II	Market Price		4.9214 (10.41)	5.0534 (10.68)	5.0568 (10.88)	5.0397 (10.71)	-.0488 (-2.87)		.4510 (5.94)	.0203 (.44)	-.4298 (-8.12)	.8127	61.3698	.15907	107
III	Market Price	5.3719 (11.09)					-.4375 (-2.31)	.1865 (2.03)	.3970 (5.02)	.0109 (.23)	-.4502 (-8.11)	.8018	81.7061	.16202	107
IV	Market Price		5.1159 (10.56)	5.1058 (10.65)	5.2437 (11.03)	5.2297 (10.86)	-.3549 (-1.85)	.1483 (1.60)	.4129 (5.22)	.0190 (.41)	-.4539 (-8.31)	.8175	54.8739	.15783	107

* The numbers in parenthesis, ( ), are the values of the t-statistics.

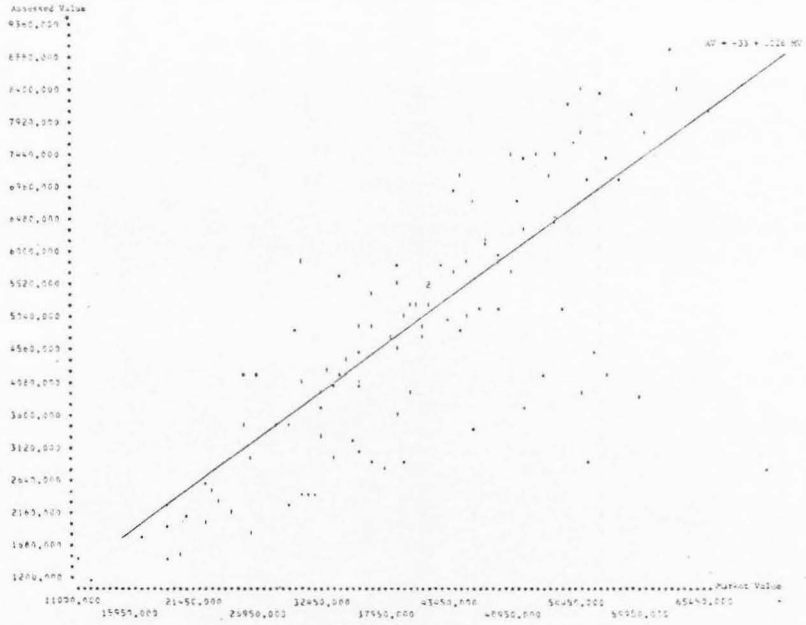
Findings on Assessment Variation

The secondary objective of this thesis is to determine if there is significant variation in assessed to market value ratios and if that variation is systematic. This was done in several ways. First, assessed value was regressed on market value. The estimated equation is reported in Table 8. The coefficient on market price of 0.1264 and a nonsignificant constant term suggest that the expected assessed to market value ratio for any randomly selected parcel would be 12.6 percent, not 20 percent as argued by local officials. The coefficient of determination (R^2) is 0.65 and the F-statistic is 195.2. A scatter diagram showing the relationship of actual assessments to actual market value is given in Graph 1.

TABLE 8.--Regression Coefficients and Statistical Results

Dependent Variable	Constant	Market Value	R-Squared	F-Statistic	Standard Error	Number of Observations
Assessed value	-133.2 (-0.36)	0.1264 (13.97)	0.65	195.2	1134.29	107

The second objective, testing for any indications of systematic variation, was completed by regressing assessed value on a market price by property value group. These property value groups were broken down as: 0 to $30,000; $30,000 to $40,000; $40,000 to $50,000; and $50,000 and above. To determine the variation within a given group, the standard error of the regression, R-squared, and F-statistic for the regressions



Graph 1. Assessed to market value scatter diagram.

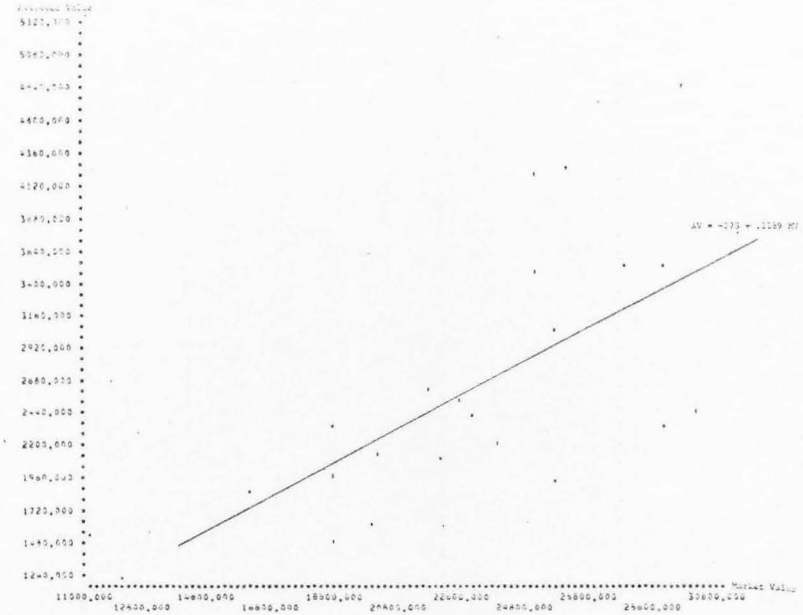
have been computed. To compare the assessed to market value ratio between groups the slope and intercept of each best fit least squares line for the regressions have been compared. As previously determined, the assessed to market value ratio for the best fit least squares line for all observations is approximately 12.6 percent. From an equity point of view, any structures assessed at less than 12.6 percent would be underassessed, and any structures assessed at over 12.6 percent would be overassessed. Of course, minor deviations from this average are not only acceptable, but expected.

Table 9 gives the regression coefficients and statistical results from the four regressions by group. From the regression results, the coefficient of determination for the second group, $30,000 to $40,000, was 0.67, indicating extreme variation within that group. The intragroup variation in the assessed to market value ratio ranged from 8.8 percent in the second group to a high of 14.6 percent in the third and fourth categories.

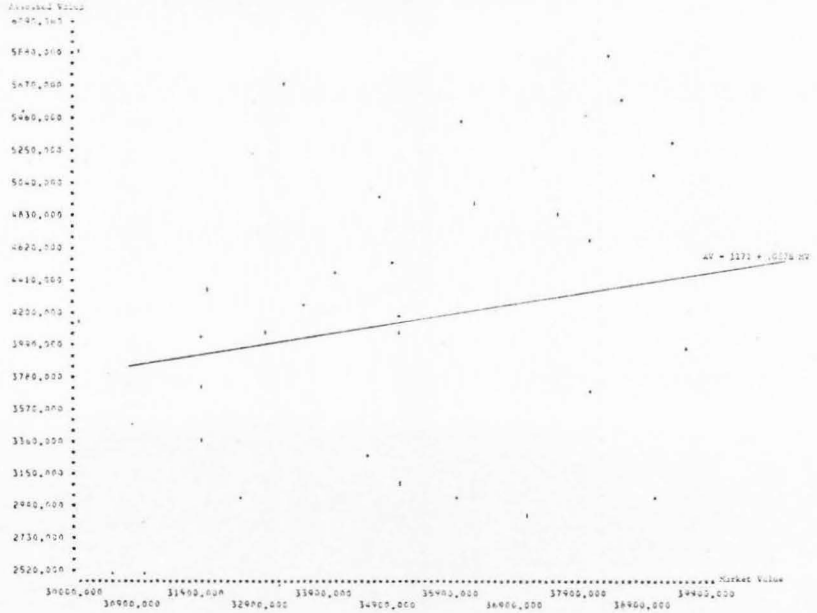
Graphs 2, 3, 4, and 5 are scatter diagrams showing the variation in assessment by market value group. From these diagrams it is noted the lack of variation in the 0-$30,000 group in comparison with the other groups. Statistically this can be noted from the higher R-squared, higher F-statistic, and lower standard error of the regression (Table 9) for the first group than the other groups. Along with having the lowest intragroup variation, the 0-$30,000 group's best fit least squares line has a slope of about 12.9 percent which is closest among the various groups to the slope of the best fit least squares line for all observations.

TABLE 9.--Regression Coefficients and Statistical Results

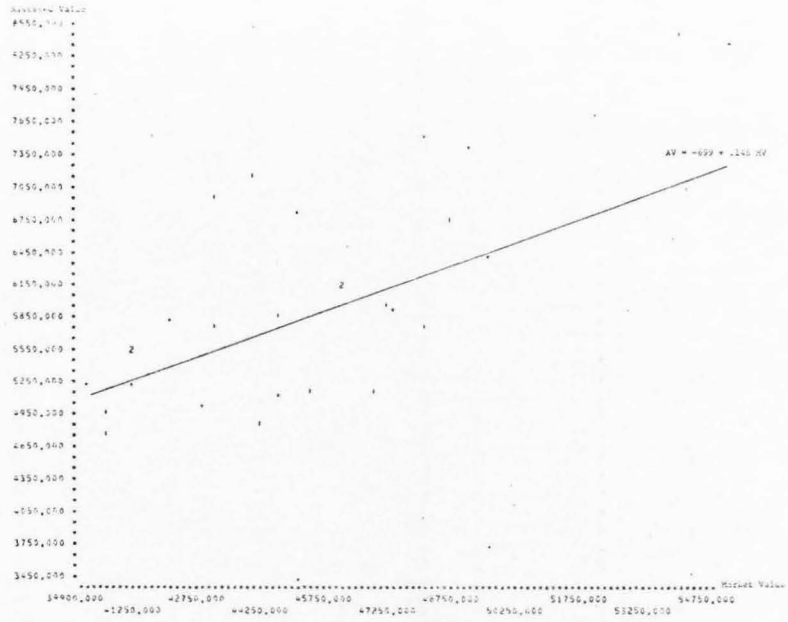
Market Value Group	Dependent Variable	Constant	Market Price	R-Squared	F-Statistic	Standard Error	Number of Observations
0-$30,000	Assessed value	-272.51 (-0.41)	0.1289 (4.50)	0.4904	20.2088	708.111	23
$30,000-$40,000	Assessed value	1172.14 (0.56)	0.0878 (1.47)	0.0670	2.15566	975.699	32
$40,000-$50,000	Assessed value	-698.72 (-0.28)	0.1460 (2.62)	0.2030	6.87588	995.899	29
$50,000-above	Assessed value	-1470.26 (-0.28)	0.1460 (1.55)	0.1030	2.41116	1746.18	23



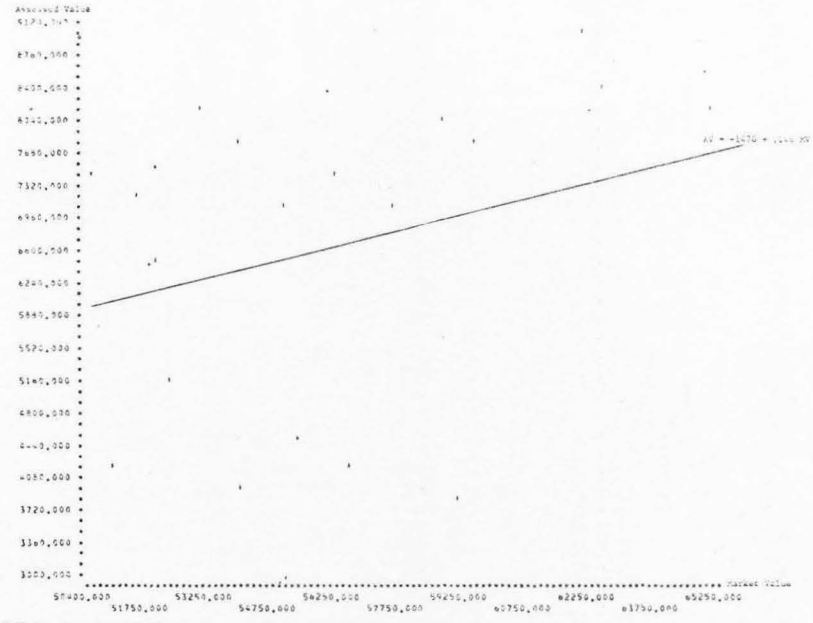
Graph 2. Assessed to market value scatter diagram for 0-$30,000 group.



Graph 3. Assessed to market value scatter diagram for $30,000-$40,000 group.



Graph 4. Assessed to market value scatter diagram for $40,000-$50,000 group.



Graph 5. Assessed to market value scatter diagram for $50,000 and above group.

The $30,000 to $40,000 group is by far the most underassessed group. Its 8.8 percent assessed to market value ratio is almost four percent less than the ratio for all observations. The second group also has the most intragroup variations. This variation is apparent from its R-square, which is only 0.0670, and from the scatter diagram (Graph 3).

The last two groups, $40,000 to $50,000 and $50,000 and above have assessed to market value ratios that are well above the ratio for all observations. These properties are being overassessed by about two percentage points.[15] The intragroup variation is extensive, especially in the $50,000 and above group.

The intergroup variation of the best fit least-squares lines may seem insignificant; however, as Table 10 shows, these small percentage differences result in large tax differences. These data demonstrate the variation in annual base for a given valued property depending on what assessed to market value ratio is used. The tax is computed using the 1976 mill levy for Logan City (60.97 mills).

Differences in the taxes due to variations in the assessed to market value ratios are, in most cases, more important than differences in the market value. For example, the tax difference between a $35,000 house assessed at 8.8 percent as compared to 14.6 percent is $123.77, while a $35,000 house assessed at 8.8 percent would only have a $107.30 tax difference from a $55,000 house assessed at 8.8 percent.

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[15]For example, a $50,000 house in this situation would be overassessed by $1,000. In 1976, this would have resulted in overtaxing the owner by $60.97.

TABLE 10.--Property Tax Resulting from Variations in Assessed to Market Market Value Ratios for Different Valued Properties

Market Value	Assessed to Market Value Ratio				
	12.6%	12.9%	8.8%	14.6%	20%
$25,000	$192.06	$196.63	$134.13	$222.54	$304.85
$35,000	$268.88	$275.28	$187.79	$311.56	$426.79
$45,000	$345.70	$353.93	$241.44	$400.57	$548.73
$55,000	$422.52	$432.58	$295.09	$489.59	$670.67
$65,000	$499.34	$511.23	$348.75	$578.61	$792.61

SUMMARY AND CONCLUSION

In Chapter I, the property tax was reviewed with special emphasis on the criticisms and advocated reforms of the tax. One of these reforms was the professionalizing of the assessment process. This study, although directed towards capturing the capitalization effect, has as a secondary objective the measurement of variation in the assessed to market value ratios for real estate in the area studied. In accomplishing this objective, a statistical model was utilized. This process not only identified inequities in the assessment process, but demonstrated the feasibility of computerizing the assessment process. By simply knowing the age of the structure, square feet of the structure, quality of the neighborhood, and the property tax, the property value can be assessed quickly and consistently. This process of assessment may be more efficient, equitable, and accurate than the procedure of having an assessor evaluate particular sites on an ad hoc basis.

The theories underlying the incidence of the property tax are also discussed in Chapter I. Two extreme examples were discussed: one, that any tax is completely capitalized into a lower market value; and two, that the burden of the tax is almost completely shifted onto the consumer. In evaluating the extent of capitalization in the market, the elasticity of the supply function is the determining factor. The example that suggests complete capitalization is based on the assumption of a

perfectly inelastic supply function for real estate. The assumption of an elastic supply function must be made to fulfill the shifting example.

The primary objective of this study was to empirically estimate the incidence of the property tax (i.e., the extent to which it is capitalized). As discussed in Chapter II, there has been no consensus among the previous empiircal studies on the incidence of the tax. In addition, many weaknesses were found in these models and the data used. In most cases, these weaknesses biased the results obtained.

The model presented in Chapter III is unique in that it eliminated the problems encountered in previous studies. The data set, discussed in Chapter IV, is also unique in that it is for one year in one community. All properties within this community were reassessed the previous year. Another feature of the data set is that all characteristics were for individual properties not gross averages and percentages.

The estimated equations, also presented in Chapter IV, identify significant capitalization coefficients. These coefficients ranged from -0.4159 to -0.4539. These findings support the hypothesis that the supply function for real estate is quite inelastic and the burden of the tax is reflected in lower selling prices. This fact has policy implications in that an owner of real estate may receive "windfall" gains or losses due to tax changes. These gains and losses will be greater than just the immediate change in the tax burden but will also include changes in the market value of the piece of property.

An area suitable for further research would be the equity and efficiency questions of the property tax itself. It might be useful to look at the equity and efficiency effects of a sliding scale on the mill levy

or assessment to market value ratio depending on market value or income level. These and other issues related to the practical application of assessment methods and the tax itself need further study. Since the property tax is the "cornerstone" for all local fiscal operations, any improvement in equity or efficiency would be socially desirable.

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