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Income distribution effects of the urban property tax with emphasis on the reappraisal lag: a theoretical and empirical analysis of the Multnomah Couny experience

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There exist a number of factors which operate as potentially significant determinants of the distributional impact of the property tax within any specific urban or metropolitan area. This study is an attempt to explain the income distribution effects of one factor -- the property tax reappraisal lag. The study is limited mainly to the impact of the lag on owners of single-family housing.

An income distribution problem arises because each property subject to the property tax is reappraised only every five or six years. Each Ore-

gon county is divided into five or six maintenance districts to facilitate reappraisal. For example, Multnomah County, which is the subject area of the thesis test, currently has five maintenance districts. All properties in one maintenance district are reappraised each year.

Insofar as property values, as well as the income of owners of these properties, experience differential movements during the five-year period in which the original appraisal is maintained on the assessment rolls, the reappraisal lag redistributes the property tax burden within the area. The hypothesis presented here is that the property tax reappraisal lag operates to increase the burden of the property tax on owners of lower-value single-family housing, while at the same time diminishing the burden of the tax on owners of higher-value single-family housing.

In order to test this hypothesis, a sample was drawn from single-family housing sales data maintained by the Sales Ratio Division of the Multnomah County Assessors' Office. Multnomah County maintains computerized records of all property transfers occuring within Multnomah County.

Through the use of simple and multiple regression analysis, it was possible to examine the following questions: (1) what factors produce the initial assessment level pattern in Multnomah County; (2) how does the reappraisal lag affect the initial assessment pattern; and (3) what are the distribution effects of the initial assessment level and the reappraisal lag pattern.

The results of the study strongly support the hypothesis. Within Multnomah County the reappraisal lag operates to redistribute approximately $1,200,000 per year from owners of lower-value to owners of higher-value single-

family housing, significantly increasing tax burdens on lower-income groups. The redistribution of tax burdens is complicated by the relationship between business and residential property. If redistribution occurs only within the single-family housing property class, owners of housing valued below approximately $14,695 would experience a decline in tax burden, while owners of housing valued above this amount would experience an increase in tax burden. If redistribution results in a lower tax rate for business property, the crossover point mentioned above would decline to approximately $10,260. At the same time, because of the tax rate decline effect, there would be a net shift of tax burden roughly equal to $2.8 million per year from business to residential property.

INCOME DISTRIBUTION EFFECTS OF THE URBAN PROPERTY TAX WITH EMPHASIS ON THE REAPPRAISAL LAG: A THEORETICAL AND EMPIRICAL ANALYSIS OF THE MULTNOMAH COUNTY EXPERIENCE

by

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CHAPTER I

INTRODUCTION

While the number of publications concerned with the property tax has responded in geometric proportions to the growing revenue demands of cities, the number of theoretical and empirical works leading toward a better understanding of the complex effects of the tax within an urban or metropolitan area are few.[1]

One aspect of the property tax which has not only been exposed to major criticism, but which has also been subject to considerable misunderstanding concerns the question of who pays the tax.[2] In spite of the fact that a large number of studies have been done, indicating that the incidence (burden) of the property tax is highly regressive (by regressive it is meant that as income increases, tax as a proportion of income decreases), a few studies conclude that the tax is proportional or even slightly progressive.

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[1]The major exception is Dick Netzer's Impact of the Property Tax: Its Economic Implications for Urban Problems, (Washington: Government Printing Office), 1968. This is a research report done for the National Commission on Urban Problems.

[2]Netzer specifically lists what he considers the major defects of the property tax: (1) its adverse effects on the central city housing stock; (2) the difficulty in uniformly assessing business property; (3) the horizontal inequity of housing taxes within income classes; (4) the regressivity of housing taxes among tenants and among home owners; (5) the lack of neutrality among types of economic activity, particularly in connection with taxes on transportation and public utility property; (6) the adverse effects of high central city business taxes; (7) the effects on urban development patterns outside the central city; and (8) some part of the regressivity of the tax, in particular that part which results in taxing the central poor to provide public services designed to alleviate or overcome poverty. See Ibid., p. 35.

In view of the extensive criticism and this lack of consistency, it is surprising that there have been few attempts to explain the interrelationships of various factors operating to affect the burden of the property tax. A study leading to a better comprehension of those factors which determine the incidence of a specific property tax within a specific urban or metropolitan area would be an important contribution. With this in mind, this study is an attempt to explain one factor, the property tax reappraisal lag, as it affects the burden of the property tax within an urban area.[3]

The existence of the reappraisal lag is easily explained by the enormity of the job of appraising properties in any major urban area. An attempt to annually reappraise each property parcel would quickly approach diminishing returns as administrative costs associated with the reappraisal increased. Therefore, in order to meet the practical administrative problem of property reappraisal, Oregon counties are divided into maintenance districts to facilitate reappraisal. In Multnomah County, the subject area of this study, there presently exist five maintenance districts and, consequently, each property parcel is reappraised every five years.[4] Prior to 1968-69, Multnomah County was on a six-year maintenance cycle. Insofar as property values, as well as the income of owners of these properties, experience differential movements

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[3]There is a tendency to interchange the use of assessment and appraisal. Appraisal specifically refers to the value placed on a property by the appraiser, while assessment is more general terminology indicating the assessed value for tax purposes, ignoring the amount of time since the last appraisal. Also, by the term "specific property tax" it is meant that studies of property tax incidence should relate to a city, county or metropolitan area as a single economic unit.

[4]ORS (Oregon Revised Statutes) 308.234 requires orderly completion of a six-year reappraisal cycle.

during the five-year period in which the original appraisal is maintained on the assessment rolls, the reappraisal lag redistributes the property tax burden within the area.

By raising the issue of the reappraisal lag in property tax administration, this paper confronts two basic questions: first of all, is there a tendency for properties of unequal value to be assessed initially at a different percentage of their market value, and secondly, how is this initial relationship altered over the period of the lag. The paper further attempts to offer an explanation for both the initial assessment level by value of property and for changes in this relationship over the period of the reappraisal lag. In regard to both of these questions, the primary concern of this paper will be with the effect of both the differential level of assessment by value of single-family housing and changes in this initial position on the distribution of the property tax burden (burden is here defined simply as the property tax bill as a percentage of total income).

Aside from the fact that the property tax is a source of individual inequities, a great deal of concern has recently developed over the distributional effects of the tax burden within urban areas. Data recently developed by Dr. Waldo E. Carlson of the Research Division of the Oregon State Tax Commission supports this conclusion.[5] Although Carlson's study is a 2 percent sample of the entire State of Oregon, it has special relevance among incidence studies because it does not involve the use of simple aggregates.[6] His sam-

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[5]Carlson, Waldo E., "Housing Property Tax Burdens," Interoffice Memorandum, February 8, 1968.

[6]Carlson's study also estimated the approximate property tax burden of Oregon renters. While the problem of the property tax in relation to ren-

ple is from 1965 itemized individual income tax returns for the State of Oregon (including only those returns in which the property tax was itemized as a Federal tax deduction).

As indicated in Table I, not only does the property tax as a percentage of total income decline sharply throughout the entire income range, but if adjustments are made for percentage of the tax recouped through the Federal tax deduction for the property tax, the tax is even more regressive. In addition, although the mortgage interest deduction was not separately itemized in 1965, further correction of the data would statistically increase regressivity even more. This is due to the fact that as income increases, the percentage recouped for any deduction increases because of the higher marginal tax rates identified with higher incomes.

Generally speaking, most incidence studies of the property tax find regressivity. However, as indicated before, the studies do not have consistent results and few find the tax as sharply regressive as Carlson's study.[7] There are at least three reasons why this is the case: (1) most studies involve the use of aggregate data, which Carlson has for the most part avoided by using individual income tax returns; (2) many of the initial statistical results are modified in some studies by adjustment in the income concept used and by the allocation of expenditure benefits of the property tax by income

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ters is very important and acts as a significant deterrent to consumption of better housing by lower-income groups, the problem cannot be discussed here. See Ibid., Table IV, p. 13.

[7]See, for example, David Brainin and John J. Germanis, "Comments on 'Distribution of Property, Retail Sales and Personal Income Tax Burdens in California: An Empirical Analysis of Inequity in Taxation' by Gerhard N. Rostvold," National Tax Journal, V. 20, No. 1 (March, 1967), pp. 106-11.

class; and (3) there exist a number of factors, for example differential tax rates and assessment level differences in different parts of a given urban or metropolitan area which function to create differences in the distribution of the property tax burden.

TABLE I

ESTIMATED PROPERTY TAX BURDEN AS A PERCENT OF TAXABLE INCOME

Total Income Range	Property Tax as a Percent of Total Income	Average Percent Recouped When Property Tax Used as a Deduction
$ 1,000	29.5	15.5
$ 1,000 - 2,000	10.9	18.2
2,000 - 3,000	7.3	18.7
3,000 - 4,000	6.7	19.5
4,000 - 5,000	4.8	20.1
5,000 - 6,000	4.3	20.8
6,000 - 7,000	3.5	22.7
7,000 - 8,000	3.1	23.1
8,000 - 9,000	2.9	24.4
9,000 - 10,000	2.6	25.3
10,000 - 15,000	2.6	27.3
15,000 - 20,000	2.4	31.0
20,000 and above	1.8	36.9
Average (weighted)*	2.9	25.0

Source: Carlson, Waldon E., "Household Property Tax Burdens," Interoffice Memorandum, February 8, 1968, p. 11.

*The average is weighted by percent of sample in each income range. Because evidence indicates that a smaller percentage of low-income households file a tax return, these statistics on property tax burden (tax income) may be somewhat inaccurate, depending upon how households who file a tax return differ from households that do not file a return.

The most reliable source of information on the American property tax is Dick Netzer's Economics of the Property Tax. In the portion of his study concerned with the incidence of the tax, Netzer finally concludes that, "the

property tax is regressive throughout the income range; significantly regressive up to about $6,000 - $7,000, mildly regressive or proportional from there to $20,000, and steeply regressive for higher incomes."[8]

It is important to note that in terms of individuals, or in terms of meaningful geographic areas of analysis, Netzer's conclusion is valid only if our area of interest is the United States as a whole. If, however, as this paper implicitly assumes, we are interested in the impact of the property tax burden within an economic unit such as a city or metropolitan area, the use of broad income classes and such a large geographic area is very misleading.

In a more recent study, Netzer draws upon data from individual cities. Importantly, he appears to attribute considerably more significance to the impact of the property tax on lower-income groups.[9] This apparent modification suggests the existence of such a significant variation in the property tax between and within urban areas that the use of national averages is nearly meaningless in a discussion of a particular urban area, such as Multnomah County.

Those studies which have confined their analysis to a county, city, or a single metropolitan area and have used individual household income related to property tax payments of the household reveal much greater regressivity. For example, Gerhard Rostvold's sample-based study of Los Angeles County, as well as his later study of three California metropolitan areas and

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[8]Netzer, Dick, Economics of the Property Tax, (Washington: The Brookings Institution), 1966, p. 51. See Tables 3-6, p. 49 and Tables 3-7, p. 50. Netzer points out, however, that disaggregated data of eight northeastern New Jersey counties reveals a markedly regressive tax. In fact, he suggests the degree of regressivity is probably greater than that for any other major tax in the United States. See pp. 58-9 and Appendix E.

[9]Netzer, Dick, Impact of the Property Tax: Its Implications for Urban Problems, Op. Cit. See Table II, p. 19.

another community of approximately 20,000 support Carlson's general statistical conclusions.[10] Data from the latter community show that the median property tax as a percentage of annual household income ranges from 15.0 percent for households with incomes averaging $2,000 to 3.5 percent for households with incomes averaging $14,000.[11]

A second factor which is another source of inconsistency in property tax incidence studies involves the manipulation of statistical results to account for the allocation of benefits financed by the property tax. Although it is not possible to discuss the question thoroughly, the point is briefly mentioned here to suggest a basic conflict between taxation and urban problems. The notion that we may conclude from the expenditure side of the property tax that the tax is somehow "justified" does not acknowledge the importance of income distribution as a significant determinant of urban problems.

No one would deny that the revenue needs of cities have forced them into the awkward position of taxing the poor to pay for services which help the poor. Also the political fragmentation existing within most metropolitan areas clearly increases the problem of redistributing the burden of the property tax. However, if the above analysis leads one to conclude that taxing the poor is somehow logical and necessary, it merely perpetuates problems caused by reducing the incomes of this group. It seems futile to tax money

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[10]Rostvold, Gerhard N., "Property Tax Payments in Relation to Household Income: A Case Study of Los Angeles County," National Tax Journal, XVI, No. 2, (June, 1963), pp. 197-9. See also the same author, "Distribution of Property, Retail Sales, and Personal Income Tax Burdens in California: An Empirical Analysis of Inequity in Taxation," National Tax Journal, XIX, No. 1, (March, 1966), pp. 38-47.

[11]Rostvold, Gerhard N., "Reply," National Tax Journal, XX, No. 1, (March, 1967), pp. 112-3.

away from poor families, thereby significantly worsening an already unfortunate situation, in order to develop programs designed to alleviate conditions aggrevated by incomes reduced through property taxation.[12]

The third and final reason for the existence of inconsistent results among studies of property tax incidence is the major subject area of this study. There exist a number of factors which operate as potentially significant determinants of the distributional impact of the property tax within any specific urban or metropolitan area. For example, within Multnomah County there are approximately 150 levy code areas,[13] each with an independently determined tax rate and each contributing to a wide range of rates within the County. Further, and more important to a study of the reappraisal lag, there are a number of additional factors which influence the relationship between assessed value and market value of individual properties, therefore signifi-

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[12]A recent study was performed by Hugh O. Nourse relating to the question being raised here. Nourse attempted to estimate the effect on the degree improvement in substandard housing which would follow from an income maintenance program bringing households with income below $3,000 up to that level. He concluded that the degree of improvement could be from as little as 20 percent of all substandard housing, or as high as 93 percent. The final answer depends mainly upon the income elasticity of demand for housing on the part of low-income families. See Hugh O. Nourse, Income Redistribution and the Urban Housing Market, Discussion Paper Series Number 3, (Chicago: Center for Urban Studies, University of Illinois), 1968, p. 32.

[13]Multnomah County, Oregon, Annual Report, Finance Department, Accounting Division for Fiscal Year ending June 30, 1967 and Assessment and Taxation Division for Assessment and Tax Year 1967-68. A tax code area is an area in which a single common tax rate applies to all properties within the area. For any single property parcel within a tax code area the total tax rate is the sum of the separate tax rates levied by special districts, authorities and other units of government authorized to levy a property tax within the area. All property within a tax code area, then, is subject to the same tax rate because each piece of property falls within the same tax districts. Consequently, the range of tax rates within any sizable urban area results from the proliferation of such taxing districts (sewer, water, school, lighting, etc.) in the area.

cantly affecting the burden of the tax within the area.

With these factors in mind, the following questions are examined in this paper: (1) what factors produce the initial assessment level pattern in Multnomah County; (2) how does the reappraisal lag affect the initial assessment pattern; and (3) what are the distributional effects of the initial assessment level and the reappraisal lag pattern?

The hypothesis presented here is that the property tax reappraisal lag operates to increase the burden of the property tax on owners of lower-income properties, while at the same time diminishing the burden of the tax on owners of higher-income properties. It does this because there is a strong tendency for lower-income properties to either remain constant or to depreciate in value over the period of the reappraisal lag. At the same time there is an equally strong tendency for higher-income properties to appreciate in value over the period of the lag. Also with important consequences, the reappraisal lag reinforces the tendency for lower-income properties to be initially overassessed relative to their market value, while higher-income properties tend to be underassessed.

Chapter II includes a more detailed discussion of the reappraisal lag. It involves an explanation of present efforts being made to eliminate the lag, as well as the State of Oregon and Multnomah County's continuous efforts to maintain an equitable level of assessment through the use of State and County sales-ratio studies. Census of Governments evidence of the differential level of assessment by value of property is also presented. Finally, the chapter develops a general model which attempts to explain alteration of tax burden as a function of the tax rate, the Federal tax deduction for the property tax,

and the level of assessment. Chapter III is the main portion of the study and is concerned with the following: (1) development of the thesis test, (2) a simple regression analysis of assessed value on sale price to show the initial level of assessment by value of housing and shifts in this function over the reappraisal lag, and, finally, (3) a multiple linear regression analysis attempting to explain the ratio of assessed value to sale price (AV/SP) and changes in the ratio over the lag as a function of five independent variables.

The attempt to explain the AV/SP ratio in the last chapter is merely an attempt to discover some of the reasons for the empirical results presented in the first part of the paper. Once it was determined that low-value housing tends to be overassessed while higher-value housing tends to be underassessed, it is necessary to offer an explanation for these results. The multiple regression analysis points out that part of the explanation can be found by relating the AV/SP ratio to age of the house, distance from the center of the city and certain neighborhood effects.

Finally, it should be pointed out that implicit within any burden statistics used in this study is the assumption that the burden is unshifted. Evidence from Netzer's study of the property tax indicates that approximately 90 percent of the property tax burden is unshifted.[14]

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[14]See Dick Netzer, Impact of the Property Tax: Its Economic Implications for Urban Problems, op. cit., p. 16.

CHAPTER II

A BRIEF DISCUSSION OF THE REAPPRAISAL LAG AND ITS IMPORTANCE

While there appears to be general acceptance of the equity and revenue importance of the reappraisal lag by assessors and State Tax Commission personnel involved with property tax administration,[15] there has been little, if any, analysis of the reappraisal lag in economic literature. In general, however, there are at least three reasons to be concerned about the amount of time between property reappraisal. First, it could create extensive land-use effects; second, it causes a considerable revenue loss from general underassessment; and third, if this paper's hypothesis is correct, it involves a significant redistribution of income from owners of low-value properties to owners of higher-value properties. The latter is the primary concern of this study.

Land-Use, Revenue, Equity

The land-use effects of underassessment due to the reappraisal lag may be extensive within an urban area such as Multnomah County. With the growth of urban problems, interest in the property tax has broadened to include the relationship between the property tax and the use of land. Jerome Pickard, of the Urban Land Institute, briefly alluded to the significance of

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[15] In discussions with county assessors and personnel involved with administration of the property tax in Multnomah, Clackamas and Washington Counties, as well as with State Tax Commission personnel, it is clear that there is general familiarity with the importance of the reappraisal lag. Several mentioned that it does have equity considerations. Others were concerned primarily with the revenue loss question.

the reappraisal lag on open space land-use in the urban fringe, commenting that, "If the assessment ever caught up with the full value of the land in the urban fringe, tax levies would probably be several times the present value."[16]

There has been more recent interest in the role of the property tax as a tool for controlling land-use in urban areas. Although not specifically mentioned, the reappraisal lag reduces the cost of holding land for speculation, as well as maintaining it in less than optimum use.[17]

An additional factor suggesting the importance of the reappraisal lag is the amount of revenue loss due to general underassessment in Multnomah County. Underassessment (anything less than 100 percent of market value) results from both the initial level of assessment at the time the appraisal is made and the reappraisal lag. The relative importance of these factors will be discussed below in conjunction with the statistical analysis.

Furthermore, in order to give an accurate picture of what is occurring, the revenue loss effect should be related to the third effect, which is concerned with inequities produced by the reappraisal lag, as well as the possible initial differential level of assessment by value of property. Evidence to be presented later points out that within Multnomah County single-family housing below $7,500 to $10,000 tends to be assessed at 100 percent or more of market value (see the discussion in the next section on sales-ratio studies).

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[16]Pickard, Jerome P., Taxation and Land Use in Metropolitan and Urban America, Research Monograph 12, (Washington: Urban Land Institute, 1966), p. 28.

[17]See, for example, Bahl, Roy W., "A Land Speculation Model: The Role of the Property Tax as a Constraint to Urban Sprawl," Journal of Regional Science, Vol. 8, No. 2 (1968).

Therefore, if it is assumed for the moment that the hypothesis is correct, the potential increase in revenue that would be derived by eliminating underassessment (whether this occurs as a result of the initial underassessment at the time of appraisal, because of the lag in reappraisal, or both) would come primarily from properties with values above $7,500 to $10,000. As Table II indicates, the potential revenue increase is substantial (note that these statistics are for total assessed value of all Real Property -- in 1966, nonfarm single-family housing in Multnomah County comprised approximately 62 percent of Real Property).

TABLE II

AN ESTIMATE OF THE GAIN IN REVENUE BY TAXING ALL REAL PROPERTY AT 100 PERCENT OF MARKET VALUE, MULTNOMAH COUNTY

Ratio	Assessed Value of Real Property**	Tax Rate/ $1,000***	Revenue (Mill)
95.1*	$2,979,554,840	29.35	87.5
100.0	$3,133,075,540	29.35	92.0

Source: Oregon State Tax Commission, Ratio Study 1968 Locally Assessed Property, (Salem: Oregon State Tax Commission), 1968.

*Ninety-five and one-tenths percent is the average overall ratio of assessed value to sale price (market value) for locally assessed real property in Multnomah County.

**Taken from the Bureau of Governmental Research, Local Government Finance, (Eugene: University of Oregon), April, 1969, p. 4.

***Tax rate is the median tax rate for Multnomah County, Ibid., pp. 10-3.

Based upon these rough estimates, the additional revenue that would be obtained if all Real Property were assessed at 100 percent of market value is the difference between $87.5 million and $92.0 million -- or $4.5 million.

(The revenue derived from residential property is 62 percent of 4.5 million, or roughly 2.79 million.)[18]

In terms of the potential equity effects, if our hypothesis is correct, this amounts to a redistribution of up to $4.5 million annually from lower-income to higher-income properties within Multnomah County.

There have been recent efforts in Oregon to develop a method of eliminating the lag in reappraisal. Jerry Dasso, in cooperation with the Oregon State Tax Commission, has developed a multiple regression equation which may eventually lead to annual reappraisal of single-family housing.[19]

It appears, then, that the reappraisal lag has a number of complex effects which are only partially understood. However, except for the amount of revenue loss and a general notion that the lag creates inequities, the reappraisal lag has been subject to no consistent analysis.[20] It is reasonable to expect the effects of the lag to vary considerably from one area to another, as social and economic characteristics, as well as the administration of the property tax vary. Within Multnomah County the potential equity effects are quite large, as indicated by the amount of revenue loss and the large propor-

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[18]A separate estimate was derived from Multnomah County statistics on market value of Residential Property in the County. This estimate is roughly the same -- approximately 2.8 million dollars. See Appendix B, Table XXIII.

[19]From telephone interviews with Jerry Dasso and with the Oregon State Tax Commission. Although the model developed utilized Salem, Oregon as the test area, it should be relatively easy to adapt the equation to any unique circumstances found in other counties. The study is not yet available.

[20]Jerry Dasso of the University of Oregon has an upcoming article discussing the equity effects of the reappraisal lag. It is to be published in the July issue of the Appraiser's Journal. His general conclusions are (1) higher value property tends to be underassessed and (2) rural property is underassessed. From Ibid.

tion of older, lower-value housing within the City of Portland.

Assessment Level and Sales-Ratio Studies in Oregon

The basis for a statistical test of the hypothesis that the reappraisal lag operates to increase the burden of the property tax on owners of lower-income properties, while diminishing the burden of the tax on owners of higher-income properties is the annual, unpublished Multnomah County sales-ratio study. As a part of the state-wide equalization program, each county is required to determine the relationship between assessed value and market value of properties sold within the county by a study of assessed value - sale price ratios for properties sold each year. At the same time, the State performs a separate study for each county in order to assure the accuracy of the county ratio analysis. On a national level the Census of Governments does a detailed ratio study on a state-wide and county basis every five years, allowing for some inter-state and inter-county comparison of assessment level.

The evidence from these sources suggests three things: (1) assessment uniformity has improved in Oregon, (2) assessment uniformity within Multnomah County is superior to that for the State as a whole, and (3) there is a trend toward overassessment of lower-value properties, and underassessment of higher-value properties in the United States as a whole, with this trend manifesting itself somewhat more acutely in Oregon.[21]

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[21] See the Advisory Commission on Intergovernmental Relations, State and Local Finances 1966-69, (Washington: Government Printing Office), 1968, Table 44, p. 102; see also Oregon State Tax Commission, Ratio Study 1968 Locally Assessed Property, (Salem: Oregon State Tax Commission), 1968 and U.S. Department of Commerce, Bureau of the Census, 1967 Census of Governments: Taxable Property Values, Vol. 2, (Washington: Government Printing Office), 1968, Table 17, p. 79.

The Sales Ratio Study in Oregon

From the standpoint of operating an equitable property tax system, the relationship between the State and the county in regard to assessment standards is an important one. Under regulations prescribed by the State Tax Commission (as a part of the Commission's responsibility to perform research in the development of appraisal standards), each Oregon county assessor has been required since 1955 to make an annual assessment ratio (sales ratio) study.[22] This requirement is a part of the equalization program begun in 1951.

The State of Oregon sets specific assessment requirements which the county must meet. Given the present 100 percent level of assessment in Oregon,[23] each county is required to maintain an average ratio of assessed value

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[22]The State Tax Commission plays a prominent role in the administration of the Oregon property tax. It assesses some property, supervises local property assessment and tax collection, and also serves as a board of appeals. See ACIR, Role of the States in Strengthening the Property Tax, Vol. 2, (Washington: Government Printing Office, 1963), pp. 132-6. The State Tax Commission has been involved in sales-ratio studies since its creation in 1909, however it has only been since 1950 that the ratio studies have been used to determine assigned county ratios.

One of the five major recommendations made by the National Commission on Urban Problems for improvement of the Property Tax was for careful studies of assessment ratios to be conducted and publicized. While the data developed by the State of Oregon and each county within the State is utilized primarily to promote State property tax equalization and to assist local assessors, it is desirable that the results of these studies be more widely publicized. An additional standard that could be applied utilizing data currently collected by counties would be to test for ratio dispersion about the mean by value of house ranges, rather than just by major property class. Also, particular neighborhoods which are experiencing ratio difficulties (e.g., areas experiencing depreciation) could also be more carefully analyzed. See Urban Affairs Reports: A Special Report: Recommendations of the National Commission on Urban Problems, (New York: Commerce Clearing House, Inc., 1968). See pp. 199-223.

[23]Ibid., p. 136. Most counties from other states assess property at

to sale price between 90 and 110 percent -- a 10 percent tolerance level.[24] This is an average for all classes of property, including residential, commercial, and industrial. If the county fails to meet the prescribed level, the State Tax Commission requires action be taken to bring that county within the statutory limits or to substitute the State's own ratio for that of the county (as determined from the separate State ratio analysis).[25]

Assessment Improvement and Assessment Uniformity

Assessment uniformity in Oregon has improved significantly since 1956 and, according to one statistical measure, Oregon has one of the more efficient and sound property tax administrations in the United States. This is suggested by the 1966 coefficient of intra-area dispersion for non-farm housing assessment in Oregon (see Table III). In 1966 the coefficient was 18.9. In percentage terms, this is a measure of the average departure of individual assessments from the typical or median level of valuation for property in the area. The 18.9 was lower than the coefficient found in over three-fifths of the

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less than 100 percent of market value and, therefore, adjust rates upward accordingly.

[24]The 1967 Legislative Session enacted what has become known as the "truth in taxation" law which requires that as of January 1, 1968 all real or personal property within each county shall be assessed at 100 percent of its true cash value. See Oregon State Tax Commission, Ratio Study 1968 Locally Assessed Property, op. cit., p. 6.

[25]Following the above direction, the 1968 ratio study indicates that twelve counties were experiencing ratio difficulties. This means that the assessment levels of a particular class or classes of property were falling near or below the statutory limits. Because of this the Commission sent letters to all twelve counties. Multnomah County was not one of the counties experiencing difficulties.

states.[26] Also, the decline in the Oregon coefficient since 1956 may indicate significant improvement in assessment administration (a decline from 32.8 to 18.9). However, in areas where property values of sub-areas are changing rapidly, this dispersion will tend to be larger -- therefore, the dispersion is partly a function of the market, and not just "good administration of the property tax."

TABLE III

COEFFICIENTS OF DISPERSION FOR ASSESSMENTS OF NON-FARM HOUSES, THE UNITED STATES AND OREGON, 1956, 1961 AND 1966*

Area	1956	1961	1966
United States	29.9	25.8	19.2
Oregon	32.8	24.7	18.9

Source: Advisory Commission on Intergovernmental Relations, State and Local Finances: Significant Features 1966 to 1969, (Washington: Government Printing Office), 1968, Table 44, p. 102.

*This coefficient is the result of measuring the difference between the median assessment ratio and each of the individual item ratios; adding these differences, dividing this sum by the number of items, dividing this result (which is an average deviation) by the median assessment ratio, and multiplying by 100. The coefficient here is the median area of those surveyed.

Using data from the State of Oregon's 1968 ratio study, assessment uniformity in Multnomah County appears to be superior to that for the State as a whole. The coefficient of dispersion for residential property (which does not distinquish between single-family and multiple-family units) was only

[26] Advisory Commission on Intergovernmental Relations, State and Local Finances 1966-1969, loc. cit., Table 44, p. 102.

9.8 for urban and 8.1 for suburban portions of the County.[27] Only three out of a total of thirty-six Oregon counties had 1968 coefficients this low.

There is reason to believe, however, that the dispersion of values about the median is not random, as the coefficient would lead one to believe. One indication is that urban residential property is more likely than suburban residential property to be overassessed (see Table IV). Also, the Census of Governments study of assessment levels indicates a tendency to underassess higher-value properties.

TABLE IV

URBAN AND SUBURBAN RESIDENTIAL PROPERTY -- 1967 SALES AND 1967 ASSESSMENTS -- MULTNOMAH AND WASHINGTON COUNTIES

Area*	Coefficient Of Dispersion	Percent of Total Sales with AV/SP Greater than 110
Multnomah County		
Total	9.8	8.7
Urban		10.8
Suburban	8.1	5.3
Washington County		
Total	8.4	3.0
Urban		2.6
Suburban	8.4	1.5

Source: Computed from data in Oregon State Tax Commission, Ratio Study 1968 Locally Assessed Property, op. cit., pp. 4, 27, and 35.

*Urban includes all incorporated areas, while suburban includes those areas immediately surrounding the incorporated areas.

[27]Oregon State Tax Commission, Ratio Study of 1968 Locally Assessed Property, op. cit.

Table IV points out that urban Multnomah County has a higher percentage of properties with an assessed value - sale price ratio over 110 than the suburban portion of the County. Within Multnomah County the percentage of urban properties overassessed (10.8 percent) is twice the percentage of suburban properties overassessed (5.3 percent). Further, the percentage of overassessed properties in Multnomah County (8.7 percent) is nearly three times that found in Washington County. Washington County is the most rapidly growing suburban area within the Portland metropolitan area. These facts suggest that the older, lower-value housing stock of the central City within Multnomah County tends to be overassessed relative to the newer, suburban properties.

Further evidence from the 1967 Census of Governments points out that there is a tendency to underassess higher-value properties, while overassessing lower-value properties.[28] This is indicated by the price-related differential of assessment ratios. This measure is an unweighted mean assessment ratio of a particular area divided by the sales-based average assessment ratio of the area. In other words, because the mean is obtained by adding ratios calculated for the individual sales and dividing by the number of items, while the sales-based average ratio is obtained by dividing the aggregate assessed value of the sold properties by the total of their prices, if higher-value houses tend to be underassessed relative to lower-value houses, the sales-based ratio will be smaller than the mean ratio. If this is the case, a price-related differential greater than 100 is a summary indication of a tendency

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[28]U.S. Department of Commerce, Bureau of the Census, 1967 Census of Governments: Taxable Property Values, op. cit., Table 17. See also p. 13 for an explanation of this calculation.

toward a lower ratio of assessment for relatively high-value properties than for low-value properties in the area.

While in the United States as a whole 39 percent of all areas tested had ratios greater than 105.0, in Oregon the figure was 61 percent.[29] Although this is merely an average relationship, it does appear that the tendency is stronger within Oregon as a whole than in most areas of the United States.

It can be concluded, then, that available published data support the hypothesis that higher-value properties tend to be underassessed, while lower-value properties are relatively overassessed. However, the data do not explain why this occurs. Moreover, the data fail to specify assessed value - sale price ratios by value of property. Therefore, without more detailed analysis, it is impossible at this point to estimate the relative importance of the initial level of assessment versus the reappraisal lag in explaining levels of assessment by property value.

An Income Distribution Model of the Property Tax

In order to place the reappraisal lag into its proper context, it might be profitable to identify more specifically those factors which function to produce the individual home owner's tax burden (tax as a proportion of income). This section, then, develops two models, the first of which attempts to explain the importance of the following factors in affecting property tax burdens: (1) value of housing as a percent of income, (2) tax rate, (3) percentage of property tax recouped through the Federal income tax deduction, (4) initial level of assessment by value of house, and (5) the reappraisal

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[29] Ibid., Table 17, p. 79.

lag. The second model demonstrates the importance of the tax rate decline as assessed valuation is increased (or decreased) to market value, holding total revenue constant. This model is extremely important in explaining shifts in tax burden that would result if the assessment level differentials were eliminated.

Model 1: Variables Determining Property Tax Burden

The following factors interrelate and contribute to the total tax burden, with

(1) $T = f\{MV/Y, t, R, AV/MV\}$

where: T = tax bill

Y = total income of individual

MV = market value of house

t = tax rate

R = amount of property tax recouped through the Federal Income Tax deduction for the property tax

AV = assessed value of house

Value of Housing

The reason most often cited as the primary cause of property tax regressivity is the fact that as income increases, the average amount spent on housing declines as a percent of income. The available data point out that this is correct. FHA mortgage statistics show that, on the average, in 1966 a person with annual income of $4,200 purchased a house valued at approximately 2.90 times his income ($12,203), while a person with annual income of

$13,800 purchased a house valued at only 1.62 times his income ($22,345).[30]

Tax Rate

In spite of the fact that apparently no study exists which relates average tax rates to average value of housing (either nationally or locally), available evidence suggests that higher average tax rates tend to be associated with lower-value housing. Within the Portland metropolitan area in 1969, median tax rates by county range from approximately 2 1/2 percent of assessed value (with assessed value based on 100 percent valuation) for both Clackamas and Washington Counties to nearly 3 percent in Multnomah County.[31] In other words, both of Portland's suburban counties have lower median tax rates than does Multnomah County, which contains the City of Portland.

Significant rate differentials also exist within each county. As pointed out earlier, there are approximately 150 different tax rates within Multnomah County. However, because the City of Portland is a tax code area, it has only one tax rate. A 1963-64 survey by the Portland Public School District points out that the average total tax rate for school districts within Multnomah County ranged from approximately 1 1/2 percent to roughly

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[30]U.S. Department of Housing and Urban Development, Statistical Yearbook 1966, (Washington: Government Printing Office, 1968), computed from Table 40 a, p. 127. See Appendix A for a list of value of house-income ratios derived from FHA statistics.

[31]Bureau of Governmental Research and Service, op. cit., pp. 10-13. For national evidence of a tax rate differential see Netzer, Impact of the Property Tax: Its Implications for Urban Problems, op. cit., Table 12, p. 24. Available evidence indicates that effective tax rates (tax/market value) are higher in central cities than in suburban areas in three-fourths of the areas tested.

3 percent of assessed value.[32] Therefore, the highest average tax rate within the County was roughly twice that of the lowest.[33]

Since the Central City tax code area (City of Portland) contains the majority of the metropolitan area's low-value housing (and low-income households) and because this tax code area consistently has a tax rate near the highest in the Portland area, it is reasonable to assume a tax rate differential exists. For purposes of the simplified model developed here, it is assumed that the average tax rate associated with low-value housing is 3 percent, while 2 1/2 percent is associated with high-value housing.

Initial Level of Assessment and Reappraisal Lag

For a single household, the tax burden is represented by the tax rate times the assessed valuation of the house divided by income:

$$(1)\quad \frac{T}{Y} = \frac{t(AV)}{Y}$$

Consequently, it becomes important to know if the relationship between assessed value and market value (AV/MV) varies significantly with the value of housing.

In addition to data presented earlier, evidence to be presented later supports the hypothesis that assessed value as a proportion of sale price declines as the value of housing increases. It was suggested earlier that this results from (1) the initial level of assessment by value of housing at the

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[32]Portland Public School District, Metropolitan School Finance Survey, (Portland: Portland Public School District, 1965), pp. 4-5.

[33]The 1960 Census, although quite out of date, registers a higher median value of housing for Clackamas and Washington counties than for Multnomah County. See Bureau of the Census, County and City Data Book 1967, (Washington: Government Printing Office, 1968), p. 304.

the time of appraisal and (2) the change in AV/MV over the reappraisal lag. This hypothesis may be expressed in the following manner:

(2) $AV/MV = f(MV, L)$

Where: AV = assessed value of house

MV = market value of house (sale price)

L = time lag in reappraisal

In order to demonstrate the effect of the assessment level differential on the distribution of tax burdens, it is assumed in the model that the low-value house is initially appraised at 110 percent of its value, and as the house declines in value while retaining its original assessment, it becomes assessed at 120 percent of its market value. At the same time, it is assumed that the high-value house is initially appraised at 80 percent of its value. During the time lag in reappraisal the house increases in value to the point where it is assessed at 70 percent of its market value.

Given the assumptions previously outlined, Table V is a model indicating the direction each of these variables affects property tax burdens.

The model, then, assumes that the low-value house was originally appraised at $11,000 (while its market value was $10,000). During the lag in appraisal the house declines in value to the point where its true value is $9,000. At the same time, it is assumed that the high-value house is initially appraised at $17,000 (while its market value was $22,000). During the reappraisal lag the house increases in value so that it is now worth $25,000.

It is not possible to indicate the relative importance of these factors in increasing the regressivity of the tax. A much more detailed and disaggregated model would be necessary to determine the more precise interrela-

TABLE V

A MODEL INDICATING CHANGES IN TAX BURDEN AS AFFECTED BY THE ASSESSED VALUE - SALE PRICE RATIO, TAX RATE DIFFERENTIAL, APPRAISAL DIFFERENTIAL, REAPPRAISAL LAG, AND THE FEDERAL PROPERTY TAX DEDUCTION

	Low-Income Household*			High-Income Household		
		Tax/Income**			Tax/Income**	
Variables Affecting Tax Burden	t (AV) / Y =	With Federal Deduction	Without Federal Deduction	t (AV) / Y =	With Federal Deduction	Without Federal Deduction
AV/MV = 1	.03(9,000)/3,000 =	.072	.090	.03(25,000)/15,000 =	.035	.050
Tax Rate Differential	.03(9,000)/3,000 =	.072	.090	.025(25,000)/15,000 =	.029	.041
Appraisal Differential	.03(10,000)/3,000=	.080	.100	.025(22,000)/15,000 =	.025	.036
Reappraisal Lag	.03(11,000)/3,000=	.088	.110	.025(17,000)/15,000 =	.019	.028

*Low-income household: Y = $3,000, MV = $9,000; high-income household: Y = $15,000, MV = $25,000.

**The tax/income ratio (T/Y) is the tax bill paid as a percentage of income, or tax burden.

lationships of the variables governing the burden of the property tax within an urban area such as Multnomah County. It is reasonable to expect large inter- and intra-area differences in the relative role each variable would assume in determining property tax burdens. This is due to conditions affecting the costs of housing, choice of ownership versus renting, tax rate differences, and land value appreciation, as well as assessment practices.

Model 2: Changes in Tax Burden Resulting From Elimination of Assessment Level Differentials While Maintaining a Constant Total Revenue

Certain indirect effects also contribute to tax burden. For example, changes in AV/MV over the reappraisal lag do not affect all houses equally and, therefore, result in: (1) a lower than equitable tax bill for individuals owning homes whose value increased; (2) a higher than "normal" tax bill for those individuals owning homes whose value decreased;[34] and (3) any other movements in tax rates that result from the fact that increases in value were not taxed and decreases in value were taxed (e.g., tax burden increases that would not have occurred if all houses were assessed at their current market value).

Table VI assumes that there exist three houses and that they are assessed at different percentages of their market value. It is also assumed that total tax revenue is held constant as all three houses are taxed at 100 percent of their value.

In an urban area such as Multnomah County, the problem of determining changes in tax burden that would occur if all houses were assessed at 100

[34]Normal is here defined as a tax bill resulting from taxation of a house which experiences some average rate of value appreciation.

TABLE VI

A MODEL OF CHANGES IN TAX BURDEN THAT WOULD OCCUR IF ALL HOUSES WERE ASSESSED AT 100 PERCENT OF MARKET VALUE, ASSUMING A CONSTANT TOTAL REVENUE

				With Lag (t = .03) Total Revenue = $1,400		Without Lag (t = .02) Total Revenue = $1,400		
Income	MV	AV	AV/MV	Tax Bill	Tax/Income	Tax Bill	Tax/Income	Change In Tax Bill
$ 2,500	$10,000	$11,700	1.20	$350	.14	$200	.08	- $150
10,000	20,000	15,000	.75	450	.05	400	.04	- 50
25,000	40,000	20,000	.50	600	.02	800	.03	200

percent of their market value is complicated by the uneven distribution of houses by value range. This problem is treated in more detail in the next chapter.

Both of the models presented point out that the extent to which property tax regressivity is altered during the period of the reappraisal lag depends primarily upon two critical variables -- these are the value of house-income ratio and the differential rate of increase in market value of housing. The length of the cycle and the variance in the distribution of market values, then, determines the extent to which these variables redistribute the tax burden. If we assume that the same total revenue is collected after the lag is eliminated, then housing experiencing increases in assessed value just offsetting the decline in tax rate will maintain the same tax bill (and, therefore, tax burden); housing below this value will experience a decline in tax burden; and housing above this value will experience an increase in tax burden. These relationships are fundamental to an understanding of the complex effects of the reappraisal lag and are presented in more detail in Chapter III along with actual estimates of changes in burden that might be expected with elimination of the time lag in appraisal.

Additional Complicating Factors

Both of the models presented in this chapter assume no changes in income over the appraisal lag. It is reasonable to assume that over a reappraisal lag of five to six years, there would occur differential shifts in income which would, therefore, affect the relative tax/income ratios. For example, if there is an increase in income inequality during the period of the lag

(assuming all other things constant), then it would be expected that the property tax would become more regressive.

A further important modification in statistical results indicating tax burden would occur if it were possible to include changes in value of assets in a practical definition of income. A Haig-Simons definition of income includes all increases in "net worth" in the income concept.[35] Since available evidence indicates that the ratio of assets to income increases as income increases, during periods of rising asset values, regressivity is greater than statistical studies of property tax burden reveal.[36]

Value of house appreciation is one increase in net worth which is not included in the normal definition of taxable income. If this increase (or decrease) in most individuals' major asset were included as income in tax burden studies, statistical results would be significantly modified. If a person's home increases in value over the reappraisal lag by $5,000, and if the increase occurs evenly over the five-year cycle, in a Haig-Simons sense, this amounts to an additional $1,000 annual income in the form of an increase in net worth.

A final complicating factor not apparent in either model involves mobility of population. For any one individual, the models must assume no mobility. However, the analysis may not be significantly altered if we further assume that a person moving chooses a similar home -- one that is with-

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[35]See Richard Goode, The Individual Income Tax, (Washington: The Brookings Institution, 1964), pp. 28-33.

[36]See Board of Governors of the Federal Reserve System, Survey of Financial Characteristics of Consumers, August, 1966 and Federal Reserve Bulletin, January, 1967.

in the same or higher value range and, therefore, tends to be subject to the same reappraisal lag influences. If our interest is concerned primarily with income groups, rather than with individuals, at least in the short-run (possibly five to ten years) mobility should not demonstrably affect the results.[37]

It may be concluded that the total effects of the reappraisal lag are uncertain. Indirect evidence from data developed by Multnomah County, the State of Oregon and the U.S. Bureau of the Census indicates that lower-value housing tends to be overassessed relative to higher-value housing. A tentative thesis is that these results may be explained by the initial differential level of assessment by value of housing and by differential value of house increases over the time lag in appraisal. As the two models demonstrate, the impact of the reappraisal lag on the distribution of tax burden is complicated by the value of house-income ratio, differential rates of value appreciation, variance in the distribution of market values, and, importantly, by the resulting tax rate decline which would follow from maintaining a constant total tax levy.

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[37]Some other possible factors which could shift the incidence of the property tax over time include: (1) differential increases in the tax rate affecting different income groups, (2) changes in consumption of housing by income class, (3) changes in assessment practices differentially affecting the range of housing values, (4) differential shifts in value of housing produced by the lag in reappraisal, (5) changes in factors affecting the shifting of the property tax, (6) shifts in the pattern of residential consumption -- e.g., ownership versus renting, (7) new legislation affecting the proportion a person pays in property tax, or (8) shifts in patterns affecting redistribution of revenue -- e.g., state tax relief.

CHAPTER III

A TEST OF THE REAPPRAISAL LAG THESIS

A statistical test of the reappraisal lag thesis involves two parts: (1) an attempt to identify the relationship between assessed value and sale price by use of simple regression analysis. The initial level of assessment and changes in the initial level of assessment over the reappraisal lag are analyzed; (2) an attempt to explain the ratio of assessed value to sale price by use of multiple regression analysis involving five independent variables, emphasizing the change in the regression through introduction of the lag.

Construction of the Test

As pointed out earlier, the basis for the test of the reappraisal lag thesis is Multnomah County's 1969 Ratio Study. Multnomah County provides a useful basis for the study because it contains approximately one-fourth of the State's population (1967 estimate was 555,700) and because of the availability of data. In addition, Multnomah County maintains computerized records of all property transfers occuring within the County.[38]

The total sample includes 404 deed sales of single-family houses occurring within Multnomah County during 1968 (see Appendix B for additional information on the sample).[39] The areas chosen to be included in the sample

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[38]Although the data is not in published form, it was made available through the Sales-Ratio Department and the Computer Center, Multnomah County.

[39]The 1969 Ratio Study classifies sales as deed, contract or unquali-

were visually-selected, ten-block square sections (quarter sections) located in various parts of the County. The sections were chosen so as to include a wide range of single-family housing, taking into consideration the following factors: (1) value, (2) age of housing, (3) distance from the central city, (4) homogeneity of area, and (5) maintenance district. (See Appendix B for a more detailed explanation of method.) The major limitation of this particular method of sample selection is the division of the County into five maintenance districts for the reappraisal cycle, and the impossibility of providing the same range of housing variables in each of the five districts. For example, a maintenance district in the eastern portion of the County may not include a significant sample of houses valued from $5,000 to $10,000. However, once the ten-block square areas have been selected, the sales are randomly sampled within each area.

Since all sales included in the sample occur in 1968, in introducing the reappraisal lag, the particular maintenance district in which the sale occurred determines the amount of time since the last reappraisal. Therefore, identification of the initial level of assessment by value of housing is comprised of that maintenance district which was reappraised in 1968 -- i.e., 1968 sales and 1968 reappraisal; whereas the introduction of the lag effect is comprised of those maintenance districts reappraised in years other than 1968 -- e.g., if maintenance district No. 3 were last reappraised in 1966, all

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fied sales. Only deed sales were included in the sample because of the possibility of irregularities being involved in either contract or unqualified sales. Although in most areas within the City this does not amount to a large proportion of total sales, the exclusion of contract sales within areas such as Albina would have important effects. A much larger proportion of total sales within the low-value, negro housing district involve contract sales and, therefore, assume much more importance.

sales occurring in that district during 1968 involve a two-year reappraisal lag. (See Table VII)

TABLE VII

CONSTRUCTION OF THE THESIS TEST

*Maintenance District	Year Of Last Reappraisal	Year Of Sale	Lag (Years)	Reappraisal Lag
2	1968	1968	0	Initial Assessment Level (Lo)
1	1967	1968	1	Lag Effect (L_1)
5	1966	1968	2	Lag Effect (L_2)
4	1965	1968	3	Lag Effect (L_3)

*This is the correct maintenance cycle for Multnomah County.

A simple regression of assessed value on sale price was performed for each of the four districts from which data was collected. Four separate regressions were performed in order to determine the initial level of assessment and shifts in the function over a three-year lag. (See Table VII). This involves a least-squares fit in which each of the four separate samples is computer-tested against six basic curve types.[40] Utilizing these regressions, estimates of assessed value by sale price of housing (and, therefore, the dollar amount of underassessment) are made. Also, from these equations the dollar amount of taxes not paid due to underassessment (by value of housing) is estimated. This includes: (1) an estimate of taxes not paid in a

[40]General Electric, Time-Sharing Service Regression Analysis: Program Library Users Guide, (Bethesda, Maryland: Information Services Department, 1968), pp. 19-21. The CURFTS program was utilized for the simple regressions.

single year (by value of housing) after a three-year appraisal lag, and (2) an estimate of the present value of taxes not paid (and, therefore, income retained for consumption) over a five-year appraisal cycle.

For the second part of the thesis test, the multiple linear regression analysis is also computer-tested for each of the four separate samples.[41] This regression is an attempt to explain the assessed value - sale price ratio AV/MV as a function of five independent variables, including (1) sale price, (2) age of house, (3) average sale price of housing in the ten-block square area, (4) distance from the center of the city, and (5) the percentage by which the sale price of the house differs from the average sale price of housing in the quarter section area. Table VIII contains a summary of the regression analyses involved in this study.

Simple Regression Analysis of Initial Level of Assessment

It is the purpose of this section to identify more specifically the relationship between assessed value and market value of housing (sale price) at the time of appraisal. This relationship would then specify the initial level of assessment by value of housing and would be the basis upon which to analyze shifts in the relationship over time and, therefore, the effect of the appraisal lag.

According to data developed by Multnomah County, the initial level of assessment is nearly 100 percent. This is determined from the average assessed value - sale price ratio for that maintenance district which was reappraised in 1968-69 (i.e., no reappraisal lag). The mean urban ratio was .993, while

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[41] Portland State University Computer Center.

the mean suburban ratio was 1.01 (see Appendix C, Table XXIV for AV/MV ratios by each maintenance district in 1968).[42]

TABLE VIII

SUMMARY OF REGRESSION ANALYSES

Variable	Simple Regression	Multiple Linear Regression	Symbol for MLR
Dependent Variable	1) Assessed Value	1) Assessed Value/Sale Price	AVSP
Independent Variables	2) Sale Price	2) Sale Price	SP
		3) Age of House	AGE
		4) Average Sale Price of Housing in Area	SPAV
		5) Distance (in blocks) from Center of City	DIST
		6) Percentage by which Sale Price of House differs (+ or -) from average sale price of housing in area	PDIF

Based upon the regression analyses in this section, however, these average ratios succeed in hiding significant ratio differentials by value of property.[43] Therefore, in order to test the first part of the hypothesis, a simple regression of assessed value on sale price for housing both reappraised

[42]Multnomah County, 1969 Ratio Study, Ratio Subsection. Note that the assessed value - sale price ratio is the same as AV/MV and the multiple regression symbol AVSP (discussed later).

[43]Although the analyses of this study are limited to single-family housing, a similar study could be performed utilizing multiple-family, commercial or industrial property. Data maintained by Multnomah County for ratio analyses distinguishes between these property classes.

and sold in 1968 was performed.

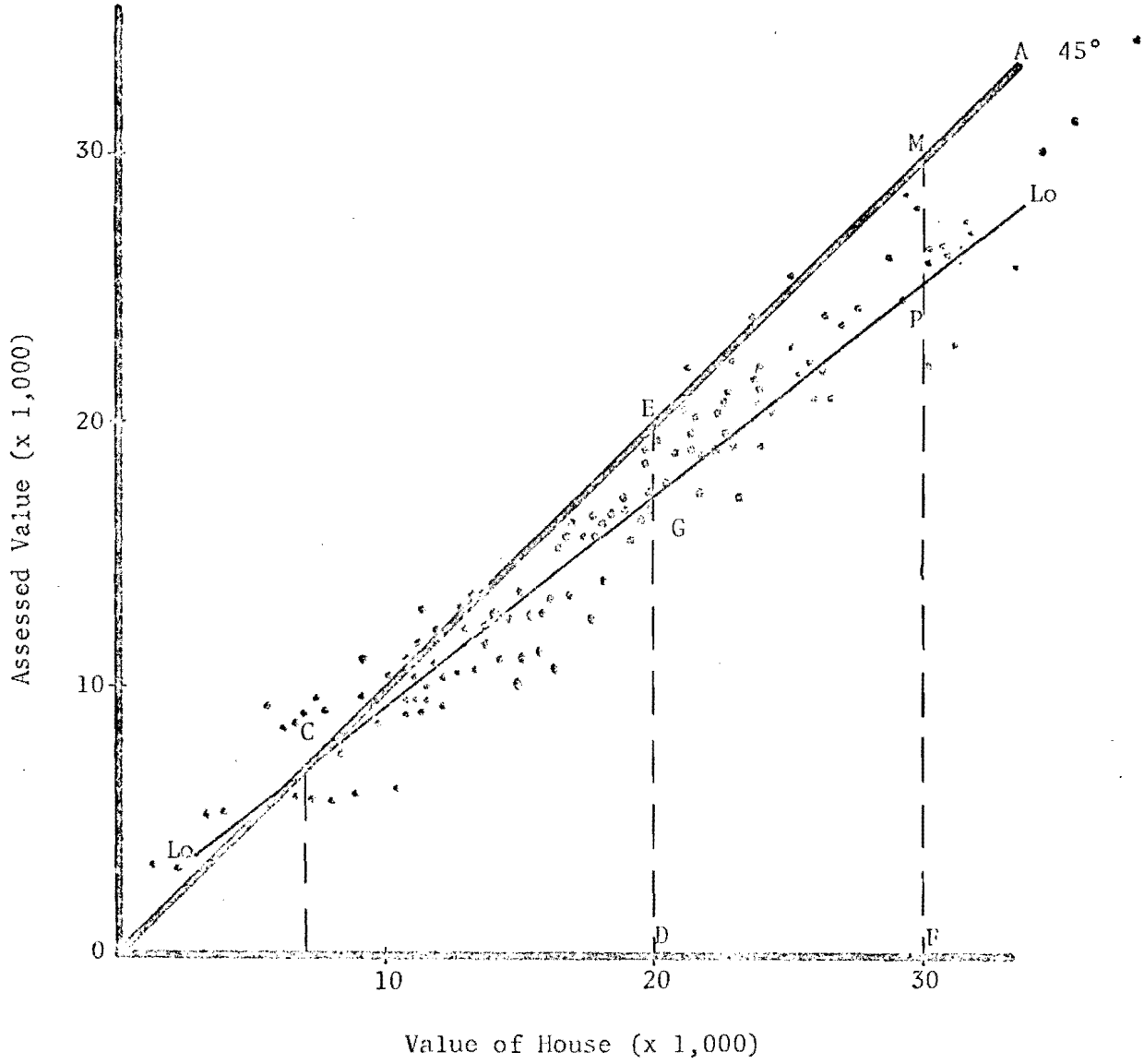
Figure I is a graph of the simple regression of assessed value on sale price. OA is a 45 degree line from the origin and, therefore, any point lying on this line represents a house which was both assessed and sold at the same price. Consequently, any point to the left of OA represents overassessment, and any point to the right of OA represents underassessment.

Line Lo is the regression of assessed value on sale price for 1968 reappraisals and 1968 sales and, therefore, represents the initial level of assessment by value of property. (As indicated in the previous section, each regression in this section was computer-tested by the least-squares method against six basic curve types. In each case, although the portion of the curve below $10,000 appears non-linear, the best fit turned out to be linear and of the form Y = A + BX.) Any deviation of Lo from OA is a deviation of assessed value from market value and, therefore, it is possible to measure the deviation as the vertical distance from Lo to OA at any given point. For example, in Figure I the estimated ratio of assessed value to sale price (AV/MV) for a $20,000 house is DG/DE or $17,960/20,000. The estimated AV/MV for a $30,000 house is simply FP/FM.

As indicated by the graph, Lo crosses OA at point C, at an estimated value of $7,370. Therefore, below this value single-family housing tends to be initially overassessed while housing above this value tends to be underassessed. Above point C, then, estimated underassessment for housing valued by the market at $20,000 is equal to the linear distance GE. At the same time, estimated underassessment for housing valued at $30,000 is equal to the linear distance PM. (See Table IX for a summary of the four equations de-

FIGURE I

INITIAL LEVEL OF ASSESSMENT AT TIME OF REAPPRAISAL BY VALUE OF SINGLE-FAMILY HOUSING, 1968 SALES, 1968 REAPPRAISAL, MULTNOMAH COUNTY, OREGON



veloped for this section and the explained variance of the dependent variable).

Simple Regression Analysis Indicating A Change In Assessment Level Due to Reappraisal Lag

The regression of assessed value on sale price for housing sold in 1968, but last reappraised in 1967, 1966 or 1965 (each is a separate regression line) indicates a significant shift in the level of assessment (AV/MV) over the reappraisal lag (see Figures II and III). The introduction of the reappraisal lag indicates (1) a tendency for housing values below approximately $7,400 to depreciate over the lag in reappraisal, and (2) in general, value appreciation for housing above $7,400. The regression lines in Figure II are:

Lo -- Initial Assessment Level

L1 -- One-Year Reappraisal Lag

L2 -- Two-Year Reappraisal Lag

L3 -- Three-Year Reappraisal Lag

To a certain extent, data restrictions (as discussed in the previous section) limit the accuracy of the estimates represented by regression lines L2 and L3. The most accurate representation of the shift in the lag function is indicated by the movement from Lo to L1, as shown in Figure II, both of which involve a large sample, as well as a wide range of housing variables. (See Appendix B, Table XXIII for a list of quarter sections included. Table IX to follow lists the sample size by regression line.) Whereas each regression line contains a reasonably wide range of housing values, L2 and L3 do not contain as wide a range of other housing characteristics. Insofar as the data permits, however, lines L1, L2 and L3 afford some interesting observations in regard to the effect of the reappraisal lag.

FIGURE II

INITIAL LEVEL OF ASSESSMENT AT THE TIME OF REAPPRAISAL AND CHANGES IN ASSESSMENT LEVEL DURING A ONE-YEAR REAPPRAISAL LAG, MULTNOMAH COUNTY, OREGON

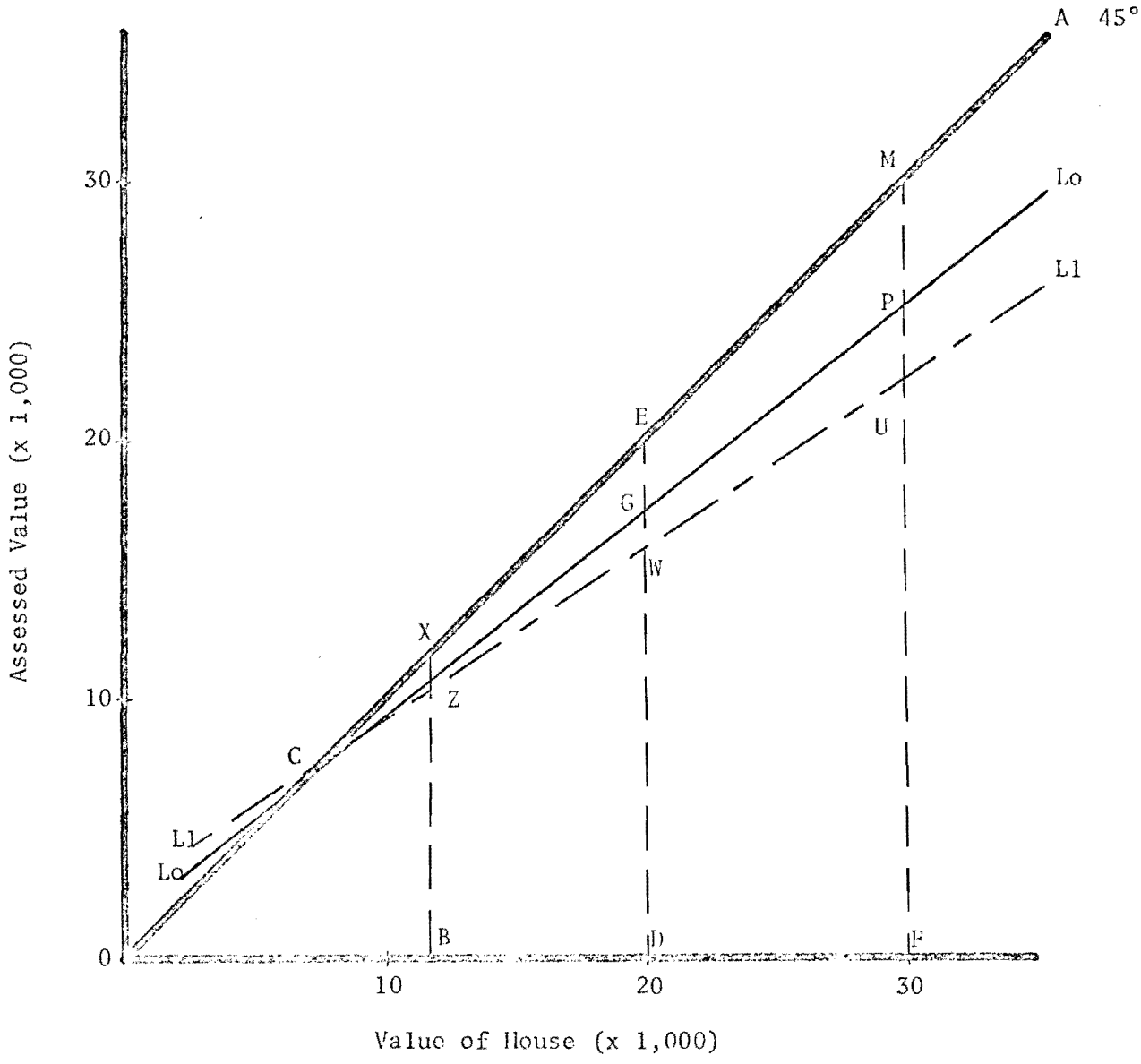
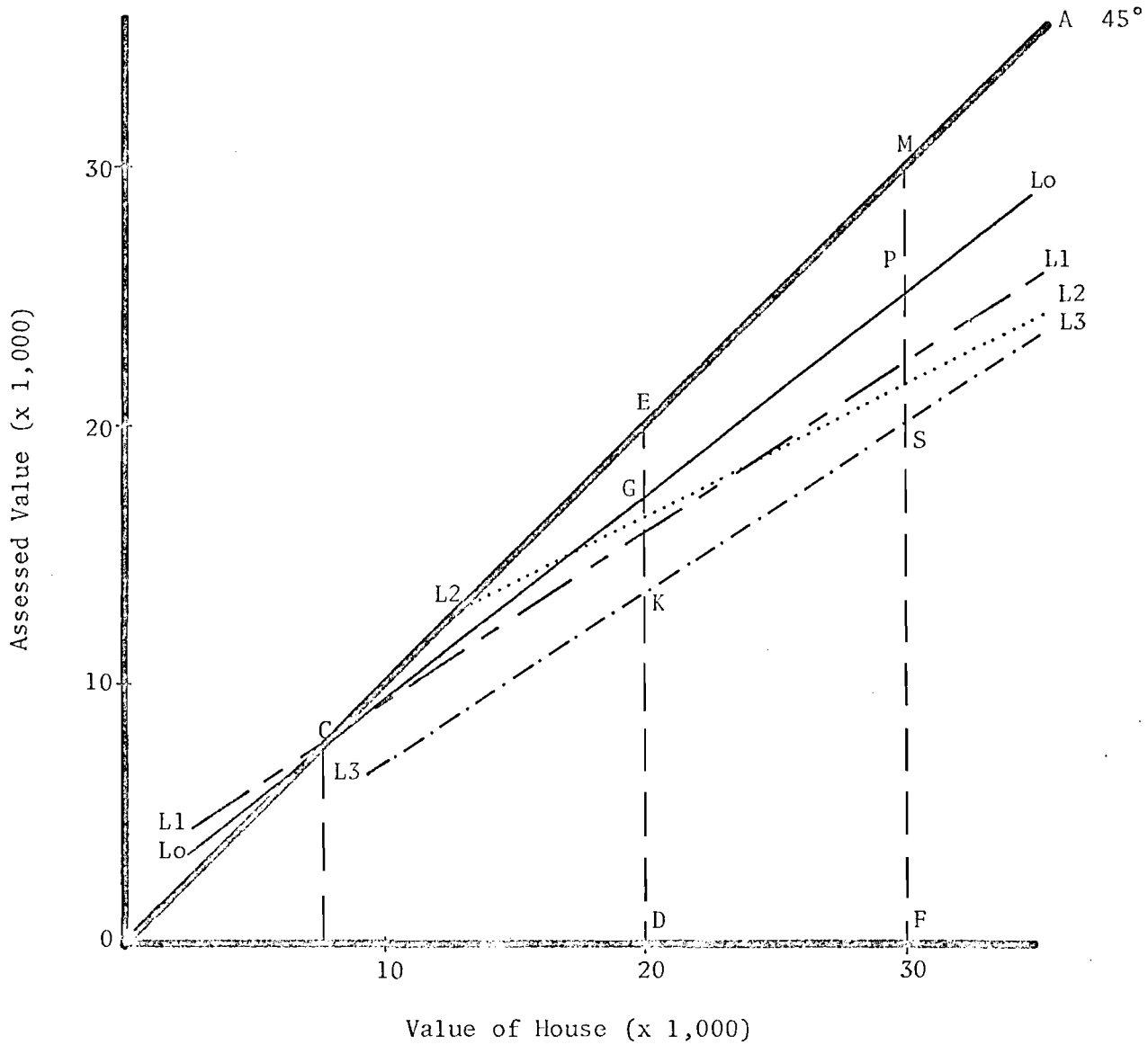


FIGURE III

INITIAL LEVEL OF ASSESSMENT AT THE TIME OF REAPPRAISAL AND CHANGES IN ASSESSMENT LEVEL DURING A THREE-YEAR REAPPRAISAL LAG, MULTNOMAH COUNTY, OREGON



As indicated by Figure II, there appears to be a tendency for lower-value properties (roughly below $7,400) to depreciate in value. This is shown by the upward shift in the lag function to the left of point C from Lo to L1. This movement, then, due to the decline in the market value of housing below $7,400, results in an increase in the AV/MV ratio. Consequently, housing in this value range is not only initially overassessed, as pointed out in the previous section, but the reappraisal lag operates to increase the overassessment because of value depreciation (the regression line understates the overassessment of housing below $7,400. Most of the observations below this value fall on the high side of the regression line, indicating that this portion of the curve is probably non-linear). Housing which falls within this category is, for the most part, located within the Albina area, which is primarily occupied by the Portland negro population. This factor will be discussed in more detail later.[44]

As further suggested by Figures II and III, housing valued above $7,400 tends to appreciate over the reappraisal lag. This is indicated by the downward shift in the lag function from Lo to L3 to the right of point C. Therefore, as the market value of housing in this value range increases, the AV/MV ratio declines, causing further underassessment. On the whole, then, while housing valued below $7,400 tends to become relatively more overassessed during the reappraisal lag, housing valued above this amount is prone to be-

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[44]Additional evidence supporting the point made here that depreciation in value has occurred in the Albina area is found in Appendix C, Table XXIV. Data developed by the Multnomah County Ratio Department shows that the ratio of assessed value to sale prices in District 5, which contains a major portion of Albina properties, is still very close to 100 percent after a two-year lag in reappraisal. The mean ratio is .993. If we assume some properties in the district appreciated in value, others must have depreciated.

come relatively more underassessed.

TABLE IX

SUMMARY OF REGRESSION EQUATIONS FOR INITIAL LEVEL OF ASSESSMENT AND THREE-YEAR REAPPRAISAL LAG

Lag	Equation	Index Of Determination*	Sample Size
Initial Assessment (Lo)	Y = 1180.02 + .838859X	.940574	134
1 Year Lag (L_1)	Y = 1726.98 + .761463X	.900292	163
2 Year Lag (L_2)	Y = 4329.18 + .665763X	.865714	62
3 Year Lag (L_3)	Y = 13.507 + .763077X	.922531	45

*The Index of Determination is the explained variance in the dependent variable (assessed value). It is simply the correlation coefficient squared (r^2).

See General Electric, Time-Sharing Service Regression Analysis: Program Library Users Guide, (Bethesda, Maryland: Information Service Department, 1968), p. 3. As pointed out earlier, the two-year and three-year lag samples are smaller than the first two samples because of the problems with the shape and composition of housing in each maintenance district.

As discussed earlier, data problems limit the usefulness of regressions L2 and L3 in terms of comparing L2 and L3 with Lo and L1. This is particularly important because the shape of maintenance districts excludes very low-value housing from regressions L2 and L3. Housing values in this low range, however, were included in both Lo and L1. Consequently, the shape of regression lines L2 and L3 is of a different form than would be the case had these lower-values been included.

An Estimate of Changes in Tax Burden That Would Occur If Initial Assessment Pattern and Lag are Eliminated

Utilizing equations developed from the simple regression analyses (see Table IX), it is possible to estimate changes in tax burden that would occur if the initial assessment pattern and the reappraisal lag are eliminated. At this point, however, it is necessary to introduce a further complication which results from the fact that single-family housing is only a part of one of the three major classes of taxable property (residential, commercial and industrial). Because a constitutional provision prohibits tax rate differentials on the basis of property category, elimination of underassessment on single-family housing will increase the total assessed valuation on single-family housing relative to business property. Consequently, if a constant total tax levy is maintained while total assessed value increases, the tax rate will decline not only on single-family housing but also on commercial and industrial properties. Therefore, these relationships create the possibility for elimination of the lag to redistribute property tax burdens from business property to single-family housing, as well as from owners of low-value single-family housing to owners of high-value single-family housing.

In order to separate the incidence effects provided by these complications, separate calculations are made showing shifts in tax burdens resulting from the following: (1) the case which assumes that redistribution of tax burdens occurs only within the property class single-family housing, and (2) the case which assumes that redistribution of tax burdens includes industrial and commercial properties, as well as single-family houses. A constant total tax levy is assumed for both models.

Tax Burden Shifts Assuming Shifts Occur Only Within Single-Family Housing

As mentioned before, it is assumed that the total tax levy remains constant while assessed valuation increases and tax rates are adjusted downward. A further assumption is that it is possible to increase (or decrease in the case of housing which is initially overassessed) assessment levels to 100 percent of market value.[45] With these assumptions, it then becomes possible to estimate that point at which the increase in assessed valuation is just offset by the decline in the tax rate. Therefore, owners of all housing valued above this amount would experience increases in their tax bill, while owners of housing valued below this amount experience decreases in their tax bill.

As mentioned above, this first model assumes that the effects of redistribution of the tax burden occur only within the single-family housing property class. This is indicated by the fact that while total assessed valuation of single-family housing increases, the total revenue derived from this property class remains constant. For the second model total revenue derived from single-family housing increases, while total revenue derived from business property declines.

Table X provides data on the distribution of single-family houses by value range (see column 1).[46] From this distribution and from the regression

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[45]If it is not possible to eliminate the initial differential level of assessment along with the increase or decrease in value over the lag, a smaller increase in assessed valuation would occur and, therefore, the tax rate would not decline as far. If the amount were known, a solution could be found by setting the tax bill before the lag is eliminated equal to the tax bill with the initial assessment pattern (line Lo in Figure II).

[46]The value-range distribution was derived from data provided by a

TABLE X

A MODEL OF CHANGES IN ASSESSED VALUATION AND TOTAL REVENUE BY VALUE RANGE ASSUMING REDISTRIBUTION OCCURS ONLY WITHIN SINGLE-FAMILY HOUSING

Value Range	Number Of Units	Total Assessed Valuation With Lag*	Total Revenue With Lag (t = .03)**	Total Assessed Valuation Without Lag***	Total Revenue Without Lag (t = .0264)****
$ 0 - 4,999	5,184	$ 23,151,744	$ 694,656	$ 18,144,100	$ 476,928
5,000 - 7,499	11,035	72,279,250	2,173,895	68,968,750	1,820,775
7,500 - 9,999	15,167	128,100,482	3,837,251	132,711,250	3,503,577
10,000 - 12,499	17,601	182,029,542	5,456,310	198,011,250	5,227,497
12,500 - 14,999	21,978	268,944,786	8,065,926	302,197,500	7,978,014
15,000 - 17,499	16,958	239,667,414	7,190,192	275,567,500	7,274,982
17,500 - 19,999	9,421	150,999,788	4,531,501	176,643,750	4,664,395
20,000 - 24,999	10,029	189,267,288	5,676,414	225,652,500	5,957,226
25,000 and over	9,608	272,377,192	8,166,800	336,280,000	8,877,792
TOTAL Column	117,029 (1)	1,526,800,000 (2)	45,792,945 (3)	1,734,176,000 (4)	45,781,186 (5)

*Except for the value-range class $0-4,999 and $25,000 and over, the midpoint is selected arbitrarily as the average value of house for the class. $3,500 and $35,000 respectively are selected for these two ranges.

**Computed by tax rate (.03) times total assessed valuation by value range (column 2).

equations, it was possible to estimate assessed valuation by value range, total revenue by value range assuming a 3 percent tax rate, and the decline in the tax rate associated with the increase in total assessed valuation as underassessment and overassessment are eliminated.

As the data in Table X clearly indicate, the increase in assessed valuation on housing which is underassessed far outweighs the decrease in assessed valuation on housing which is overassessed. The net increase in assessed valuation, or total underassessment of single-family housing, is approximately $207,376,000 (column 4 minus column 2).[47]

Given the data presented in Table X, the decline in the tax rate is as follows. The tax rate is simply total revenue (TR) divided by total assessed valuation (AV), or $t = \frac{TR}{AV}$. Because there is a net increase in assessed valuation, the tax rate will decline if total revenue is held constant. Given a 3 percent tax rate prior to elimination of underassessment, total revenue is roughly $45,800,000 (.03 x $1,526,800,000). Given a constant tax levy, the new tax rate after assessed valuation has increased is equal to $45,800,000/

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special computer tabulation from the Multnomah County Data Processing Division. See Appendix E, Table XLIII for an explanation of this distribution.

***It is assumed that valuation is 100 percent of market value. Assessed valuation with lag is computed from the average lag equation as described in footnote 48.

****The method for determining the tax rate decline is given below.

[47]The general formula for calculating total underassessment for such a distribution is as follows:

$$U = \sum_{r=1}^{r=n} u_{r_n} \times N_{r_n}$$

Where: U = total underassessment
r = value range
u = average underassessment by value range
N = number of units by value range
n = nth range

$1,734,176,000, or .0264.

With the assumption that the redistribution of the tax burden occurs only within the single-family housing property class, Table XI gives changes in tax bills that could be expected to result as assessment level differentials are eliminated. As the data illustrate, owners of housing through the value-range $12,500 to $14,999 would, on the average, experience a decline in their tax bill, while owners of housing valued above this amount would experience increases in their tax bill. A simple calculation reveals that this tax shift would amount to a redistribution of approximately $1,200,000 per year from owners of low-value properties to owners of higher-value properties. This calculation follows from multiplying the average tax bill change by value range times the number of units in that range (column 1 in Table X times column 3 in Table XI). Because total revenue is held constant, an inspection of Table XI points out that the total decrease in tax revenue derived from low-value housing equals the total increase in revenue derived from high-value properties (columns 3 and 5 in Table X).

Given the slopes of the regression lines in Figure III, the desired point at which the tax bill remains constant can be estimated by solving for the point at which the tax bill before the lag and initial assessment pattern are eliminated is equal to the tax bill after the assessment level is equal to 100 percent of market value. The equation representing the assessment level before the lag is eliminated is an average of the four equations contained in Table IX.[48] The previous analysis of the tax rate decline from 3 percent

[48]The correct method for determining the appropriate equation would be to perform a separate regression which includes all four samples lumped together. Rather than run a separate regression, an estimate was made by finding the average of the four equations given in Table IX.

TABLE XI

A MODEL OF CHANGES IN TAX BILLS THAT WOULD RESULT WITH ELIMINATION OF ASSESSMENT LEVEL DIFFERENTIALS ASSUMING REDISTRIBUTION OCCURS ONLY WITHIN SINGLE-FAMILY HOUSING

Value Range	Average Tax Bill With Lag (t = .030)	Average Tax Bill After Lag Eliminated (t = .0264)	Average Change In Tax Bill	Total Change In Revenue**	Percentage Change In Revenue***
$ 0 - 4,999	$134	$ 92	$-42	$-217,728	-.31
5,000 - 7,499	197	165	-32	-353,120	-.16
7,500 - 9,999	253	231	-22	-333,674	-.09
10,000 - 12,499	310	297	-13	-228,813	-.04
12,500 - 14,999	367	363	4	- 87,912	-.01
15,000 - 17,499	424	429	5	84,790	.01
17,500 - 19,999	481	495	14	131,894	.03
20,000 - 24,999	566	594	28	280,812	.05
25,000 and over	850	924	74	710,992	.09
Column	(1)	(2)	(3)	(4)	(5)

*The total increase in revenue does not exactly equal the total decrease in revenue due to rounding.

**For each value range, this is merely average change in tax bill times the number of housing units in that range.

***This equals total change in revenue divided by total revenue with the lag. The latter figure is contained in Table X.

to 2.6 percent is utilized here.

If T = the tax bill

t = the tax rate

Y = assessed valuation

X = market value

Then, the tax bill before the lag and initial assessment pattern are eliminated is equal to:

(1) $t = .030$

$T = .030Y$ Where $Y = 1812.42 + .75816X$

And, the tax bill after the lag and initial assessment pattern are eliminated is equal to:

(2) $t = .0264$

$T = .0264Y$ Where $Y = X$

Then, by setting (1) equal to (2) and solving for X, the value of housing which, on the average, experiences no change in the tax bill can be easily estimated.

Tax Bill Before = Tax Bill After

$.030(1812.42 + .75816X) = .0264X$

$X = \$14,695$

Therefore, given the assumptions previously outlined, owners of housing valued below $14,695 would benefit from elimination of assessment level differentials, while owners of housing above this amount would not benefit. This means that approximately 55 percent of existing households (64,330/117,029) would benefit from elimination of the lag and initial assessment pattern.

Tax Burden Shifts Assuming Redistribution Includes Commercial, Industrial and Residential Property

Because the tax rate which applies to single-family housing must apply to all categories of taxable property, commercial and industrial property must be included in a realistic model of tax burden shifts. Consequently, the increase in total assessed valuation of single-family housing which results from eliminating underassessment (and overassessment) reduces the tax rate for all classes of property. The incidence effects become more complex because the tax rate decline is less than it would be in the previous model (.0264). The previous model assumed that single-family housing would be taxed at a rate of 2.6 percent, while business property would continue to be taxed at a rate of 3 percent.

In this situation, the tax rate would decline from 3 percent to roughly 2.8 percent of assessed value.[49] Table XII gives the estimates which follow from these assumptions. The data demonstrate that while maintaining a constant total tax levy (revenue) in Multnomah County ($89,386,000 in 1968-69), the total revenue derived from single-family housing increases by approximately $2.8 million. This can be easily calculated from Table XII by subtracting the decline in total revenue derived from low-value properties from the increase in total revenue from high-value properties (column 4). Since the total revenue derived from single-family housing equals $45.8 million (see Ta-

[49]An average property tax rate for the County is equal to: the total tax levy/total assessed valuation subject to property taxation (TR/AV). In Multnomah County this is equal to $89,386,645/$2,979,554,840, or .030. Given the estimated net increase in assessed valuation with elimination of the lag, the new tax rate would then be: $89,386,645/$2,979,554,840 + $215,677,258 = .028.

TABLE XII

A MODEL OF CHANGES IN TOTAL REVENUE DERIVED FROM SINGLE-FAMILY HOUSING ASSUMING TAX RATE DECLINE FOR ALL PROPERTIES

Value Range	Total Revenue With Lag (t = .030)**	Total Revenue Without Lag (t = .028)	Total Revenue Without Lag (t = .0264)*	Change In Total Revenue (2) - (1)	Change In Total Revenue (3) - (1)*
$ 0 - 4,999	$ 694,656	$ 508,032	$ 476,928	$ -186,624	$ -217,728
5,000 - 7,499	2,173,895	1,931,125	1,820,775	-242,770	-353,120
7,500 - 9,999	3,837,251	3,715,914	3,503,577	-121,336	-333,674
10,000 - 12,499	5,456,310	5,544,315	5,227,497	88,005	-228,813
12,500 - 14,999	8,065,926	8,461,530	7,978,014	395,604	- 87,912
15,000 - 17,499	7,190,192	7,715,890	7,274,982	525,698	84,790
17,500 - 19,999	4,531,501	4,946,025	4,664,395	414,524	131,894
20,000 - 24,999	5,676,414	6,318,270	5,957,226	641,856	280,812
25,000 and over	8,166,800	9,415,840	8,877,792	1,249,040	710,992
TOTAL Column	45,792,945 (1)	48,556,941 (2)	45,781,186 (3)	2,763,996 (4)	11,759 (5)

*This column is taken from Table X. It assumes redistribution only among single-family housing. Theoretically, total revenue would be constant, but is not here due to rounding.

**Assessed valuation with lag is computed from the average lag equation described in footnote 48.

ble XIV) and the total revenue derived from business property equals $43.6 million, business property would experience a 6 percent decline in its overall tax burden, while single-family housing would experience a 6 percent overall increase in its tax burden.

Table XIII, then, estimates changes in the tax bill that would follow from this analysis.

A comparison of Tables XI and XIII clearly indicates that not only do tax bills decline less for lower-value properties in this case, but owners of higher-value single-family properties would experience a greater average increase in their tax bill. This result follows from the smaller decline in the tax rate. In addition, Table XII points out that very large differences would result in the amount of total revenue change, depending upon whether the tax rate declines from .030 to .028 or to .0264 (compare columns 1, 2 and 3 in Table XII).

Further, if we follow this more realistic model for calculating the cross-over point below which tax bills would decrease and above which tax bills would increase, a different result is obtained. Utilizing the same equations but substituting a tax rate of 2.8 percent, the value of house which would experience no change in the tax bill is as follows:

Tax Bill Before = Tax Bill After

$$.030(1812.42 + .75816X) = .028X$$

$$X = \$10,260$$

With the smaller tax rate decline, then, only owners of houses valued below $10,260 would benefit from the elimination of assessment level differentials. Therefore, given the assumptions of this second model, some low-

TABLE XIII

A MODEL OF CHANGES IN TAX BILLS THAT WOULD RESULT IF REDISTRIBUTION INCLUDES ALL PROPERTY CLASSES VERSUS REDISTRIBUTION WHICH INCLUDES ONLY SINGLE-FAMILY HOUSING

Value Range	Average Tax Bill With Lag (t = .030)*	Average Tax Bill Without Lag (t = .028)	Average Tax Bill Without Lag (t = .0264)*	Change In Tax Bill (1) - (2)	Change In Tax Bill (1) - (3)*
$ 0 - 4,999	$134	$ 98	$ 92	$ -36	$ -42
5,000 - 7,499	197	175	165	-22	-32
7,500 - 9,999	253	245	231	- 8	-22
10,000 - 12,499	310	315	297	5	-13
12,500 - 14,999	367	385	363	18	4
15,000 - 17,499	424	455	429	31	5
17,500 - 19,999	481	525	495	44	14
20,000 - 24,999	566	630	594	64	28
25,000 and over	850	980	924	130	74
Column	(1)	(2)	(3)	(4)	(5)

*From Table XI. The average tax bill with lag is calculated by use of the average lag equation (see footnote 48). The average tax bill without lag assumes housing is assessed at 100 percent of market value.

income households benefit from the existence of the lag and the initial assessment pattern and would, consequently, experience some increase in tax burden. If FHA statistics on value of house-income ratios are correct, the income of the average homeowner experiencing no change in the tax bill would be approximately $2,500, still well within the poverty range.

As pointed out earlier and in Table XIV, a significant drawback to elimination of the assessment level differential which is demonstrated by the second model is that it would result in a shift in tax burden of approximately $2.8 million annually from business property to single-family residences. The bulk of this increased burden would be borne by owners of middle- to high-value dwellings, while at the same time smaller decreases in tax burden would occur for owners of low-value houses.

TABLE XIV

ESTIMATED SHIFT IN PROPERTY TAX BURDENS FROM BUSINESS PROPERTY TO SINGLE-FAMILY RESIDENCES

Property	Total Tax With Lag (millions)	Total Tax Without Lag (millions)	Net Change In Tax
Business	43.6	40.8	-2.8
Single-Family	45.8	48.6	2.8
TOTAL	89.4	89.4	0.0

Regression Estimates of Taxes Not Paid Due to Both the Initial Differential Level of Assessment and to the Reappraisal Lag

Another way of viewing the problem of the reappraisal lag and initial assessment pattern is (1) to estimate changes in the AV/MV ratio over the lag, analyzing the relative importance of the initial assessment pattern ver-

sus the time lag in appraisal, and (2) to estimate the value of the lag to the average owner of a single-family house in a particular value-range. The latter is done through present value estimates of taxes not paid (or paid) due to underassessment (overassessment) over a five-year appraisal cycle.

Although each of the lines is not a comparable regression as far as the range of housing characteristics is concerned, it is possible to estimate the effects of both the initial differential level of assessment by value of housing and the reappraisal lag shift by use of the equations.

From Figure III it appears that for housing valued at approximately $20,000 the underassessment caused by value appreciation over a three-year lag (line segment GK) is somewhat greater than initial underassessment at the time of appraisal (line segment EG). For $30,000 housing the two factors are roughly equal.

For a normal appraisal cycle of five to six years, then, it appears at this point that the reappraisal lag may be the more significant contributor to inequities resulting from underassessment of middle- and higher-value housing and overassessment of lower-value housing. However, visual inspection of Figure III is not sufficient to indicate the relative importance of the lag versus the appraisal-induced inequities.

Estimates developed from the regressions point out that in absolute dollar amounts the underassessment is quite large. Table XV estimates that after a three-year reappraisal lag, underassessment values range from $ -534 for housing valued at $5,000 to $9,463 for housing valued at $40,000. If we assume an average tax rate of 3 percent, the estimated range of dollar benefit due to underassessment for individuals living in housing that has not

been reappraised for three years is from approximately $ -16 ($5,000 home) to $284 ($40,000 home) for that one year.

TABLE XV

REGRESSION ESTIMATES OF INITIAL ASSESSMENT LEVEL, LEVEL OF ASSESSMENT AFTER THREE-YEAR REAPPRAISAL LAG, AND ESTIMATE OF DIFFERENCE BETWEEN ASSESSED VALUE AND SALE PRICE AFTER REAPPRAISAL LAG

Value Of Housing (Sale Price)	Initial AV/MV	AV/MV After 3-Year Lag*	Absolute Difference Between AV and MV		Taxes That Would Have Been Paid If AV/MV = 100**
			Initial	After Lag	
$ 5,000	107.0	111.0	-374	-534	-16
7,370	100.0	100.0	0	0	0
20,000	89.8	76.4	2,040	4,730	142
30,000	87.8	76.4	3,650	7,090	213
40,000	86.8	76.3	4,200	9,463	284

*Estimate for $5,000 home is based only on a one-year lag. The lack of observations for additional years prevent estimates from being made.

**Assumes tax rate is 3 percent.

Additional estimates developed from the regression equations suggest that the dollar amount of taxes not paid due to underassessment over a five-year reappraisal cycle is even more significant. The estimates given in Table XV are only estimates of taxes not paid in one particular year (1968) by housing that has not been reappraised for three years. Estimates developed for Table XVI, however, are present value estimates of the income retained from taxes not paid due to underassessment over a hypothetical five-year

appraisal cycle. (The amount is negative in the case of overassessment of lower-value housing).[50]

TABLE XVI

PRESENT VALUE ESTIMATES OF TAXES NOT PAID DUE TO BOTH INITIAL LEVEL OF ASSESSMENT AND TO CHANGES IN THE LEVEL OF ASSESSMENT OVER A FIVE-YEAR APPRAISAL LAG, MULTNOMAH COUNTY, OREGON*

Value of Housing	Estimated Present Value of Taxes Not Paid Due to Underassessment: Lag	No Lag	Value of Lag
$ 5,000	$ -67	$-50	$-17
7,370	0	0	0
15,000	362	166	156
20,000	502	274	228
30,000	782	491	291
40,000	1,011	565	446

*See Appendix E, Table XXXVI, for derivation of present values. A 6 percent rate of interest is assumed.

The formula for estimating the present value of the income stream (from taxes not paid due to underassessment) over a five-year appraisal cycle can be specified as:[51]

[50]Because the estimates are from cross-section analyses and not time-series studies, it is necessary to assume for sake of simplification that the estimates are not significantly altered. Ideally, it would be necessary to construct a time-series test which segregates housing by value range and analyzes the change in assessment level over the appraisal cycle for this particular sample.

[51]This equation for estimating present value assumes that the individuals spend 100 percent of the income retained (or, in the case of overassess-

$$PV = t(U_I) + \frac{t\ (U_{L1})}{1 + r} + \frac{t\ (U_{L2})}{(1 + r)^2} + \frac{t\ (U_{L3})}{(1 + r)^3} + \frac{t\ (U_{L4})}{(1 + r)^4}$$

Where: PV = present value of taxes not paid due to underassessment over a five-year appraisal cycle

t = tax rate

U_I = initial amount of underassessment (overassessment)

U_{Ln} = underassessment (overassessment) after n years lag

r = rate of interest

In a more simplified form:

$$PV = t\ (U_I) + \frac{t\ (U_{Ln})}{(1 + r)^n}$$

Based upon this formula, then, Table XVI gives the appropriate present value estimates by value of housing (see Figure IV for a graph of estimates from Table XVI).

As indicated in Table XVI and Figure IV, present value estimates which include both the initial level of underassessment and the increase in underassessment over the reappraisal lag range from a negative $67 for owners of housing valued at $5,000 to a positive $1,011 for owners of housing valued at $40,000 (see Appendix E, Table XXXVI for derivation of the estimates).[52] Interestingly enough, the present value estimates which assume no lag (in

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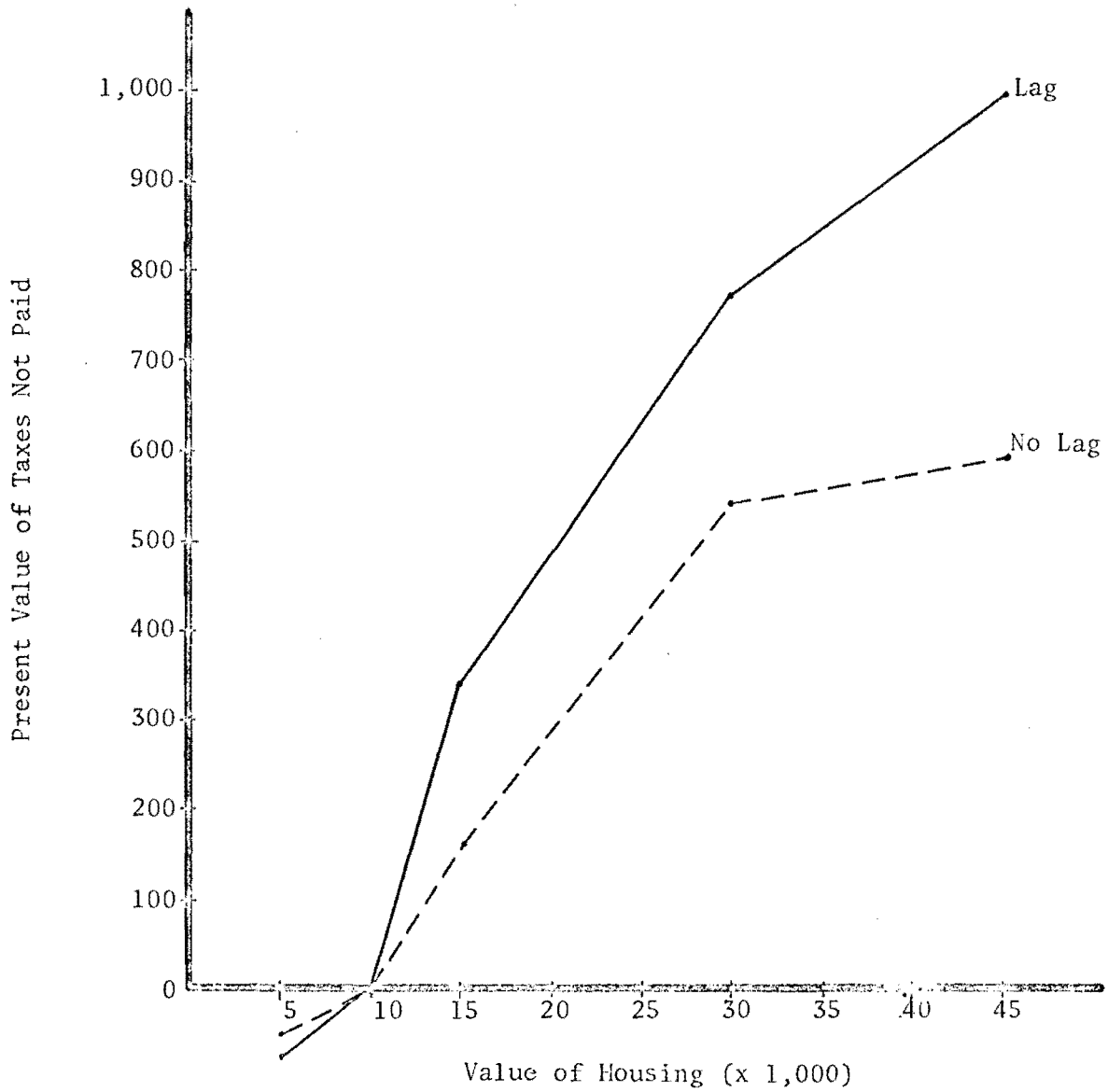
ment, would have spent 100 percent). Over a five-year cycle, this assumption would not significantly alter the estimates. However, any estimates of the long-run effects of differential levels of assessment would have to include provision for saving. Present value estimates assume a 6 percent rate of interest.

[52]The $-67 estimate for $5,000 housing assumes that no value depreciation occurs after the first-year lag. This is because no observations in this value range were available given the shape of maintenance districts in Multnomah County.

FIGURE IV

GRAPH OF PRESENT VALUE ESTIMATES OF TAXES NOT PAID
DUE TO BOTH INITIAL LEVEL OF ASSESSMENT AND
TO CHANGES IN THE LEVEL OF ASSESSMENT
DURING A FIVE-YEAR APPRAISAL CYCLE,
MULTNOMAH COUNTY, OREGON *



*A 6 percent interest rate is assumed.

other words, the initial level of assessment established at the time of appraisal is maintained throughout the five-year cycle) indicate that the initial differential level of assessment by value of housing is as important, or more important than the lag-induced underassessment. This is also indicated in Figure IV.

The evidence presented in this section, then, supports the original hypothesis. Based upon the data developed from the regression equations, it may be concluded that a significant initial differential level of assessment by value of housing exists, with housing below approximately $7,400 being initially overassessed and housing valued above this amount being initially underassessed. In addition, over the reappraisal cycle, there appears to be depreciation in value for housing valued below $7,400, thereby increasing overassessment. At the same time, housing above roughly $7,400 appears to experience significant value appreciation, therefore increasing the underassessment.

The distributional effects of the lag and the initial assessment pattern are complicated by both the tax rate effect (as total revenue is held constant) and the fact that the constitution requires the same tax rate be applied to all categories of property. Under the assumption that redistribution of tax burdens occurs only within single-family housing, if assessment level differentials are eliminated, it is estimated that on the average owners of housing valued below $14,695 would experience a decline in tax burdens while owners of housing valued above this amount would experience an increase in tax burdens. Given the more realistic assumption that redistribution would include business property, on the average owners of housing valued below

$10,260 would experience decreases in tax burdens, while owners of housing above this amount would experience increases in tax burdens. At the same time, this latter assumption would result in a shift of tax burden from business property to single-family housing.

Although the original hypothesis suggests that the reappraisal lag is the more significant contributor to inequities from underassessment of higher-value housing, the analysis of this section indicates that the initial differential level of assessment by value of housing, when viewed over a five-year appraisal cycle, is as important as the reappraisal lag. This, then, would imply that elimination of the reappraisal lag will not correct all the inequities produced by the lag and the initial assessment pattern.

A Preliminary Multiple Linear Regression Analysis Attempting to Explain the Assessed Value - Sale Price Ratio Over the Reappraisal Lag

A multiple regression analysis was performed in an endeavor to explain the assessed value - sale price ratio by relating the AV/MV ratio to five independent variables. From the previous simple regression analysis, it is evident that as value of housing increases, there is a strong tendency for the AV/MV ratio to decline, both as a result of the initial level of assessment and as a result of factors affecting the market value of housing during the normal lag in reappraisal. However, it has not as yet been shown what factors other than value of housing would cause the ratio to vary within an urban area.

It should be pointed out that a high, significant amount of intercorrelation of the independent variables was found (see Tables XXXVII to

XLI in Appendix E). For example, significant negative correlation was found between age of house and sale price. Also, significant positive correlation was found between sale price and distance from the center of the City. Consequently, the reliability of the partial correlation coefficients (r) for some of the samples (as given in Table XXI) is reduced. Although this is the case, the overall validity of the multiple correlation coefficients (R) and the explained variances of the dependent variables (R^2) is not reduced. Further, it must be stressed that the method of sample selection and the construction of the test (samples are randomly drawn from selected quarter sections -- ten-square block areas -- from within each maintenance district. See Appendix B) causes the variability of the cross-correlation simple r's from sample to sample (see Appendix E for a comparison of simple cross r's from each sample). As a group, however, the variables used in the multiple linear regressions are strategic in explaining the assessed value - sale price (AV/MV) ratio, even though it is impossible to parcel out the extent of each variable as a causal factor.

Table XVII gives a summary of the variables used in the multiple regression analyses.

The regression explains 67 percent of the variance in the dependent variable (AVSP) in the initial year (R^2 = .6741).[53] As Table XVIII indicates, however, as the reappraisal lag is introduced by separate regressions of each of the samples, the explained variance declines from the high of 67 percent

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[53]As indicated, the explained variance is merely the correlation coefficient squared. See Ezekiel, Mordecai and Karl A. Fox, Methods of Correlation and Regression Analysis, (New York: John Wiley & Sons, Inc., 1959). The dependent variable AVSP is the multiple regression symbol representing AV/MV.

to a low of 26 percent. In short, as time is allowed to operate, the importance of the five explanatory variables declines and other not-accounted-for factors begin to differentially affect the market value of housing.[54]

TABLE XVII

SUMMARY OF VARIABLES USED IN MULTIPLE LINEAR REGRESSION ANALYSIS

Item	Variable	Symbol
Dependent Variable	Assessed Value/Sale Price	AVSP
Independent Variables	Sale Price	SP
	Age of House	AGE
	Average Sale Price of Housing in Quarter Section	SPAV
	Distance from Center of City	DIST
	Percentage Difference Between SP and SPAV in Quarter Section	PDIF

In spite of the fact that the explanatory power of the five variables

[54]Additional variables that may add to explanatory power of further regression analysis include:

1) density of population
2) average value of housing in surrounding quarter sections
3) capitalization variable (tax rate differential)
4) dollar amount of housing improvement during lag
5) change in neighborhood characteristics during lag (e.g., zoning)
6) land/total value of property
7) variable showing effect of individual assessor
8) new construction variable
9) changes in legal boundaries
10) more exact measurement of time of sale (e.g., month of sale may affect the sale price; also, some sales may have been closer to 1967, 1968)
11) multiple-family units in area
12) commercial, industrial units in area

declines over the lag, in all cases their inclusion explains more of the variance in the AVSP ratio than does SP alone. This is pointed out by the higher multiple correlation (including SP, SPAV, PDIF, AGE and DIST) than is obtained by a simple correlation between AVSP and SP. See Table XIX. Table XX includes a simple correlation analysis of AVSP with each of the five independentr variables. This table is referred to later in the separate discussion of each variable to follow.

TABLE XVIII

EXPLAINED VARIANCE AND MULTIPLE CORRELATION COEFFICIENTS FOR REGRESSION ANALYSES

Year	R Multiple Correlation	(R^2) Explained Variance
Initial Year	.8210	.6741
One-Year Lag	.6903	.4765
Two-Year Lag	.5097	.2598
Three-Year Lag	.5606	.3143

In addition, whereas sale price of housing explains from 87 to 94 percent of the variance in assessed value (as indicated in the earlier simple regression of assessed value on sale price), sale price explains a much smaller proportion of the variance in the AVSP ratio. The simple correlation of AVSP and SP ranges from only -.17 to -.49, pointing out the difficulty in explaining a ratio, such as AVSP.

Insofar as the data permits, the multiple regression analysis allows for some preliminary observations in regard to the role each of the independent variables plays in the regression. Table XXI arranges the variables

according to absolute size of the beta coefficient and, therefore, gives some indication of the relative importance each assumes in the regression. Therefore, three aspects of each variable are discussed separately.

TABLE XIX

A COMPARISON OF THE SIMPLE CORRELATION OF AVSP AND SP WITH MULTIPLE CORRELATION ANALYSIS

Year	Simple Correlation of AVSP and SP	Multiple Correlation Including SP, SPAV, PDIF, AGE, DIST
Initial Year	-.3983	.8210
1 Year Lag	-.4912	.6903
*2 Year Lag	-.3084	.5097
**3 Year Lag	-.1730	.5606

*Only AGE, PDIF, SPAV included in equation for two-year lag. SP did not significantly change explained variance and the entire sample was the same distance from the center of the City.

**Only SP, PDIF, and AGE included in equation for three-year lag. The entire sample came from two quarter sections and therefore DIST and SPAV did not enter the equation.

TABLE XX

SIMPLE CORRELATION COEFFICIENTS BETWEEN AVSP AND INDEPENDENT VARIABLES

Lag Equation	PDIF	SP	AGE	SPAV	DIST
No Lag	-.5476	-.3983	.1802	-.2838	-.2268
1 Year Lag	-.5508	-.4912	.1883	-.3523	-.2087
2 Years Lag	-.1420	-.3084	-.3047	-.3660	.3659
3 Years Lag	-.1733	-.1730	-.3097	------	------

TABLE XXI

VARIABLES ARRANGED BY SIZE OF BETA COEFFICIENT AND BY NUMBER OF YEARS LAG*

Year	Variable	Partial R	Beta Coefficient
Initial Year	SP	.6444	2.2725
	SPAV	-.6950	-2.1970
	PDIF	-.7554	-1.8401
	AGE	-.3913	-0.8044
	DIST	-.2240	-0.4098
1 Year Lag	PDIF	-.5259	-1.3391
	SP	.3732	1.3377
	SPAV	-.4569	-1.1430
	AGE	-.1734	-0.1581
	DIST	-.1488	-0.1108
2 Year Lag**	AGE	-.3531	-0.3862
	PDIF	-.3126	-0.3243
	SPAV	-.2789	-0.2624
3 Year Lag***	SP	-.0564	-6.7882
	PDIF	.0515	6.1897
	AGE	-.5402	-0.6863

*The coefficient of partial correlation may be defined as a measure of the extent to which that part of the variation in the dependent variable which was not explained by the other independent factors can be explained by the addition of the new factor. The beta coefficient expresses the regression coefficient in terms of its own standard deviation, thereby making the unit in which each variable is expressed comparable. See Ezekiel, Mordecai and Karl A. Fox, Methods of Correlation and Regression Analysis, (New York: John Wiley & Sons, Inc., 1959), pp. 190-6.

**SP did not add sufficiently to the explained variance to allow it to remain in the equation. Also, there was little significant difference in the distance variable, so it also did not add to the explained variance.

***Neither DIST nor SPAV entered the equation because the sample is primarily from the same area.

Sale Price (SP)

SP is the most important variable in the initial year, roughly equal to PDIF after one year's lag. SP does not enter the equation after two years'

lag,[55] but was the most important variable in the three-year lag sample. Although the simple correlation between AVSP and SP is significantly negative for each sample (see Table XX), the beta coefficients are positive (see Table XXI), indicating that if the other variables are held constant, as SP increases AVSP also increases. Also, there is a tendency for the beta coefficient to decline (and possibly become negative) as the time lag is introduced. This suggests that value appreciation for higher-value properties is greater and, consequently, eliminates the initial positive relationship between AVSP and SP (all other things being equal).

It may be that this initial positive relationship is due primarily to the tendency to initially assess newer, suburban properties closer to market value (correlation of AGE and SP indicates a strong tendency for SP to increase as AGE declines). To a certain extent, then, because of the similarity and newness of construction of suburban housing, it may be relatively easy to assess these properties. In addition, it may be that assessors, realizing that suburban properties tend to appreciate more rapidly than older central city housing during the reappraisal lag, tend to assess these properties at a higher proportion of market value.

In reality, however, all things are not equal and the significant negative correlation between AVSP and SP clearly indicates the tendency for AVSP to decline as SP increases.

Average Sale Price of Housing in Quarter Section (SPAV)

The SPAV variable is the second most important explanatory variable

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[55]See Table XXI for additional explanation.

in the initial year and the third important variable after one-year's lag. As discussed earlier, however, because of data limitations of the two-year and three-year lag samples, SPAV has less significance for the two-year lag and is not included in the three-year lag. Unlike SP, the sign attached to SPAV is negative, pointing out that, all other things being equal, as SPAV increases AVSP declines. This is the result to be expected because a simple correlation between AVSP and SPAV is significantly negative (see Table XX). As with SP, as the time lag is introduced, the explanatory power of the variable SPAV declines.

The SPAV variable is primarily intended to reveal neighborhood effects. In other words, as the average value of housing in any neighborhood increases, the positive effects of the neighborhood should transfer to all housing in the immediate area by increasing the market value of housing and, therefore, contributing to a lower AVSP ratio. However, it appears that the significant intercorrelation of SPAV and SP and SPAV and AGE (age of house) limit the ability to interpret the variable. A positive correlation exists between SP and SPAV, suggesting that higher-value housing tends to be grouped into specific neighborhoods, as would be expected. It points out that inequities which result from the general lower-level of assessment of higher-value housing tends to be concentrated in specific neighborhoods. Also, the negative correlation between SPAV and AGE suggests, as is also expected, that the inequities tend to discriminate against owners of older housing and, therefore, in favor of owners of newer housing. The importance of SPAV, or the neighborhood effects from living in a favorable, higher-value area, is further suggested by the increasing negative correlation of AVSP and SPAV over the

reappraisal lag (increases from -.28 to -.37 after a two-year lag -- see Table XX).

Percentage Difference Between SP and SPAV (PDIF)

As Table XXI points out, the PDIF variable is the third most important variable in the initial year (ranking very close to both SP and SPAV) and the most important variable after a one-year lag. Because of sample limitations, it is not clear whether any significance can be attached to PDIF in the two-year and three-year lag.

The beta coefficient is negative, meaning that all other things being equal, as the difference between the value of any one house varies from the SPAV of the area, there is a tendency to initially underassess that house. As the reappraisal lag is introduced, however, as with the other variables, the explanatory power of PDIF declines. The negative sign of the PDIF beta coefficient is to be expected, since a simple correlation of AVSP and PDIF is significantly negative for each regression (see Table XX).

Unfortunately, the PDIF variable does not differentiate between housing which is below SPAV and housing which is above SPAV. A variable which would indicate this would be an important additional variable suggesting neighborhood effects. The PDIF variable, as used in these regression analyses, however, merely indicates that there is a tendency to initially underassess housing which differs from the average value of housing in the neighborhood. It is included primarily to suggest that assessors have more difficulty in assessing housing which deviates from the neighborhood average. A more detailed analysis is necessary to determine whether lower-value housing

tends to be underassessed in high SPAV areas, if higher-value housing is more underassessed in low SPAV areas than in high SPAV areas, etc.

Age of Housing (AGE)

AGE is the fourth most important variable in both the initial year regression and the one-year lag regression. The variable appears to be only more important than DIST (distance from center of city). As with the other variables, its importance declines as the lag is introduced. The sign associated with the AGE beta coefficient is negative. This suggests that, if the other variables are held constant, as age of housing increases, AVSP declines. Because a low positive simple correlation between AVSP and AGE exist for the initial year and one-year lag regressions (as AGE increases, AVSP increases) the negative beta coefficients would normally not be expected. However, although there is a significant negative correlation between AGE and SP (as AGE increases, SP declines), the existence of older neighborhoods with very high-value housing in expensive areas of the city would lead one to expect a negative beta coefficient.

More importantly, however, the significant negative correlation between AGE and SP and AGE and SPAV suggests that the inequity effects of differential levels of assessment discriminates against older housing. Further, due to the tendency for neighborhoods to contain housing of similar vintage, this concentrates the effect within specific, old neighborhoods. Therefore, while the neighborhood effects of SPAV favorably affect newer, higher-value housing, it also unfavorably affects older, lower-value housing.

Distance from Center of City (DIST)

DIST is the least important variable for both the initial year and the one-year lag regressions. Because of data limitations, it does not enter in either the two-year or three-year lag regressions. As expected, the sign of the beta coefficient is negative in each case, although it also declines in importance after a one-year lag.

A simple correlation between AVSP and DIST is low but negative. Therefore, as distance from the central portion of the city declines, the AVSP ratio increases, also suggesting the tendency to assess housing within the central city more heavily.

In general, then, it may be concluded that (1) although the variables included in the multiple regression analysis initially explains 67 percent of the variance in the assessed value - sale price ratio, these variables assume less importance as the reappraisal lag is introduced; (2) both the initial level of assessment and the reappraisal lag discriminate against owners of lower-value housing and in favor of owners of higher-value housing. This merely reconfirms the conclusion of the simple regression analysis of the previous section. The unexpected positive sign of the sale price (SP) beta coefficient suggests that if the other variables are held constant, as sale price increases the ratio of assessed value to sale price increases. However, in terms of the income distribution effects, all other things are not equal and the simple correlation between the assessed value - sale price ratio and sale price is distinctly negative; (3) sale price (SP), average sale price of housing in the neighborhood (SPAV), and the percentage difference between sale price and the average sale price of housing in the neighborhood (PDIF)

are the more important explanatory variables. Age of housing (AGE) and distance from the center of the city (DIST) assume less importance; (4) also, the initial level of assessment and the reappraisal lag discriminate in favor of neighborhoods with high average value housing. Further, due to the positive neighborhood effects of the high average value areas, the time lag in reappraisal worsens the distributional effects of the lag; (5) there also appears to be a tendency for assessment practices to discriminate in favor of housing which differs from the average value of housing in the neighborhood; (6) as expected, the initial level of assessment and the reappraisal lag tend to discriminate against older housing; and (7) there is a tendency to assess housing nearer the central portion of the city more heavily.

CHAPTER IV

CONCLUSIONS AND RECOMMENDATIONS

Recent, belated concern for urban-related problems has spurred a renewed interest in the property tax. Consequently, it has been subjected to an increasingly severe barrage of criticism. While this paper adds an additional mark of criticism, its emphasis has been primarily on developing some understanding of one seldom-mentioned aspect of the property tax which has received little consistent analysis -- the reappraisal lag. The initial assessment level pattern and the impact of the lag on this pattern are analyzed. The general conclusions of the paper are as follows:

1. Data limitations of the samples utilized in the study must be stressed. Because of the shape of maintenance districts in Multnomah County, it was not possible to include the same range of variables and number of observations in each sample. As it turned out, the two best regressions are the initial level of assessment and the one-year lag equations. Also, because income statistics are not available, it was necessary to assume that FHA data for 1966 national housing sales accurately represents value of house/income ratios for Multnomah County. As local value of house/income ratios vary from FHA statistics, estimates of tax burden relationships are somewhat modified.

Further, because of data limitations, regressions were performed for only the initial level of assessment, a one-, two-, and three-year lag. Multnomah County currently operates on a five-year appraisal cycle. Other counties in Oregon are required by State law to reappraise each property only

every six years. Consequently, although distributional effects of a five-year reappraisal lag are estimated, for some areas the total impact may be an underestimate.

It was also necessary to assume that no changes in income occur during the lag. While it is not clear how this assumption alters the conclusions, evidence from data developed by the Oregon State Tax Commission suggests an increase in income inequality during the last four years. This would increase the regressivity more than indicated in data developed by Carlson. Also, although not included in the income concept used in our estimates, if changes in value of assets is included in the income definition, during periods of rising asset values regressivity would be statistically increased. This is due to the fact that assets as a proportion of income increase as income increases.

2. Available evidence from published Federal, State and County statistics indicates that lower-value housing tends to be overassessed, while higher-value housing is underassessed. This is suggested by the Bureau of Census' price-related differential of assessment ratios for the State of Oregon as a whole, and by the significantly higher proportion of urban than suburban residential property in the Portland metropolitan area which is overassessed. None of the available data, however, indicate why this is the case.

3. The validity of the thesis that both the initial assessment pattern and the impact of the reappraisal lag on this pattern operate to increase the burden of the property tax on owners of lower-value housing, while reducing the burden of the tax on owners of higher-value housing hinges on several critical variables: the value of house/income ratios, differential rates of

increase in value of housing, variance in the distribution of market values, the length of the appraisal cycle, the total amount of underassessment in any one year in relation to the total tax levy (and, therefore, the amount of reduction in the tax rate, assuming a constant tax levy), and the amount of underassessment that can be eliminated. The value of house-income ratios are especially important because a smaller percent increase in the value of property is necessary for lower-value housing than is the case for higher-value housing in order to maintain the same burden relationship. For owners of housing which is overassessed, tax burden can only decline with elimination of the lag.

4. Evidence developed in this paper strongly supports the thesis that the initial assessment pattern and the reappraisal lag redistribute income from owners of lower-value housing to owners of higher-value housing. However, the distributional effects of the lag and the initial assessment pattern are complicated by both the tax rate effect and the fact that it is not possible to apply differential tax rates based on class of property -- i.e., business versus residential property. Under the assumption that redistribution of tax burdens occurs only within single-family housing, if assessment level differentials are eliminated, it is estimated that on the average owners of housing valued below $14,695 would experience a decline in tax burdens while owners of housing valued above this amount would experience an increase in tax burdens. Given the more realistic assumption that redistribution would include business property, on the average owners of housing below $10,260 would experience decreases in tax burdens, while owners of housing above this amount would experience increases in tax burdens. At the same

time, this latter assumption would result in a shift of tax burden from business property to single-family housing.

5. Given the more realistic assumption, owners of housing above $10,260 currently benefit from the existence of the lag and, therefore, will experience an increase in tax burden if the lag is eliminated. Since the income estimate for owners of housing valued in this range is approximately $2,500, tax burdens will increase for households with very low incomes and high tax burdens.

6. In terms of the property tax, tax burden, which is generally defined as the tax bill as a proportion of income, is a function of several variables: the value of house/income ratio, the assessed value as a proportion of market value, tax rate, and the amount of tax recouped through the Federal deductions for the property tax and mortgage interest payments. Therefore, while the initial assessment pattern and the lag in appraisal are the determinants of the assessed value - sale price ratio and, therefore, significantly affect tax burden, tax rate differentials and amount of tax recouped through Federal deductions also affect tax burden. Importantly, tax rate differentials and the amount of tax recouped modify the impact of eliminating the gap between assessed value and market value of housing. While it is not clear how tax rate differentials modify the analysis, because of the higher marginal Federal Income Tax rates identified with higher-income home owners, the distributional impact of eliminating the initial assessment level and the lag on higher-income persons will be lessened.

7. Unexpectedly, when viewed over a five-year appraisal cycle, the initial differential level of assessment by value of housing in Multnomah

County involves income distribution effects equal to or greater than that created by the reappraisal lag. Thus it should be pointed out, then, that although efforts to eliminate the lag would significantly reduce inequities resulting from value changes over the lag, additional efforts would be required to eliminate appraisal-induced inequities. For purposes of simplification, estimates of the value of housing which would experience no change in the tax bill assume that the assessment level for all housing can be maintained at 100 percent of market value.

8. The income distribution effects of the reappraisal lag undoubtedly assume more importance if the area of analysis is extended beyond Multnomah County to include the more rapidly growing suburban counties. A detailed study would probably find that within this larger area the reappraisal lag is the more significant contributor to inequities resulting from disparities between assessed value and market value.

9. While the analysis of this paper is necessarily limited to the income distribution effects of the initial assessment level and the reappraisal lag on single-family housing, there is little doubt that an analysis which included other property categories would reveal further inequity resulting from differential assessed value - sale price ratios. For example, commercial and industrial property is not only particularly difficult to assess due to the lack of significant market data and the uniqueness of structures, but these properties are also subject to a different set of market influences affecting changes in value over a reappraisal lag.

Because any effort to eliminate the reappraisal lag is dependent upon market data, the uniqueness of these properties and the infrequency of

sales means that approximately one-third or more of the property value in any county is not subject to accurate assessment. In the past this has meant that commercial and industrial property tends to be underassessed.

Therefore, if it becomes possible through computerization of market data and regression analyses to annually reappraise single-family housing, while commercial and industrial property remains on the same level of assessment, there will be a shift in burden from commercial and industrial properties to single-family housing.

10. For any single property parcel the total tax rate is the sum of the separate tax rates levied by special districts, authorities and other units of government authorized to levy a property tax within the area in which the property falls. Given the proliferation of such taxing districts and given the differences in assessed value per person in these areas, a wide range of tax rates exists not only within the metropolitan area, but also within individual counties. Therefore, in order to eliminate inequities not only within each county, but also between counties, it would be desirable to establish a single tax rate throughout the metropolitan area. If areas which presently have low tax rates are also areas which are experiencing rapid increases in property values, elimination of the reappraisal lag may result in even lower tax rates for these areas because of the resulting higher assessed valuation.

11. Because there is an obvious tendency for similar property tax burdens to be concentrated within specific neighborhoods (that is, housing within any one neighborhood tends to be near the same age and value, and subject to the same neighborhood effects), housing within a given neighborhood

is also prone to the same initial level of assessment and reappraisal lag influences.

This fact is extremely important in areas of low-value housing. Data suggest that, not only are these very low-value houses initially overassessed, but that after only a one-year reappraisal lag, depreciation seems to have caused these properties to become relatively more overassessed.[56] Insofar as the property tax raises the cost of housing, putting a significant part of the existing housing market beyond the reach of low-income groups, and discouraging investment in housing, by raising the property tax above what it would be otherwise, both the initial level of assessment and the reappraisal lag add to this problem.[57]

12. The five explanatory variables included in the multiple linear regression analyses (sale price, average sale price of housing in the neighborhood, the percentage difference between sale price and average sale price of housing in the neighborhood, age of house, and distance from the center of

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[56]Another study supports the conclusions of this paper. Raymond Richman found that in Pittsburgh the slum wards, which are the oldest wards in the City, in 1958, 1959 and 1960 all were assessed at a higher fraction of market value (sale price) than the City average. See Raymond Richman, "Real Estate Tax Reform as a Solution to Urban Problems," Hearings Before the National Commission on Urban Problems, Vol. I, May-June, 1967: Baltimore, New Haven, Boston, Pittsburgh, (Washington: Government Printing Office, 1968), pp. 343-52.

Also, evidence from Multnomah County sales in 1969 support this conclusion. These data are yet unpublished and will go to make up the 1970 ratio study.

[57]It is thought by some that if heavier emphasis were placed on land values (as opposed to the total value of the property), slum properties would be forced to move to some higher economic use. This is often considered in terms of slum multiple-family housing and their profitability for slum landlords. For single-family housing, it is clear that any thought given to increasing the burden of the property tax on owners of slum housing is absurd economic logic.

the City) are not sufficient to explain the assessed value - sale price ratio (AVSP) over the reappraisal lag.

Also, while as a group the independent variables are strategic in explaining the ratio, because of the significant intercorrelation of the independent variables, it is impossible to indicate the extent each variable contributes to the explained variance of the dependent variable. While the reliability of the partial correlation coefficients is significantly reduced by the intercorrelation, it appears that the independent variables which assume the most importance in the regressions are sale price, average sale price of housing in the neighborhood, and percentage difference between sale price and the average sale price of housing in the neighborhood. Age of house and distance from the center of the City appear to assume the least importance.

Also, although the six-variable multiple regression explains 67 percent of the variance in the ratio at the time of appraisal (no lag), the decline in the explained variance as the appraisal lag is introduced indicates that the problem of explaining and predicting market value of individual houses is much more complex.

APPENDIX A

VALUE OF HOUSE/INCOME RATIOS

TABLE XXII

FHA STATISTICS ON 1966 VALUE OF HOUSE/INCOME RATIOS*

(Sale Price) Average Value of House	Income Of Buyer	Value of House/ Income Ratio
10,497	2,400**	4.37
12,203	4,200	2.90
13,646	5,400	2.53
15,093	6,600	2.29
16,551	7,800	2.12
17,731	9,000	1.97
18,918	10,200	1.85
20,015	11,400	1.76
21,562	12,600	1.71
22,345	13,800	1.62
23,991	18,000	1.33

Source: U.S. Department of Housing and Urban Development, Statistical Yearbook 1966 (Washington: Government Printing Office, 1967), p. 127.

*Note FHA statistics for 1966 may not represent normal H/Y pattern due to unusually high interest rates during this period.

**For monthly income of less than $300, $200 was arbitrarily selected as average. For $1,200 per month and over $1,500 was arbitrarily selected as an average. For all others, the mid point for the income range was selected (e.g., if $400 to $499 per month was given, $450 per month was chosen as an average).

APPENDIX B

REGRESSION SAMPLE

Information Included in the Multnomah County 1969 Ratio Study

Each sale included in the Multnomah County 1969 Ratio Study includes the following information: type of unit (single-family, multiple-family, industrial or commercial); zoning characteristics; type of sale (deed, contract, or unqualified sale); date of sale; sale price; year appraised; appraiser's personal number; valuation for tax purposes (approximate land valuation, improvement valuation, and total assessed valuation); and the ratio of assessed value to sale price. In addition, although not specifically included in the ratio study, information on the tax bill and tax rate for each property sold within Multnomah County is available on file in the County's computer or from the individual property file records.

TABLE XXIII

SUMMARY INFORMATION ON SAMPLES USED IN REGRESSION

Information	Dist. 1	Dist. 2	Dist. 3*	Dist. 4	Dist. 5
Year of Last Appraisal	1967-68	1968-69	1964-65	1965-66	1966-67
Quarter Sections	2630	2730	-------	3633	3625
	2533	2644		3733	3723
	2531	2744			3227
	2632	2845			3228
	2633	2731			
	2634	2734			
Sample Size	163	134	-------	45	62

*No sample size is included from District 3 because of the severe data limitations encountered in obtaining data from this maintenance district.

APPENDIX C

AVAILABLE DATA

TABLE XXIV

URBAN AND SUBURBAN ASSESSED VALUE-SALE PRICE RATIOS BY MAINTENANCE DISTRICTS, MULTNOMAH COUNTY, OREGON, 1968

Property Class	District 1 (1967-68)*	District 2 (1968-69)	District 3 (1964-65)	District 4 (1965-66)	District 5 (1966-67)
Urban Residential					
Arithmetic Mean	97.7	99.3	92.5	93.8	99.3
Weighted Mean	96.2	97.8	89.9	92.6	93.8
Median	95.4	98.7	89.8	92.2	95.9
Suburban Residential					
Arithmetic Mean	97.6	101.1	98.7	92.5	100.2
Weighted Mean	95.5	99.8	94.6	90.9	94.2
Median	96.4	99.6	94.0	90.4	98.9

Source: Multnomah County, Oregon, 1969 Ratio Study, Ratio Subsection, (Unpublished data from Sales Ratio Division, Multnomah County Assessors' Office, 1969).

$$\text{Weighted Mean} = \frac{\text{Total Assessment}}{\text{Total Sale Price}}$$

$$\text{Arithmetic Mean} = \frac{\text{Total Ratios}}{\text{Number of Sales}}$$

*Date given is the date of last appraisal.

TABLE XXV

URBAN AND SUBURBAN ASSESSED VALUE - SALE PRICE RATIOS
1967-1969, MULTNOMAH COUNTY, OREGON

Date	Urban	Suburban
1967	95.6	94.8
1968	95.1	94.6
1969	95.6	97.9

Source: Multnomah County, Oregon, 1969 Ratio Study, Ratio Subsection, (Unpublished data from Sales Ratio Division, Multnomah County Assessors' Office, 1969).

TABLE XXVI

FREQUENCY DISTRIBUTION OF ASSESSED VALUE - SALE PRICE RATIOS FOR URBAN AND SUBURBAN RESIDENTIAL PROPERTY, MULTNOMAH COUNTY, OREGON, 1968 SALES, 1969 ASSESSMENTS

	Frequency of Real Property Ratios											
Property Class	20*	40	60	80	100	120	140	160	180	200	220	Total Sales
Urban Residential	3	2	18	823	1,624	223	76	14	9	1		2,793
Suburban Residential	3		6	307	1,412	145	38	15	4	2		1,932

Source: Multnomah County, Oregon, 1969 Ratio Study, Ratio Subsection, (Unpublished data from Sales Ratio Division, Multnomah County Assessors' Office, 1969).

*The frequency is by a range of twenty. For example, sixty means the range is from fifty to seventy.

TABLE XXVII

FREQUENCY DISTRIBUTION OF ASSESSED VALUE - SALE PRICE RATIOS FOR URBAN AND SUBURBAN RESIDENTIAL PROPERTY, MULTNOMAH COUNTY, OREGON 1967 SALES, 1967 ASSESSMENTS

Property Class	Frequency of Real Property Ratios												Total Sales
	20	40	60	80	100	120	140	160	180	200	220	240	
Urban Residential		1	16	579	1,196	156	33	21	6	2			2,010
Suburban Residential		9	367	795	48	8	6	1	2				1,236

Source: Multnomah County, Oregon, Ratio Study 1968, Sales Data Ratio Sheet Summary, (Unpublished data from Sales Ratio Division, Multnomah County Assessors' Office, 1968).

TABLE XXVIII

ASSESSED VALUE - SALE PRICE RATIOS FOR MULTNOMAH, CLACKAMAS AND WASHINGTON COUNTIES, TOTAL SALES IN SAMPLE, SALES WITH RATIO OF 110+, AVERAGE DEVIATION, AND COEFFICIENT OF DISPERSION, 1967 SALES - 1967 ASSESSMENTS

County	Total Sales In Sample	Total Sales With AV/SP 110 and over	Average Deviation	Coefficient Of Dispersion	Percent Of Sales With AV/SP 110 and over
Multnomah					
Total	3,246	283	---	---	8.7
Urban	2,010	218	9.5	9.8	10.8
Suburban	1,236	65	7.7	8.1	5.3
Clackamas					
Total	805	79	---	---	9.8
Urban	460	54	9.0	9.1	11.7
Suburban	345	25	9.5	10.0	7.2
Washington					
Total	1,451	43	---	---	3.0
Urban	532	14	7.8	8.4	2.6
Suburban	919	29	7.8	8.4	1.5

Source: Derived from data in Oregon State Tax Commission, Ratio Study 1968 Locally Assessed Property, (Salem: State of Oregon, 1969), Sections 4, 27 and 35.

TABLE XXIX

NUMBER OF ACCOUNTS BY PROPERTY CLASS AND BY MAINTENANCE DISTRICT
1968 SALES, 1969 ASSESSMENTS, MULTNOMAH COUNTY, OREGON

Property Class	Dist. 1	Dist. 2	Dist. 3	Dist. 4	Dist. 5
Urban Residential	11,563	9,823	22,306	10,381	23,154
Urban Multiple - Housing	3,625	2,736	9,449	2,352	5,973
Suburban Residential	13,506	18,518	3,619	3,260	899
Suburban Multiple Housing	565	656	35	44	9

Source: Multnomah County, Oregon, 1969 Ratio Study, Ratio Subsection, (Unpublished data from Sales Ratio Division, Multnomah County Assessors' Office, 1969).

TABLE XXX

ESTIMATED TRUE CASH VALUE BY URBAN, SUBURBAN PROPERTY CLASS,
1968 SALES, 1967 ASSESSMENTS, MULTNOMAH COUNTY, OREGON

Property Class	Number Of Accounts	Estimated True Cash Value
Urban Residential	77,227	$1,299,696,125
Suburban Residential	39,802	569,310,363

Source: Multnomah County, Oregon, 1969 Ratio Study, Ratio Subsection, (Unpublished data from Sales Ratio Division, Multnomah County Assessors' Office, 1969).

APPENDIX D

SALES RATIO DATA

TABLE XXXI

HISTORICAL RATIO OF ASSESSED VALUE TO SALE PRICE, 1959-1967, MULTNOMAH, WASHINGTON AND CLACKAMAS COUNTIES, URBAN AND SUBURBAN RESIDENTIAL*

	Multnomah		Washington		Clackamas	
	Urban	Suburban	Urban	Suburban	Urban	Suburban
1959	87.0	90.3	80.7	78.7	91.0	90.0
1960	81.0	87.3	----	----	92.0	90.0
1961	94.4	102.7	97.6	98.4	93.6	94.8
1962	88.5	99.0	93.6	95.2	92.4	94.0
1963	97.0	105.2	97.6	96.0	94.8	97.6
1964	97.8	102.8	97.6	97.2	93.2	95.6
1965	90.0	94.6	96.8	96.8	93.2	94.0
1966	95.6	94.8	95.6	96.0	94.8	95.6
1967	96.9	95.1	93.3	92.8	98.6	95.0

Source: Oregon State Tax Commission, Ratio Study 1968 Locally Assessed Property, Sections 26, 34, and 3, (Salem: State of Oregon, 1969).

*Data were computed for this table by setting the ratio for each year equal to 100 percent (100/posted ratio for following year x ratio of AV/MV -- e.g., 1967 posted ratio = 25 percent = 100/24 = 4 x 1966 AV/MV = 4 x 23.9 = 95.6).

TABLE XXXII

COEFFICIENT OF DISPERSION FOR SALES RATIOS, URBAN AND SUBURBAN 1967 SALES, 1967 ASSESSMENTS, MULTNOMAH COUNTY, OREGON

Property Class	Average Ratio	Average Deviation	Coefficient Of Dispersion	No. Of Sales*
Urban Residential	96.9	9.5	9.8	2,010
Urban Land Only	82.8	27.4	33.1	79
Suburban Residential	95.1	7.7	8.1	1,236
Suburban Land Only	78.1	26.5	33.9	62

Source: Oregon State Tax Commission, Ratio Study 1968 Locally Assessed Property, Section 26, (Salem: State of Oregon, 1969).

*Total number of sales in Multnomah County sample = 3,907.

TABLE XXXIII

MEASURABLE SALES OF ORDINARY REAL ESTATE DURING A 6-MONTH PERIOD, BY TYPE OF PROPERTY, 1966 - OREGON AND SMSA PORTION*

Item	Percentage Ratio of Assessed Value To Sale Price of Sold Properties Simple Sales Based Average ** State-Wide	SMSA Portion
All Types of Property	20.2	20.4
Residential	21.7	21.7
Acreage and Farms	14.1	14.9
Vacant Lots	14.6	12.8
Commercial and Industrial	19.5	20.4

Source: U.S. Bureau of the Census, Taxable Property Values, 1967 Census of Governments, (Washington: Government Printing Office, 1968), p. 46, Table 9.

*Excludes transfers of new single-family houses not previously occupied.

**Equal to $\frac{\text{Total Assessed Value of Sold Property}}{\text{Sum of Sales Prices of Sold Properties}}$

TABLE XXXIV

PERCENT DISTRIBUTION OF GROSS ASSESSED VALUE OF LOCALLY ASSESSED PROPERTY, BY TYPE, 1966 -- OREGON AND SMSA PORTION

Area	Total	Residential Non-Farm Total	Single-Family Houses Only	Acreage & Farms	Vacant Lots	Commercial and Industrial Total	Comm.	Indust.	Other
Oregon	100.0	53.0	49.6	22.0	1.7	22.9	13.3	9.6	0.4
SMSA Portion	100.0	62.0	57.6	11.7	1.7	23.9	16.3	7.6	0.4

Source: U.S. Bureau of the Census, Taxable Property Values, 1967 Census of Governments, (Washington: Government Printing Office, 1968), p. 36, Table 5.

TABLE XXXV

STATISTICS ON REAL PROPERTY ASSESSMENTS AND ON MEASURABLE SALES OF NON-FARM HOUSES DURING A 6-MONTH PERIOD, 1966, MULTNOMAH, WASHINGTON, AND CLACKAMAS COUNTIES

	Clackamas	Portland Part Of Clackamas	Multnomah	Portland Part Of Multnomah	Washington
Non Farm Single-Family Houses					
Number	34,764	5,208	146,448	104,328	26,208
Gross Assessed Value (x 1,000)	118,915	-----	414,927	274,063	91,635
Average Assessed Value	3,421	-----	2,833	2,627	3,496
Measurable Sales Of Non-Farm Single-Family Housing During 6 mo. Period					
Number	469	-----	2,156	1,470	686
Gross Assessed Value of Houses Sold (x 1,000) Total	1,534	-----	5,898	3,874	2,641
Average	3,272	-----	2,736	2,636	3,851
Indicated Approximate Market Value Of All Non-Farm Houses Assessed (x million)					
Total	561	-----	1,921	1,275	417
Average Per Property	16,100	-----	13,100	12,200	15,900

Source: U.S. Bureau of the Census, Taxable Property Values, 1967 Census of Governments, (Washington: Government Printing Office, 1968), pp. 138-9, Table 19.

APPENDIX E

PRESENT VALUE ESTIMATES, CORRELATION COEFFICIENTS AND ESTIMATED DISTRIBUTION OF SINGLE-FAMILY HOUSING

TABLE XXXVI

DERIVATION OF PRESENT VALUE ESTIMATES OF TAXES NOT PAID DURING A FIVE-YEAR APPRAISAL CYCLE, MULTNOMAH COUNTY, OREGON*

Value Of Housing	Initial Year	1 Year Lag	2 Year Lag	3 Year Lag	4 Year Lag	Total Present Value 5-Year Cycle
$ 5,000	-11.22	-15.11	-14.30	-13.57	-12.81	-67.01
7,370	0	0	0	0	0	0
15,000	37.11	56.74	74.27	90.02	103.41	361.55
20,000	61.20	83.12	102.69	120.27	135.07	502.35
30,000	109.50	135.76	159.21	180.27	197.71	782.45
40,000	126.00	168.50	206.46	240.55	269.18	1010.69

*The estimates are based upon: (1) a 6 percent rate of interest, (2) the assumption that the amount of underassessment due to the reappraisal lag is evenly distributed over the cycle, (3) the assumption that housing that experienced depreciation over the first year lag (below $7,370) did not experience any further value depreciation, (4) the assumption that the fourth year lag (only three were tested by regression analysis) was equivalent to the average of the other three, and (5) the tax rate for Multnomah County was 3 percent.

TABLE XXXVII

CORRELATION COEFFICIENTS SPAV AND OTHER VARIABLES

Lag Equation	SP	AGE	DIST	PDIF
No Lag	.8072	-.9024	.8953	.1523
1 Year	.7760	-.5084	.2283	.2429
2 Year	.5007	.2703	-----	-----
3 Year	-----	-----	-----	-----

TABLE XXXVIII

CORRELATION COEFFICIENTS DIST AND OTHER VARIABLES

Lag Equation	SP	AGE	SPAV	PDIF
No Lag	.7433	-.9403	.8953	.1617
1 Year	.1108	.1447	.2283	.1626
2 Year	-.5007	-.2703	-----	-----
3 Year	-----	-----	-----	-----

TABLE XXXIX

CORRELATION COEFFICIENTS PDIF AND OTHER VARIABLES

Lag Equation	SP	AGE	SPAV	DIST
No Lag	.6666	-.2215	.1523	.1607
1 Year	.7626	-.4037	.2429	.1626
2 Year	.8453	-.4701	-----	-----
3 Year	-----	-.6193	-----	-----

TABLE XL

CORRELATION COEFFICIENTS SP AND OTHER VARIABLES

Lag Equation	AGE	SPAV	DIST	PDIF
No Lag	-.7881	.8072	.7433	.6666
1 Year	-.5783	.7760	.1108	.7626
2 Year	-.2586	.5007	-.5007	.8453
3 Year	-.6202	-----	-----	-----

TABLE XLI

CORRELATION COEFFICIENTS AGE AND OTHER VARIABLES

Lag Equation	SP	SPAV	DIST	PDIF
No Lag	-.7881	-.9024	-.9403	-.2215
1 Year	-.5783	-.5084	.1447	-.4037
2 Year	-.2586	.2703	-.2703	-.4701
3 Year	-.6202	------	------	-.6193

TABLE XLII

MULTIPLE LINEAR REGRESSIONS EQUATIONS

	Y	A	X 1	X 2	X 3	X 4	X 5
Lag	AVSP	Constant	PDIF	SP	AGE	SPAV	DIST
No Lag	AVSP	165.321	-1.2353	.0055	-.7228	-.0076	-.1417
1 Year	AVSP	170.969	-1.1629	.0064	-.3684	-.0092	-.4054
2 Year	AVSP	103.5576	-.1140	------	.2968	-.0004	------
3 Year	AVSP	247.0325	1.3026	-.0058	-.7058	------	------

TABLE XLIII

ESTIMATED DISTRIBUTION OF SINGLE-FAMILY HOUSES BY VALUE RANGE, MULTNOMAH COUNTY, OREGON, 1968

Value Range	Total Sales	Percent of Total Sales	Estimate of the Total Number of Houses By Value Range
$ 0 - $ 4,999	406	.0443	5,184
5,000 - 7,499	863	.0943	11,035
7,500 - 9,999	1,186	.1296	15,167
10,000 - 12,499	1,377	.1504	17,601
12,500 - 14,999	1,719	.1878	21,978
15,000 - 17,499	1,326	.1449	16,958
17,500 - 19,999	737	.0805	9,421
20,000 - 24,999	785	.0857	10,029
25,000 and over	752	.0821	9,608
Total	9,151	1.0000	117,029*

Source: This table is derived from a special computer printout of all property sales occurring with Multnomah County during 1968. Multnomah County maintains records on computer file of all sales that occur within the County in order to facilitate its reappraisal program and to meet the ratio requirements of the State of Oregon.

*This is the sum of urban and suburban residential properties in Multnomah County in 1968 (multiple housing is excluded). The total of the individual items does not add up to 117,029 due to rounding.

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