USE-VALUE ASSESSMENT IN MACOMB COUNTY, MICHIGAN: SIMULATED EFFECTS ON TOWNSHIP FINANCES IN FIVE TOWNSHIPS IN THE RURAL-URBAN FRINGE, 1960-1969

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ABSTRACT

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This work constituted one segment of a study undertaken by the Michigan State University Agricultural Experiment Station (East Lansing) to investigate changes brought about in agricultural land use on the rural-urban fringe of rapidly expanding metropolitan areas. The major objective was to investigate the redistributive effects in local governmental taxation of two differing use-value alternatives to ad valorem property taxation. Five townships in the rural-urban fringe of Macomb County during the time from 1960 to 1969 formed the study area.

Using a stratified random sample drawn from the property tax assessment rolls (the sample frame) for the five study townships for the year 1960, estimates were formed of farm assessed valuations and farm land acreages for the years 1961-1969. A complete census was taken of assessed valuations per acre greater than or equal to

ninety-five percent of the sample frame. From the samples taken, three series of models were formulated. The first model investigated the ad valorem taxation system for the years 1960-1969. The second series of models simulated the taxation system if plain use-value assessment had been operable in these townships in this time span. The third series of models simulated property taxation under deferred taxation. Three participation levels and three selected theoretical farm land use-values were used with both the simulated plain and deferred taxation models. The deferred taxation models incorporated two differing proportion levels of participation as well as two periods of "roll-back."

All five townships experienced large increases in equalized valuations and tax revenues in the ten year study period. Non-farm land equalized valuation and revenue increased considerably more than farm equalized valuation and revenue in this same time period. Farm land acreage decreased considerably in the most urban township and very little in the most rural township.

Township tax rates increased under both plain and deferred taxation in all townships, but were less under deferred than plain use-value taxation. In the more urban townships, where there is less farm land assessed valuation and farm land acreage to participate in use-value assessment, the tax rates increased less than in the more rural

townships where a large share of township equalized valuation and township revenue is derived from the farm sector.

Millage rates in the non-farm and non-participating farm land sector increased considerably under plain use-value assessment. The increase in these millage rates was greater in the more rural townships. Millage rates increased also under deferred taxation but the increase was less than under plain use-value assessment. The increase in millage rates was less under the five year than under three year deferred taxation as more tax revenue was returned to the township tax coffers from farmers ceasing to participate in deferred taxation. In the more rural townships, the millage rate increases were not as great at the higher levels of participation. Millage rates decreased more in the participating farm land sector than the increase in the non-farm or non-participating farm sector of each township. Again, decreases were larger in the more rural townships than in the more urban townships.

Farm land tax revenue needed for compensation from the non-farm and non-participating farm sector was greater in the more rural townships. The higher the level of participation, the greater the tax revenue needed from these other two sectors.

Limited sales data was compared to equalized valuations for certain years and in certain legal sections of the townships. Assessment ratios were formulated and

showed great variability in property valuation. High sale prices of farm acreage indicated that even deferred taxation, with its "roll-back" penalty, would not be overly effective in keeping land in agricultural use.

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CHAPTER I

INTRODUCTION

General Introduction

In the twenty-five year time span since the end of World War II, the counties of southern Michigan have undergone considerable change in terms of land use.[1] Several major forces have contributed to this change. Population in the majority of these counties increased tremendously between 1945 and 1970; this population increase has been primarily from rural to urbanizing areas. Migration from other states and increased birth rates have also played a part in this population increase. This increasing population in southern Michigan has resulted in land use problems of a very critical nature. Because the larger expanding urban areas and the "prime" agricultural land are both located in southern Michigan, one of the most serious of the land use problems has been, and continues to be, the rapid disappearance of Michigan's "prime" agricultural land. The disappearance of "prime" agricultural land is

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[1]By southern counties, the author is referring to those Michigan counties lying south of an imaginary line stretching from the Muskegon area to the Bay City area.

especially pronounced in the rural-urban fringe areas around the larger and rapidly expanding metropolitan areas. Along with and associated with the disappearance of "prime" agricultural land in southern Michigan is the "scatteration" or "leapfrogging" of urban development around the remaining land in agricultural use.

Agriculture has been strongly affected by the rapidly changing land use patterns developing in southern Michigan. Urban and suburban residents demand more governmental services, but the cost of these services must be borne by all sectors of the economy, including agriculture. Property taxes must increase to pay for the additional local services and the higher cost of government at this level. Real estate developers, as well as others creating land scatteration patterns, bring about higher land prices than those normally prevailing in an agrarian setting. Higher land prices in turn create higher property assessed valuations and thus bring about higher property taxes to be paid by agriculture. Stocker states that:

> Property taxes are a fixed cost of agricultural production. The owner's tax bill does not vary with output or with the price of farm products. Even if he allows his land to lie idle, the taxes are not affected, in the short run at least. Moreover, the farmer is likely to feel particularly helpless in the face of rising property taxes because, unlike other costs that are subject to his personal control, property taxes are governed largely by the will of the community. Finally, opportunities for "shifting" the property tax are limited, because the farmer typically sells his product in a market in which his individual

> influence is negligible. He cannot pass the tax on to the consumer in the form of higher prices.[2]

Higher land prices and higher taxes thus make it very difficult for an agricultural owner and operator to efficiently compete where these conditions are found.

To alleviate one of the many problems faced by the agricultural industry in each individual state, that of increasing property tax in terms of decreasing income and property taxes based upon the potential and not the actual market price of farmland, many of these states have enacted legislation aimed at reducing the ad valorem (according to value) property tax paid by farmers. This legislation saw its beginnings in specific legislation for agricultural property taxation in Maryland in the early 1950's and has come to be called use-value or preferential assessment.[3] Essentially, use-value legislation states as its prime credo that land in agricultural use will be taxed on its use in agriculture and not on its probable use or value for other purposes. By taxing agriculture land under

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[2]U.S. Department of Agriculture, Economic Research Service, Frederick D. Stocker, "How high are farm property taxes," The Farm Cost Situation, ARS Pub. 43-75 (FCS-24) (Washington, D.C.: Government Printing Office, May, 1958), p. 36.

[3]U.S. Department of Agriculture, Economic Research Service, Thomas F. Hady and Thomas F. Stinson, "Taxation of farmland on the rural-urban fringe: a summary of state preferential assessment activity," Agric. Econ. Report No. 119 (Washington, D.C.: Government Printing Office, Sept., 1967).

use-value assessment instead of ad valorem taxation, there is a belief by the states having this type of legislation that each individual agricultural property owner will be able to remain in farming by giving him a "tax break." This, hopefully, will alleviate the need for premature sale of the property for non-agrarian purposes and also will create "green belts," agricultural preserves, or open space lands, especially in the rural-urban fringe of the expanding metropolitan areas.

In 1969, use-value legislation was introduced into the Michigan legislature but the several versions of this type of property taxation "died" quiet deaths in various committees. One version, H.R. 2533, passed the House and Senate in the 1970 legislative session and finally came to rest in the House's Committee of the Whole. Now another version of the previous use-value legislation, H.B. 4100, has been re-introduced by Representative Spencer from Lapeer County and his associates.[4]

Objectives of the Study

Because use-value legislation will affect the incidence of the ad valorem property tax in Michigan, a research project was undertaken to investigate the

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[4]For one version of H.B. 4100 which is subject to change, the reader is referred to the Appendix, p. .

economic effects of use-value assessment on land use patterns.[5] This individual study of one county is part of the research project and will investigate some financial or redistributive aspects of use-value assessment in a rapidly urbanizing county of Michigan. It has as its major objectives:

1. To determine past effects in ad valorem taxation and the incidence of that taxation on agricultural and non-agricultural lands in selected townships of Macomb County.
2. To measure the effects of plain use-value assessment using simulation models in the same selected townships of Macomb County with plain use-value tax features and the effect of this type of assessment on local government revenues, millage rates, and the incidence of the tax burden between the farm and non-farm sectors.[6]
3. To measure the effects of use-value assessment with "roll-back" or deferred tax features in the

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[5]"Economic effects of use-value assessment on land use patterns," Michigan Agricultural Experiment Station Project No. 1047, currently being conducted by the Department of Resource Development, Michigan State University, East Lansing, Project leader is Dr. Raleigh Barlowe.

[6]Plain use-value assessment means that lands devoted to agriculture are assessed on the basis of their value in agriculture and other potential uses are to be ignored by the assessing officer.

same selected townships of Macomb County and the effect of this type of "roll-back" or deferred assessment on local government revenues, millage rates, and the incidence of the tax burden between the farm and non-farm sectors.[7]

This study will first present a short overview on the general property tax, then a short discussion of use-value and the general types of use-value in the states having this type of legislation. The study area will then be described in terms of its physical and economic aspects and the relevance of Macomb County in this part of the study. The methodological approach will then be described which will include explaining and defining the rural-urban fringe, both generally and for operational purposes. The sample design selected representative farms in this fringe area. From these selected sample farms, estimates were made of the incidence of taxation at the township level between the farm and non-farm sectors. Several models were then used to measure the incidence or distributive effects of the current taxation system as well as the taxation systems under plain use-value assessment with and without "roll-back" provisions. Analysis will follow

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[7]"Roll-back" or deferred assessment means that farmers ceasing to participate in use-value assessment must pay, in the form of a penalty, part or all of the back taxes due on the agricultural land.

after the basic models have been described. Finally, a summary and policy recommendations will be made to describe what has happened and what may happen to agricultural land lying in the rural-urban fringe areas of rapidly expanding metropolitan areas under existing and use-value systems of property taxation.

CHAPTER II

AGRICULTURE AND TAXATION

The General Property Tax

The general property tax, or as it has commonly come to be called, the ad valorem property tax, is one of the oldest and the most important taxes to be found in the United States. Barlowe states that ". . . this tax is far and away our most important tax on landed property."[8] For local governments, this tax on (landed) property has become and currently is the major source of revenue. Until 1934, in Michigan, this tax was levied by both state and local governments, but since that time has been imposed only by local governmental units.[9] In 1960, general property tax levies in Michigan were $851 million; by 1970 they had increased to $1,795 million.[10]

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[8]Raleigh Barlowe, Land Resource Economics: The Political Economy of Rural and Urban Land Resource Use (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1958), p. 534.

[9]Densel C. Cline and Milton C. Taylor, Michigan Tax Reform (East Lansing, Michigan State University, Institute for Community Development and Services, 1966), p. 19.

[10]Michigan Abstract (East Lansing, Michigan State University, Bureau of Business and Economic Research, 8th ed., 1970), p. 529.

Because the general property tax is the major source of local revenue, both in Michigan as well as throughout the United States, and because it is one of the most critical of the taxes paid out of income by the owners and operators of agricultural land, it is necessary to understand some of its operation. An understanding of the ad valorem property tax and its operation is especially critical to those who are interested in agricultural land located in the rural-urban fringe.[11]

Our founding fathers, some two hundred years ago, believed that there was a strong correlation between wealth and land ownership. This was essentially true in that period of time. The ownership of land and its resources constituted a source of wealth that could be suitably taxed by the local governments and by the states. Jensen stated that the:

> . . . chief precedents (of the real property tax) are found in the English land and property tax concepts the early settlers brought to the American colonies and in the early quitrents which the settlers in some colonies paid to agents of the Crown.[12]

Wealth, of course, has now come to have a different connotation than it did in the early developmental stages of

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[11]The author will discuss the rural-urban fringe, both in a general and operational context in Chapter III.

[12]Jens P. Jensen, Property Taxation in the United States (Chicago: University of Chicago Press, 1931), Chapter II.

this nation. Land ownership, and the uses to which this land is put, varies much more now than it did while our nation was developing.

Land now has come to be viewed as a gift of nature, whereas wealth is considered a levy on a potential yield of assets, not necessarily those of land yield. Henry George made the distinction when he stated that:

> A house and the lot on which it stands are alike property, as being the object of ownership and are alike classed by the lawyers as real estate. Yet in nature and relations they differ widely. The one is produced by human labor, and belongs to the class in political economy styled wealth. The other is a part of nature, and belongs to the class in political economy styled land.[13]

The general property tax is a tax upon all wealth, tangible and intangible, movable and immovable that has exchange value or the quantity of one thing that will be given for another. The general property tax has many characteristics. Jensen stated its most important characteristics when he said that:

> It has long been customary to comprehend property taxes in the United States under the name of the general property tax, whose ruling concept is that all property is valued uniformly and taxed at a uniform rate in each taxing jurisdiction. This concept is and has been unquestionably the outstanding characteristic of American taxation. (Italics added.)[14]

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[13]Henry George, Progress and Poverty: An Inquiry into the Cause of Industrial Depressions and of Increase of Want with Increase of Wealth-the Remedy (New York: Random House, a reprint of his 1879 edition), p. 337.

[14]Jensen, op. cit., p. 1.

The general property tax essentially consists of two main categories of taxation. These are the categories of real and personal property taxation. Personal property taxation is classified into two sub-categories. These are tangible personal property which includes a great variety of goods such as business furniture, manufacturer's inventories, farm machinery and harvested crops. Intangible personal property is mainly contractual rights that have been acquired by individuals or corporations and are items such as stocks, money, and book credit. Real property, or real estate as it is sometimes called, also has two subcategories of taxation. The first category consists of a tax on land and the second is a tax on improvements or buildings.[15] The distinction between real and personal property is a fine and often relative one. Real property usually is made up of immovables.[16]

Because the real property or ad valorem property tax is of both ancient vintage and also the chief source of revenue for local governments, it has gathered much criticism over the years. Barlowe states that ". . . like most taxes, the property tax has both its strong and weak

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[15]On the township property tax assessment records, these two categories of taxation are classified as farm vacant and farm improved. The classification will be discussed in more detail in Chapter III.

[16]Harold M. Groves, Financing Government (New York: Holt, Rinehart and Winston, 6th ed., 1964), pp. 50-53.

points."[17] Our concern in this dissertation is not as much with the strengths as it is with the weaknesses of the property tax. Groves states that the theoretical limitations of the property tax are that: (1) it is a poor measure of benefits received; (2) double taxation is encountered; (3) there are alternative procedures with debts and credits; (4) it ignores the intangible asset of personal abilities; (5) it creates an inconvenience in that some property may go for long periods without earning income; (6) it is a burden to lower income and elderly people; (7) it is regressive in nature; (8) it is maladapted to modern conditions; and (9) there is a poor correlation between the property tax and the income from that property.[18] These criticisms are applicable to all property, but when dealing with agricultural land on the rural-urban fringe, the criticisms become much more important. The last criticism, for example, that there is a poor correlation between the property tax and the income from that property, is especially relevant in dealing with agricultural land lying in the fringe areas of expanding metropolitan areas where land is undergoing the conversion from agricultural to urban use. In rural areas, an owner and operator of agricultural land is generally paying

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[17] Barlowe, op. cit., p. 558.

[18] Groves, op. cit., pp. 57-66.

taxes from the income of the agricultural productivity of that land. This land is valued, assessed, and taxed on that productivity base. However, with the encroachment of suburbia and the expanding metropolitan population needing land for non-agricultural uses, problems arise.

Urbanization and Its Effects on Agriculture

Land and its resources always have and always will undergo change, both in terms of ownership as well as of changing use. Barlowe terms this as "succession in land use" and then states that:

> Land resources tend to move to those owners who bid the most for their control and to those uses that offer the highest return for their utilization. This concept operates with rural and urban lands alike.[19]

Land that was once barren now contains large cities, land that was once desert now grows crops. Two hundred years ago our country's economy was agrarian in nature, now it is largely industrial as well as becoming increasingly service-oriented. Our population two hundred years ago was rural, but now, in this, the twentieth century ". . . ours is an increasingly urban population, which demands that more and more land be converted from rural to urban uses."[20] Of course, in the conversion of this rural land

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[19]Barlowe, op. cit., p. 219.

[20]A. Allan Schmid, Converting Land from Rural to Urban Uses (Baltimore: Johns Hopkins Press, 1968), p. 3.

to urban land, many conflicts and problems arise. Barlowe and Hostetler, in discussing subdivision trends in southwestern Michigan stated that:

> . . . the appearance (of subdivisions) has created problems both for cities and for agriculture--for cities because laying out subdivisions normally sets the land use pattern for years to come, and for agriculture because many new subdivisions have blossomed out in areas occupied by productive farms only a few years before.[21]

This conflict in land use on the rural-urban fringe has many names. One of the more common is "suburban sprawl." Because "suburban sprawl" has an important effect upon agricultural land owners and operators in the rural-urban fringe, it is necessary to first discuss "suburban sprawl" and then to investigate its effects upon rural-urban fringe land that is in agricultural production and use. In the succession of land from its natural state to higher and better uses, ". . . one possible major causative factor of suburban sprawl can be eliminated--agriculture."[22] Yet it is upon agriculture that the effects of suburban or urban sprawl are very noticeable. The requirements of

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[21]Raleigh Barlowe and John E. Hostetler, "Subdivision trends in southwestern Michigan, 1944-1958," Quarterly Bulletin of Michigan Agricultural Experiment Station, Michigan State University, East Lansing, Vol. 42, No. 2 (Nov., 1959), Reprint, p. 373.

[22]Marion Clawson, "Urban sprawl and speculation in suburban land," Land Economics, Vol. 38, No. 2 (May, 1962), p. 100.

agricultural land for non-agricultural uses have strongly affected the use of agricultural lands in the fringe areas.

"Suburban sprawl" has been defined and described many ways. Harvey and Clark state that ". . . sprawl is sometimes described as the scattering of urban settlement over the landscape."[23] Clawson defines sprawl as ". . . large closely settled areas intermingled haphazardly with unused areas."[24] Clawson then goes on to state that raw, underdeveloped suburban land has several peculiar characteristics (enumeration added):

> (1) . . . land for suburban development is not a homogenous commodity, any more than is land for any other possible use.
> (2) The history of land ownership usually results in a present ownership pattern of variable size tracts of land owned by different owners.
> (3) The owner of a discrete tract often must sell it all, or a major part, if he wishes to sell any.
> (4) Society, acting through government at the same level, has given suburban land further special characteristics (such as) location with respect to transportation, to water supply, to sewerage, to other services . . .
> (5) Society has affected the value of suburban land in other ways--by taxes, by zoning and building codes, and the like.
> (6) Suburban land also differs greatly in accessibility, especially to major highways and sometimes rail lines.
> (7) The market for suburban land is a derived one, dependent upon the market for dwellings, shopping centers, or industrial plants erected on it.

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[23] Robert O. Harvey and W. A. V. Clark, "The nature and economics of urban sprawl," Land Economics, Vol. 41, No. 1 (Feb., 1965), p. 1.

[24] Clawson, op. cit., p. 99.

> (8) Lastly, the market for suburban land is usually very thin. There are very few buyers and sellers at any one time.[25]

Suburban sprawl appears to many to be an unplanned, uncontrolled, uneconomical use of land over time. Harvey and Clark state that this sprawl has one of three distinct forms. The first form is low density development. This is the gluttonous use of land in opposition to a value judgment about a higher density which would have been more appropriate. Ribbon development sprawl results in segments which are compact within themselves but which extend axially and leave the interstices undeveloped. Leap-frog development is the settlement of discontinuous, although possibly compact, patches of urban land uses.[26]

All three types of sprawl have an effect upon agricultural land in the rural-urban fringe. The type of sprawl found in a particular locality at a particular point in time, or even the cause of sprawl, is not unimportant.[27] What is more important, however, is that

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[25] Ibid., pp. 101-102.

[26] Harvey and Clark, op. cit., p. 2.

[27] House states that ". . . the causes commonly given for sprawl include land speculation, physical and geographical characteristics which promote undesirable land development, real property taxes, and governmental policies." See U.S. Department of Agriculture, Economic Research Service, Peter W. House, "Opposing views of taxation of land near cities" (Washington, D.C.: Government Printing Office, June, 1968), p. 1.

sprawl, in general, creates overall unfavorable conditions in land use and taxation that affect an individual farmer actively engaged in agricultural production in rapidly expanding metropolitan areas of growth.

The owner or operator of farmland in the rural-urban fringe finds himself in a peculiar situation. On the one hand he is actively engaged in full-time farming. At a point in time, though, he will find himself caught in the conflict of continuing in agriculture or cashing in as the immediate seller of his land for non-farm use. Scofield elaborates upon this when he states that:

> Bona fide farmers tend at first to be unwilling participants in and indifferent bystanders to the rate and direction of urban dispersal. Later, they become aware of the new problems and decisions involved if they are to realize the maximum gains and advantages from their ownership of land lying in the path of urban growth.[28]

Involved in this conflict of productivity versus sale, there are several reasons why an individual farmer may decide to sell his farmland besides just increasing property taxes. Several of these reasons, and these do not comprise a complete list, are the cost-price squeeze, non-farm job opportunities, retirement plans, debt pressure,

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[28]U.S. Department of Agriculture, Economic Research Service, Current Developments in the Farm Real Estate Market, William H. Scofield, "The land market in the urban fringe" (Washington, D.C.: Government Printing Office, Oct., 1961), p. 26.

lack of hired labor, lack of expansion opportunities, estate settlement, the desire for an urban environment, and of course, the prospect of earning high capital gains. These reasons for selling, and the demand for the limited supply of agricultural land, create several conflicts. The immediate conflict arising is that the value and hence the price of the agricultural land in the rural-urban fringe increases. The price of the land in turn is determined by the various uses to which it can be put. Sargent, writing in 1959, categorized the principal factors affecting economic supply and demand for land into endogenous and exogenous factors. He listed the endogenous factors or the physical attributes of land as soil, fertility, permeability, texture, slope, cover, wildlife, topography, known subsurface minerals, and water. The exogenous factors he divided into the categories of geographical, economic, social and cultural, governmental, technological, and population factors.[29] The endogenous or internal factors, coupled with the managerial abilities of an individual farmer determines the productivity of the land for agricultural uses. A farmer, wishing to expand his operation to meet better economies of scale in a competitive economy, can not obtain credit for more than the appraised

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[29]Frederic O. Sargent, "Land market and price analysis in an agro-industrial economy," Appraisal Journal, Vol. 27, No. 3 (July, 1959), p. 362.

value that the land will support. Even if he can bid for and obtain a small acreage of land adjacent to his present farm without the addition of more capital investment in machinery and equipment, the dilemma of how much time is left before he must sell his entire farm and leave the agricultural industry permanently still remains. Property taxes, because they are a fixed cost of operation regardless of his productivity and income, further affect the timing of an agricultural land owner's decision to dispose of his land for urban use.

The agricultural owner and operator today finds himself in a difficult position if he wishes to remain in agriculture. To remain in a competitive position, he must not only become more efficient in his managerial practices, but while increasing his economies of scale, he must expand his operation in terms of land and capital. This in turn creates still higher taxes that must be paid, including property taxes which have taken on an ever increasing proportion of his net farm income. Total taxies levied on farm real estate in Michigan increased from $13.7 million in 1950 to $68.7 million in 1969. Taxes levied on farm real estate as a percentage of net farm income in Michigan in 1950 were 4.2 percent and in 1969 had increased to 19.0 percent.[30]

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[30]U.S. Department of Agriculture, Economic Research Service, Farm Real Estate Taxes: Recent Trends and Developments, RET-10 (Washington, D.C.: Government Printing Office, Feb., 1971), pp. 6, 14.

This increase in property taxes is the result of several forces over which the agricultural owner and operator has little control. Besides being caught in a cost-price squeeze, the cost of local government administration and services continues to increase every year. The property tax, which is derived from the assessed valuations of property which in turn is theoretically derived from the market price of property, is also increasing. Ad valorem appraisal practice suggests that land valuations should be based on the highest and best permitted use of land. This appraisal philosophy in turn partially helps to create scatteration patterns and suburban sprawl. In rural areas, the assessment of agricultural lands is not difficult because of the evidence available to the individual assessor as to past and present use to which the land has been and is put. On the rural-urban fringe, however, the probable demand for land to be put to urban uses, modified by a time factor and uncertainty about future market value, creates severe assessment problems.

Coupled with increasing property taxes, the criteria under which an assessor must value property, and the demand for agricultural land in the fringe areas, a farmer may hope to keep his land in agricultural production because he believes farming is a highly desirable way of life. The alternative facing him is to sell to an individual for non-agrarian motives such as speculation,

investment, tax avoidance, recreation, residential use, or prestige or keep the land as his own "retirement" fund. He may sell to housing developers who wish to change the land to a more intensive use. He may also have an opportunity to sell the land to either industrial corporations or a governmental unit.[31]

Use-Value Assessment and Agriculture[32]

During the past fifteen years, there has been a growing interest in many states, including Michigan, to seek an alternative to the present system of ad valorem property taxation on farmland and especially farmland and open-space land in the rural-urban fringe. This interest has grown from the beliefs of many that the current system of taxation as it concerns agricultural land: (1) places an excessive tax burden upon bona fide farmers; (2) results

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[31]Sargent discusses at greater length the varying motives for purchasing and owning land. See Frederic O. Sargent, "The demand for land in Texas," Misc. Publication 235, Texas Agricultural Experiment Station, College Station, Texas (Oct. 10, 1957), pp. 1-4.

[32]This section is a product of many sources. Several of the more important were Hady, op. cit., Richard E. Friday, "Summaries of state legislation dealing with the preservation of farmland," Agric. Econ. Exten. Bulletin 547, Cornell University, Ithaca, New York (Oct., 1969), and Raleigh Barlowe, Gordon Bachman, and James G. Ahl, "Use-value assessment legislation in the United States," paper distributed at the annual Regional Northeastern Agricultural Experiment Station Meeting, New York, N.Y., Dec. 7-8, 1970.

in a disorganized conversion of land from rural to urban uses in the rural-urban fringe areas; and (3) encourages the disappearance of open-space in the rural-urban fringe area. Proponents of use-value assessment of farmland for taxation believe that the above mentioned problems could be greatly relieved by the passage of legislation that would reduce the present property tax burden on farmland and land lying within the rural-urban fringe. Consequently, many states have passed legislation dealing with assessment of agricultural and open-space land.

While each of the alternative tax procedures that have been passed by varying state legislatures is unique unto itself, there nevertheless exists enough similarity among some to enable them to be grouped into general classifications. This legislation generally falls into five categories of alternatives. These are: (1) plain use-value assessment; (2) deferred (often referred to as roll-back) taxation; (3) contractual agreements for easement or development rights; (4) use-value assessment combined with planning or zoning; and (5) a fifth type of alternative which could be classified as use-value assessment. This fifth type of alternative is called the classified property tax.

The plain use-value assessment laws usually stipulate that lands actually devoted to agriculture (or other land qualifying under the legislation) be assessed on the

basis of its value in agriculture, and that other potential uses are to be ignored by the assessing officer. Thus, under plain use-value assessment, the criterion of value is based upon value-in-use rather than current market value of existing or potential uses. This criterion of value is the essential feature of this type of alternative and is designed to prevent nearby changes in land use from having an effect upon the assessed valuation of the property. As of January, 1971, several states had this type of use-value assessment; they include Arkansas, Colorado, Connecticut, Delaware, Indiana, and New Mexico.

Deferred taxation (or roll-back taxation) represents a type of alternative in which two assessed values are placed upon each parcel of qualifying land. One value represents the value in use as under plain use-value assessment. The other value represents the value the property would have had in the absence of use-value assessment. As long as the land remains in an appropriate use as designated in the legislation, property taxes are based on the value-in-use criterion and the remaining taxes that would have applied in the absence of use-value assessment are deferred or postponed. However, if the land changes to a use not designated in the legislation, all or part of the amount of deferred taxes become due. The number of years for which the deferred taxes are due varies by state as does the percentage of the deferred taxes. States

having this type of use-value legislation as of January, 1971, were Alaska, Maryland, Minnesota, New Jersey, Rhode Island, Texas, and Utah.[33]

A typical arrangement in the development rights and easements approach is for the qualifying landowner to sign a long-term contract agreeing to surrender his non-agricultural development rights for the life of the contract. In return, the landowner would have his property assessed only on the basis of its value in agricultural uses. An alternative approach would have the farmer sell an easement right to all non-agricultural development on his land for a specified number of years. In return, the assessing officer would consider the effect of the easement upon the value of the property when assessing for property tax purposes. In most cases, there is a penalty either in the form of a fine, deferred taxes due, or a capital gains tax, if the contract is broken by converting or selling the land for a non-agricultural use. States having this type of legislation currently are Florida and Oregon.

The planning and zoning approach attempts to combine features of the use-value assessment or deferred taxation approach with official planning or zoning efforts.

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[33]See the Appendix for legal references to individual state use-value assessment. As a state, Minnesota has two types of legislation concerning use-value assessment so it is located both under plain use-value assessment and also under the classified property tax section.

The result is typically a selective form of use-value assessment or tax deferral in which planning or zoning regulations establish agricultural zones or preserves where the provisions of use-value assessment or tax deferral would apply. Areas outside these zones or preserves may not receive all the benefits of these tax relief measures. California, Hawaii, and Pennsylvania are states with this type of legislation.

Another alternative is the classified property tax. This alternative is designed to treat different types of taxable property differently. Varying tax rates or ratios of assessment to true value are applied to different classes of property. This type of alternative differs from the four previously mentioned alternatives in that several states have had legislation for some time but it was not designed to preserve agricultural or open space land on the rural-urban fringe per se. Whether this type of legislation is a separate category of use-value assessment is also a moot question. States with this type of taxation include Arizona, Minnesota, Ohio, and West Virginia.

Each passing month finds more states adopting new or modifying current use-value legislation that has been essentially enacted within the last decade or so. Michigan is currently in the process of considering adopting use-value legislation. There is little evidence of the

theoretical aspects of taxation such as the shifting and incidence of real property taxation or whether this type of legislation keeps land in agricultural or open-space use. The remainder of this paper will deal with the re-distributive aspects of the property tax burden in an urbanizing area. This is a problem which is just as critical as those posed by the many theoretical problems dealing with taxation as well as value systems.

CHAPTER III

SAMPLING DESIGN AND FORMATION OF TOWNSHIP ESTIMATES

The Study Area

Nowhere in the State of Michigan has the change of land use from agricultural to urban been more rapid than in the area lying immediately north of the Detroit metropolitan region. Macomb County forms an excellent area for the study of land settlement, changing land use, and the redistributive effects of property taxation. In 1959, forty-nine percent of the land in Macomb County was in farms. This total had diminished to forty-five percent in 1964.[34] Preliminary census and other data for 1970 indicate that this total may well have diminished to less than forty percent.[35] Preliminary population reports indicate that the 1970 population of Macomb County increased from 305,804 in 1960 to 625,309 people in 1970, an increase of

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[34] U.S. Department of Commerce, Bureau of Census, 1964 Census of Agriculture: Michigan, Vol. 1, Part 13 (Washington, D.C.: Government Printing Office, 1967), p. 262.

[35] This assumption is based on advance population reports, talks with county planning officials, and other data which surfaced during a year of research in the area.

fifty-four percent. Relatively, Macomb County has undergone greater population change than any county in the State of Michigan in the last ten years.[36]

Macomb County is in the southeastern part of Michigan, bordering on Lake St. Clair and Anchor Bay. In length it is about thirty miles from north to south, and it is about eighteen miles wide. Its total area is approximately 481 square miles or 307,840 acres.[37] Except for a small area in the northwestern part, the county is a part of an old lake-bed plain which varies from level to gently undulating. The majority of the drainage of Macomb County is into Lake St. Clair. The climate of this area is characterized by moist, short, cool summers with a growing season of around 125 days and cold winters.

The economic make-up of Macomb County is enmeshed with that of the large and complex Detroit metropolitan industrial region. Macomb County itself can be divided into three general regions in terms of economic make-up. The northern one-third of the County is dominated essentially by extractive industries such as mining and

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[36]U.S. Department of Commerce, Bureau of Census, 1970 Census of Population: Michigan (Advance Report) (Washington, D.C.: Government Printing Office, Jan., 1971), pp. 3-16.

[37]U.S. Department of Commerce, Bureau of Census, Areas of the U.S., 1940, Sixteenth Census (Washington, D.C.: Government Printing Office, 1942), pp. 133-134.

agriculture. The southern one-third of the County is the location of productive and distributive industries. The area separating these two areas of contrasting characteristics is the area that is in transition. A map of Macomb County with the townships selected for study is located in this Chapter.

The industrial structure of Macomb County is closely related to the automobile. Consequently, steel, glass, plastics, chemicals, machines, metal fabrications, and all types of hardware are produced in the County. General Motors, Ford, and Chrysler have installations of major importance in the area. In 1966, sixty percent of the labor force, or approximately 89,547 people, were employed in 1,133 manufacturing establishments. In 1967, industry accounted for about thirty percent of the total county tax base. In 1963, there were 3,052 retail establishments employing 15,514 people in the county, 335 wholesale trade establishments employing 2,986 people, and 1,897 selected service establishments with 4,105 employees.[38]

Agriculture always has been and continues to be an important industry in Macomb County. Wildermuth, Stack, and Veatch stated that ". . . agriculture was well advanced

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[38] Economic Growth, Macomb County, Michigan: 1967-1990, Report of the Macomb County Planning Commission (Nov., 1967), pp. 9-35.

in Macomb County before the Civil War."[39] In the 1920's they list the dominant crops of Macomb County as hay, oats, corn, wheat, rye, potatoes, beans, buckwheat, and sugar beets. There were also some fruit and dairy farms.[40] Presently, the Michigan Agricultural Statistics show corn, wheat, oats, dry beans, soybeans, and hay are still being produced in quantity in Macomb County.[41] In 1964, Macomb County ranked eighth in the state in the sale of nursery and greenhouse products, second in vegetables grown under glass, cut flowers, potted plants, florist greens and bedding plants, and fifth in field vegetables.[42] Depending upon the particular township and location, Macomb County produces specialty crops such as mushroom, sod, and horse farms; they also have general crop and dairy farms.[43]

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[39]U.S. Department of Agriculture, Bureau of Chemistry and Soils, Robert Wildermuth, J. W. Stack, and J. O. Veatch, Soil Survey of Macomb County, Michigan (Washington, D.C.: Government Printing Office, 1928), p. 1016.

[40]Ibid., pp. 1016-1021.

[41]Michigan Agricultural Statistics, Michigan Department of Agriculture, Michigan Crop Reporting Service, Lansing, Michigan (July, 1970), pp. 14-17.

[42]K. T. Wright, Michigan's Agriculture: Its Income, Major Products, Locations, and Changes, a source book based on information from 1964 Census Reports, Extension Bulletin No. 582, Cooperative Extension Service (East Lansing, Michigan State University, Aug., 1967), pp. 59-62.

[43]From an interview with Jack A. Prescott, Macomb County Cooperative Extension Director, Aug., 1970.

The type of agricultural production undertaken has generated an interesting change that is related to the Macomb County population transition from an area essentially ninety-five percent rural in the twenties to eighty-five percent urban in the sixties. The expanding metropolitan Detroit region has led farmers in the southern part of the county into a more intensive type of agriculture. While the total number of farms in Macomb County decreased from 2,645 in 1954 to 1,609 farms in 1964, the average size and value of each farm increased. The average farm size in 1954 was 70.5 acres; in 1964 it was 84.4 acres. The value of land and buildings increased seventy-eight percent in this ten year period, from $24,000 to $42,000. While the number of farms less than 180 acres decreased, following national trends, there has been a significant increase in money invested per farm.[44] Because of this changing mix and more intensive type of agriculture undertaken and the decrease in farmland acreage, this county, which was once strongly agrarian in nature, was chosen in order to study the effects of urganization on local taxation of land lying in the rural-urban fringe.

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[44]U.S. Department of Commerce, 1964 Census of Agriculture, Vol. 1, Part 13, op. cit., p. 262.

Defining the Rural-Urban Fringe

The land area of any county in relation to the rural-urban fringe is large and coupled with the time factor, the fringe area is both continually changing as well as difficult to define. The townships of a county in which the rural-urban fringe is found are townships in transition. Consequently, it becomes necessary to generally discuss what is meant by the rural-urban fringe and then to operationally define it, at a point in time, for the purpose of this study.

In an attempt at defining the rural-urban fringe, one encounters the same problems as defining suburban sprawl. Both are parts of the same phenomena that takes place in the area surrounding an expanding metropolitan region. The County and City Data Book of 1967 lists the Standard Metropolitan Statistical Areas (SMSA's) of the United States. Detroit, of course, because it contains 50,000 or more population as well as meeting the other criteria for an SMSA, is one of these. Macomb County is included as a contiguous county in the Detroit SMSA region.[45] In 1960, Wayne County (Detroit) had little land in agriculture. Macomb County did, however, and still does.

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[45]U.S. Department of Commerce, Bureau of Census, County and City Data Book of 1967: A Statistical Abstract Supplement (Washington, D.C.: Government Printing Office, 1967), pp. xxii-xv, 645.

Much of Detroit's rural-urban fringe, however, even in 1960, was located in Macomb County.

Varying definitions exist for the rural-urban fringe no matter where it is located, and as previously stated, this fringe area is a changing phenomena. Samuel W. Blizzard and William F. Anderson defined the rural-urban fringe as ". . . that area of mixed urban and land uses between the point where the full city services cease to be available and the point where agricultural uses predominate."[46] This is from a sociological viewpoint and is an incomplete definition in many ways. Transportation, for instance the interstate highway system, has made accessibility to the metropolitan city proper much less difficult than in the past. Even agricultural economists have difficulty in defining agricultural use. Wehrwein, in 1940, defined the rural-urban fringe as ". . . the territory between well-established urban land uses and farming."[47] This definition does not identify and elaborate on "part-time" farming. In defining the rural-urban fringe area

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[46]Samuel W. Blizzard and William F. Anderson, Problems in Rural-Urban Fringe Research: Conceptualization and Delineation, Progress Report No. 89, Pennsylvania State College Agricultural Station, State College, Pennsylvania (Nov., 1952), p. 11.

[47]George S. Wehrwein, "Land classification for rural zoning," The Classification of Land, Missouri Agricultural Experiment Station Bulletin No. 421 (Dec., 1940), p. 136.

using an urban approach, the County and City Data Book defines an urbanized area as follows:

> An urbanized area contains at least one city of 50,000 inhabitants or more in 1960, as well as the surrounding closely settled incorporated places and unincorporated areas that meet the criteria listed below. An urbanized area may be thought of as divided into the central city or cities, and the remainder of the area, known as the urban fringe.
>
> . . . . . .
>
> In addition to its central city or cities, an urbanized area also contains the following types of contiguous areas, which together constitute its urban fringe:
>
> 1. Incorporated places with 2,500 inhabitants or more.
> 2. Incorporated places with less than 2,500 inhabitants, provided each has a closely settled area of 100 housing units or more.
> 3. Towns in the New England States, townships in New Jersey and Pennsylvania, and counties elsewhere are classified as urban.
> 4. Enumeration districts in unincorporated territory with a population density of 1,000 inhabitants or more per square mile.
> 5. Other enumeration districts in unincorporated territory with lower population density provided that they served one of the following purposes:
>   a. to eliminate enclaves
>   b. to close indentations in the urbanized areas of one mile or less across the open end, and
>   c. to link outlying enumeration districts of qualifying density that were no more than one and one-half miles from the main body of the urbanized area.[48]

Whether one defines the rural-urban fringe from a sociological, agricultural economic, or demographic viewpoint, for each study of a particular rural-urban fringe

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[48]County and City Data Book of 1967, op. cit., p. xvi.

area, it must be operationally defined for that area and for a particular point in time.[49] None of the foregoing definitions is incorrect; they are just incomplete in terms of discussing taxation as it applies to farmland on the rural-urban fringe.

The Rural-Urban Fringe in Macomb County

In studying the redistributive effects of taxation of agricultural land in the rural-urban fringe, the township is the smallest political unit with which it is possible to work. Incorporated villages or cities have little land in agricultural use. Normally, agricultural land lies outside of city, village, or incorporated places. People lying within the political boundaries of a village or city have their land assessed and their taxes levied by a city or village official. Taxes are levied by the township supervisor on the majority of lands lying in the fringe area. The agricultural lands are assessed by township officials and it is to the township that their tax

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[49]For a more detailed description of the rural-urban fringe, the author refers the reader to Chapter II of a master's thesis written by Louis A. Vargha. Independence Township: A Township in Transition. A Study of Suburbanization in a Selected Portion of the Rural-Urban Fringe of Oakland County, Michigan (East Lansing: Michigan State University, 1958), pp. 8-22.

levy must be paid. To further compound the problem of studying the redistributive effects of taxation of agricultural land, neither population enumeration districts nor school districts follow township political lines. Consequently, any distributive effects of taxation must be studied at the township level of government.

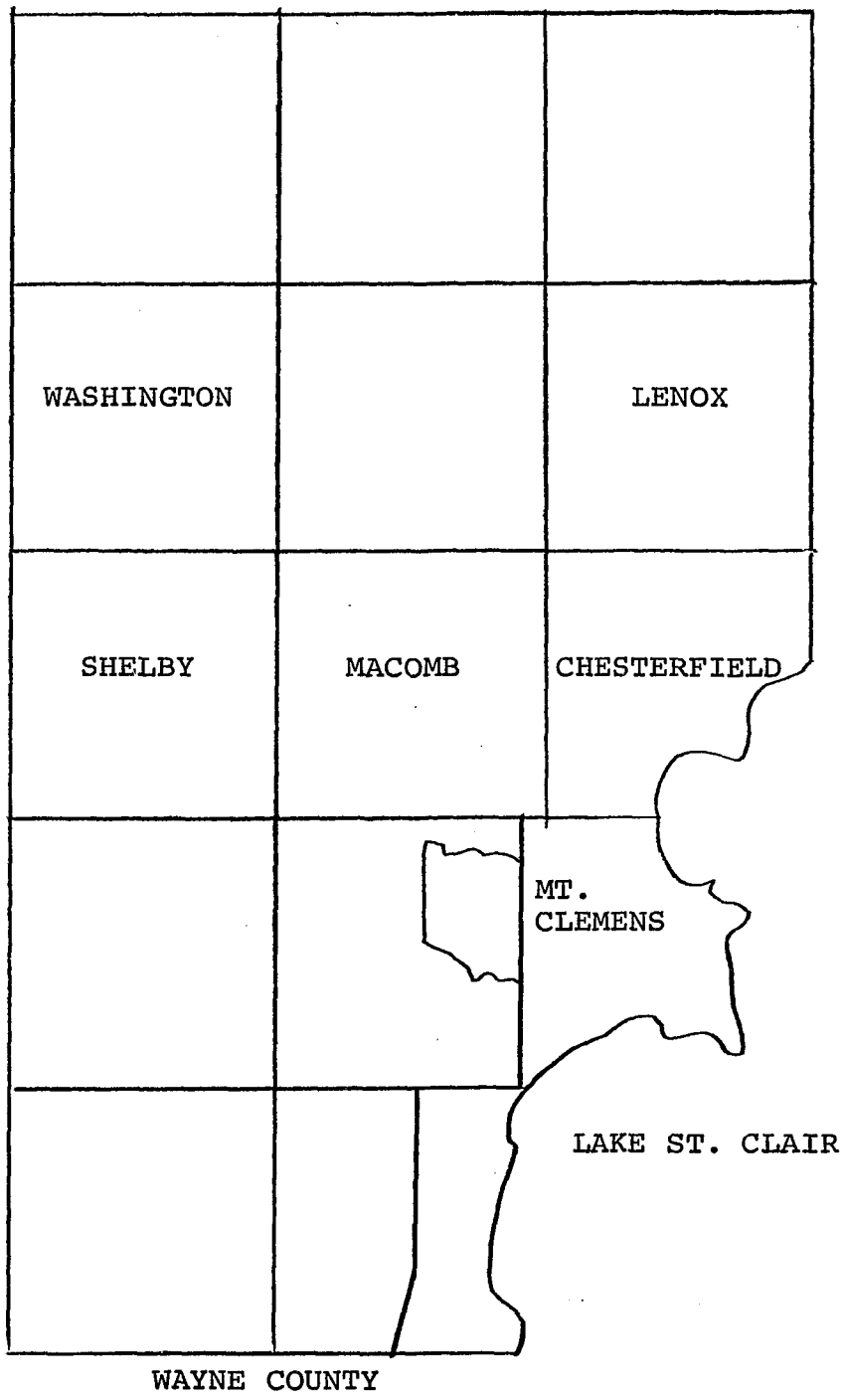
Once the township level of government had been selected as the political unit of study, several other criteria were needed to determine that the proper townships in Macomb County to study were chosen. The primary criterion was that townships selected must contain a large amount of agricultural land. Land use in these townships must also be undergoing or have undergone the transition from agricultural to urban use. In determining individual townships that had undergone or were undergoing dramatic changing land use and settlement patterns, several primary indicators were used: (1) percent of land in agricultural use in 1959 versus 1964; (2) population density in 1960 versus 1970; (3) number of platted areas between 1960 and 1970; and (4) judgment of informed officials. Several of the minor indicators also used were: (1) transportation routes; (2) location of utility lines; (3) soil; and (4) drainage. After examining these indicators, five townships were selected that were in varying stages of transition from rural to urban use. These townships in Macomb County were Chesterfield, Lenox, Macomb, Shelby, and Washington.

Chesterfield and Shelby were the most urbanized of the townships in 1960 as well as 1969. By choosing these townships, it was hoped that both the north-south growth as well as the east-west growth of Macomb County could be investigated. The study townships are shown in Figure 1.

Once the individual townships had been selected, a time span of ten years (1960-1969) was chosen as the study period. Several constraints dictated this length of time. First, data collection on the individual township level became difficult for the years preceding 1960. Some township property tax assessment rolls were easily located and comprehensible; others unfortunately were not. While the property tax assessment rolls for all townships in Macomb County were located centrally, at the Macomb County Court House, it was necessary to travel to each of the five townships selected for property classifications of the sample units selected. Second, the rural-urban fringe is a constantly changing phenomena; townships in which the fringe existed in 1960 had to remain in a state of transition for a ten year period although individual legal sections within the individual townships had changed from rural to urban use. If one had wished to study townships in transition over a longer period of time than from 1960 through 1969, more townships would have had to have been incorporated into the study. Note that these townships are now highly urbanized. Finally, the property tax

FIGURE 1

STUDY TOWNSHIPS IN MACOMB COUNTY



system is always undergoing some revision in Michigan. In the early 1960's property classifications made by township assessors were changed. In the middle 1960's county equalization was undertaken. The further into the past one investigates, the more changes there are that must be dealt with in property taxation. In order to make comparisons over time, it is necessary to remove the differential effects of changing standards. These limitations dictated the choice of the years 1960-1969.

It was felt by the researcher that with an appropriate sample design, sample farms could be randomly selected that would be theoretically representative of all farms for the study townships. If a few individual farms had been chosen using a case study approach, generalization became difficult for all types of agriculture, as well as the agricultural "mix" of products, produced by individual farms in Macomb County. Therefore, a sample design was constructed to choose farms for the actual analysis. It was also felt that with an appropriate sample design, the objectives of this study as mentioned in Chapter I could still be met.

The Sample Design[50]

The universe of the sample

The 1964 Census of Agriculture shows that in 1959 Macomb County had 1,896 farms; this number had diminished to 1,609 farms in 1964. The land area in farms in 1959 was 151,229 acres and 135,767 acres in 1964.[51] Township data was available for the 1959 census but not for the 1964 census. Using the 1959 township census data, the universe for the sample drawn was all land in each of the five townships of Chesterfield, Lenox, Macomb, Shelby, and Washington that was classified as "land in farms." Table 1 shows this information.

The sample unit

Because the concern of this study is with property taxation and the property tax rolls were available on a township level, the sample unit then became each property listing in the 1960 property tax assessment rolls for Chesterfield, Lenox, Macomb, Shelby, and Washington

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[50]The formal sample design of this study is a product of two sources. Basically, W. Edwards Deming, Sample Design in Business Research (New York: John Wiley and Sons, Inc., 1960) was used. Modifications due to the nature of the study were made by the author in consultation with Dr. Daniel E. Chappelle, Professor of Resource Development, Michigan State University, East Lansing.

[51]1964 Census of Agriculture, op. cit., p. 263.

TABLE 1

ACREAGES OF ALL LAND IN FARMS IN STUDY TOWNSHIPS OF MACOMB COUNTY: 1959

	No. of Farms	All Land in Farms According to Use (Acres)									
		Total	Cropland				Woodland		Other Pasture		Other Land
			Harvested	Pastured	Soil Improvement	Other	Pasture	Not Pasture	Total	Improvement	
Macomb County	1,896	151,229	87,636	15,068	3,157	13,457	7,313	7,729	4,298	424	12,571
Chesterfield	138	9,630	5,595	1,048	87	1,079	525	341	216	105	739
Lenox	206	16,987	9,001	2,051	346	1,848	1,206	740	547	23	1,248
Macomb	214	15,755	9,680	1,214	271	1,315	1,153	466	273	24	1,383
Shelby	152	6,770	2,881	1,142	94	1,315	131	507	69	28	631
Washington	121	13,582	7,005	1,635	557	1,004	510	1,214	479	104	1,178

Source: U.S. Department of Agriculture, Bureau of the Census, 1959 Census of Agriculture by Townships: Michigan (County and Minor Civil Divisions) (Washington, D.C.: Government Printing Office, 1962), p. 85.

townships in Macomb County, Michigan. These property listings were those that were at least five acres or larger in size and that were classified as "farm improved" or "farm vacant."

Sample unit size

The minimum size limitation of five acres was selected for several reasons. The 1964 Census of Agriculture: Michigan stated that in 1959, approximately 177 farms out of a total of 1,896 for Macomb County (that is, 9.34 percent) were less than ten acres in size.[52] Although farmland acreage and cropland harvested were only 0.5 percent and 0.4 percent, respectively, of the total acreage in farms, Macomb County has many "specialty" farms. These specialty farms tend to be rather small in size. In 1964 as previously mentioned, this county ranked fifth in the state in sales of field vegetables, eighth in nursery product sales, and second in the sale of cut flowers, potted plants, and vegetables grown under glass. Other specialty farms found in Macomb County include sod and mushroom farms. These are farm products that generally have a sizeable capital investment in physical plant and labor, but not necessarily land acreage. These specialty

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[52]U.S. Department of Agriculture, Bureau of the Census, 1964 Census of Agriculture, op. cit., pp. 262-263.

types of farms in many cases are the predominant type of agricultural operation carried on in lands lying in the rural-urban fringe area. It was felt that a minimum size of five acres would include in the analysis a broader sample of all types and sizes of farm operations and be more representative of agriculture in Macomb County. All non-farm listings of five acres in size or larger were excluded from the sample frame.

The sample frame

The sample frame for each of the five townships was the listing of the sample units contained in the 1960 Property Tax Assessment Roll for each of the individual townships.[53] The property tax assessment rolls for all five townships were found to contain certain standard information. There is an identification code number for each sample unit. Along with this code number appears the owner's name, a legal description of the property, the acreage of the sample unit, the assessed valuation of the property, the school district or districts within which it is located, and the total taxes, as well as the individual taxes making up the total taxes, paid by the property owner based upon the assessed valuation of the property.

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[53] 1960 Property Tax Assessment Rolls: Chesterfield Township, Vols. 368 and 369; Lenox Township, Vol. 380; Macomb Township, Vol. 379; Shelby Township, Vols. 382 and 384; Washington Township, Vol. 389.

Each individual property or sample unit is also classified as to whether that unit is "farm improved" or "farm vacant." The "farm improved" category meant that some buildings were found on the land. These buildings could consist of any structure from a small storage shed to a residential farm house or dairy barn. Other classifications on the property tax assessment rolls were residential and industrial and these of course were non-agricultural properties and so were excluded from the sample frame.

Construction of sample frame

A sample frame was then constructed for each of the five townships to be studied and analyzed in Macomb County. Each sample frame was divided into six strata on an urban-transitional-rural continuum formed by a combination of the ledger entries in the 1960 property tax assessment rolls for each township and an aggregation of rankings by individual legal section and using varying selected indicators of urbanization.

In the 1960 property tax assessment rolls, each ledger entry classified as farm land was classified into either the farm improved or farm vacant classification. As stated previously, the farm improved entries indicated the presence of buildings on the assessed land. These ledger entries were further subdivided in thirty-six sections for each individual township with the exception of

Chesterfield. This township, which borders Lake St. Clair, does not contain thirty-six legal sections, and also contains private claims.[54] The private claims were superimposed upon a rectangular section map and placed in appropriate sections. Those private claims "overlapping" several sections were placed in the legal section containing the majority of the acreage of each individual private claim. Sections excluded in Chesterfield Township were 25, 34, 35, and 36 which are located under the water of Anchor Bay.

An urban-transition-rural continuum of from one to thirty-six was then formed for each individual township and each legal section within the township according to an aggregation of several primary and secondary indicators as to how "urbanized" each legal section of land was. Table 2 shows in which part of the urban-transition-rural continuum each section lies and the one private claim was placed. The primary indicators were from 1958 and 1965 land use studies made in Macomb County by the Macomb County Planning Commission. The primary indicators from these land use studies were: (1) percent of land in agriculture, 1958 and 1965; (2) percent ranking of urban acreage, 1965; (3) percent of land in residential use, 1965; and (4) ranking of urban acreage, 1965. Secondary

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[54] A private claim is a metes and bounds description of land preceding the Ordinance of 1785.

TABLE 2

LEGAL SECTIONS IN THE RURAL-TRANSITIONAL-URBAN FRINGE
IN FIVE TOWNSHIPS IN MACOMB COUNTY: 1960-1970

Township	Rural Sections	Transitional Sections	Urban Sections
Chesterfield[a]	6, 7, 14, 15	1, 2, 3, 4, 5, 8, 9, 10, 16, 17, 18, 20, 31	11, 12, 13, 19, 21, 22, 23, 24, 26, 27, 28, 29, 30, 32, 33
Lenox	4, 5, 6, 7, 8, 9, 10, 15, 16, 17, 18, 19, 20, 21, 22, 24, 25, 26	3, 11, 12, 13, 14, 23, 27, 28, 30, 31, 32, 35	1, 2, 29, 33, 34, 36
Macomb	3, 4, 5, 7, 9, 10, 11, 14, 15, 16, 18, 19, 22, 27, 30, 34	2, 6, 8, 13, 17, 20, 21, 28, 29, 31, 32, 33	1, 12, 23, 24, 25, 26, 35, 36
Shelby	1, 2, 4, 5, 6, 12, 13, 14, 23, 24, 25, 26, 35, 36	3, 7, 9, 10, 11, 15, 16, 32	8, 17, 18, 19, 20, 21, 22, 27, 28, 29, 30, 31, 33, 34
Washington	6, 9, 10, 13, 14, 21, 24, 25, 26, 28, 36	1, 3, 4, 5, 7, 8, 11, 12, 15, 16, 17, 19, 22, 23, 27, 34, 35	2, 18, 20, 29, 30, 31, 32, 33

[a]Chesterfield does not contain 36 legal sections. Private claims were placed in legal sections also.

indicators used were derived from several sources including the land use studies of 1958 and 1965. These indicators were: (1) acreage in transportation use, 1958 and 1965; (2) percent of land in residential use, 1958 and 1965; (3) absence of major utility lines (electric, gas and oil, sewer, and water distribution systems), 1966 and 1967; (4) an urbanized rural map distributed by the Macomb County Cooperative Extension Service in 1967; and (5) platting activities from 1950-1960 to 1961-1967 distributed by the Southeast Michigan Council of Governments or more commonly referred to as the TALUS Report of 1969.[55]

Using the combination of the two types of agricultural property tax classifications of ledger entries and a classification of urban, transitional, and rural, six strata were formed. Each legal section for each of the five townships was included in only one of the six strata. The six strata formed in each sample frame were: (1) urban-farm improved; (2) urban-farm vacant; (3) transitional-farm improved; (4) transitional-farm vacant; (5) rural-farm improved; and (6) rural-farm vacant.

Each sample unit in each individual sample frame had an identification code established by the individual township that was consistent between townships and this

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[55] TALUS: Residential Platting and Development Survey, 1950-1967. Report prepared by Detroit Regional Transportation and Land Use Commission, August 29, 1967.

identification code was used to identify sample units in establishing the sampling technique and also for identification of the samples in the years from 1961 through 1969. This identification code does not change basically. When an original sample unit from 1960 had subdivided, the identification code is modified as is, of course, the legal description. This change resulted in a change in ownership and a change in acreage in the identification code. When there had been a change in ownership, and where the original sample units had been subdivided, two or more sample units then entered the sample frame in the applicable years from 1961 through 1969. This addition was necessary to show the complete evolution of a sample unit, with a specific identification code number and legal description, from the base year of 1960 along with the accompanying changes in land use, taxation, and assessed valuations of the property that had occurred through 1969.

Sample size of each township

Because the sample units already existed in layers or classes, and it was felt necessary to investigate and analyze both similar as well as possible differences between existing strata of the two types of property taxation classifications concerning agriculture and the formed strata, the Neyman allocation method of stratified sampling

was chosen. A separate sample was drawn from the sample frame of each township. The sample size for each township was determined by the general formula:

$$\sigma^2_{\bar{x}} = \frac{(\bar{\sigma}_w)^2}{n} - \frac{\sigma^2_w}{N} \text{ or } n = \frac{(\bar{\sigma}_w)^2 N}{N\sigma^2_{\bar{x}} + \sigma^2_w}$$

where: n = sample unit size to be drawn for each township.

$\bar{\sigma}_w$ = weighted average standard deviation for each stratum in a township or $\bar{\sigma}_w = P_1\sigma_1 + P_2\sigma_2 + \ldots P_i\sigma_i$ and where P_i is i stratum's proportion of the sample unit in the sample frame; σ_i is the standard deviation of the sample unit within stratum i or:

$$\sigma_i = \frac{\Sigma(x_i - \bar{x}_i)^2}{N}, \text{ and where } \Sigma(x_i - \bar{x}_i)^2 = \Sigma x_i - \frac{(\Sigma x_i)^2}{N}$$

and where P_i and σ_i = 1, 2, . . . , 6; and where x_i is the assessed valuation on an acreage basis of each individual observation within stratum i 1 to 6.

σ^2_w = weighted average variance within each stratum in a township, or: $\sigma^2_w = P_1\sigma^2_1 + P_2\sigma^2_2 + \ldots P_i\sigma^2_i$, where i is 1 to 6.

N = number of sample units in the sample frame for each township.

$\sigma_{\bar{x}}$ = standard error of the sampling procedure.

The standard error of the sampling procedure was determined by setting the standard error of the estimation at five

dollars with a probability of ninety percent. Therefore:

$1.64\ \sigma_{\bar{x}} = \$10.00$

$\sigma_{\bar{x}} = \$\ 6.10$

A rather low standard error of estimation was selected because the estimated per acre valuation obtained from sampling was multiplied by the acreage of the sample units in that particular strata. This had the effect of greatly magnifying any error present in the original per acre estimate. A significance level of 1.0 was selected. From this significance level a t value of 1.64 (based on a confidence level of .90) was selected in order to reduce sample size as much as possible considering the low standard error of estimation selected.

Census data and reduction of sample size per stratum

To further reduce the sample size in each stratum and in each township due to great variability in assessed valuations per acre, a separation of data was made into sample data and census data. The mean of each stratum was found for each township of assessed valuations per acre and 1.64 standard deviations were added to or subtracted from this mean. This in turn produced a range of assessed valuations per acre which theoretically encompassed ninety percent of all ledger entries. A complete census was then taken on all assessed values per acre greater than this

figure ($\bar{x}_i \pm 1.64\sigma$) for each stratum. Standard deviations were then re-calculated for all property tax assessment ledger entries falling within the formulated range. All entries greater than the range of the mean plus 1.64 standard deviations were completely enumerated. No assessed valuations per acre were found to be below the mean minus 1.64 standard deviations. The reduced sample size plus the complete census gave a combined reduced sample size for each stratum and each township. Table 3 shows the random sample and census figures derived from this procedure. Table 4 shows the reduction in sample size gained from using this technique. This reduction technique reduced the samples to be collected by 20 percent.

Allocation of samples to strata

Once the division of the sample units had been made into either a random sample range ($\bar{x}_i \pm 1.64\sigma$) or a complete census unit that was either greater than ($\bar{x}_i + 1.64\sigma$) or less than ($\bar{x}_i - 1.64\sigma$), the random sample units in the sample were allocated to the various strata by the procedure known as the Neyman allocation. This procedure allocates the sample to the strata in proportion to the standard deviation of the sampling units within each strata. The sample size of each strata was fixed in advance by the following equation:

TABLE 3

NUMBER OF RANDOM AND CENSUS UNITS PER STRATUM AND TOWNSHIP TAKEN FROM PROPERTY TAX ASSESSMENT ROLLS, 1960

Stratum	Townships										Totals		
	Chesterfield		Lenox		Macomb		Shelby		Washington				
	Random Sample Units	Census Units	Random Sample Units	Census Units	Random Sample Units	Census Units	Random Sample Units	Census Units	Random Sample Units	Census Units	Random Sample Units	Census Units	Combined
Urban-farm improved	3	2 (44)[a]	2	3 (40)	5	5 (72)	3	3 (21)	7	3 (26)	20	16 (203)	36
Urban-farm vacant	3	4 (47)	2	2 (15)	2	2 (62)	2	2 (21)	2	1 (16)	11	11 (161)	22
Transitional-farm improved	17	6 (128)	2	12 (122)	8	11 (139)	7	2 (56)	16	8 (96)	50	39 (541)	89
Transitional-farm vacant	6	7 (95)	2	4 (50)	2	7 (76)	2	2 (17)	4	3 (77)	16	23 (315)	39
Rural-farm improved	4	4 (39)	3	8 (184)	4	7 (146)	18	10 (153)	7	10 (99)	36	39 (621)	75
Rural-farm vacant	2	1 (22)	2	3 (74)	2	4 (82)	2	1 (31)	2	3 (41)	10	12 (250)	22
Total	35	24 (375)	13	32 (485)	23	36 (577)	34	20 (299)	38	28 (355)	143	140 (2,091)	283

[a]Figures in parentheses in the Census Units columns represent the total observations in the sample frame for each stratum and township.

TABLE 4

REDUCTION GAINED IN SAMPLE SIZE FROM USING CENSUS UNIT TECHNIQUE

Township	90% Level of Significance No Census	90% Level of Significance With Census	Difference Due to Degree of Freedom or Rounding	Total
Chesterfield	84	58	1	59
Lenox	27	41	4	45
Macomb	70	58	1	59
Shelby	59	52	2	54
Washington	100	64	2	66
Total	340	273	-	283

Reduction = 340 - 273 = 67 = 19.7%

$$n_i = \frac{n(P_i\sigma_i)}{\bar{\sigma}_w}$$

where: n_i = sample unit size drawn from each stratum for each township and where i is 1 to 6.

n = sample unit size drawn for each township.

p_i = a stratum's proportion of the sample unit in the sample frame and where i is 1 to 6.

σ_i = the standard deviation of the sample unit within a stratum and where i is 1 to 6.

$\bar{\sigma}_w$ = weighted average standard deviation for each stratum in a township or: $\bar{\sigma}_w = P_1\sigma_1 + P_2\sigma_2 + \ldots P_i\sigma_i$, and i is 1 to 6.

The complete census units in each stratum were not dealt with until after estimates for each stratum had been formulated. After the random sample units had been drawn, estimates were formulated for both farm acreage and assessed valuations in each stratum. The census units were then recombined to form the total values for each stratum and each township. This step will be discussed in more detail later.

Zoning intervals and subsamples

Once the sample size had been determined for each of the six strata, it was necessary to determine the zoning intervals and the number of subsamples. The zoning intervals and number of subsamples within each zone are dependent upon the overall sample size and the sample size within each strata. The zones were created by dividing

each stratum into zones containing an equal number of sampling units. While the zoning intervals within a certain strata are equal, they were not necessarily equal for the rest of the strata. A stratum with a greater standard deviation among its sampling units will have a smaller zoning interval in order that it can be sampled more heavily. A zoning procedure was selected which would give greater randomness in sample selection. From each zone was then drawn a series of subsamples.

The zoning interval for each stratum was then calculated from the following formula:

$$Z_i = \frac{S_k N_i}{n_i}$$

where: Z_i = zoning interval for the ith stratum in a township.

S_k = number of subsamples in the ith stratum and the kth zone.

N_i = number of sample units in the frame for the ith stratum.

n_i = sample unit size drawn from the ith stratum.

The choice of the zoning intervals and the number of subsamples contained in each involved a compromise between taking advantage of any natural stratification that may have existed in a stratum and gaining sufficient degrees of freedom in the estimate of the population variance. A larger number of zones would reflect more of the natural

stratification that may exist within a stratum where the sample units are likely to vary from zone to zone. But a larger number of subsamples with a smaller number of zones would increase the number of degrees of freedom.

Since the sample frame for each township was divided into six strata, emphasis was placed upon increasing the number of degrees of freedom rather than attempting to capture any natural stratification that may exist in the sample units after stratification. However, in many cases, only two samples were drawn per stratum and it was necessary to use two subsamples. This then meant dividing the frame and tabulations into thick zones for subtotals in order to gain sufficient degrees of freedom to estimate the variance.

Selection of subsamples

The randomly selected subsamples for each zone within a stratum were selected with the aid of a table of random numbers.[56] As stated, those sample units where the assessed valuations per acre were 1.64 standard deviation or more above the mean were completely enumerated and excluded from the sample. Random numbers between 1 and Z_1

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[56]U.S. Department of Agriculture, E. N. Munns, T. G. Hoerner, and V. A. Clements, "Converting factors and tables of equivalents used in forestry," Misc. Pub. No. 225 (Washington, D.C.: Government Printing Office, revised June, 1949), pp. 24-27.

were used to select one sample unit from every zone in stratum one. Random numbers between 1 and Z_2 were used to select one sample unit from every zone in stratum two. This process was continued for the remaining strata. This then constituted subsample one. The same process was continued for the remaining strata. Random numbers were drawn without replacement to ensure that a sample unit did not appear in the subsample for a particular zone more than once.

The random numbers constituting the sample were then translated into serial numbers which corresponded with the identification code of each sample unit in the sample frame. Each sample unit, both census and random, was identified as to which stratum, zone, and subsample from which it came. Once the random subsamples had been drawn and identified, estimates for farm land assessed valuations were made for each stratum and township.

Formation of Township Estimates

Sample estimate by stratum

The next step of the sample plan was the estimation of the assessed valuation of farm land for each stratum and each township. Assessed valuation per acre of farm land was formed for each stratum for all subsamples. This resulted by summation of the sample units for each stratum.

The summation of farm land assessed valuation per acre was divided by the number of sample units contained in each stratum to produce the mean (or $\bar{X}$) of the farm land assessed valuation in each stratum. The formula used was:

$$\bar{X} = \frac{\Sigma x_i}{n_i}$$

where: Σx_i = the assessed valuation per acre of the randomly drawn individual sample units of the ith stratum.

n_i = the sample unit size drawn from the ith stratum for each township.

This operation resulted in the combination of thin zones into one thick zone for each stratum. The result was that Z_i then became the N_i for each stratum and an additional degree of freedom was gained for each former thin zone except one that was combined into the thick zone.

The estimate of the assessed valuation for each stratum was then obtained by the following formula:

$$\underline{\bar{X}}_i = Z_i\bar{X}_i \text{ or } \underline{\bar{X}}_i = N_i\bar{X}_i \text{ and } V_i = \underline{\bar{X}}_i A_i$$

where: $\underline{\bar{X}}_i$ = the estimate of the assessed valuation for the ith stratum.

$N_i = Z_i$ = the number of sample units in the ith stratum.

$\bar{X}_i$ = the mean of the farm land assessed valuations in the ith stratum.

V_i = total estimated assessed valuation for the ith stratum.

A_i = the mean acreage of the sample units contained in the ith stratum.

Zoning intervals were chosen to ensure greater randomness of sample selection and because natural stratification existed in the sample frame. Once samples had been selected, the zoning intervals were recombined into strata to form estimations. Note that the former thin zones were combined into one thick zone for each stratum and the degrees of freedom k(k-1) was increased for each former thin zone (except one) that had been combined into a thick zone. The combination of thin zones into thick zones not only added additional degrees of freedom but also greatly reduced the computational complexity.

Combining estimates of assessed valuation and census sample units

Once farm land estimations had been calculated for each stratum, the census units were recombined or added to these estimates for both farm land assessed valuations and acreages. The complete census units (the x_i or individual units in each stratum where assessed value per acre were above the mean + 1.64σ in each stratum) had originally been withdrawn while calculating the number of and identifying random sample units. This was due to large variance in each individual stratum, especially the farm improved stratum. Once farm land estimations had been formulated for each stratum, the assessed valuations and acreages for each complete census unit or observation were recombined

in the order in which they first appeared in each stratum of the sample frame of each township.

Sample estimate for entire sample frame

The last step in the sample plan was the formation of the sample estimate for the entire sample frame. This produced an estimate of the assessed valuation of farm land for the frame and was simply a matter of summing the V_i (assessed valuation of farm land for each stratum) over the entire sample frame for the random sample units. These were additive because the weightings created by unequal Z_i (N_i) had already been incorporated into the estimate of V_i. The census sample units were then added to the estimated random sample units.

Once the estimates of the assessed valuation and acreage of farm land in each township were completed, it was then possible to proceed into the formal analysis of the possible redistributive effects of property taxation under plain and deferred use-value assessment.

CHAPTER IV

SIMULATION MODELS

The Operation of the Basic Tax System

The sample design described in Chapter III estimated farm land acreages and assessed valuations for the year 1960 in Chesterfield, Lenox, Macomb, Shelby, and Washington townships in Macomb County. Once estimates had been formulated for the six individual strata in each of the five townships, they were added together to form estimated acreages and assessed valuations of farm land in each individual township.

Prior to 1965, the general property tax burden varied greatly in different localities in relation to full value of the property. Since 1965, the general property tax law has required that property be assessed at fifty percent of true cash value where:

> The words "cash value" shall be held to mean the usual selling price at the place where the property is located at the time of assessment, being the price which could be obtained therefore at private sale, and not at forced or auction sale.[57]

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[57]Cline and Taylor, Michigan Tax Reform, op. cit., p. 21.

The original purpose of state equalized valuation had been to ". . . provide a fair basis of apportionment among the counties of the annual state tax on general property. . . . [It] was last levied in 1934."[58] This original purpose has changed now to formulate basic factors for state aid grants to school districts. County equalization became important, however, in that in the early 1960's county equalization was established to determine the proper share of property taxes which should be raised in each township to meet the principle of uniformity. Before the middle 1960's, many counties equalized "at the face of the rolls" or ". . . technically complied with the law by declaring that the equalized valuation of every assessing unit was the same as its total assessed valuation."[59] Since 1965, equalization has been taken more seriously in most assessing units.

Conversion of Assessed Valuations to Equalized Valuations

The 1960's saw several changes take place in the ad valorem system of taxation in Michigan. One of the more important of these changes was the establishment of County Boards of Equalization in the middle 1960's. These

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[58] Ibid., p. 23.

[59] Ibid., pp. 24-25.

Boards started equalizing the property tax rolls in the years between 1965-1967. By 1968, all property tax rolls had theoretically been equalized. Because of this change in the mid-1960's, the assessed valuations of the property tax rolls of the 1960's were converted to equalized valuations. Consequently, the estimated farm land assessed valuations for each year and each township were multiplied by the equalization factor for that year and township or:

$$FAV_{ty}(e_{ty}) = FEV_{ty}$$

where: FAV = farm land assessed valuation (dollars).

e = equalization factor.

FEV = farm land equalized valuation (dollars).

t = township.

y = year.

Total township tax rates were then derived by the process of dividing total township equalized valuations by total township tax revenues for each township each year. The formula used was:

$$TORT_{ty} = \frac{TORV_{ty}}{TOEV_{ty}}$$

where: TORT = total township tax rate (percentage).

TORV = total township revenue (dollars).

TOEV = total township equalized valuation (dollars).

t = township.

y = year.

These total township tax rates were then multiplied with the estimated farm land equalized valuations derived previously to give an estimated farm land tax revenue for each of the five townships for each year by the formula:

$$(FEV_{ty})(TORT_{ty}) = FRV_{ty}$$

where: FEV = farm land equalized valuation (dollars).

TORT = total township tax rate (percentage).

FRV = farm land tax revenue (dollars).

t = township.

y = year.

Determination of Use-Values

There is no one figure that can be used to represent "true use-value."[60] Each sample unit differed as to productivity of soil, type, and location of farming operation, individual managerial abilities of the operators, assessed valuation per acre of the farm land, and a variety of other factors. Lack of both data and comparable data also complicated any attempt to determine a use-value based on soil productivity.[61] Because the range in

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[60]"True use-value" in this sense refers to the assessment of farm land on the basis of its productivity value in agriculture or horticulture rather than on the basis of its market value.

[61]The author attempted to derive use-value using an income capitalization approach in conjunction with soil types, productivity yields, etc., but met with little success.

assessed values per acre of all the sample units varied greatly, three use-value figures were selected as most representative of the many and diverse types of farming operations in Macomb County. Time and analysis constraints dictated this choice. The three use-value figures selected were $100, $300, and $500 per acre.[62] The hypothetical models used are flexible for any use-value figure that one wishes to select. This also alleviated but does not solve the problem of dealing with the increase in the value of land over time.

Once the three use-value figures were selected, it then became necessary to determine farm land use-value on the township basis. This was done by multiplying the three figures of $100, $300, and $500 per acre by the farm land acreage of each township and for each year. These three figures were used for all townships and for all the years from 1960 through 1969. Essentially, then:

$$UV/AC = \$100;\ UV/AC = \$300;\ UV/AC = \$500$$

where: UV = use-value of farm land (dollars)

AC = per acre by sample unit (acres)

then:

$$(FAC_{ty})(UV/AC) = FUV_{ity}$$

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[62] These figures were chosen after an investigation of property tax assessment rolls, census figures for real estate values, and several other sources were consulted as representative of both farm improved and farm vacant land in Macomb County. There had also been a considerable increase in real estate values in the ten year study period.

where: FAC = township farm land acreage (acres).

FUV = farm land use-value (dollars).

t = township.

y = year.

i = stratum.

Non-Farm Land Equalized Valuations, Revenue, and Acreages

Once farm land use-values were calculated on a township basis, then non-farm land equalized valuations were calculated. This was done by subtracting the estimated farm land equalized values from known total township equalized value or:

$$NFEV_{ty} = TOEV_{ty} - FEV_{ty}$$

where: NFEV = non-farm equalized valuation (dollars).

TOEV = total township equalized valuation (dollars),

FEV = farm land equalized valuation (dollars).

t = township.

y = year.

Then non-farm tax revenue was calculated by the same process:

$$NFRV_{ty} = TORV_{ty} - FRV_{ty}$$

where: NFRV = non-farm tax revenue (dollars).

TORV = total township tax revenue (dollars).

FRV = farm land tax revenue (dollars).

t = township.

y = year.

Finally, in this part of the basic analysis, non-farm acreage was obtained by subtracting the estimated farm land acreage from total township acreage or:

$$NFAC_{ty} = TOAC_{ty} - FAC_{ty}$$

where: NFAC = non-farm acreage (acres).

TOAC = total township acreage (acres).

FAC = estimated farm land acreage (acres).

t = township.

y = year.

The manipulations of the above relationships just produced enable one to have the basic estimated and collected township data needed to undertake a series of tax simulation models in investigating the redistributive tax effects of both plain and deferred use-value assessment. Under ad valorem property taxation and in studying the shifting and incidence of taxation of agricultural land on the rural-urban fringe, just two sectors exist. One, of course, is the agricultural or rural sector; the other is the urban or "all other" sector. Under both plain and deferred use-value assessment, a third sector must be investigated. This third sector is composed of those farmers in the

agricultural sector that will participate in use-value assessment and those in this same sector that will not. Hence, various proportions of farm land in each township will not be included under use-value assessment, but will remain under the existing ad valorem property taxation sector for several reasons.

Plain Use-Value Models

Model number one-percentage change in township tax rates

The first model formulated to study the effects of plain use-value assessment was one to calculate new tax rates that resulted from plain use-value assessment ($TORT_{ty(uv)}$). The model used was:

$$TORT_{ty(uv)} = \frac{TORV_{ty(av)}}{(P_1)(FEV_{ty}) + (P_2)(FUV_{ty}) + (P_3)(NFEV_{ty})}$$

where: $TORV_{ty(av)}$ = the township tax revenue collected from township records in township t and year y (dollars).

FEV_{ty} = the estimated farm land equalized valuation in township t and year y (dollars).

FUV_{ty} = the estimated farm land use-value for all townships and years (dollars).

$NFEV_{ty}$ = the previously calculated and estimated non-farm equalized valuation (dollars).

P_1 = proportion of township farm land equalized valuation not participating in use-value assessment (percentage).

P_2 = proportion of township farm land equalized valuation participating in use-value assessment (percentage).

P_3 = proportion of township non-farm land equalized valuation not participating in use-value assessment (percentage).

Because not all farmers will participate in use-value assessment, three levels of participation rates (these are the P's in the above formula) were used for all townships for all years. These levels are to be found in Table 5. Because the non-farm sector will not be included in use-value legislation, the participation rate (P_3) will always be 1.00 at all levels of participation. The participation rates P_1 and P_2 are complements of one another in that the proportions of farms in the township participating and not participating in use-value assessment must always sum to 1.00.

It was then necessary to combine the three levels of participation with the three previously selected levels of farm land use-value (FUV_{ty}) that had been calculated for all townships and all years. Thus, the three levels of participation rates used with each of the three farm land use-values for each township and each year yield nine different combinations which resulted in the first step towards nine new township tax rates. Table 6 shows the combinations of values for participation levels and farm land use-values.

TABLE 5

LEVELS OF PARTICIPATION RATES
IN SIMULATION MODELS

Participation Levels	P_1	P_2	P_3
1	.75	.25	1.00
2	.50	.50	1.00
3	.25	.75	1.00

where: P_1 = proportion of township farm land equalized valuation not participating in use-value assessment.

P_2 = proportion of township farm land equalized valuation participating in use-value assessment.

P_3 = proportion of township non-farm land equalized valuation not participating in use-value assessment.

TABLE 6

COMBINATIONS OF VALUES FOR PARTICIPATION LEVELS AND FARM LAND USE-VALUES IN MODEL ONE

Farm Land Use Value	Participation Level	P_1	P_2	P_3
FUV_1	1	.75	.25	1.00
	2	.50	.50	1.00
	3	.25	.75	1.00
FUV_2	1	.75	.25	1.00
	2	.50	.50	1.00
	3	.25	.75	1.00
FUV_3	1	.75	.25	1.00
	2	.50	.50	1.00
	3	.25	.75	1.00

where: FUV_1 = \$100 farm land use-value per acre.

FUV_2 = \$300 farm land use-value per acre.

FUV_3 = \$500 farm land use-value per acre.

P_1 = proportion of township farm land equalized valuation not participating in use-value assessment (percentage).

P_2 = proportion of township farm land equalized valuation participating in use-value assessment (percentage).

P_3 = proportion of township non-farm land equalized valuation not participating in use-value assessment (percentage).

The nine combinations of values produced by Table 6 for the three participation rate levels (P_1, P_2, P_3) and farm land under use-value assessment (FUV_{ty}) were then used in conjunction with the single variables for total township revenue ($TORV_{ty}$), township estimated farm land equalized value (FEV_{ty}), and estimated non-farm land equalized value ($NFEV_{ty}$) to calculate nine new tax rates ($TORT_{ty(uv)}$) for each township and each year under use-value assessment. This procedure was repeated for each of the ten years (1960-1969) to produce a total of 450 new township tax rates.

The percentage increase or decrease in the township tax rate for each township for each year was then calculated by:

$$\frac{TORT_{ty(uv)} - TORT_{ty(av)}}{TORT_{ty(av)}} \times 100$$

where: $TORT_{ty(uv)}$ = total township tax rate under use-value assessment (dollars).

$TORT_{ty(av)}$ = total township tax rate under ad valorem or assessed value taxation (dollars).

Model number two-percentage change in non-farm millage rates

Once the new tax rates for each township and each year were calculated, they in turn were used in Model Two to compute the shift and incidence (or change in tax

revenue) of taxation in the non-farm sector of the township that resulted from use-value assessment. First it was necessary to determine the change in tax revenue. This was done by:

$$NFRV_{ty(uv)} - NFRV_{ty(av)} = (TORT_{ty(uv)})(P_3)(NFEV_{ty}) - (TORT_{ty(av)})(P_3)(NFEV_{ty})$$

where: $TORT_{ty(uv)}$ = total township tax rate under use-value assessment for year y and township t (percentage).

P_3 = proportion of township non-farm land equalized valuation not participating in use-value assessment (percentage).

$NFEV_{ty}$ = non-farm land equalized valuation for year y and township t (dollars).

$TORT_{ty(av)}$ = total township tax rate under ad valorem assessment in year y and township t (percentage).

$NFRV_{ty(uv)}$ = non-farm land tax revenue under use-value assessment for year y and township t (dollars).

$NFRV_{ty(av)}$ = non-farm land tax revenue under ad valorem assessment in year y and township t (dollars).

The proportion of township non-farm land equalized valuation not participating in use-value $(P_3)(NFEV_{ty})$ components in this model had the same value as the value in the previous Model One. There was also only one value for each township for each year for the total township tax rate under ad valorem taxation. The nine new tax rates that were previously calculated by Model One were used as the

values of the total tax rate of the township under use-value assessment ($TORT_{ty(uv)}$). Again there were nine solutions for each township and 450 solutions for all ten years.

Once the change in tax revenue has been calculated for the non-farm sector of each township that came about as a result of use-value assessment, the change in non-farm tax millage rates for each township and year were calculated by:

$$\frac{NFRV_{ty(uv)} - NFRV_{ty(av)}}{NFRV_{ty(av)}} \times 1000$$

where: $NFRV_{ty(uv)}$ = non-farm tax revenue under use-value assessment (dollars).

$NFRV_{ty(av)}$ = non-farm tax revenue under ad valorem taxation (dollars).

This in turn produced nine millage rates for each township. Because there are five townships in the study and a ten year time span, 450 new millage rates were generated.

Again, using the nine new tax rates that were produced by Model One, the shift and incidence (change in revenue) in that part of the farm land in each township not participating in use-value assessment was calculated by:

$$FRV_{ty(uv)} - FRV_{ty(av)} = (TORT_{ty(uv)})(P_1)(FEV_{ty}) - (TORT_{ty(av)})(P_1)(FEV_{ty})$$

where: $TORT_{ty(uv)}$ = total township tax rate under use-value assessment for year y and township t (percentage).

P_1 = proportion of township farm land equalized valuation not participating in use-value assessment (percentage).

FEV_{ty} = farm land equalized valuation in year y and township t (dollars).

$TORT_{ty(av)}$ = total township tax rate under ad valorem assessment in year y and township t (percentage).

$FRV_{ty(uv)}$ = farm land tax revenue under use-value assessment in year y and township t (dollars).

$FRV_{ty(av)}$ = farm land tax revenue under ad valorem assessment in year y and township t (dollars).

Again, the two components of the model (P_1) and (FEV_{ty}) had the same value for each year and each township. There will also be only one value ($TORT_{ty(av)}$) for each township for each year. The nine new tax rates that were previously calculated in Model One will be used as the value of the ($TORT_{ty(av)}$) variable. Again, there were three new tax rates corresponding to each level of (P_1). These are the same combinations of new tax rates and participation levels that were presented earlier in Table 6. The ordering was changed for ease of computation and these combinations are shown in Table 7. The solution to this model shows the differences between tax revenues from the non-participating farm sector under use-value assessment and

TABLE 7

COMBINATIONS OF VALUES FOR PARTICIPATION LEVELS AND FARM LAND USE-VALUES IN MODEL TWO

Farm Land Use Value	Participation Level	P_1	P_2	P_3
FUV_1	1	.75	.25	1.00
FUV_2	1	.75	.25	1.00
FUV_3	1	.75	.25	1.00
FUV_1	2	.50	.50	1.00
FUV_2	2	.50	.50	1.00
FUV_3	2	.50	.50	1.00
FUV_1	3	.25	.75	1.00
FUV_2	3	.25	.75	1.00
FUV_3	3	.25	.75	1.00

where: FUV_1 = $100 farm land use-value per acre.

FUV_2 = $300 farm land use-value per acre.

FUV_3 = $500 farm land use-value per acre.

P_1 = proportion of township farm land equalized valuation not participating in use-value assessment (percentage).

P_2 = proportion of township farm land equalized valuation participating in use-value assessment (percentage).

P_3 = proportion of township non-farm land equalized valuation not participating in use-value assessment (percentage).

ad valorem assessment. There were nine solutions for each township for each year for a total of 450 solutions for all townships for all years.

Model number three-percentage change in farm land revenue

The nine new tax rates that were produced in Model One were used to calculate the shifts and incidence of tax revenues in that part of the farm sector participating in use-value assessment. The model used was:

$$FRV_{ty(uv)} - FRV_{ty(av)} = (TORT_{ty(uv)})(P_2)(FUV_{ty}) - (TORT_{ty(av)})(P_2)(FEV_{ty})$$

where: $FRV_{ty(uv)}$ = farm land tax revenue for that farm land under use-value assessment in township t and year y (dollars).

$FRV_{ty(av)}$ = farm land tax revenue for that farm land under ad valorem assessment in township t and year y (dollars).

$TORT_{ty(uv)}$ = total township tax rate under use-value assessment for township t and year y (percentage).

P_2 = proportion of township farm land equalized valuation participating in use-value assessment (percentage).

FUV_{ty} = farm land use-value for all townships t and year y (dollars).

$TORT_{ty(av)}$ = total township tax rate under ad valorem assessment for township t and year y (percentage).

FEV_{ty} = estimated farm land equalized valuation for township t and year y (dollars).

There was only one value for the four variables ($TORT_{ty(av)}$) and (FEV_{ty}) for each township for each year. However, there were nine combinations of values for the variables (P_2), ($TORT_{ty(uv)}$), and (FUV_{ty}). The nine combinations are shown in Table 7. These combinations of values for the three variables will produce nine solutions for each township for each year, again 450 solutions for all townships for all years.

The percentage change in tax revenues from participating farm land in each township for each year was calculated by the following formula:

$$\frac{FRV_{ty(uv)} - FRV_{ty(av)}}{FRV_{ty(av)}} \times 100$$

where: $FRV_{ty(uv)}$ = township farm land tax revenue for farm land participating in use-value assessment in year y (dollars).

$FRV_{ty(av)}$ = township farm land tax revenue for farm land participating in ad valorem taxation for year y (dollars).

Model four-change in millage rates of participating farm land

The next step in the analysis was calculating the change in farm land millage rates of that farm land participating in use-value assessment. This was done because a millage rate showed the amount per $1,000 of assessed or equalized valuation that any individual sample unit must pay. The formula used was:

$$\frac{FRV_{ty(uv)} - FRV_{ty(av)}}{(P_2)(FEV_{ty})} \times 1000$$

where: $FRV_{ty(uv)}$ = farm land tax revenue under use-value assessment for township t and year y (dollars).

$FRV_{ty(av)}$ = farm land tax revenue under ad valorem assessment for township t and year y (dollars).

P_2 = proportion of township farm land equalized valuation participating in use-value assessment (percentage).

FEV_{ty} = farm land equalized valuation for township t and year y (dollars).

Deferred Taxation Models

The basic township data previously formulated was then incorporated into a second series of models designed to calculate new tax rates and measure the shift and incidence of tax revenues resulting from alternatives of deferred taxation. The models to be used with deferred taxation were essentially similar to those just presented concerning plain use-value assessment. The main difference between the plain use-value assessment model and the deferred taxation models are that a roll-back component has been added to the equation in Model One that calculates new tax rates. The equations used to measure the shift and incidence of the tax burden are the same for the deferred taxation as the equations that measured the change in tax revenues for plain use-value assessment.

Model number five-percentage change in township tax rates with deferred taxation

The first model to calculate a number of new tax rates resulting from deferred taxation was:

$$TORT_{ty(df)} = \frac{TORV_{ty(av)} + \sum_{r=3,5}(FRV_{ty(av)} - FRV_{ty(uv)})(w)(s)}{(P_1)(FEV_{ty}) + (P_2)(FUV_{ty}) + (P_3)(NFEV_{ty})}$$

where: $TORV_{ty(av)}$ = township tax revenue collected from township records (dollars).

$FRV_{ty(av)}$ = farm land tax revenue under ad valorem assessment for township t and year y (dollars).

$FRV_{ty(uv)}$ = farm land tax revenue under use-value assessment for township t and year y (dollars).

r = the number of years of roll-back (years).

w = the amount of the roll-back (percentage).

s = the proportion of farm land participating in a deferred tax program (percentage).

P_1 = proportion of township farm land equalized valuation not participating in deferred assessment (percentage).

P_2 = proportion of township farm land equalized valuation participating in deferred assessment (percentage).

P_3 = proportion of township non-farm land equalized valuation not participating in deferred taxation (percentage).

FEV_{ty} = estimated farm land equalized valuation for township t and year y (dollars).

FUV_{ty} = farm land use-value for townships t and year y (dollars).

$NFEV_{ty}$ = non-farm equalized valuation for township t and year y (dollars).

This is essentially the same model as Model One except that a roll-back of tax revenue has been added to total township revenue under ad valorem taxation ($TORV_{ty(av)}$) in the numerator. The nine ($FRV_{ty(av)} - FRV_{ty(uv)}$) components of the roll-back are the nine solutions produced by Model Four for each township for each year. The variable r is the number of years of roll-back and will assume two values, three years and five years. These two figures seem to be the most commonly used in deferred taxation legislation. The variable w is the amount of the roll-back and will assume a value of 1.00. The variable s is the proportion of farm land participating in a deferred tax program that the roll-back applies to and will assume two values, 0.10 and 0.20. Current literature in states having deferred taxation indicated a low participation rate by farmers even though deferred taxation exists. The following table (Table 8) shows the combinations of values used which the variables in the model will assume.

Due to computational problems and the fact that only ten years' data was collected, Model Five was not calculated for each of the ten years in the study period. Instead the model was used for eight years with the three

TABLE 8

VALUES OF VARIABLES IN MODEL FIVE

Farm Land Use-Value	Value of P_1	Value of P_2	Value of P_3	Value of w	Value of r	Value of s
FUV_1	.75	.25	1.00	1.00	3	.10
						.20
					5	.10
						.20
	.50	.50	1.00	1.00	3	.10
						.20
					5	.10
						.20
	.25	.75	1.00	1.00	3	.10
						.20
					5	.10
						.20
FUV_2	.75	.25	1.00	1.00	3	.10
						.20
					5	.10
						.20
	.50	.50	1.00	1.00	3	.10
						.20
					5	.10
						.20
	.25	.75	1.00	1.00	3	.10
						.20
					5	.10
						.20

TABLE 8--Continued

Farm Land Use-Value	Value of P_1	Value of P_2	Value of P_3	Value of w	Value of r	Value of s
FUV_3	.75	.25	1.00	1.00	3	.10
						.20
					5	.10
						.20
	.50	.50	1.00	1.00	3	.10
						.20
					5	.10
						.20
	.25	.75	1.00	1.00	3	.10
						.20
					5	.10
						.20

where: FUV_1 = $100 farm land use-value per acre.

FUV_2 = $300 farm land use-value per acre.

FUV_3 = $500 farm land use-value per acre.

P_1 = proportion of township farm land equalized valuation not participating in deferred assessment (percentage).

P_2 = proportion of township farm land equalized valuation participating in deferred assessment (percentage).

P_3 = proportion of township non-farm land equalized valuation not participating in deferred assessment (percentage).

w = the amount of the roll-back (percentage).

r = the number of years of the roll-back (years).

s = the proportion of farm land participating in a deferred tax program (percentage).

year roll-back and for six years with the five year roll-back. Table 9 shows the yearly value used for the variables (FEV_{ty}), ($NFEV_{ty}$), ($TORV_{ty}$), and ($FRV_{ty(av)} - FRV_{ty(uv)}$). Thus each of the eighteen roll-backs involving three years in Table 7 was used in combination with the eight yearly sets of values in Table 9 and each of the eighteen roll-backs involving five years in Table 7 was used in combination with the six yearly sets of values in Table 9. These combinations were used in Model Five to produce 252 new tax rates ($TORT_{ty(df)}$) for each township for all years (or 1,260 new township tax rates for all townships for the selected years). A total of thirty-six new tax rates were computed by Model Five for each of the selected years.

Once new tax rates were computed for Model Five for each of the selected years, the percentage change in the township tax rate for each township for the selected years was calculated using the following formula:

$$\frac{TORT_{ty(df)} - TORT_{ty(av)}}{TORT_{ty(av)}} \times 100$$

where: $TORT_{ty(df)}$ = total township tax rate under deferred assessment for township t and year y (percentage).

$TORT_{ty(av)}$ = total township tax rate under ad valorem assessment for township t and year y (percentage).

TABLE 9

YEARLY VALUES OF VARIABLES IN MODEL FIVE

Three Year Roll-Back		Five Year Roll-Back	
Combined Years of $FRV_{(av)}$ - $FRV_{(uv)}$	Year of FEV, NFEV and TORV	Combined Years of $FRV_{(av)}$ - $FRV_{(uv)}$	Year of FEV, NFEV and TORV
1960-1962	1962	1960-1964	1964
1961-1963	1963	1961-1965	1965
1962-1964	1964	1962-1966	1966
1963-1965	1965	1963-1967	1967
1964-1966	1966	1964-1968	1968
1965-1967	1967	1965-1969	1969
1966-1968	1968	---	--
1967-1969	1969	---	--

where: $FRV_{(av)}$ = farm land tax revenue under ad valorem assessment (dollars).

$FRV_{(uv)}$ = farm land tax revenue under use-value assessment (dollars).

FEV = farm land equalized valuation (dollars).

NFEV = non-farm land equalized valuation (dollars).

TORV = total township tax revenue (dollars).

Model number six-percentage change in non-farm millage rates with deferred taxation

Each of the thirty-six new tax rates calculated for each township for selected years was then incorporated into Model Six to measure the shift and incidence of tax revenues in the non-farm land sector of the township. This was done by:

$$NFRV_{ty(df)} - NFRV_{ty(av)} = (TORT_{ty(df)})(P_3)$$

$$(NFEV_{ty}) - (TORT_{ty(av)})(P_3)$$

where: $NFRV_{ty(df)}$ = non-farm land tax revenue under deferred assessment for township t and year y (dollars).

$NFRV_{ty(av)}$ = non-farm land tax revenue under ad valorem assessment for township t and year y (dollars).

$TORT_{ty(df)}$ = total township tax rate under deferred assessment for township t and year y (percentage).

P_3 = proportion of township non-farm land equalized valuation not participating in deferred taxation (percentage).

$NFEV_{ty}$ = non-farm equalized valuation for township t and year y (dollars).

$TORT_{ty(av)}$ = total township tax rate under ad valorem assessment for township t and year y (percentage).

The $(TORT_{ty(av)})(P_3)(NFEV_{ty})$ component in this model is the same as its corresponding component in Model Two. The $(TORT_{ty(df)})$ variable is the new tax rate resulting from Model Five. This model produced thirty-six solutions for

each township in the selected years in Table 9 (or 1,260 solutions for all townships for the selected years).

The change in the non-farm land millage rates for each township for selected years was then calculated by:

$$\frac{NFRV_{ty(df)} - NFRV_{ty(av)}}{NFEV_{ty(av)}} \times 1000$$

where: $NFRV_{ty(df)}$ = non-farm land tax revenue under deferred assessment for township t and year y (dollars).

$NFRV_{ty(av)}$ = non-farm land tax revenue under ad valorem assessment for township t and year y (dollars).

The thirty-six new tax rates that were formulated in Model Five were then used to measure the change in revenue in that part of the farm land sector not participating in a tax deferral program. The equation used was:

$$FRV_{ty(df)} - FRV_{ty(av)} = (TORT_{ty(df)})(P_1)(FEV_{ty}) - (TORT_{ty(av)})(P_1)(FEV_{ty})$$

where: $FRV_{ty(df)}$ = farm land tax revenue under deferred assessment for township t and year y (dollars).

$FRV_{ty(av)}$ = farm land tax revenue under ad valorem assessment for township t and year y (dollars).

$TORT_{ty(df)}$ = total township tax rate under deferred assessment for township t and year y (percentage).

P_1 = proportion of township equalized valuation not participating in deferred assessment (percentage).

FEV_{ty} = farm land equalized valuation for township t and year y (dollars).

$TORT_{ty(av)}$ = total township tax rate under ad valorem assessment for township t and year y (percentage).

This equation is essentially the same as the equation in Model Three. The $(TORT_{ty(av)})(P_1)(FEV_{ty})$ component of this equation was the same as the respective component in Model Three. The combinations of values that the variables $(TORT_{ty(df)})$ and (P_1) may assume are shown in Table 8. All thirty-six new tax rates derived by Table 8 were used in conjunction with the respective yearly combinations in Table 9 to produce thirty-six solutions for each township for selected years (or 1,260 solutions for all townships for all selected years).

Model number seven-change in revenue in farm land participating in deferred taxation program

Once the change in revenue in that part of the farm sector not participating in a tax deferral system was established, the thirty-six new tax rates produced by Model Five were then used to estimate the change in revenue in that part of the farm land sector participating in a tax deferral program. This model was essentially the same as Model Three:

$$FRV_{ty(df)} - FRV_{ty(av)} = (TORT_{ty(df)})(P_2)(FUV_{ty}) - (TORT_{ty(av)})(P_2)(FEV_{ty})$$

where: $FRV_{ty(df)}$ = farm land tax revenue under deferred assessment for township t and year y (dollars).

$FRV_{ty(av)}$ = farm land tax revenue under ad valorem assessment for township t and year y (dollars).

$TORT_{ty(df)}$ = total township tax rate under deferred assessment for township t and year y (percentage).

P_2 = proportion of township farm land equalized valuation participating in deferred assessment (percentage).

FUV_{ty} = farm land use-value for township t and year y (dollars).

$TORT_{ty(av)}$ = total township tax rate under ad valorem assessment for township t and year y (percentage).

FEV_{ty} = farm land equalized valuation for township t and year y (dollars).

The $(TORT_{ty(df)})(P_2)(FEV_{ty})$ component in this model was the same as its respective counterpart in Model Three. The combination of values for the variables $(TORT_{ty(df)})$, (P_2), and (FUV_{ty}) were given in Table 8. All of the thirty-six tax rates $(TORT_{ty(df)})$ produced by Model Five were used in conjunction with the values of (P_2) and (FUV_{ty}) given in Table 9 to produce thirty-six solutions for each township for the selected years.

The percentage change in the participating farm land revenues was then calculated by:

$$\frac{FRV_{ty(df)} - FRV_{ty(av)}}{FRV_{ty(av)}} \times 100$$

where: $FRV_{ty(df)}$ = farm land tax revenue under deferred assessment for township t and year y (dollars).

$FRV_{ty(av)}$ = farm land tax revenue under ad valorem assessment for township t and year y (dollars).

Model eight-change in millage rate of participating farm land

Using the percentage change in the participating farm land revenues formulated above, the change in millage rates of participating farm land for each township for the selected years were calculated by the following formula:

$$\frac{FRV_{ty(df)} - FRV_{ty(av)}}{(P_2)(FEV_{ty})} \times 1000$$

where: $FRV_{ty(df)}$ = farm land tax revenue under deferred assessment for township t and year y (dollars).

$FRV_{ty(av)}$ = farm land tax revenue under ad valorem assessment for township t and year y (dollars).

P_2 = proportion of township farm land equalized valuation participating in deferred assessment (percentage).

FEV_{ty} = farm land equalized valuation in township t and year y (dollars).

Using these basic eight models, four which were formulated to analyze the effects of plain use-value taxation and four for the deferred taxation models, and using

the CDC 6500 computing system, the models were then analyzed. Chapter V shows the analysis of the present ad valorem system of taxation as well as the analyses of these eight basic models just presented. The results of the effectiveness of both plain and deferred taxation in all five study townships is discussed in detail.

CHAPTER V

ANALYSIS OF TOWNSHIP ESTIMATES AND SIMULATION MODELS

Chapter III produced estimations for the variables of farm land equalized valuation (FEV), non-farm land equalized valuation (NFEV), farm land tax revenue (FRV), non-farm land tax revenue (NFRV), farm land acreage (FAC), and non-farm land acreage (NFAC) for the townships of Chesterfield, Lenox, Macomb, Shelby, and Washington in Macomb County. These township estimations were used in combination with known township values of total township equalized valuation (TOEV), total township tax revenue (TORV), total township acreage (TOAC), and total township tax rate (TORT, which was derived by TORV/TOEV) to analyze the present ad valorem system of taxation for the years 1960-1969 in these townships. Chapter IV presented selected simulation models that were formulated to analyze the possible effects of use-value assessment between the farm and non-farm sector for these years and in these townships. This chapter will analyze and discuss the changes that have taken place in ad valorem taxation and then using the formulated simulation models of Chapter IV,

investigate and compare some possible effects of both plain and deferred systems of use-value taxation in these five townships.

Assumptions

In order to analyze and discuss the changes that have taken place in these five townships in the rural-urban fringe, it was necessary for the researcher to make the assumptions:

1. That TORV, which is derived from the equalized valuations of property and the township budget which is the allocation of TORV, occur in the same fiscal year. There is in actuality a "lag" between the time TORV is collected by the township financial officer and spent.

2. That the equalized personal property tax assessment portion of the total equalized assessment for the township is evenly proportioned between the farm and non-farm sectors. The total TOEV for a township consists of a real property tax assessment portion and a personal property tax assessment portion.

3. That township budgets either remain constant or increase slightly over time. There was no year in any township where this was not the case in the townships studied and the years investigated.

Analysis of Ad Valorem Taxation in the Townships: 1960-1969

Using the township estimates for the variables FEV, NFEV, FRV, NFRV, FAC, and NFAC, and data collected from the property tax assessment rolls for the variables TOEV, TORV, and TOAC, several trends in the ten year period from 1960-1969 were analyzed. Table 10 shows the percentage increase in these selected variables as well as in the TORT derived from dividing TORV by TOEV. Each individual township has seen a sizeable increase in both the estimated and known variables. The TOEV increased considerably more in the more "urbanized" townships of Shelby and Chesterfield and the least in one of the most rural, Lenox. The percentage increases in this ten year period for the TOEV for Shelby and Chesterfield were 107 percent and 111 percent, respectively, as compared to fifteen percent in Lenox. Macomb and Washington townships saw eighty-one and eighty-nine percent increases, respectively, in this same time period for the TOEV.

In investigating TORV, the same percentage pattern of increases is observed. The two more urbanized townships of Chesterfield and Shelby recorded the largest percentage increases, 213 and 270 percent, respectively. Lenox, the most rural, again showed only a sixty-three percent increase in TORV. Macomb and Washington, however, showed much larger percentage increases, 197 and 200 percent, respectively than when analyzing TOEV.

TABLE 10

PERCENTAGE INCREASE IN SELECTED TOWNSHIP VARIABLES UNDER AD VALOREM TAXATION: 1960-1969

Township	Selected Township Variable[a]	1960 (Dollars)	1969 (Dollars)	Increase or Decrease (Dollars)	Increase or Decrease (Percentage)
Chesterfield	TOEV	17,444,844	36,724,756	19,279,912	110.52
Lenox	TOEV	14,764,186	16,907,937	2,143,751	14.52
Macomb	TOEV	11,568,035	20,975,683	9,407,648	81.32
Shelby	TOEV	49,968,296	103,677,085	53,708,789	107.49
Washington	TOEV	12,166,427	23,015,805	10,849,376	89.17
Chesterfield	FEV	3,266,248	5,084,612	1,818,364	55.67
Lenox	FEV	4,010,939	5,366,394	1,355,455	33.79
Macomb	FEV	5,372,202	7,478,301	2,106,099	39.20
Shelby	FEV	3,773,844	6,371,000	2,597,156	60.82
Washington	FEV	3,619,291	4,899,942	1,280,651	35.38
Chesterfield	NFEV	14,178,596	31,640,144	17,461,548	123.15
Lenox	NFEV	10,753,247	11,541,543	788,296	7.33
Macomb	NFEV	6,195,833	13,497,382	7,301,549	117.85
Shelby	NFEV	46,194,452	97,306,085	51,111,633	110.64
Washington	NFEV	8,547,136	18,116,313	9,569,177	111.96
Chesterfield	TORV	423,842	1,327,991	904,149	213.32
Lenox	TORV	332,911	543,463	210,552	63.25
Macomb	TORV	291,772	865,381	573,609	196.59
Shelby	TORV	1,318,273	4,879,683	3,561,410	270.16
Washington	TORV	343,055	1,029,135	686,080	200.00
Chesterfield	FRV	79,357	183,863	104,506	131.69
Lenox	FRV	90,441	172,489	82,048	90.72
Macomb	FRV	135,499	308,528	173,029	127.70
Shelby	FRV	99,562	299,859	200,297	201.18
Washington	FRV	102,053	219,077	117,024	114.67
Chesterfield	NFRV	344,485	1,144,128	799,643	232.13
Lenox	NFRV	242,470	370,974	128,504	53.00
Macomb	NFRV	156,273	556,853	400,580	256.33
Shelby	NFRV	1,218,711	4,579,824	3,361,113	275.79
Washington	NFRV	241,002	810,058	569,056	236.12

TABLE 10--Continued

Township	Selected Township Variable[a]	1960 (Dollars)	1969 (Dollars)	Increase or Decrease (Dollars)	Increase or Decrease (Percentage)
Chesterfield	FUV_1	1,220,348	1,185,070	-35,278	-2.89
Lenox	FUV_1	2,161,867	2,176,100	14,233	0.66
Macomb	FUV_1	1,973,460	1,902,467	-70,993	-3.60
Shelby	FUV_1	1,209,000	1,143,880	-65,120	-5.39
Washington	FUV_1	2,225,032	2,186,956	-38,076	-1.71
Chesterfield	FUV_2	3,661,044	3,555,210	-105,834	-2.89
Lenox	FUV_2	6,485,600	6,528,300	42,700	0.66
Macomb	FUV_2	5,920,380	5,707,400	-212,980	-3.60
Shelby	FUV_2	3,627,000	3,431,640	-195,360	-5.39
Washington	FUV_2	6,675,096	6,560,867	-114,229	-1.71
Chesterfield	FUV_3	6,101,740	5,925,350	-176,390	-2.89
Lenox	FUV_3	10,809,333	10,880,500	71,167	0.66
Macomb	FUV_3	9,867,300	9,512,333	-354,967	-3.60
Shelby	FUV_3	6,045,000	5,719,400	-325,600	-5.39
Washington	FUV_3	11,125,161	10,934,779	-190,382	-1.71

TABLE 10--Continued

Township	Selected Township Variable [a]	1960 (Acres)	1969 (Acres)	Increase or Decrease (Acres)	Increase or Decrease (Percentage)
Chesterfield	FAC	12,203	11,851	-352	-2.80
Lenox	FAC	21,619	21,761	142	0.66
Macomb	FAC	19,735	19,025	-710	-3.60
Shelby	FAC	12,090	11,439	-651	-5.38
Washington	FAC	22,250	21,870	-380	-1.71
Chesterfield	NFAC	5,909	6,261	352	5.96
Lenox	NFAC	2,253	2,111	-142	-6.30
Macomb	NFAC	3,625	4,335	710	19.59
Shelby	NFAC	11,014	11,665	651	5.91
Washington	NFAC	470	850	380	80.85
		(Rates)	(Rates)	(Rates)	
Chesterfield	TORT	.02429612	.03616065	.01186453	48.83
Lenox	TORT	.02254855	.03214248	.00959393	42.55
Macomb	TORT	.02522226	.04125639	.01603413	63.57
Shelby	TORT	.02638219	.04706618	.02068399	78.40
Washington	TORT	.02819686	.04471427	.01651741	58.58

[a] TOEV = total township equalized valuation.

FEV = farm land equalized valuation.

NFEV = non-farm land equalized valuation.

TORV = township tax revenue.

FRV = farm land tax revenue.

NFRV = non-farm land tax revenue.

FAC = farm land acreage.

NFAC = non-farm land acreage.

TORT = township tax rate.

FUV_1 = farm land use-value at $100/acre.

FUV_2 = farm land use-value at $300/acre.

FUV_3 = farm land use-value at $500/acre.

Because TORT is the result of TORV divided by TOEV, percentage increases were also evident in this variable. Shelby, the most urbanized township had the largest increase, seventy-eight percent, for the period 1960-1969. However, here Macomb and Washington townships (sixty-four and fifty-nine percent, respectively) had a larger increase than the more urbanized township of Chesterfield with forty-nine percent. Lenox, the most rural, again ranks fifth, or last, with a TORT increase of forty-three percent.

There has also been a decrease in FAC and a gain in NFAC in these townships. Chesterfield, Macomb, Shelby, and Washington all "lost" land, it is assumed, to non-farm use. There was a slight gain in FAC in the ten year period in Lenox township of one percent. However, due to the estimation technique used in the analysis, the percentages as well as acreages, shown in Table 10 should not be interpreted as precise figures, especially in Lenox and Washington townships. The FAC gain in Lenox was relatively small in terms of TOAC. There was some over-estimation in Washington township for the years 1961 through 1966. The estimated variables (FEV, NFEV, FRV, and NFRV) of Table 10 are important in that with the exception of Lenox township, NFEV and NFRV have increased much more percentage-wise over the ten year time span than the FEV and FRV. The increase in the three selected theoretical farm land use-values (FUV) is also shown.

Table 11 shows the ten year averages of the same variables, both known and estimated, that were discussed in Table 10. The figures for each variable and for the ten year period, 1960-1969, were averaged. These average figures were then used, not only for analysis of the ad valorem system of taxation, but for the plain and deferred use-value systems of taxation as well. Time constraints and the overall objectives of this study dictated this choice.

By taking the average of the ten year study period, again, in terms of TOEV and TORV, Shelby township ranked first with a TOEV of $64,802,059 and TORV of $2,456,195. Chesterfield township was second with a TOEV of $22,750,323 and a TORV of $702,558. Washington township was third in TOEV and TORV. Lenox township ranked fourth in TOEV but fifth in TORV. Macomb township ranked fifth in TOEV but fourth in TORV. By looking at Table 11 though, it is evident that Shelby township had, by far, the greatest TOEV and TORV of the five townships. In terms of TOEV and TORV, Shelby was the most urbanized of the five study townships. The difference between these variables and the next township, Chesterfield, was sizeable. Shelby township had approximately three times the TOEV that Chesterfield did in this study period. In terms of TORT's however, the rankings somewhat change. Shelby is first again but Macomb and Washington are second and third, respectively, using

TABLE 11

TEN YEAR AVERAGE OF SELECTED TOWNSHIP VARIABLES UNDER AD VALOREM TAXATION: 1960-1969[a]

Selected Township Variable[b]	Townships				
	Chesterfield	Lenox	Macomb	Shelby	Washington
	(Dollars)	(Dollars)	(Dollars)	(Dollars)	(Dollars)
TOEV	22,750,323	15,517,824	15,053,685	64,802,059	15,780,790
NFEV	19,041,286	11,320,874	9,013,176	60,755,228	11,818,822
FEV	3,712,637	4,196,950	6,075,509	4,046,831	3,961,968
TORV	702,558	424,172	494,486	2,456,159	575,521
NFRV	589,712	309,852	298,328	2,305,469	435,515
FRV	112,842	116,320	196,158	150,691	142,006
FUV_1	1,217,565	2,101,257	1,952,171	1,190,832	2,382,383
FUV_2	3,652,696	6,303,770	5,856,514	3,572,497	7,147,149
FUV_3	6,087,827	10,506,283	9,760,856	5,954,162	11,911,916
	(Rates)	(Rates)	(Rates)	(Rates)	(Rates)
TORT	.02949368	.02738528	.03177384	.03616469	.03535273

[a]Due to averaging, the totals of the NFEV, FEV, NFRV, and FRV variables do not agree with TOEV or TORV.

[b]TOEV = total township equalized valuation.
NFEV = non-farm land equalized valuation.
FEV = farm land equalized valuation.
TORV = total township tax revenue.
NFRV = non-farm land tax revenue.
FRV = farm land tax revenue.
FUV_1 = farm land use-value at $100/acre.
FUV_2 = farm land use-value at $300/acre.
FUV_3 = farm land use-value at $500/acre.
TORT = total township tax rate.

ten year averages for the study townships. The TORT is important because if one multiplies this figure by 1000 for each township, a millage rate per $1000 of equalized valuation can be and was formulated for an ad valorem system of taxation for a ten year average.

Table 12 shows both the farm and non-farm percentages of the known values and acreages for TOEV, TORV, and TOAC and the estimated values and acreages of NFEV, NFRV, NFAC, FEV, FRV, and FAC. In 1960, NFEV accounted for an estimated ninety-two percent of the TOEV in Shelby township; eighty-one percent in Chesterfield, seventy-three percent in Lenox, seventy percent in Washington and fifty-four percent in Macomb. By 1969, these percentages had increased to ninety-five percent in Shelby, eighty-six percent in Chesterfield township, seventy-nine percent in Washington and sixty-four percent in Macomb. Lenox township was the exception with a decrease in NFEV to sixty-eight percent in 1969 from seventy-three percent in 1960. This is partly due to its being the most "rural" of the five townships studied but also partly due to the estimation procedure used in Chapter III. As NFEV had increased in the majority of townships as a percentage of TOEV, FEV had decreased from eight percent in 1960 in Shelby to five percent in 1969 and from a low of forty-six percent in Macomb in 1960 to thirty-six percent in 1969.

TABLE 12

FARM-NON-FARM PERCENTAGES OF SELECTED VARIABLES UNDER AD VALOREM TAXATION: 1960-1969

Selected Township Variables[a]	Townships									
	Chesterfield		Lenox		Macomb		Shelby		Washington	
	1960 (%)	1969 (%)	1960 (%)	1969 (%)	1960 (%)	1969 (%)	1960 (%)	1969 (%)	1960 (%)	1969 (%)
NFEV	81.3	86.2	72.8	68.3	53.6	64.3	92.4	95.2	70.3	78.7
FEV	18.7	13.8	27.2	31.7	46.4	35.7	7.6	4.8	29.7	21.3
TOEV	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
NFRV	81.3	86.2	72.8	68.3	53.6	64.3	92.4	93.9	70.3	78.7
FRV	18.7	13.8	27.2	31.7	46.4	35.7	7.6	6.1	29.7	21.3
TORV	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
NFAC	32.6	34.6	9.4	8.8	15.5	18.6	47.7	50.5	2.1	3.7[b]
FAC	67.4	65.4	90.6	91.2	84.5	81.4	52.3	49.5	97.9	96.3[b]
TOAC	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

[a]NFEV = non-farm land equalized valuation.
FEV = farm land equalized valuation.
TOEV = total township equalized valuation.
NFRV = non-farm land tax revenue.
FRV = farm land tax revenue.
TORV = total township tax revenue.
NFAC = non-farm land acreage.
FAC = farm land acreage.
TOAC = total township acreage.

[b]Due to overestimation, acreage for this township is not meaningful.

NFRV as a percentage of TORV showed the same pattern of increase in four townships with Lenox township again being an exception. In 1960, NFRV accounted for ninety-two percent of TORV in Shelby township; by 1969 this had increased to ninety-four percent. Shelby, by all indicators investigated and used is the most "urbanized" township. However, even in one of the more rural townships and using NFRV as a percentage of TORV as a guide, NFRV in Lenox township was seventy-three percent in 1960 and sixty-eight percent in 1969. Again, Lenox township was the only township to show a decrease in NFRV in the ten year time span; all the other townships showed increases in NFRV and decreases in FRV in the years from 1960 to 1969.

FAC decreased in four townships with Lenox township being an exception and showing a slight increase. Shelby, the most urbanized of the townships had, in 1969, just fifty percent of its land acreage remaining in agriculture; Chesterfield just sixty-five percent. Washington, township, in terms of FAC, was highest with ninety-six percent but even this had decreased two percent in the ten year time period. Less land than this may actually be in agriculture due to the over-estimation problem previously mentioned.

Analysis of Plain Use-Value Assessment Models

Once ad valorem taxation trends for the ten year time period and for the townships of Chesterfield, Lenox, Macomb, Shelby, and Washington had been analyzed, possible ramifications of a use-value system of taxation were investigated. This was done using the tax models previously described and developed in Chapter IV. The first use-value model dealt with township tax rates (TORT) under the assumption a plain use-value system of taxation had been instituted in these five townships for the ten year time span 1960-1969.

Under a plain use-value assessment system, each township was divided into three sectors as previously explained in Chapter IV. These were a non-farm sector (P_3), a farm sector that would participate in a use-value assessment system of taxation (P_2), and a farm sector that would not participate in use-value assessment (P_1). Three levels of participation were arbitrarily chosen for the participating farm sector (P_2) and these levels of participation were 25, 50, and 75 percent.[63] Three arbitrarily chosen theoretical use-values were selected of $100, $300, and $500 per acre.

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[63]The reader is reminded that the three levels of participation actually refer to three levels of FEV as a percentage of TOEV and do not refer to specific numbers of farmers or farm land acreage participating in use-value assessment.

Model one-percentage change in township tax rates

Table 13 shows the ten year average percentage changes that would have taken place in the township tax rates (TORT) under the varying levels of participation, selected use-values, and if a plain use-value assessment system of taxation had been operative. It was observed that the TORT's increased under $100 use-value for all five townships. However, this new TORT, while consistent for the township, is actually not quite relevant for the three sectors in each township. Because TORT is a result of TORV divided by TOEV, the varying sectors are influenced by these variables. If TORV must remain at its current level for administrative purposes (and actually there has been a slight increase over time), and TORV is derived from equalized valuations, then each sector is influenced differently by plain use-value assessment. While TOEV can be considered a constant, the farmers participating in a plain use-value assessment program are assessed at a lower rate than those farmers not participating or the non-farm sector which cannot participate in plain use-value assessment. FEV for the non-participating farmers and NFEV should have to rise to meet TOEV to offset the lessened equalized valuations and hence revenue derived from the percentage of farmers in a township participating in plain use-value assessment.

TABLE 13

TEN YEAR AVERAGE PERCENTAGE CHANGE IN TOWNSHIP TAX RATES UNDER PLAIN-USE VALUE ASSESSMENT WITH SELECTED USE-VALUES AND LEVELS OF PARTICIPATION[a]

Farm Land Use-Value Per Acre	Participation Levels		Townships				
	(P_1)[b]	(P_2)[b]	Chesterfield	Lenox	Macomb	Shelby	Washington
$100	.75	.25	2.82	3.52	7.30	1.12	2.70
$100	.50	.50	5.81	7.30	15.75	2.26	5.56
$100	.25	.75	8.97	11.40	25.86	3.43	8.58
$300	.75	.25	-0.91	-3.29	1.02	0.13	-4.66
$300	.50	.50	-1.74	-6.36	2.34	0.27	-8.87
$300	.25	.75	-2.50	-9.23	3.98	0.41	-12.70
$500	.75	.25	-2.84	-9.25	-6.16	-0.83	-11.01
$500	.50	.50	-5.49	-16.92	-11.54	-1.64	-19.75
$500	.25	.75	-7.93	-23.42	-16.28	-2.44	-26.88

[a]The years 1960-1969 were used to compute these averages.

[b]These terms are defined as follows:

P_1 = proportion of township farm land equalized valuation not participating in plain use-value assessment.

P_2 = proportion of township farm land equalized valuation participating in plain use-value assessment.

Under the theoretical use-value of $100 per acre, TORT's increased for all levels of participation. If twenty-five percent of the FEV in each township had elected to participate in a plain use-value taxation system, TORT's increased in all townships from one percent in the most "urbanized" township (Shelby) to seven percent in one of the more rural (Macomb). This is, of course, due partially to the fact that the more "urbanized" townships had less FAC eligible to participate under plain use-value assessment. In Shelby township, however, FEV was still a sizeable amount in relative terms. Using the ten year averages shown in Table 11, it ranked third and not fifth in FEV although it ranked last in FAC. In the more rural townships, plain use-value assessment would have had a greater impact in terms of TOEV and TORV. The greatest impact was in Macomb township which was the township that both had the greatest and highest variations in assessed valuation per acre in the sample frame and was also the most "transitional" of the townships studied. As the participation percentage increased from twenty-five to fifty and seventy-five percent, the impact of plain use-value assessment became ever greater, in TORT increases, with the exception of Shelby township which is highly urbanized. At a participation level of seventy-five percent, the TORT in Macomb township increased twenty-six percent at a use-value of $100 per acre. In the more rural townships of

Lenox and Washington, TORT's increased to eleven and eight percent respectively, as compared to four percent and three percent at a twenty-five percent level of participation in these same townships.

Only two townships are affected by increasing the theoretical use-value from $100 per acre to $300 per acre. These townships are Shelby and Macomb which had TORT increases at the twenty-five percent level of participation of less than one percent and slightly over one percent, respectively. At the seventy-five percent level of participation by farmers, the TORT's had increased very little in Shelby (less than one-half of one percent) to an increase of only four percent in Macomb. In the other townships, and using an average figure for the ten year time span, TORT's did not increase but became irrelevant. The minus figures in Table 13 represent TORT's that would be greater for farmers participating in a plain use-value assessment program than they would have had under ad valorem taxation. Few if any farmers would participate in any taxation program whereby their property tax rate (and hence their tax bill) would be greater than under the existing system. At all participation levels, the theoretical $500 use-value per acre was set too high. Essentially, use-value at this level is unrealistic in terms of the existing assessed valuations per acre. Simulated

use-values somewhere between $100 and $300 would have been more realistic in Chesterfield, Lenox, and Washington townships.

Model two-percentage change in non-farm millage rates

New TORT's were derived by Model One using three levels of FEV participation and three selected theoretical use-values as if a plain use-value system of taxation had been instituted in the townships of Chesterfield, Lenox, Macomb, Shelby, and Washington in Macomb County. Using the new TORT's derived by Model One, the percentage change in non-farm land millage rates in each of the five townships were then analyzed. To derive these non-farm land millage rate changes, the TORT's under the ad valorem system of taxation (and these TORT's for this sector were TORV/TOEV) were multiplied by NFEV for each township to determine the NFRV under ad valorem taxation. This NFRV under ad valorem taxation was then subtracted from NFRV formed by using the new TORT derived from Model One under a plain use-value assessment system of taxation. Because the non-farm sector cannot participate in plain use-value assessment, the participation rate for this sector for all three theoretical use-values was a factor of one. NFRV under the use-value system of taxation was formed by multiplying the new TORT from Model One by NFEV for the

three theoretical use-value levels. Non-farm land millage rate changes by percentage were derived by:

$$\frac{NFRV_{(uv)} - NFRV_{(av)}}{NFEV} \times 1000$$

where: $NFRV_{(uv)}$ = non-farm land tax revenue under use-value assessment (dollars).

$NFRV_{(av)}$ = non-farm land tax revenue under ad valorem assessment (dollars).

NFRV and NFMR (non-farm millage rate) are very critical in any township (or state) adopting a plain use-value assessment system of taxation. NFRV is important because this is the added revenue needed from the non-farm sector to balance the loss of revenue from the participating farm sector (or in FEV) and yet provide the same township budget (or level of services) as under the present ad valorem system of taxation. Millage rates are important because they represent the amount of taxation per $1000 equalized valuation a property owner must pay. To a rural farm or non-farm property tax payer, the township tax rate (TORT) is of most concern. The NFMR's in Model Two represent the increase in millage rates needed from the non-farm sector to compensate for the amount of participating farmers in a use-value system of taxation.

Table 14 shows the ten year average percentage changes in non-farm land millage rates under plain use-value assessment. The effect of plain use-value assessment

TABLE 14

TEN YEAR AVERAGE PERCENTAGE CHANGES IN NON-FARM MILLAGE RATES UNDER PLAIN USE-VALUE ASSESSMENT WITH SELECTED USE-VALUES AND LEVELS OF PARTICIPATION[a]

Farm Land Use-Value Per Acre	Participation Levels		Townships				
	(P_1)[b]	(P_2)[b]	Chesterfield	Lenox	Macomb	Shelby	Washington
$100	.75	.25	0.83	0.99	2.32	0.40	0.96
$100	.50	.50	1.71	2.06	5.00	0.81	1.97
$100	.25	.75	2.64	3.23	8.14	1.23	3.04
$300	.75	.25	0.00	-0.88	0.96	0.06	-1.57
$300	.50	.50	0.01	-1.69	2.03	0.12	-2.99
$300	.25	.75	0.02	-2.46	3.21	0.18	-4.29
$500	.75	.25	-0.78	-2.51	-1.84	-0.28	-3.76
$500	.50	.50	-1.51	-4.60	-3.46	-0.54	-6.76
$500	.25	.75	-2.19	-6.36	-4.89	-0.81	-9.22

[a]The years 1960-1969 were used to compute these averages.

[b]These terms are defined as follows:

P_1 = proportion of township farm land equalized valuation not participating in plain use-value assessment.

P_2 = proportion of township farm land equalized valuation participating in plain use-value assessment.

in this table and for this sector are the same as in Table 13 which investigated the ten year averages for percentage changes in TORT's. At the theoretical $100 use-value/acre level, the greatest percentage increase would be in Macomb township with a percentage increase in the millage rate of two percent if twenty-five percent of the FEV participated in plain use-value assessment. This increased to five percent if fifty percent of the farmers participated; eight percent if seventy-five percent of the FEV participated in a system of plain use-value assessment. Lenox township was second, Washington third, Chesterfield fourth, and the most urban township, Shelby, was last at all three participation levels and at $100 use-value/acre. Shelby township millage rate increases were just under one percent for the two lower levels of participation and just over one percent for the third. However, even though Shelby township had by far the greatest amount of TOEV of the townships, as well as the greatest proportion of NFEV to TOEV, a use-value program would still be noticeable upon the urban property owner in this township. The added tax burden would just be spread among more property owners. The greater the level of FEV participation by farmers, even in Shelby township, the greater or more noticeable the effect would be. Another interesting trend is the large difference in millage rates between Macomb township and the other four townships. At $100 use-value/acre and

a seventy-five percent participation level, the non-farm sector of Macomb would have an increased millage rate of eight percent as compared to three percent in Lenox and Washington townships. Again, at $300 use-value/acre, in only two townships was this theoretical use-value relevant and those are Macomb and Shelby townships. The $300 use-value/acre level for the other townships was set at too high a level.

Millage rates are the amount per $1000 equalized valuation that a property owner must pay in a tax year at a set assessment ratio. This assessment ratio is currently fifty percent of market value. Table 15 shows a hypothetical example of a property with an equalized valuation of $20,000 in the non-farm sector for all five townships and the effects on the millage rates of both ad valorem and plain use-value assessment at $100/acre on that property in one tax year. Again, three levels of participation in FEV are shown.

Under the current ad valorem tax system, and using the average ten year TORT's, the owner of property assessed at $20,000 would pay a total tax bill in one tax year from a high in Shelby township of $361.65 to a low of $273.85 in Lenox township. Under a plain use-value system, the greatest increase per $1000 equalized valuation would occur in Macomb township at all three levels of participation. Again, Shelby township is the lowest in the

TABLE 15

HYPOTHETICAL EXAMPLE OF THE EFFECT OF PLAIN USE-VALUE ASSESSMENT ON THE NON-FARM SECTOR USING TEN YEAR AVERAGE MILLAGE RATES AT $100 UV/ACRE FOR THE FIVE STUDY TOWNSHIPS

	Chesterfield	Lenox	Macomb	Shelby	Washington
Property with an equalized or assessed valuation of:	$20,000	$20,000	$20,000	$20,000	$20,000
and an Assessment Ratio of 50%	$10,000	$10,000	$10,000	$10,000	$10,000
would have a tax assessment under ad valorem taxation (29.49 per $1,000 x 10 = $294.94 in Chesterfield township for example) of:	$294.94	$273.85	$317.74	$361.65	$353.53
This tax assessment under plain use-value assessment (at $100 UV/acre) would be at a participation level of:					
25%	$303.24	$283.75	$340.94	$365.65	$363.15
50%	$312.04	$294.45	$367.74	$369.75	$373.23
75%	$321.34	$306.15	$399.14	$373.95	$383.93
Total dollar increase in the tax assessment would be at:					
25%	$8.30	$9.90	$23.20	$4.00	$9.60
50%	$17.10	$20.60	$50.00	$8.10	$19.70
75%	$26.40	$32.30	$81.40	$12.30	$30.40

increase in non-farm millage rates, but as mentioned previously, there are more property taxpayers to share the increased tax burden of a plain use-value system of taxation in this particular township. The TOEV and NFEV of Shelby township is almost three times as great as in the next most "urbanized" township, Chesterfield. Macomb, while it does not have the FEV of Lenox and Washington townships, had high individual property assessed valuations per acre in the sample frame.

The township rankings in the increased tax levies due to percentage increases in non-farm millage rates are the same at all three levels of participation. This is not true, however, for the total tax bill the owner of a $20,000 non-farm property must pay in the five townships. The owner of a $20,000 property paid the largest tax bill in Shelby under both ad valorem taxation and if only twenty-five percent of the FEV in this township had participated in a plain use-value system of taxation. If the level of participation increased to fifty percent, the $20,000 property owner in Washington paid a larger total tax bill under plain use-value assessment than did the property owner in Shelby township. At a participation level of seventy-five percent, the non-farm owner in Macomb township had the largest tax bill in relation to the other four townships with Shelby then ranking third. Lenox township, probably the most rural of the townships,

ranked lowest in total tax bill under ad valorem assessment or in total tax bill at any level of participation under a plain use-value taxation system.

Model three-percentage change in farm land tax revenue

Again, using the new TORT's produced by Model One, the shift and incidence of farm tax revenue, in that part of the farm sector participating in plain use-value assessment, was investigated. It was first necessary to determine the loss of farm land tax revenue (FRV) and then once this had been accomplished, to determine the percentage change in farm land revenue for each of the five study townships. It was felt that by deriving a percentage change in FRV for those townships participating in plain use-value assessment, a more "relative" amount of change could be analyzed within and between townships rather than just analyzing the dollar amount of revenue lost.

This model, like Model Two, had linkages with the new TORT's determined in Model One. The new TORT's derived by Model One were used with this model to determine FRV in the participating farm sector of each township. Originally, several models had been formulated to investigate the changes in tax revenues per acre for both the participating and non-participating farmers under plain use-value assessment. It was necessary to first determine FRV to

implement these models. However, these tax revenue per acre models were discarded because they were erroneous in determining tax revenues per acre when the original sample size had been drawn from individual observations and using assessed valuation per acre in the sample frames. This produced in effect a type of "double counting." It would also have been necessary to assume that FEV and FAC were proportionately equal. The percentage change in the FRV model, however, still remained relevant and was analyzed. Table 16 shows the ten year average figures for the percentage change in FRV for that proportion of farmers (or FEV) in the farm sector participating in a plain use-value system of assessment.

The township rankings for this model are almost identical with the previous two models. At $100 use-value/acre, there was a loss of revenue in all townships that must be compensated for by the other two sectors in each township, the non-participating farm sector and the non-farm sector. At all three levels of participation, Shelby township ranked highest and Washington lowest. If twenty-five percent of the farmers had participated in use-value assessment, there was a decrease of sixty-nine percent in the revenue coming from the farm sector in Shelby township. Chesterfield, the second most urbanized township, also ranked second at this level of participation with a decrease in FRV of sixty-five percent, closely followed by

TABLE 16

TEN YEAR AVERAGE PERCENTAGE CHANGE IN PARTICIPATING FARM LAND REVENUE UNDER A PLAIN USE-VALUE ASSESSMENT SYSTEM OF TAXATION[a]

Farm Land Use-Value Per Acre	Participation Levels		Townships				
	$(P_1)^b$	$(P_2)^b$	Chesterfield	Lenox	Macomb	Shelby	Washington
$100	.75	.25	-65.28	-47.65	-64.73	-69.28	-39.82
$100	.50	.50	-64.27	-45.78	-61.95	-68.93	-38.18
$100	.25	.75	-63.21	-43.76	-58.71	-68.57	-36.43
$300	.75	.25	1.13	46.74	-14.02	-8.75	67.36
$300	.50	.50	0.95	41.98	-14.20	-8.66	59.70
$300	.25	.75	0.77	37.54	-14.09	-8.56	52.77
$500	.75	.25	63.78	129.50	53.87	50.58	160.03
$500	.50	.50	59.02	109.97	44.71	49.22	133.90
$500	.25	.75	54.56	93.53	36.66	47.95	112.67

[a]The years 1960-1969 were used to compute these averages.

[b]These terms are defined as follows:

P_1 = proportion of township farm land equalized valuation not participating in plain use-value assessment.

P_2 = proportion of township farm land equalized valuation participating in plain use-value assessment.

Macomb township. Washington and Lenox had percentage decreases of forty percent and forty-eight percent, respectively. At the fifty and seventy-five percent level of farm land participation in use-value assessment, these townships ranked again in the same order. There was a slight decrease in the percentages at the seventy-five percent level of farm land participation over the twenty-five percent level of participation in all townships. This was caused by the fact that in the basic manipulations, there were three levels of farm land participation but only one FEV used for each of the three levels.

At $300 use-value/acre, the figures in Table 16 again only show two townships where this use-value/acre were applicable. These were Shelby and Macomb with Macomb ranking highest for all three levels of participation. As with the previous models, the $300 and $500 use-value/acre used for the townships of Chesterfield, Lenox, and Washington were "pegged" too high. At these higher use-value figures, use-value assessment would not be undertaken in these townships as there would be no "tax break" for any sector under use-value assessment. The ad valorem equalized value per acre of all land in these townships was less than a theoretical use-value of $300 per acre.

Model four-percentage change in participating farm land millage rates

The last plain use-value assessment model designed was used to analyze the change in millage rates of farm land participating in use-value assessment at different levels of participation and simulated use-values. This model again has a linkage with Model One because it is based on the relationship that TOEV = NFEV + FEV. Model One derived new TORT's for all five study townships using TORV/TOEV under plain use-value assessment. Model Two investigated percentage changes in non-farm land millage rates using the relationships of NFRV/NFEV under use-value assessment. Model Three then analyzed the increase or decrease in FRV under plain use-value assessment. This model used the increase or decrease in the FRV/FEV relationship to determine millage rates farmers would pay who participated in use-value assessment at differing levels of participation and at the three selected use-values of $100, $300, and $500 an acre. Model Two dealt with the non-farm land sector; this model deals with the participating farm land sector. Table 17 shows the ten year average change in the millage rates of farmers participating under use-value assessment.

At the selected use-value of $100 per acre, the millage rates would decrease in all townships for farmers

TABLE 17

TEN YEAR AVERAGE CHANGE IN MILLAGE RATES OF PARTICIPATING FARM LAND UNDER PLAIN USE-VALUE ASSESSMENT[a]

Farm Land Use-Value Per Acre	Participation Levels		Townships				
	(P_1)[b]	(P_2)[b]	Chesterfield	Lenox	Macomb	Shelby	Washington
$100	.75	.25	-19.52	-13.23	-20.08	-25.33	-14.40
$100	.50	.50	-19.24	-12.71	-19.94	-25.21	-13.83
$100	.25	.75	-18.93	-12.14	-18.93	-25.08	-13.22
$300	.75	.25	-0.44	12.30	-10.34	-3.97	23.02
$300	.50	.50	-0.46	11.05	-9.80	-3.93	20.46
$300	.25	.75	-0.48	9.88	-9.17	-3.82	18.13
$500	.75	.25	17.61	34.68	16.28	16.98	55.51
$500	.50	.50	16.32	29.45	13.57	16.55	46.64
$500	.25	.75	15.12	25.03	11.18	16.12	39.40

[a]The years 1960-1969 were used to compute these averages.

[b]These terms are defined as follows:

P_1 = proportion of township farm land equalized valuation not participating in plain use-value assessment.

P_2 = proportion of township farm land equalized valuation participating in plain use-value assessment.

participating in use-value assessment, from a high in Shelby township of twenty-five percent to a low of thirteen percent in Lenox township at the twenty-five percent level of participation. The millage rates decreased slightly more at the higher levels of participation. However, it must be remembered that in Shelby township, NFEV constitutes over ninety percent of the TOEV. The amount of extra millage needed from the non-farm and the non-participating farm sector was much less than this twenty-five percent millage rate decrease because the TORV would be "spread" over a large TOEV base. Even in the other townships, NFEV is also a larger percentage of TOEV than FEV. (The reader is referred back to Table 10 for the NFEV, FEV, TOEV, NFRV, FRV, and TORV in each township.)

In the several other models analyzed, the selected level of a use-value of $300 per acre was relevant to two townships. In Shelby and Macomb townships the selected use-value of $300 per acre represented the situation of use-value approaching or equalizing itself to FEV. In this model, $300 use-value per acre is relevant to Chesterfield township as well. This is not surprising in that Chesterfield ranked second in terms of many of the indicators of "urbanization" and in the three previous models FEV in this township would have equalized to a use-value slightly under $300 per acre in most cases. The acreage amount of farm land available for participation in use-value assessment in this township is second to Shelby.

Another interesting observation about Table 17 is that there is not much of a range between participation levels at any one selected use-value level, but there was a substantial difference between the selected use-value of $100 per acre and $300 per acre. This would lead one to believe that in any of the five study townships, the participating rate or level of farm land or farmers participating in use-value assessment was not as critical a factor as the selected use-value under which participating farmers would operate. An assumption could be made that in the more rural townships, where a larger share of both TOEV and TORV comes from the farm sector, the amount of farmers participating in use-value assessment may be important. In the more urbanized townships, where TOEV is in large part derived from NFEV, the selected use-value was a much more critical feature than the amount of farmers participating at a selected use-value. In the more urbanized townships, there are just fewer farmers with less farm land acreage in most cases.

Table 18 shows the same hypothetical example of the same $20,000 property that was analyzed under non-farm millage rates. The decreased tax payment made by participating farmers varies from a high of $253.30 in Shelby township at the twenty-five percent farm land participation level to a low in Lenox township of $132.30 at this same participation level. The decrease in the tax payment, in

TABLE 18

HYPOTHETICAL EXAMPLE OF THE EFFECT OF PLAIN USE-VALUE ASSESSMENT ON THE PARTICIPATING FARM SECTOR USING TEN YEAR AVERAGE MILLAGE RATES FOR THE FIVE STUDY TOWNSHIPS

	Chesterfield	Lenox	Macomb	Shelby	Washington
Property with an equalized or assessed property valuation of:	$20,000	$20,000	$20,000	$20,000	$20,000
and an Assessment Ratio of 50%	$10,000	$10,000	$10,000	$10,000	$10,000
which has an ad valorem tax payment of:	$294.94	$273.85	$317.74	$361.65	$353.53
would have a decrease in this tax payment under plain use-value assessment of $100 UV/acre and a participation level of:					
25%	$195.20	$132.30	$208.00	$253.30	$144.00
50%	$192.40	$127.10	$199.40	$252.10	$138.30
75%	$189.30	$121.40	$189.30	$250.80	$132.20
and at $300 UV/acre this decrease in the tax payment would be:					
25%	$4.40		$103.40	$39.70	
50%	$4.60		$98.00	$39.30	
75%	$4.80		$91.70	$38.20	

any one township, does not vary much with level of farm land participation. It decreases slightly more in the more rural townships which would be expected. In Chesterfield township, the use-value of $300 per acre had almost equalized itself to FEV, in Macomb and Shelby townships, this same use-value was still below FEV. In Lenox and Washington townships, the $300 use-value per acre again was irrelevant because farmers would not participate in any use-value assessment program if it meant an increase in their total tax bill.

A sensitivity analysis was run on all four plain use-value models in the five townships holding first use-value constant at $300 use-value per acre and varying the participation levels from twenty-five to seventy-five percent. Then the participation level was held constant at fifty percent and use-value was varied from $100 to $500 per acre. The relative range of holding use-value constant and then the participation level constant were then compared. Table 19 shows the ranges in the five townships for a constant use-value of $300 per acre and with the two extreme participation levels, and then with a participation level of fifty percent as the constant. As can be seen, and as previously mentioned in text, the relative range between the $300 use-value per acre is much greater than the relative range between the participation levels of fifty percent with use-value varying from $100 to $500 per

TABLE 19

SENSITIVITY ANALYSIS FOR THE FOUR PLAIN USE-VALUE ASSESSMENT MODELS USING SIX YEAR AVERAGES FOR THE FIVE STUDY TOWNSHIPS

Model Number	Townships				
	Chesterfield	Lenox	Macomb	Shelby	Washington
One:					
$300 use-value/acre[a]	11.30	24.22	27.29	3.90	25.31
P_2 = 50%[b]	1.59	5.94	2.96	0.28	3.83
Two:					
$300 use-value/acre[a]	3.22	6.66	8.46	1.35	8.73
P_2 = 50%[b]	0.02	3.34	2.25	0.12	1.30
Three:					
$300 use-value/acre[a]	123.29	155.75	106.66	118.15	172.08
P_2 = 50%[b]	0.36	9.20	0.07	0.19	6.93
Four:					
$300 use-value/acre[a]	35.56	42.16	33.51	41.76	60.47
P_2 = 50%[b]	0.02	2.42	1.17	0.15	2.33

[a]Holding $300 use-value/acre constant and varying participation levels from twenty-five percent to seventy-five percent.

[b]Holding the participation level or proportion of farm land equalized valuation constant at fifty percent and varying use-value from $100 use-value/acre to $500 use-value/acre and where P_2 = proportion of township equalized valuation participating in use-value assessment.

acre. This essentially means that in any change towards a plain use-value system of taxation, the use-value to be used is a far more critical factor than the amount of participating FAC in any of the five townships.

Analysis of Deferred Taxation Models

Models One, Two, Three, and Four investigated, respectively, the percentage change in township tax rates (TORT), non-farm land millage rates (NFMR), participating farm land revenues (FRV), and the millage rates of farm land participating in plain use-value assessment (FMR) for five selected townships in Macomb County for the years 1960-1969. In order to analyze the effects of deferred or "roll-back" taxation in the five study townships, a second series of models, basically similar to Models One, Two, Three, and Four were developed. The essential difference between the first and second series of models is that a "roll-back" or deferred component was added to this series of models. This second series of models then became Models Five, Six, Seven, and Eight. Because the most common type of deferred taxation legislation has either a three or five year "roll-back," each of Models Five, Six, Seven, and Eight have two subparts. One subpart dealt with deferred taxation with a three year "roll-back" component; the other subpart analyzed a five year "roll-back" in the five study townships of Chesterfield, Lenox, Macomb, Shelby, and Washington.

Deferred taxation differs from plain use-value assessment in that under plain use-value assessment, there is no "penalty" for farmers ceasing to participate in use-value assessment. Under deferred or "roll-back" taxation, once land changes to a use not designated by the legislation, all or part of the amount of taxes that have been deferred for a certain time period become payable by the land owner, hence the terminology "roll-back." In Models Five, Six, Seven, and Eight, it was assumed that the full amount of tax revenue deferred for a three year and a five year time span would have to be repaid to the township for those farmers ceasing to participate in a deferred taxation program. Because the only difference in FRV returned to the township tax coffers from the three and five year "roll-back" is one of only two time periods, the two subparts of each model were combined and will be described together in this part of the analysis.

Model five-percentage change in the township tax rate under three and five year deferred taxation

Using essentially Model One with a "roll-back" component of FRV added to TORV and the nine solutions of the difference in FRV under ad valorem and the FRV under plain use-value produced by Model Four, Model Five was constructed. Because only ten years of data were collected, this model, as well as models Six, Seven, and

Eight could only incorporate data for an eight year time span for the three year "roll-back" and for six years with the five year "roll-back." Due to the constraints of time in the process of data analysis, only two selected proportions, ten percent and twenty percent, were analyzed for the proportion of farm land that would actually participate in a deferred tax program.[64] These two levels or proportions of farm land participating in deferred taxation then becomes a percentage amount of FEV at each level of participation that is actually affected by deferred taxation. The same participation levels of that proportion or percentage of FEV participating in use-value assessment were maintained for deferred assessment. Table 20 shows the respective six and eight year average percentage changes in TORT's under three and five year deferred taxation for the three selected use-values, participation levels, and for all five study townships.

Table 20 shows that TORT's would increase for all townships under three and five year deferred taxation at all three levels of participation and for the two proportions of FRV returning to TORV for farmers ceasing to participate under deferred taxation and at $100 use-value

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[64]Current literature from states having this type of legislation indicate that approximately less than twenty-five percent of the farmers in those states elect to participate in deferred taxation.

TABLE 20

PERCENTAGE CHANGE IN TOWNSHIP TAX RATE UNDER THREE YEAR AND FIVE YEAR DEFERRED TAXATION

r=3[a]	Participation and Proportion Levels			Townships				
FUV[a]	$(P_1)^a$	$(P_2)^a$	$(s)^a$	Chesterfield	Lenox	Macomb	Shelby	Washington
$100	.75	.25	.10	2.07	2.66	5.31	0.81	1.92
$100	.75	.25	.20	1.33	1.73	3.44	0.53	1.25
$100	.50	.50	.10	4.29	5.62	11.63	1.66	4.01
$100	.50	.50	.20	2.79	3.76	7.77	1.06	2.70
$100	.25	.75	.10	6.67	8.91	19.26	2.50	6.29
$100	.25	.75	.20	4.40	6.13	13.33	1.62	4.36
$300	.75	.25	.10	0.70[b]	--	1.25[c]	0.14	--
$300	.75	.25	.20	0.56[b]	--	0.99[c]	0.11	--
$300	.50	.50	.10	1.43[b]	--	2.59[c]	0.27	--
$300	.50	.50	.20	1.15[b]	--	2.11[c]	0.22	--
$300	.25	.75	.10	2.18[b]	--	4.04[c]	0.42	--
$300	.25	.75	.20	1.78[b]	--	3.38[c]	0.33	--
r=5[a]								
$100	.75	.25	.10	1.72	2.34	4.36	0.65	1.63
$100	.75	.25	.20	0.65	0.89	1.24	0.24	0.66
$100	.50	.50	.10	3.59	4.99	9.65	1.33	3.43
$100	.50	.50	.20	1.42	2.10	3.05	0.50	1.52
$100	.25	.75	.10	5.60	8.02	16.17	2.02	5.43
$100	.25	.75	.20	2.31	3.70	7.58	0.77	2.63

TABLE 20--Continued

r=3[a]	Participation and Proportion Levels			Townships				
FUV[a]	(P_1)[a]	(P_2)[a]	(s)[a]	Chesterfield	Lenox	Macomb	Shelby	Washington
$300	.75	.25	.10	0.70[b]	--	1.23[c]	0.17	--
$300	.75	.25	.20	0.56[b]	--	0.95[c]	0.14	--
$300	.50	.50	.10	1.43[b]	--	2.55[c]	0.35	--
$300	.50	.50	.20	1.15[b]	--	2.04[c]	0.27	--
$300	.25	.75	.10	2.18[b]	--	3.99[c]	0.52	--
$300	.25	.75	.20	1.78[b]	--	3.28[c]	0.41	--

[a]These terms are defined as follows:

r = the number of years of "roll-back."

FUV = farm land use-value per acre.

P_1 = proportion of township farm land equalized valuation not participating in deferred assessment.

P_2 = proportion of township farm land equalized valuation participating in deferred assessment.

s = proportion of farm land participating in a deferred tax program.

[b]These figures are based only on years from 1967-1969.

[c]These figures are based only on years from 1966-1969.

per acre. At a use-value of $300 per acre, increased tax rates were only applicable in Chesterfield, Macomb, and Shelby townships and then only for certain years. Equalization was undertaken in all townships between 1965 and 1967 and this made it impossible to compare TORT's in these townships under deferred taxation using time spans longer than the last few years. TORT's increased as the amount of farm land and the number of farmers participating in deferred taxation increased. Shelby had the smallest amount of both FAC in agricultural use and FEV as a percentage of TOEV. Lenox township, one of the more rural of the townships, had the second highest increased tax rates with Chesterfield and Washington varying with amount of farm land and participating farmers. At twenty percent of the proportion of farm land participation, the TORT is less in all townships for the three use-value levels and three participation levels. This is because larger amounts of FRV are returned to TORV as more FAC was withdrawn from a deferred taxation assessment program. Again, while TORT's would increase for all property taxpayers in a township, the farmers under use-value assessment would actually pay less of a total tax bill as long as use-value were less than equalized value. As mentioned previously, farmers would not participate in any system of use-value taxation if their property tax bill were larger after use-value assessment than under ad valorem taxation.

Table 21 shows both the increased TORT's that come about under use-value assessment as well as the comparison between TORT's under plain use-value and under deferred property taxation. The largest TORT increases were under plain use-value legislation. TORT's were less under the three year "roll-back" and decreased even more for the five year roll-back. This was of course due to the added FRV returned to TORV paid as a penalty by those farmers ceasing to participate in deferred taxation.

Table 21 shows only the percentage increases in TORT's for the selected use-value of $100 per acre. Due to equalization being undertaken in the five study townships in the years 1965-1967, only the years of data from 1966-1969, depending upon the township, to compute averages could be used. While the last four or five years of TORT's calculated was sufficient to average several three year roll-back periods, it was not sufficient or relevant for the five year roll-back for other than the year 1969. No comparison could be made for the average three year and five year roll-back TORT's in Chesterfield, Macomb, and Shelby townships at $300 use-value per acre.

It is interesting to note that the percentage decreases in both the three year and five year TORT's are almost the same for all five townships and for the two proportions of farm land that the roll-back applies to. The TORT's of course are less at the twenty-five percent

TABLE 21

COMPARISON OF TOWNSHIP TAX RATES UNDER PLAIN USE-VALUE AND DEFERRED ASSESSMENT USING SIX YEAR AVERAGES FOR ALL TOWNSHIPS[a]

FUV[b]	(P_1)[b]	(P_2)[b]	TORT PUV[b]	(s)[b]	TORT r=3[b]	TORT r=5[b]	% Decrease TORT r=3	% Decrease TORT r=5
Chesterfield:								
$100	.75	.25	2.79	.10	2.07	1.72	26.00	38.00
				.20	1.36	0.65	51.00	77.00
$100	.50	.50	5.75	.10	4.29	3.59	25.00	38.00
				.20	2.84	1.42	51.00	75.00
$100	.25	.75	8.89	.10	6.68	5.60	25.00	37.00
				.20	4.46	2.31	50.00	74.00
Lenox:								
$100	.75	.25	3.78	.10	2.82	2.34	25.00	38.00
				.20	1.86	0.89	51.00	76.00
$100	.50	.50	7.88	.10	5.96	4.99	24.00	37.00
				.20	4.04	2.10	49.00	73.00
$100	.25	.75	12.34	.10	9.47	8.02	23.00	35.00
				.20	6.59	3.70	47.00	70.00
Macomb:								
$100	.75	.25	7.07	.10	5.26	4.36	26.00	38.00
				.20	3.45	1.24	51.00	82.00
$100	.50	.50	15.22	.10	11.48	9.65	25.00	37.00
				.20	7.74	3.05	49.00	80.00
$100	.25	.75	24.74	.10	18.96	16.17	23.00	35.00
				.20	13.19	7.58	47.00	69.00
Shelby:								
$100	.75	.25	1.06	.10	0.79	0.65	25.00	39.00
				.20	0.52	0.24	51.00	77.00
$100	.50	.50	2.15	.10	1.61	1.33	25.00	38.00
				.20	1.05	0.50	51.00	77.00
$100	.25	.75	3.26	.10	2.44	2.02	25.00	38.00
				.20	1.61	0.77	51.00	76.00

TABLE 21--CONTINUED

FUV[b]	$(P_1)^b$	$(P_2)^b$	TORT PUV[b]	$(s)^b$	TORT r=3[b]	TORT r=5[b]	% Decrease TORT r=3	% Decrease TORT r=5
Washington:								
$100	.75	.25	2.60	.10	1.95	1.63	25.00	37.00
				.20	1.31	0.66	50.00	75.00
$100	.50	.50	5.34	.10	4.07	3.43	24.00	36.00
				.20	2.80	1.52	48.00	72.00
$100	.25	.75	8.24	.10	6.36	5.43	23.00	34.00
				.20	4.49	2.63	46.00	68.00

[a]The years 1964-1969 were used to obtain these averages.

[b]These terms are defined as follows:

FUV = farm land use-value per acre.

P_1 = proportion of township farm land equalized valuation not participating in deferred assessment.

P_2 = proportion of township farm land equalized valuation participating in deferred assessment.

TORT PUV = township tax rate under plain use-value assessment.

s = proportion of farm land participating in a deferred tax program.

TORT r=3 = township tax rate under deferred assessment with three year "roll-back."

TORT r=5 = township tax rate under deferred assessment with five year "roll-back."

level of farm land participating in use-value assessment and also at the ten percent level of the amount of farm land the roll-back applies to. By having a deferred taxation penalty for those farmers ceasing to participate in deferred assessment, TORT's are considerably reduced in all townships although of course TORT's will still be higher than under ad valorem taxation. The reductions, of course, are greatest in the more rural townships. The increased TORT's under deferred taxation were highest in Macomb township which had the third highest ten year average ad valorem TORT as well as having had the greatest proportion of both FRV and FEV to TORV and TOEV, respectively. Shelby, the most urbanized township, again, had the lowest TORT's under both three and five year deferred taxation, just as it had under plain use-value assessment. The higher the participation levels of FEV participating in deferred taxation, the higher the TORT. The longer the "roll-back" period on back taxes that become due, the greater the reduction in this TORT. In the more rural or agricultural townships, the amount of FRV returned from those farmers ceasing to participate in deferred assessment was also more relevant. This was, of course, because FEV was a greater percentage of TOEV than NFEV in these townships.

Model six-percentage change in non-farm land millage rates under three and five year deferred taxation

The percentage change in non-farm land millage rates (NFMR) under a deferred system of taxation were derived from the basic components of Model Two and using the new TORT's derived from Model Five. This model, like its counterpart, Model Two, was used to formulate the percentage increases in millage rates as if a deferred system of taxation had been undertaken in the five study townships. Table 22 shows the percentage increases for both the plain and deferred systems of taxation. Only the theoretical use-value of $100 per acre is shown. Six year average increases for the higher use-value of $300 could not be used for either the three or five year deferred taxation models due to computational problems and the fact that equalization had been undertaken in the years 1965-1967 for the three townships of Chesterfield, Macomb, and Shelby. At $300 use-value per acre these were the only townships in which a deferred system of taxation was relevant, and then only for the years since equalization was established.

In all five townships, and at $100 use-value per acre, NFMR's for the non-farm land sector were increased at the varying levels of participation and at both levels of ten and twenty percent of farm land that would

TABLE 22

COMPARISON OF THE PERCENTAGE CHANGE IN NON-FARM MILLAGE RATES UNDER PLAIN USE-VALUE AND DEFERRED ASSESSMENT FOR ALL TOWNSHIPS USING SIX YEAR AVERAGES[a]

FUV[b]	$(P_2)^b$	$(P_3)^b$	NFMR PUV[b]	$(s)^b$	NFMR r=3[b]	NFMR r=5[b]	% Decrease NFMR r=3	% Decrease NFMR r=5
Chesterfield:								
$100	.25	1.00	0.91	.10	0.68	0.57	25.00	37.00
				.20	0.45	0.23	51.00	75.00
$100	.50	1.00	1.87	.10	1.40	1.19	25.00	36.00
				.20	0.94	0.50	50.00	73.00
$100	.75	1.00	2.89	.10	2.18	1.85	25.00	36.00
				.20	1.47	0.81	49.00	72.00
Lenox:								
$100	.25	1.00	1.17	.10	0.88	0.73	25.00	38.00
				.20	0.58	0.29	50.00	75.00
$100	.50	1.00	2.44	.10	1.85	1.56	24.00	36.00
				.20	1.26	0.68	48.00	72.00
$100	.75	1.00	3.82	.10	2.94	2.51	23.00	34.00
				.20	2.06	1.19	46.00	69.00
Macomb:								
$100	.25	1.00	2.52	.10	1.88	1.57	25.00	38.00
				.20	1.23	0.62	51.00	75.00
$100	.50	1.00	5.43	.10	4.10	3.46	24.00	36.00
				.20	2.77	1.50	49.00	72.00
$100	.75	1.00	8.82	.10	6.77	5.80	23.00	34.00
				.20	4.72	2.77	46.00	69.00
Shelby:								
$100	.25	1.00	0.44	.10	0.33	0.27	25.00	39.00
				.20	0.22	0.11	50.00	75.00
$100	.50	1.00	0.88	.10	0.66	0.55	25.00	38.00
				.20	0.44	0.22	50.00	75.00
$100	.75	1.00	1.34	.10	1.00	0.84	25.00	37.00
				.20	0.67	0.34	50.00	75.00

TABLE 22--CONTINUED

FUV[b]	$(P_2)^b$	$(P_3)^b$	NFMR PUV[b]	$(s)^b$	NFMR r=3[b]	NFMR r=5[b]	% Decrease NFMR r=3	% Decrease NFMR r=5
Washington:								
$100	.25	1.00	1.03	.10	0.78	0.66	24.00	36.00
				.20	0.53	0.28	49.00	73.00
$100	.50	1.00	2.12	.10	1.62	1.38	24.00	35.00
				.20	1.12	0.64	47.00	70.00
$100	.75	1.00	3.27	.10	2.54	2.18	22.00	33.00
				.20	1.80	1.09	45.00	67.00

[a]The years 1964-1969 were used to obtain these averages.

[b]These terms are defined as follows:

FUV = farm land use-value per acre.

P_2 = proportion of township farm land equalized valuation participating in deferred assessment.

P_3 = proportion of township non-farm land equalized valuation not participating in deferred taxation.

NFMR PUV = non-farm land millage rates under plain use-value assessment.

s = proportion of farm land participating in a deferred tax program.

NFMR r=3 = non-farm land millage rates under deferred assessment with three year "roll-back."

NFMR r=5 = non-farm land millage rates under deferred assessment with five year "roll-back."

participate in deferred taxation. However, while the NFMR's increased, they were less than under a plain use-value system of assessment. This is because under deferred taxation, a "penalty" is paid by farmers ceasing to participate and this "penalty," in the form of back taxes that become due, is added to the township budget. The more FRV added to the township coffers, the less increase in the NF or non-participating FMR's. Consequently, the millage rate increases in Table 22 are less at the twenty percent than at the ten percent level. Again, the millage rate increases are greatest in Macomb township, least in Shelby; or greatest in the more rural townships where a greater proportion of FEV to TOEV is evident. Because six year averages were used for all townships and FEV in each township is approximately the same (although TOEV differs) the percentage decreases within and between townships in the NFMR is fairly constant. The more rural townships have more of a percentage decrease from one percentage level of farm land participating in deferred taxation to the next higher level. Where FEV is a greater percentage of TOEV, and where the level of participation by farmers is greater in a deferred taxation program, the higher the NFMR increase. In the more rural townships, the more tax revenue is needed from the non-farm and non-participating farm sector, just as under plain use-value assessment. The percentage decreases in the NFMR, which are fairly

constant within and between townships, have some slight internal variation depending upon level of participation and amount of the tax penalty paid.

Model seven-percentage change in farm land revenue from the participating farm sector under three and five year deferred taxation

This model, just as Models Five and Six, which had their counterparts in Models One and Two of the plain use-value models, has as its counterpart Model Three of the plain use-value models. Again, the difference in this model from the plain use-value model was that the new TORT's derived in Model Five were used and, of course, the "roll-back" component was added. Model Seven was formulated to measure the change in revenue in that part of the farm land sector participating in deferred taxation. Again, six year averages were used to make comparisons between the plain use-value and deferred systems of taxation. Only six year averages at the selected use-value of $100 per acre are shown in Table 23 because of both township equalization affecting averages in the years 1964 and 1969 in all townships and also because of computational arrangement in the computer program as previously mentioned.

The figures in Table 23 show the percentage decreases in FRV that must be compensated for at the varying levels of participation by the non-participating farm

TABLE 23

COMPARISON OF PERCENTAGE CHANGE IN FARM LAND REVENUE FROM THE PARTICIPATING FARM SECTOR BETWEEN PLAIN USE-VALUE AND DEFERRED TAXATION USING SIX YEAR AVERAGES[a]

FUV[b]	(P_1)[b]	(P_2)[b]	FRV/PUV[b]	(s)[b]	FRV r=3[b]	FRV r=5[b]	% Decrease FRV r=3	% Decrease FRV r=5
Chesterfield:								
$100	.75	.25	-67.61	.10	-67.84	-67.96	0.34	0.52
				.20	-68.07	-68.30	0.68	1.02
$100	.50	.50	-66.69	.10	-67.15	-67.38	0.69	1.03
				.20	-67.61	-68.08	1.36	2.08
$100	.25	.75	-65.70	.10	-66.41	-66.76	1.08	1.61
				.20	-67.11	-67.82	2.15	3.23
Lenox:								
$100	.75	.25	-48.89	.10	-50.34	-50.58	0.90	1.38
				.20	-50.80	-51.27	1.82	2.77
$100	.50	.50	-47.97	.10	-48.88	-49.35	1.90	2.88
				.20	-49.79	-50.73	3.79	5.75
$100	.25	.75	-45.89	.10	-47.25	-47.95	2.96	4.49
				.20	-48.50	-50.01	5.69	8.98
Macomb:								
$100	.75	.25	-66.97	.10	-67.53	-67.81	0.84	1.25
				.20	-68.09	-68.65	1.67	2.51
$100	.50	.50	-64.48	.10	-65.53	-66.21	1.63	2.68
				.20	-66.79	-67.94	3.58	5.37
$100	.25	.75	-61.58	.10	-63.36	-64.24	2.89	4.32
				.20	-65.13	-66.89	5.76	8.62
Shelby:								
$100	.75	.25	-71.05	.10	-71.13	-71.16	0.11	0.15
				.20	-71.20	-71.28	0.21	0.32
$100	.50	.50	-70.74	.10	-70.90	-70.98	0.23	0.34
				.20	-71.05	-71.22	0.44	0.68
$100	.25	.75	-70.42	.10	-70.66	-70.82	0.34	0.57
				.20	-70.90	-71.15	0.68	1.04

TABLE 23--CONTINUED

FUV^b	$(P_1)^b$	$(P_2)^b$	FRV_{PUV}^b	$(s)^b$	$FRV_{r=3}^b$	$FRV_{r=5}^b$	% Decrease FRV r=3	% Decrease FRV r=5
Washington:								
$100	.75	.25	-41.97	.10	-42.33	-42.52	0.86	1.31
				.20	-42.69	-43.07	1.72	2.62
$100	.50	.50	-40.46	.10	-41.17	-41.54	1.75	2.67
				.20	-41.88	-42.63	3.51	5.36
$100	.25	.75	-38.87	.10	-39.91	-40.46	2.68	4.09
				.20	-41.00	-42.04	5.48	8.16

[a]The years 1964-1969 were used to obtain these averages.

[b]These terms are defined as follows:

FUV = farm land use-value per acre.

P_1 = proportion of township farm land equalized valuation not participating in deferred assessment.

P_2 = proportion of township farm land equalized valuation participating in deferred assessment.

FRV_{PUV} = farm land tax revenue under plain use-value assessment.

s = proportion of farm land participating in a deferred tax program.

$FRV_{r=3}$ = farm land tax revenue under deferred assessment with three year "roll-back."

$FRV_{r=5}$ = farm land tax revenue under deferred assessment with five year "roll-back."

sector and the non-farm sector in all five study townships. The percentage decreases are larger figures in the more urbanized township of Shelby and of course are the smallest in the more rural townships of Lenox and Washington. In the more urbanized township of Shelby, FEV as a percentage of TOEV is less although similar in dollar terms as in the other townships. In the more rural townships, where FEV and FRV constitute a greater percentage of TOEV and TORV, the greater the amount of farm land participation, the greater the amount of tax revenue needed from the other two sectors. Macomb township is again the exception. The greater the difference between FEV per acre and FUV per acre, the greater the amount of FRV needed from the non-farm and non-participating farm sectors in all five study townships.

At $100 use-value per acre, deferred taxation had less effect in Shelby township than either Lenox or Washington townships. The number of farmers ceasing to participate in deferred taxation in Shelby township had less overall effect also. This is because, even with the five year penalty payment of back taxes added to TORV, a smaller proportion of farm land was affected and FRV as a percentage of TORV was less. In both Lenox and Washington townships, the range in the percentage decreases between plain use-value and deferred taxation were much greater at all levels of farm land participation as well as in the number

of farmers ceasing to participate in deferred taxation. As previously stated, the greater the amount of farmers participating in a deferred taxation program, the greater the amount of tax revenue needed by the township from the other two sectors. Because deferred taxation creates revenue to the township from farmers ceasing to participate in the form of a penalty, the five year "roll-back" is more effective in the more rural townships. In the more rural townships, the five year deferred penalty will decrease the revenue needed from the other sectors by an average of roughly three percent over the three year penalty at the higher farm land participation level of seventy-five percent. As stated earlier, the effect in Shelby township amounts to a difference of less than one percent at this farm land participation level.

Model eight-percentage change in millage rates of participating farm land under three and five year deferred taxation

Model Eight, like Models Five, Six, and Seven, is basically derived from its counterpart in the plain use-value assessment models; the counterpart of this model is Model Four of the plain use-value models. The TORT's derived from Model Five were also used in conjunction with the two "roll-back" periods. Six year averages were again used, versus ten year averages in the plain use-value models, because of the data collection constraints for the

five year "roll-back" period earlier mentioned. Only the selected use-value of $100 per acre was analyzed because of county equalization and computer program design. In only three townships (Chesterfield, Macomb, and Shelby) was the selected use-value of $300 per acre relevant, and then only for the years 1967-1969. Table 24 shows comparisons in the millage rates of participating farm land (PFMR) under plain use-value and deferred taxation at $100 use-value per acre, for the three participation levels, the two proportions of farmers participating in deferred assessment, and using six year averages. Again PFMR's are important because this is the amount of $1000 of equalized valuation a property owner must pay in the farm sector. Under both plain use-value and deferred taxation, millage rates must increase in the non-participating farm sector and the non-farm sector to offset the loss of FRV from those farmers participating in use-value or deferred assessment. If TOEV is assumed constant, a decrease in PFMR's means an increase in non-farm millage rates and non-participating farm millage rates.

Table 24 shows that the effects of both plain and deferred use-value taxation will be greater in the more rural townships. As the level of participation increases, the effects of this type of taxation are felt even more. The percentage decreases are greatest in Lenox, closely followed by Macomb and Washington townships. In Shelby,

TABLE 24

COMPARISONS IN THE PERCENTAGE CHANGE IN THE MILLAGE RATES OF PARTICIPATING FARM LAND UNDER PLAIN USE-VALUE AND DEFERRED TAXATION USING SIX YEAR AVERAGES[a]

FUV[b]	(P_1)[b]	(P_2)[b]	MRPF PUV[b]	(s)[b]	MRPF r=3[b]	MRPF r=5[b]	% Decrease MRPF r=3	% Decrease MRPF r=5
Chesterfield:								
$100	.75	.25	-22.28	.10	-22.19	-22.39	-0.40	-0.49
				.20	-22.42	-22.49	-0.62	-0.92
$100	.50	.50	-21.98	.10	-22.13	-22.20	-0.68	-0.99
				.20	-22.28	-22.42	-1.35	-1.96
$100	.25	.75	-21.68	.10	-21.89	-22.00	-0.96	-1.45
				.20	-22.11	-22.43	-1.94	-3.34
Lenox:								
$100	.75	.25	-15.14	.10	-15.28	-15.35	-0.92	-1.37
				.20	-15.42	-15.56	-1.82	-2.70
$100	.50	.50	-14.56	.10	-14.83	-14.97	-1.82	-2.74
				.20	-15.11	-15.38	-3.64	-5.33
$100	.25	.75	-13.91	.10	-14.33	-14.53	-2.93	-4.27
				.20	-14.74	-15.15	-5.63	-8.18
Macomb:								
$100	.75	.25	-23.89	.10	-24.09	-24.18	-0.83	-1.20
				.20	-24.28	-24.47	-1.61	-2.37
$100	.50	.50	-23.01	.10	-23.42	-23.61	-1.75	-2.54
				.20	-23.82	-24.21	-3.40	-4.96
$100	.25	.75	-22.00	.10	-22.61	-22.92	-2.70	-4.01
				.20	-23.24	-23.84	-5.34	-7.72
Shelby:								
$100	.75	.25	-29.21	.10	-29.24	-29.26	-0.10	-0.17
				.20	-29.27	-29.31	-0.20	-0.34
$100	.50	.50	-29.09	.10	-29.15	-29.18	-0.21	-0.31
				.20	-29.21	-29.27	-0.41	-0.61
$100	.25	.75	-28.96	.10	-29.06	-29.11	-0.34	-0.52
				.20	-29.15	-29.25	-0.65	-0.99

TABLE 24--CONTINUED

FUV[b]	$(P_1)^b$	$(P_2)^b$	MRPF PUV[b]	$(s)^b$	MRPF r=3[b]	MRPF r=5[b]	% Decrease MRPF r=3	% Decrease MRPF r=5
Washington:								
$100	.75	.25	-16.75	.10	-16.89	-16.96	-0.83	-1.24
				.20	-17.03	-17.17	-1.64	-2.45
$100	.50	.50	-16.16	.10	-16.44	-16.57	-1.70	-2.47
				.20	-16.71	-16.99	-3.29	-4.89
$100	.25	.75	-15.54	.10	-15.94	-16.15	-2.51	-3.78
				.20	-16.35	-16.75	-4.95	-7.22

[a]The years 1964-1969 were used to obtain these averages.

[b]These terms are defined as follows:

FUV = farm land use-value per acre.

P_1 = proportion of township farm land equalized valuation not participating in deferred assessment.

P_2 = proportion of township farm land equalized valuation participating in deferred assessment.

MRPF PUV = millage rate of participating farm land under plain use-value assessment.

s = proportion of farm land participating in a deferred tax program.

MRPF r=3 = millage rate of participating farm land under deferred assessment with three year "roll-back."

MRPF r=5 = millage rate of participating farm land under deferred assessment with five year "roll-back."

the township with the least amount of farm land to participate and the greatest percentage of its TOEV and TORV coming from the urban sector, the percentage decreases in farm land millage rates at the highest level of participation are still less than one percent even with a five year "roll-back" penalty of 100 percent of back taxes due for farmers ceasing to participate in deferred taxation. In the more rural townships, the percentage decreases are greater the higher the level of participating farm land and the "roll-back" period or the fewer farmers participating in a deferred tax program, but are less than under plain use-value assessment. In Lenox township, there is a decrease of over eight percent where the five year "roll-back" penalty is used, seventy-five percent of farm land is participating, and only twenty percent of the farmers are participating in a deferred tax program. The effect of deferred taxation in PFMR's is not as noticeable at the lower levels of participation but increases considerably if more farmers participated in deferred taxation.

Comparison of Market Sales Data with Assessed or Equalized Valuations per Acre from the Sample Units for Selected Years

Only a limited comparison could be made in the analysis of the effectiveness of either plain use-value or deferred taxation as compared to the market price per

acre for farm land in the study townships. Very little actual sales data were available concerning the market value of agricultural land in Macomb County. The County Board of Equalization, in 1969, had just one appraisal report representing one sample farm for equalization purposes. The only source of sales data located was the Federal Land Bank Association located in Richmond, Michigan. Even the sales data from this source were extremely limited because their records were not complete. Their sales data for the years prior to 1965 had been destroyed, and the sales data for the years 1965 to the present did not represent every sale of farm land in Macomb County. The sales data collected from this source did not necessarily represent loans made from their office to purchase land, but was rather a collection of sales that they knew about and had kept records on for business purposes.

Using this limited sales data, comparisons were made by legal section with the sample observation units drawn for the purpose of this study. Only sample units from those legal sections found in the sales data were used and then only for specific years. In some cases, there were no sample units that had been randomly drawn to compare with sales data for specific legal sections. Assessed valuations were used in the sample units if equalization had not yet been undertaken in a specific township which was usually the case in 1965. Sample units

from both the farm improved and farm vacant strata were also included if they were available. Table 25 shows the market sales data collected from the Federal Land Bank Association in comparison with sample assessed valuations or equalized valuations on a per acre basis for the legal sections that sales data was available for.

In comparing the sales or the market price of agricultural land on a per acre basis in the study townships, the market price in all townships was much greater than not only the assessed valuation but also the equalized valuations as well in those sections where comparisons could be made. The highest sale price per acre was $3,035 in Shelby township, closely followed by a sale in Macomb township of $3,000 per acre. The highest individual sale in Washington, Chesterfield, and Lenox townships per acre was $2,848, $2,381, and $1,250, respectively. The highest assessed valuation per acre was $350 in Washington township and the highest equalized valuation per acre was in Lenox where it was $850 per acre. The lowest sale or market price paid per acre for agricultural land was $489 in Macomb township. It is interesting to note that in all townships, the highest assessed or equalized valuations recorded are from census units in the sample frame which means that these particular valuations per acre are in the upper five percent of all observations in the respective sample frames for these townships. In most sections and

TABLE 25

LEGAL SECTION COMPARISON BETWEEN MARKET SALES DATA AND ASSESSED OR EQUALIZED VALUATIONS OF SAMPLE UNITS

Legal Section	Year of Sale	Sales Data (SD) or Sample Unit (SU)	Acreage	Classification[a]	Primary Stratum of Sample Units[a]	Purchase Price (PP), Assessed Valuation, (AV), or Equalized Valuation (EV) (Dollars)	Sales Price, AV or EV Per Acre (Dollars)
Chesterfield:							
3	1965	SD	80	Unk.	T	45,000 (PP)	563
3	1965	SU	40	FI	T	4,200 (AV)	150
4	1965	SD	16	FV	T	11,000 (PP)	688
4	1965	SU	78	FI	T	4,800 (AV)	61
4	1965	SU	5	FV	T	300 (AV)	60
4	1965	SU	6	FV to Re	T	---	---
4	1965	SD	10	FI	T	17,000 (PP)	1,700
5	1965	SD	80	FI	T	42,500 (PP)	531
5	1965	SU	20	FI	T	2,000 (AV)	100
5	1965	SU	41	FI	T	3,500 (AV)	85
6	1965	SD	10	FI	R	19,000 (PP)	1,900
6	1967	SD	13	Unk.	R	25,900 (PP)	2,000
6	1965	SU	119	FI	R	8,300 (AV)	70
6	1967	SU	119	FI	R	25,500 (EV)	214
6	1965	SU	36	FI	R	4,700 (AV)	130
6	1967	SU	36	FI	R	14,100 (EV)	391
6	1965	SU (C)[b]	10	FV	R	1,600 (AV)	160
6	1967	SU (C)[b]	10	FV	R	4,800 (EV)	480

TABLE 25--CONTINUED

Legal Section	Year of Sale	Sales Data (SD) or Sample Unit (SU)	Acreage	Classification[a]	Primary Stratum of Sample Units[a]	Purchase Price (PP), Assessed Valuation, (AV), or Equalized Valuation (EV) (Dollars)	Sales Price, AV or EV Per Acre (Dollars)
9	1965	SD	20	FI	T	22,500 (PP)	1,125
9	1965	SD	10	FV	T	9,000 (PP)	900
9	1965	SU (C)[b]	30	FI to Re	T	---	---
9	1965	SU (C)[b]	6	FI	T	2,400[c] (AV)	400
9	1965	SU	10	FI	T	3,000 (AV)	300
9	1965	SU	12	FV	T	1,800 (AV)	150
14	1969	SD	40	Unk.	R	65,000 (PP)	1,625
14	1969	SU (C)[b]	16	FI	R	10,500 (EV)	656
14	1969	SU[d]	58	FV	R	24,900 (EV)	429
18	1966	SD	71+	FI	T	71,120 (PP)	1,000
18	1966	SU	15	FI	T	3,500 (AV)	233
18	1966	SU (C)[b]	9	FI to Re	T	---	---
18	1966	SU	50	FV	T	3,000 (AV)	60
18	1966	SU (C)[b]	9	FV to Re	T	---	---
21	1969	SD	21	Unk.	U	50,000 (PP)	2,381
21	1969	SU	24	FV to Re	U	---	---
21	1969	SU (C)[b]	7	FI to Re	U	---	---
21	1969	SU (C)[b]	10	FV to B	U	---	---
Lenox:							
24 and 25	1970	SD	134	Unk.	R	166,470 (PP)	1,242
24	1969	SU (C)[b]	10	FI	R	8,500 (EV)	850

TABLE 25--CONTINUED

Legal Section	Year of Sale	Sales Data (SD) or Sample Unit (SU)	Acre-age	Classification[a]	Primary Stratum of Sample Units[a]	Purchase Price (PP), Assessed Valuation, (AV), or Equalized Valuation (EV) (Dollars)	Sales Price, AV or EV Per Acre (Dollars)
25	1969	SU (C)[b]	10	FI	R	12,500 (EV)	1,250
25	1969	SU (C)[b]	11	FV	R	2,600 (EV)	236
25	1969	SD	20	FV	R	15,000 (PP)	750
34	1968	SD	60	Unk.	U	60,000 (PP)	1,000
34	1968	SU	40	FI	U	9,000 (EV)	225
35	1969	SD	80	Unk.	T	100,000 (PP)	1,250
Macomb:							
5	1966	SD	80	FI	R	68,000 (PP)	850
5	1965	SD	40	FI	R	32,000 (PP)	800
6	1965	SD	10	FI	T	23,500 (PP)	2,350
6	1966	SD	56.5	FI	T	56,500 (PP)	1,000
6	1966	SU	56.5	FI	T	15,000 (EV)	265
6	1966	SU (C)[b]	5	FV to Re	T	---	---
8	1969	SD	60	Unk.	T	98,750 (PP)	1,646
8	1969	SU (C)[b]	6	FV to Re	T	---	---
8	1969	SU (C)[b]	6	FI to Re	T	---	---
13	1969	SD	10	Unk.	T	30,000 (PP)	3,000
13	1969	SU (C)[b]	5	FI to Re	T	---	---
16	1966	SD	20	Unk.	R	20,000 (PP)	1,000

TABLE 25--CONTINUED

Legal Section	Year of Sale	Sales Data (SD) or Sample Unit (SU)	Acreage	Classification[a]	Primary Stratum of Sample Units[a]	Purchase Price (PP), Assessed Valuation, (AV), or Equalized Valuation (EV) (Dollars)	Sales Price, AV or EV Per Acre (Dollars)
17	1965	SD	138	FI	T	67,500 (PP)	489
17	1965	SU	20	FI	T	2,800 (AV)	140
17	1965	SU (C)[b]	5	FI to Re	T	---	---
17	1965	SU (C)[b]	10	FI	T	3,700 (AV)	370
17	1965	SU (C)[b]	5	FI to Re	T	---	---
18	1965	SD	20	Unk.	U	14,000 (PP)	700
18	1965	SD	20	Unk.	U	18,000 (PP)	900
24 and 25	1966	SD	195	FV	U	209,425 (PP)	1,074
24	1966	SU (C)[b]	5	FI to Re	U	---	---
25	1966	SU (C)[b]	6	FI to Re	U	---	---
26	1966	SD	16	FI	U	46,857 (PP)	2,930
26	1966	SU	16	FV	U	4,000 (EV)	250
27	1965	SD	20	Unk.	R	12,500 (PP)	625
29	1965	SD	13	FI	T	12,000 (PP)	923
29	1966	SD	30	FI	T	30,000 (PP)	1,000
29	1965	SD	79	FI	T	83,500 (PP)	1,057
29	1965	SU	20	FI	T	2,000 (AV)	100
29	1965	SU (C)[b]	6	FI to Re	T	---	---
29	1965	SU	15	FI	T	3,000 (AV)	200

TABLE 25--CONTINUED

Legal Section	Year of Sale	Sales Data (SD) or Sample Unit (SU)	Acreage	Classification[a]	Primary Stratum of Sample Units[a]	Purchase Price (PP), Assessed Valuation, (AV), or Equalized Valuation (EV) (Dollars)	Sales Price, AV or EV Per Acre (Dollars)
31	1965	SD	60	Unk.	T	60,000 (PP)	1,000
Shelby:							
2	1969	SD	37	Unk.	R	37,000 (PP)	1,000
2	1969	SU (C)[b]	10	FI to Ut	R	---	---
2	1969	SU	35	FI	R	15,330 (EV)	438
13	1965	SD	40	Unk.	R	48,000 (PP)	1,200
13	1965	SD	38	FI	R	57,000 (PP)	1,500
13	1965	SU	24	FI	R	4,400 (AV)	183
13	1965	SU (C)[b]	20	FI	R	5,500 (AV)	275
13	1965	SU	39	FI	R	3,500 (AV)	89
13	1965	SU	20	FV	R	1,300 (AV)	65
23	1965	SD	14	Unk.	R	28,500 (PP)	2,035
23	1966	SD	30	Unk.	R	30,000 (PP)	1,000
23	1966	SD	37	Unk.	R	37,000 (PP)	1,000
23	1965	SU	17	FV	R	1,500 (AV)	88
23	1966	SU	17	FV	R	4,200 (EV)	305
23	1965	SU	22	FI	R	2,750 (AV)	125
23	1966	SU	22	FI	R	7,700 (EV)	350
23	1965	SU (C)[b]	20	FI to Re	R	---	---
24	1965	SD	20	Unk.	R	14,500 (PP)	725
24	1966	SD	60	Unk.	R	60,000 (PP)	1,000

TABLE 25--CONTINUED

Legal Section	Year of Sale	Sales Data (SD) or Sample Unit (SU)	Acreage	Classification[a]	Primary Stratum of Sample Units[a]	Purchase Price (PP), Assessed Valuation, (AV), or Equalized Valuation (EV) (Dollars)	Sales Price, AV or EV Per Acre (Dollars)
24	1965	SU	28	FI	R	2,000 (AV)	71
24	1966	SU	28	FV	R	5,600 (EV)	300
35	1965	SD	20	FI	R	40,000 (PP)	2,000
35	1965	SU	20	FI	R	3,300 (AV)	165
35	1965	SU	20	FI	R	3,000 (AV)	150
35	1965	SU (C)[b]	40	FI	R	6,050 (AV)	151
35	1965	SU (C)[b]	19	FI	R	4,300 (AV)	226
36	1965	SD	14	Unk.	R	42,500 (PP)	3,035
36	1965	SU	39	FI	R	3,950 (AV)	101
36	1965	SU	22	FI	R	3,850 (AV)	175
36	1965	SU (C)[b]	20	FI	R	6,500 (AV)	325
Washington:							
10	1965	SD	20	FV	R	10,000 (PP)	500
18	1966	SD	42	Unk.	U	30,000 (PP)	714
18	1966	SU	30	FI	U	4,500 (AV)	150
18	1966	SU	136	FV	U	7,000 (AV)	51
18	1966	SU	7	FV to Re	U	---	---
21	1965	SD	60	FI	R	42,000 (PP)	700
21	1965	SU (C)[b]	50	FI	R	22,500 (AV)	450

TABLE 25--CONTINUED

Legal Section	Year of Sale	Sales Data (SD) or Sample Unit (SU)	Acre-age	Classifi-cation[a]	Primary Stratum of Sample Units[a]	Purchase Price (PP), Assessed Valuation, (AV), or Equalized Valuation (EV) (Dollars)	Sales Price, AV or EV Per Acre (Dollars)
28	1965	SD	40	FI	R	40,000 (PP)	1,000
28	1965	SU	40	FV	R	1,800 (AV)	45
32	1970	SD	158	Unk.	U	450,000 (PP)	2,848
34	1966	SD	20	FI	T	45,000 (PP)	2,250
35	1965	SD	135	Unk.	T	73,000 (PP)	541
35	1965	SU	25	FI	T	2,900 (AV)	116
35	1965	SU	80	FI	T	4,800 (AV)	60
35	1965	SU	16	FV	T	900 (AV)	56

Source: Federal Land Bank Association Office, Mr. Fred H. Gaeth (Manager), Richmond, Michigan

[a]These symbols are defined as follows:

Unk. = unknown
FI = farm improved
FV = farm vacant
Re = residential
B = business
Ut = utility
T = transitional
R = rural
U = urban

[b]SU (C) is defined as sample unit-census observation.

[c]Exemption due to hardship case and assessed valuation from 1961.

most townships, the lowest sale price per acre was much greater than the highest assessed or equalized valuation, even taking into consideration that assessment ratios are a percentage of market price. There was no obvious pattern as to locational effects on market price. In the sample design each legal section was placed in either an urban, transitional, or rural strata. The highest sale price per acre of $3,035 was located in the rural stratum of Shelby; Macomb's individual high market price was in a transitional stratum, and Washington's was in the urban stratum. In some cases, a degree of urbanization could be observed by the changing classifications of the sample units in a legal section. These are the sample units with assessed or equalized valuations in Table 25 (e.g., FV to Re).

In Chesterfield, the highest sale price of $2,381 per acre for agricultural land was in a legal section where the land in one of the random sample observation units was converted to residential land before 1969. The other two census observations existing for this section not only were in the upper five percent of the assessed valuations per acre in the sample frame, but also changed use. This section had also been placed in the urban stratum. These varying indicators perhaps partially explain the high purchase price paid per acre for farm land in this legal section. Lenox township's highest market value per acre unfortunately was in a legal section for

which no sample observation was available. In Macomb township there was only one census observation unit for comparison purposes with the high market price paid of $3,000 per acre. This census unit had changed classification and hence use before 1969. This was also a transitional stratum in 1960 which may not be true at the present time. Shelby township presented a paradox. While it had the highest sale price per acre, the two random sample observations available for comparison had low assessed valuations per acre. The one census unit available had only an assessed valuation of $325 per acre. Section 36 was also one of the few rural sections contained in this township in 1960. No sample or census observations existed for comparison in Washington township where the market price per acre was third highest of the five study townships. Section 32 was one of the legal sections that, because of the indicators of urbanization mentioned in Chapter III, had been placed in the urban stratum.

Table 26 was constructed using selected sales data entries from Table 25 that had both sales price data and an observation unit in the same legal section to determine assessment ratios on a sectional basis. Because of the limited amount of sales data existing for Lenox township, no comparisons could be made for any one legal section for all five of the study townships. For those sections where more than one sale had taken place or more than one random or

TABLE 26

ASSESSMENT RATIOS FOR SELECTED LEGAL SECTIONS IN THE STUDY TOWNSHIPS

Legal Section	Year	Market Price Per Acre (Dollars)	Assessed or Equalized Valuation (AV or EV) Per Acre (Dollars)	Conversion to EV Using Township Equalization Factor (Dollars)	Assessment Ratio
Chesterfield:					
3	1965	563	150 (AV)	402	71.40
4	1965	1,700	61 (AV)	164	9.65
5	1965	531	100 (AV)[a]	267	50.47
6	1965	1,900	160 (AV)[a]	429	22.58
6	1967	2,000	480 (EV)[a]	---	24.00
9	1965	1,125	400 (AV)[a]	1,072	95.29
14	1969	1,625	656 (EV)[a]	---	40.37
18	1966	1,000	233 (AV)	625	62.50
Lenox:					
25	1969	1,250	1,250 (EV)	---	---
34	1968	1,000	225 (EV)	---	22.50
Macomb:					
6	1966	1,000	265 (EV)[a]	---	26.50
17	1965	489	370 (AV)[a]	1,131	231.29
26	1966	2,930	250 (EV)	---	8.53
29	1965	1,057	200 (AV)	611	57.81
Shelby:					
2	1969	1,000	438 (EV)[a]	---	43.80
13	1965	1,500	275 (AV)[a]	1,010	67.33
23	1965	2,035	125 (AV)	459	22.56
23	1966	1,000	350 (EV)	---	35.00
24	1965	725	71 (AV)	261	36.00
24	1966	1,000	300 (EV)[a]	---	30.00
35	1965	2,000	226 (AV)[a]	830	41.50
36	1965	3,035	325 (AV)[a]	1,193	39.31
Washington:					
18	1966	714	150 (AV)	534	74.79
21	1965	700	450 (AV)	1,627	232.43
28	1965	1,000	45 (AV)	163	16.30
35	1965	541	116 (AV)	419	77.45

[a]Denotes census observation in the sample frame.

census sample existed, the highest assessed or equalized valuation per acre, along with the highest sale price per acre were used to derive the assessment ratios. This had the effect of showing the variation in assessment practice as well as the probable under-assessment of farm land. Assessed valuations for the sample units in the years prior to 1966-1967 (depending upon the township) were converted to equalized valuation using the equalization factors derived for the formation of estimates in Chapter III.

Generally, no set pattern could be determined from the data taken from all the existing sales data that was used to determine assessment ratios. In many cases the assessment ratio was less than fifty percent which would indicate under-assessment of properties in those legal sections and those townships in which this was the case. However, there were several legal sections where the assessment ratios were very high. This may have been caused by the conversion of FAV to FEV. Both section 17 in Macomb township and section 21 in Washington township had assessment ratios of over two hundred percent. The lowest assessment ratio was also found in Macomb township in section 26. While it is difficult to determine if property is under-assessed in the study townships, this data does seem to indicate that there is a wide variation in property assessment for tax purposes in all legal sections, all strata, and in all five townships.

CHAPTER VI

SUMMARY, POLICY IMPLICATIONS, AND RECOMMENDATIONS FOR FUTURE STUDY

Summary

This study constitutes one segment of a study undertaken by the Michigan State University Agricultural Experiment Station to investigate the changes brought about in agricultural land use created by the urbanization of southern Michigan. Land undergoing the change from agricultural or rural to urban use in this process of urbanization creates many problems. One of the most serious problems created is upon local governmental finance and taxation because urban residents demand more governmental goods and services than those normally prevailing in an agrarian setting.

Property taxes, the bulwark of local governmental finance at this level, must increase to meet the urban and suburban demands for increased governmental goods and services. Coupled with rising property taxes, land speculation and scatterization patterns in land use develop. All of these factors have an immediate effect upon the farm operator actively engaged in farming in the

rural-urban fringe. This farmer in this area of rural-urban transitional land-use is caught in a cost-price squeeze that only ends when he has sold or changed the use to which his land has been put in the past and to which his land is currently put, that is, the production of farm products for sale in a commercial market. Many states, in attempting to solve the dilemma of this change taking place in the rural-urban fringe and in order to retain land in agricultural use or hold it for open space or recreational use have passed what has come to commonly be called use-value legislation.

This study had as its major objective an investigation of the possible effects the two most common types of use-value legislation would have had on local property taxation and finance in a state that does not have, but is currently contemplating this type of legislation. This major objective was investigated using randomly drawn samples of both vacant and improved farm land from the property tax assessment rolls in five selected townships in Macomb County for the years 1960-1969. Census samples were also analyzed for those sample units where the farm land assessed valuations per acre were equal to or above ninety-five percent, or two standard deviations, of the assessed valuations per acre in the sample frame. Data were collected and simulation models were formulated to analyze not only the present ad valorem system of taxation

but the two most common use-value assessment systems which are referred to as plain and deferred or "roll-back" use-value taxation.

Using a basic simulation model with several modifications and with the aid of the CDC 6500 computing system, township tax rates (TORT), farm land tax revenue (FRV), and millage rates for both the farm land sector (PFMR) and non-farm land sector (NFMR) under both plain and deferred or "roll-back" taxation were analyzed as if Chesterfield, Lenox, Macomb, Shelby, and Washington townships in Macomb County had had this type of property taxation in the years 1960-1969.

In order to investigate more fully the effects of this type of property taxation in these five study townships, each township was divided into a non-farm land sector that could not have participated (P_3), a farm land sector that would have participated (P_2), and a farm land sector that would not have participated (P_1) in plain or deferred taxation. Three hypothetical farm land use-values of $100, $300, and $500 per acre were selected as well as three farm land equalized valuation (FEV) participation levels of twenty-five, fifty, and seventy-five percent. Two proportions of ten and twenty percent of farm land equalized valuation as well as two "roll-back" periods of farm land equalized valuation were selected for use with the deferred taxation models.

Under the present ad valorem system of taxation, analysis revealed that in the ten year time period studied, total township equalized valuation (TOEV) had increased in all townships studied from a low of fifteen percent in Lenox to a high of 111 percent in Chesterfield. Total township equalized valuation increased considerably in all townships which would appear to indicate a greater demand for as well as more increased township governmental goods and services in 1969 than in 1960. Non-farm land equalized valuation (NFEV) increased much more in relation to total township equalized valuation (TOEV) than did farm land equalized valuation (FEV) in all townships in this same time period. This would indicate that the urban or non-farm land sector of each township was being assessed at a higher level to provide governmental goods and services than in the farm land sector.

Even in the more rural townships, both non-farm land tax revenue (NFRV), as well as non-farm land equalized valuation, increased more percentage-wise than their respective counterparts, farm land tax revenue and farm land equalized valuation. The township tax rate increased the most in Shelby, the least in Lenox. The larger township tax rate in Shelby would again seem to indicate a greater expenditure for township goods and services.

Shelby had the greatest percentage decrease in farm land acreage (FAC) over the ten year study period as

well as the smallest total amount of farm land acreage of the study townships. In terms of land use, one could assume that Shelby township was not only the most rapidly urbanizing of the five townships in the ten year study period but the most urban of the five townships studied as well.

In the analysis, Macomb township had the largest dollar amount of farm land equalized valuation and farm land tax revenue, as well as the largest amount of farm land equalized valuation and farm land tax revenue relative to total township equalized valuation and total township tax revenue of all townships studied. This township, however, could not be considered the most rural in terms of these variables. Depending upon the variables used, this township was in many respects the most rural but also the most transitional of the townships studied. Using all indicators that were investigated, Lenox or Washington township were the two most rural of the townships studied.

In the investigation of the possible effects use-value may have had on the five study townships in the years 1960-1969, two series of models were formulated. The first series of models dealt with the ramifications of plain use-value assessment; the second series with deferred taxation assessment using both a three and five year "roll-back" period. This "roll-back" component or variable, with modifications, became the basic difference in the two

series of models. Because of the large amount of data generated by the computer, as well as time constraints of trying to analyze the models on a year by year basis, ten year averages were used for analytical purposes for both the plain and deferred models.

To investigate plain use-value assessment, four models were formulated. The first model, Model One, investigated the percentage changes in total township tax rates brought about by plain use-value assessment. Under plain use-value assessment, total township tax rates increased for both the farm land and non-farm land sectors in all five townships. The greatest increase in the township tax rates were in the more rural townships where farm land equalized valuation as a percentage of total township equalized valuation was greatest. The higher the level of farm land equalized valuation participation, the greater the percentage increase in township tax rates at the selected use-value of $100 per acre. Macomb township had the highest township tax rate increases at all levels of participation, Shelby the lowest. In Shelby, farm land equalized valuation as a percent of total township equalized valuation is small and the total township equalized valuation was approximately three times as great compared to the other four townships. The increased tax rate, consequently, is spread among more property taxpayers. In the more rural townships, participating farmers in plain

use-value assessment would probably prefer both a lower level of participation as well as a low theoretical use-value because of the more rapid increase in township tax rates in the rural townships as the participation of farm land equalized valuation increased. In only two townships could the theoretical $300 use-value per acre be analyzed. This use-value per acre may not have been unrealistic in terms of farm land equalized valuation, but due to sample design and computer program structure could not be accurately evaluated.

Model Five, the counterpart of Model One, analyzed township tax rates under three and five year deferred taxation. While township tax rates increased in all townships under plain use-value assessment for all sectors in each township, the increased township tax rates were less under three year deferred taxation and even less under five year deferred taxation as compared to ad valorem assessment. This was due to the fact that farm land tax revenue, with a one hundred percent "roll-back" from those farmers ceasing to participate in deferred taxation was returned to the township tax coffers as tax revenue which in turn reduced the compensation needed from the non-participating farm land sector and the non-farm land sector. This in turn reduced deferred assessment township tax rates. Generally, the more rural the township, the higher the level of farm land equalized valuation

participating, and the proportion of farm land equalized valuation participating in deferred taxation, the greater the reduction in township tax rates. In the more urban township of Shelby, the percentage decrease in the township tax rates was not as great as in the more rural townships at any level of participation.

The second plain use-value model investigated the percentage change in non-farm land millage rates. The effects of plain use-value assessment in the model followed the same general pattern as in Model One. At the use-value of $100 per acre, the non-farm land millage rates increased at all levels of participation. The millage rate increases in the non-farm land sector of Shelby township were lowest, again because there was less farm land equalized valuation relative to total township equalized valuation and less farm land to participate in use-value assessment at even the highest participation level as compared to the other four townships. Macomb township again had the highest millage rates in the non-farm land sector because the more farm land equalized valuation participating in plain use-value assessment, the greater the tax burden placed upon the non-farm land and non-participating farm land sectors. Because millage rates are the amount per $1,000 of equalized valuation a property owner must pay, a hypothetical example of a property with a market value of $20,000 showed the increases in the

non-farm land owner's tax bill brought about at $100 use-value per acre at all levels of participation. The tax assessment for the property tax owner was highest in Shelby township under ad valorem taxation and at the twenty-five percent level of farm land equalized valuation participation under plain use-value assessment. At the highest level of farm land equalized valuation participation, seventy-five percent, the property owner in Macomb township had the largest property tax bill.

Model Six investigated non-farm land millage rates under both three and five year deferred taxation. Non-farm land millage rates under deferred taxation increased in all townships, but like the township tax rates under deferred taxation, were less than under plain use-value assessment. The lower non-farm land millage rates were the result of farm land tax revenue being recombined with total township equalized valuation and the township budget. The more farm land tax revenue added to the township coffers from essentially penalty payments from back taxes coming due from farmers ceasing to participate in use-value assessment, the greater the decrease in the non-farm land millage rates. Consequently, non-farm land millage rate increases are less at the twenty than the ten percent proportion of farm land equalized valuation. The millage rate increases were greatest in Macomb township, least in Shelby; or greatest in the more rural

townships where a greater proportion of farm land equalized valuation to total township equalized valuation was evident. The percentage decreases were fairly constant. The more rural townships had a greater percentage decrease from one percentage level of farm land equalized valuation participation to the next. Again, the range in non-farm land millage rate decreases was greater at any one participation level of farm land equalized valuation in the more rural townships.

Model Three investigated the percentage change in farm land tax revenue under plain use-value assessment. Again only the use-value of $100 per acre was relevant to the analysis in both this model and its counterpart, Model Six, under deferred taxation. At $100 use-value per acre, there was a loss in tax revenue in all townships and at all three levels of farm land equalized valuation participation that had to be compensated for by the other two sectors in each township, the non-participating farm land sector and the non-farm land sector. The loss of farm land tax revenue was highest in the more rural township of Washington, least in the most urban, Shelby. This loss of farm land tax revenue in Washington was greatest because the more rural the township, the more critical effect on the township budget of the revenue derived from the farm land sector. Shelby township had less farm land tax revenue as a percentage of total township tax revenue just as

it did farm land equalized valuation as a percentage of total township equalized valuation, but the loss of farm land tax revenue from the participating farm land sector of course created the largest percentage decreases. Macomb township had the largest percentage of farm land tax revenue to total township tax revenue and the second largest percentage decreases in farm land tax revenue at $100 use-value per acre assessment. At the theoretical use-value of $300 per acre, the amount of compensation needed for the loss in farm land tax revenue was less in the non-participating and non-farm land sectors of Macomb.

Model Seven became the counterpart of Model Three. Model Seven analyzed the changes in farm land tax revenue under three farm land equalized valuation participation levels, two proportions of farm land equalized valuation participating in deferred taxation, and three and five year deferred taxation "roll-back" periods. At the use-value of $100 per acre, deferred taxation had less effect in Shelby township than in the more rural townships of Lenox or Washington. The number of farmers either participating or ceasing to participate in deferred taxation had less overall effect also. Even with a five year roll-back of farm land tax revenue added to total township tax revenue, a smaller proportion of farm land equalized valuation was affected and farm land tax revenue as a percentage of total township tax revenue was less. In the

more rural townships of Lenox and Washington, the range in the percentage decreases between plain use-value and deferred taxation were greater at all levels of participation. The five year roll-back would also appear to be more effective in the more rural townships. It is in the more rural townships, however, where undoubtedly a greater percentage of farmers would participate in use-value assessment anyway.

The last plain use-value model formulated and analyzed was the percentage change in millage rates of participating farm land. The highest percentage decreases in the participating farm land millage rates were again, of course, in the participating farm land sector of Shelby township, followed by Macomb, Chesterfield, Washington, and Lenox where twenty-five percent of farm land equalized valuation participated in plain use-value assessment. The percentage decrease in participating farm land millage rates increased as farm land equalized valuation increased. The greater the participation levels in the townships, the less advantageous it is to farmers already participating in the more rural townships. At $300 use-value per acre, use-value assessment is still less than farm land equalized valuation in three townships, but the percentage decreases in participating farm land millage rates were much less and with the participating farmers in Macomb township still having sizeable decreases in their millage rates.

It was interesting to note that there is really not much of a range between participation levels at any one selected use-value level, but there was a substantial difference between the selected use-value of $100 per acre and $300 per acre in all four plain use-value models. This would lead one to believe that in any of the five study townships, the participating rate or level of farm land equalized valuation participating in use-value assessment was not as critical a factor as the selected use-value under which participating farmers would operate. A sensitivity analysis was run on all four plain use-value models and this assumption was verified because the relative ranges between the three use-values selected was far greater than the differences using the two extreme participation levels of twenty-five and seventy-five percent and holding use-value as a constant.

Model Eight was the last of the deferred taxation models and also the counterpart of Model Four of the plain use-value models. If total township equalized valuation again was assumed constant, then the greater the decrease in farm land tax revenue from the particips ting farm sector, the greater the increase in non-farm land millage rates. Under deferred taxation, the higher the level of farm land equalized valuation and the greater the proportion of farm land equalized valuation participating, the greater the increase in the non-farm land millage rates

and the less decrease in participating farm land millage rates. The percentage decreases in the participating farm land millage rates are greatest in Lenox township, closely followed by Macomb and Washington townships. In Shelby, the township with the least amount of farm land to participate and the greatest percentage of its total township equalized valuation and total township tax revenue coming from the urban sector, the percentage decreases in participating farm land millage rates at the highest level of farm land equalized valuation participation are still less than one percent with a five year "roll-back" penalty of one hundred percent. The effect of deferred taxation was greatest in Lenox township where there was a decrease of over eight percent using the five year "roll-back," at the seventy-five percent participation level, and only twenty percent of the farmers are participating in a deferred tax program.

In all townships, and in all models, deferred taxation reduced the cost to farmers not participating in use-value assessment or in the non-farm sector of each township which could not participate. This assumes that the three and five year "roll-back" represented a penalty payment for farmers ceasing to participate in use-value assessment. The farm land tax revenue collected from the farmer leaving a deferred taxation program would logically be returned to the township tax coffers. Generally

speaking, for all townships, the decrease in township tax rates and non-farm land millage rates brought about by deferred taxation was not so great. The interesting argument against deferred taxation was not that it was a worse alternative to plain use-value assessment. At least under deferred taxation, a penalty in the form of back taxes due was imposed upon farmers ceasing to participate in deferred taxation. The author's argument against either type of use-value assessment was strengthened by comparison of limited sales data compared with equalized valuations under the existing ad valorem system of taxation and an investigation of assessment sales ratios and selling prices of farm land for selected years and in selected legal sections within each township. The effectiveness of any type of use-value assessment is questioned when the market price per acre of one parcel of farm land sold in Shelby township sold for a price of $3,035 per acre. High individual sale prices of $3,000, $2,848, $2,381, and $1,250 per acre were also recorded in Macomb, Washington, Chesterfield, and Lenox townships, respectively. In most cases, the equalized valuation of the sample observation used for comparison purposes was in the upper five percent of the assessed valuations per acre in the sample frame. While assessment ratios varied greatly and could not prove over or under-assessment of agricultural land, they did lend weight to the further argument that there is a wide

variation in farm land property assessment which would undoubtedly become even more complicated if use-value legislation were enacted in Michigan.

Policy Implications of Use-Value Assessment

There is no question that there will be a definite redistributive effect in property taxation if use-value legislation is enacted in the State of Michigan. The urban property taxpayer, along with the non-participating farm taxpayer, will have to take on an increased property tax burden under either plain or deferred use-value assessment. The magnitude of this increased property tax burden will depend, however, upon several factors.

Many states currently have differing entrance or eligibility requirements for participation in use-value assessment.[65] Size of eligible tract, prior use requirements, productivity requirements, for example, all determine how much farm land actually would be eligible for

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[65]Just as these entrance requirements differ by individual state, they differ by version of contemplated legislation in Michigan. The reader has previously been referred to one version of proposed use-value legislation in the Appendix for the State of Michigan, H.B. 4100. He is now referred to a more recent and differing version, S.B. 130, also located in the Appendix, that has been introduced into the legislature since this study began eighteen months ago. Both versions of this use-value legislation differ in context and hence effect the amount of land eligible for use-value assessment.

participation in either plain or deferred use-value assessment. This amount of farm land, and hence farm land equalized valuation participating in use-value assessment, has a very important effect on the non-participating or non-farm sector in each township. The more rural the township, the greater the effect of use-value assessment. Consequently, the greatest tax redistribution would be found in the more rural townships. It is paradoxical in that most use-value legislation is politically written with the urban areas in mind (because this is where the political power lies) and yet in these areas, the effects of use-value legislation may be very negligible. In the most urbanized township, Shelby, farm land equalized valuation was a small percentage of total township equalized valuation.

The administrative costs of initiating and maintaining either plain or deferred taxation would increase over those existing under ad valorem taxation. Township tax rates would increase due to the cost of maintaining two separate tax rolls, one for those farmers participating in use-value assessment and one for those farmers who do not or for the non-farmers who cannot. Whether individual property assessment would be improved in terms of current ad valorem assessment cannot be answered. Township tax rates increased under both plain and deferred use-value taxation; they would have to increase still more to pay

for the increased administrative costs of this type of assessment. Greater efficiency in individual assessment would undoubtedly be even more expensive. Then also, the flow of funds at the township level would be hampered as amounts of tax revenue returning from farmers ceasing to participate in use-value assessment would vary in magnitude and timing. The State of Michigan would also have an increased cost in terms of defining and maintaining requirements concerning eligibility, productivity, equality, enforcement, etc.

While this particular study concentrated on investigating changes in the property tax burden between the rural and urban sectors of townships lying on the rural-urban fringe, several aspects of land use must also be mentioned concerning use-value legislation brought out by the study. It appears that neither plain nor deferred use-value legislation, even with the five year "roll-back" of one hundred percent of back taxes coming due from farmers ceasing to participate in use-value assessment would be particularly effective in keeping land from going from agricultural to urban use in the transitional areas around rapidly expanding metropolitan cities. The sale price per acre a farmer receives for his land is far in excess of any tax penalty he must pay for changing land use. Even California, which has a ten year contractual agreement with a stiff penalty or Hawaii with land use

districts have not been exempt from the pressures of urbanization under two differing versions of use-value legislation that were not considered in the analysis. Again, the paradox remains that the land most use-value legislation is aimed at is the land in the transitional areas where the sale price per acre is dictated by the law of supply and demand. The sale price of rural land is more closely correlated with agricultural productivity.

Another interesting policy question in terms of land use is that the urban taxpayer and the non-participating farmer are asked to take on an increased tax burden for the creation of "green belts," open space, etc., around metropolitan areas. While "green belts," open space, etc., would be created, the urban taxpayer must still "recreate" elsewhere as the farmer participating in use-value assessment does not lose any of the "bundle of rights" existing in his property ownership. Under proposed legislation, he does not lose control of how his land is used for purposes other than farming. The urban taxpayer still is denied public access to the agricultural land.

Another policy implication is that by retaining this land in agricultural use, it is often assumed that future recreational areas may be obtained. It may be far easier and cheaper for, say the State to buy open space

and recreational use outright than by the process of increased taxation through either plain or deferred use-value taxation.

Farmers not participating in plain use-value or deferred taxation, as long as they wish to farm their land, are placed in a poorer comparative advantage than participating farmers. Participating farmers in plain use-value or deferred taxation will pay less property tax and hence have a wider operating margin. Some of the less efficient farmers may, for a limited time, remain longer in agriculture than they would have been able to do under ad valorem taxation. This, in turn, leads the author to ask the pertinent policy question as to "how important is agriculture in the rural-urban fringe?" Once this question has been resolved, if it can be, then the next relevant question becomes "is use-value assessment the answer to stopping land speculation and scatterization, and is it an effective control for planned land use?" These are the questions which the legislators should investigate. Perhaps one should address oneself to the question of the effectiveness of the ad valorem property tax. If the ends to be accomplished in state land use can be decided upon, whether these ends be state-wide land use planning and zoning, preservation of agriculture in the rural-urban fringe, or others, the means to accomplish the ends (of which use-value assessment is but one means) can be resolved.

This dissertation has been primarily concerned with the redistributive effects of two types of use-value taxation in five townships in the rural-urban fringe of Macomb County. After eighteen months of research in the area of use-value assessment, the author has become aware of many basic weaknesses in both existing ad valorem property taxation and the probable effects of use-value legislation that should be clearly stated for the benefit of the policy-makers in Michigan. Most of these weaknesses in tax legislation are mentioned throughout the text but are summarized here because the author feels that they are relevant problems that must be dealt with if use-value legislation becomes a reality in the State of Michigan.

The basic weaknesses of the existing ad valorem property tax are many and no attempt will be made here to restate what has been said by many much more knowledgeable writers than the author. The research did show however that: (1) the agricultural sector has received indirectly already preferential tax treatment under the existing ad valorem system of taxation; (2) the majority of agricultural properties, depending upon the township, have been under-assessed in relation to market value of agricultural land; and (3) a wide variation existed in assessment ratios of agricultural land in all five study townships as well as within individual townships.

If use-value legislation is enacted in Michigan, a "Pandora's Box" will be opened for many reasons. Several of the more obvious problems created will be that: (1) there is a very serious lack of much basic data needed to implement use-value legislation. Some needed basic data will be hard to collect and involves subjective value judgments. This lack of data has also hindered efficient ad valorem taxation procedures as well; (2) while soil productivity is currently used in several states, the author feels that it alone is a "poor" indicator of use-value in dealing both with the many types of agriculture as well as the "mix" of products produced on Michigan farms. There is no relationship between soil productivity and many types of intensive or "hot house" agriculture; (3) the cost of administration to both local and state government for implementation of any system of use-value legislation will be drastically increased over current costs. Not only must basic property tax assessment improve but two tax rolls will have to be maintained, standards will have to be initiated and continually revised, and enforced; (4) in the more rural townships, where it is assumed more farmers would participate in use-value assessment, other sources of township revenue may have to be found because the increased tax burden on the non-farm and non-participating farm sector may become too high; (5) if deferred taxation is enacted, the timing and the magnitude

of any penalty payment for farmers ceasing to participate in use-value assessment creates several problems. The revenue returned to the township government in the form of penalty payments will not be consistent in amount or by time period. How these "roll-back" taxes can be handled and still maintain some efficiency of local governmental operations poses an interesting question; (6) even limited sales data show that the penalty imposed by deferred taxation would not be effective in stopping conversion of land by farmers to non-agrarian use; and (7) use-value legislation will not "solve" many, if any, of the policy goals advanced by the policy makers. It, like many other forms of land legislation, is more concerned with treating the symptoms and not the cause of the disease called "land use."

Jensen, writing about property taxation in 1931 stated:

> If any tax could have been eliminated by adverse criticism, the general property tax should have been eliminated long ago. One searches in vain for one of its friends to defend it intelligently. It is even difficult to find anyone who has given it careful study who can subsequently speak of its failure in temperate language. . . . Should some prosecuting attorney drag the tax as a culprit before a bar of justice, he would be embarrassed by the abundance of expert evidence against it. No writer of repute writing on state and local taxation in the United States has failed to offer his bit of derogatory testimony. No commission appointed to investigate any state tax system, which has had time, means, and inclination to secure the evidence, has failed to recommend the abolition of the tax or measures tending towards

> fundamental modification. Where permanent administrative tax commissions have had time, capacity, and means to busy themselves with what ought to be one of their major tasks, the study and constructive criticism of the state tax system, they have without exception arrived at similar conclusions.
>
> Yet the tax persists.[66]

Use-value legislation is but another modification to an already over-legislated and over-worked local tax. What held true forty years ago holds true today.

Recommendations for Future Study

It would be remiss of the author to conclude this dissertation without discussing several general strengths and several weaknesses of this study as well as to mention several possibilities for future study. Due to time and budget constraints, this final product is far from complete, and with the added advantage of hindsight, far from perfect.

The author feels that several major strengths of this study should be mentioned. The general models developed, with some modifications, undoubtedly can be used by anyone wishing to evaluate the redistributive taxation aspects of either what has commonly come to be called plain or deferred use-value legislation. The general models are especially pertinent to those state legislatures which do

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[66] Jens P. Jensen, Property Taxation in the United States (Chicago: University of Chicago Press, 1931), p. 478.

not have, but are currently contemplating this type of legislation. The general models can also be used to evaluate the present ad valorem property taxation system of assessment currently existing in many states. The plain use-value and deferred models are adaptable for any range of selected use-values, participation levels of farm land equalized valuation, and proportion of farmers that could or would possibly participate in use-value assessment. In the deferred taxation models, any percentage amount of "roll-back" penalty for farmers ceasing to participate in deferred taxation for any length of time could also be used. While this has been an investigation of what would have happened from the historical viewpoint, what may happen in the form of projections could also be added to the existing models and using the computer program developed as a part of this study.

While the general strengths of this dissertation have been previously discussed and can be investigated by reading the text, hindsight has also brought out several weaknesses that should be mentioned. The weaknesses, in part, become recommendations for future studies in this area of property taxation.

Use-values were assumed because there was no accurate way to determine the value of farm land using a farm income capitalization approach. Using soil productivity is one method that was tried and discarded. Using this

approach it is necessary to assume something about the "mix" of enterprises. While this approach may be relevant for some areas, it is not in the study townships in Macomb County. Mushrooms, vegetables grown under glass, and potted plants for example cannot be evaluated by investigating soil productivity. In the more urbanizing agricultural areas, intensive agriculture seems to be the rule and not the exception. The first weakness of this study, and it becomes of very large concern to the State of Michigan, is that usable data does not exist to implement use-value legislation if it does become law. More serious than this is the fact that some data could even be collected.

The second major weakness of this dissertation concerns the sample design. Several modifications are needed in the sample design of this study which, in the future, will not only allow (hopefully) for greater accuracy in results, but also for fewer computations. Once a sample frame has been determined, and in this study if was the 1960 property tax assessment rolls for each of the five study townships, it then became necessary to determine the sample size needed from the sample frame. Because of natural stratification existing, the Neyman allocation method was used to sample more heavily those strata where the assessed valuation per acre was greater. Because of wide variation in assessed valuations per acre,

essentially in the farm land improved strata, a large sample size was needed. In order to reduce the sample size needed in each township, a census unit reduction technique was developed. This census unit reduction technique would be discarded as it was costly in terms of the researcher's time and accuracy and all observation units drawn from the sample frame would have been random units. In terms of accuracy, and as mentioned previously in text, perhaps the basic unit used from the property tax assessment rolls should not have been assessed valuation per acre, but just the farm land acreage. There was not as much over-estimation using farm land acreage as when assessed valuation per acre was used.

In terms of the estimation technique, the major weakness is that there really is no sampling theory adequately developed that incorporates time as a relevant variable. All of the estimations made of farm land equalized valuation, farm land acreage, non-farm land equalized valuation, non-farm land acreage, farm land tax revenue, and non-farm land tax revenue for the years 1961-1969 were based on the ratio existing between sample observation units in proportion to sample frame on a stratum basis in the year 1960. This ratio was dramatically affected in the years 1961-1969 in several strata, in several townships, and in several years by new and old sample units entering and leaving the sample frame. This in turn

caused basic over-estimation in several of the relevant variables that could not be removed.

The major weakness of the models is that a tremendous amount of output is generated. Needless to say, this was the primary reason that ten year averages were used in the analysis. To evaluate every model year by year would have consumed too much time. In data collection, once sample size had been determined, it probably would not have been necessary to collect data for consecutive years. Trends, projections, etc., could probably have been analyzed if data had been collected just every other year, with the exception that data would have had to have been collected in the year county equalization took place in the respective townships. One other criticism of the models is that several of the models show the reverse side of other models and probably marginally do not furnish that much more additional information. There was also considerable "interlocking" of models and the errors in one are carried to the next which is true of all recursive models.

Even taking the above weaknesses and criticisms into consideration, the possibilities for the mass of data collected and for the basic techniques developed in this dissertation to investigate more than just the redistributive aspects of plain and deferred use-value assessment are many. Currently, a rural rather than a highly

urbanizing county is being investigated and will be used as a control against the two urban counties currently being studied to investigate land use patterns as well as the redistributive effects of taxation. Eventually, another urbanizing county will be selected and three rapidly urbanizing counties and the rural county will be compared. Comparisons will be possible not only between counties and townships, but also between the rural-transitional-urban strata in each as well.

Additional information could be gained for varying purposes because sample units were randomly drawn and theoretically are representative of all types of farms in the five study townships. Questionnaires, interviews, and case studies could possibly be used to form estimations of net farm income and the varying "mix" of agricultural products produced, not only in Macomb County, but in other urbanizing townships also.

The most critical area of research currently needed in Michigan is an investigation of the relationships existing between property taxation, local governmental finance, and changing land use. An in-depth study is needed of the effects of land use changes on local finance and the gain or loss of property tax revenue when land converts from rural to urban use. One possible method of approach to study could be an investigation of selected sample units in specific locations whose property tax

classification changed from either farm improved or farm vacant to a use other than agriculture on the property tax rolls. Property tax entries can be traced, by means of township identification codes, in terms of equalized valuation, acreage, ownership, and property taxes paid through the land conversion process into residential subdivisions, commercial development, or other use. It is possible to evaluate (with some degree of accuracy) the length of time agricultural land has lain idle before residential or commercial development manifests itself. Parceling of land in terms of acreages could also be fairly accurately evaluated.

Another needed study is an investigation into township finance. Evaluation is needed of the goods and services provided by both township and village or city governments as well as the administrative costs of providing these goods and services to the varying sectors of each township. Certain aspects of school finance, property taxation, and land use also should undergo a more critical analysis than in past studies. There are many areas of needed research at the present time under ad valorem taxation. Use-value assessment, with its corresponding loss of farm land tax revenue to the township government, could and probably will create severe problems in township finance. One approach to beginning to understand this problem would be by selecting just one urbanizing

township and investigating township finance in greater depth than was possible in this dissertation. The results of this research into local governmental finance could then be used as a "proxy" for other townships and further studies.

This study dealt with just two types of use-value assessment on local governmental finance. It would be well to evaluate other land use alternatives such as a planning and zoning approach. Combinations of the two types of use-value assessment used in this dissertation should also be used with these other alternative land use approaches and evaluated.

Projections, as previously mentioned, could be made using the data collected and the computer program designed for this study. Projections using existing data would provide possible future effects in both local finance and changing land use in the study townships. Several varying projections could be used to give a possible range of what may happen in these townships as "urbanization" of agricultural land in southern Michigan continues. Loss of future township tax revenues under use-value assessment could be investigated and evaluated.

Finally, greater sophistication of certain of the selected use-value models could and should be undertaken. All major property tax classifications (such as residential, business, utility, etc.) should be investigated.

The models developed in this study from property tax classifications dealt with just the agricultural sector and the non-agricultural sector. All non-agricultural property tax classifications were combined into one sector in this study. The more sophisticated selected models could be used, in turn, with the previously mentioned needed studies to help evaluate changing land use, property taxation, and local governmental finance in Michigan.

APPENDICES

APPENDIX A

LEGAL REFERENCES TO INDIVIDUAL STATE USE-VALUE ASSESSMENT

Plain Use-Value Assessment:

ARK. STAT. ANN. §§84-480, 483, 484 (Supp. 1969).
COLO. REV. STAT. §137-1-3(5) (Supp. 1967).
CONN. STAT. ANN. tit. 12, §§107a-107e (Supp. 1960-71).
DEL. CODE ANN. tit. 9, §§8330-8331D (Supp. 1968).
IND. STAT. ANN. §§64-711a--712 (Supp. 1970).
N. MEX. STAT. ANN. §§72-2-14.1--72-2-14.4 (Supp. 1969).

Deferred Use-Value Assessment:

ALASKA STAT. §29.10.398 (Supp. 1970).
MD. CODE ANN. art. 81, §§19(a)-(f) (Rep. Vol. 1969).
MINN. STAT. ANN. §§273.111--273.13 (Supp. 1970).
N.J. STAT. ANN. §§54:4-23.1--54:4-23.23 (Supp. 1970-71).
GEN. LAWS OF R.I. §§44-5-12--44-5-41, 44-27-1--44-27-6 (Supp. 1969).
TEX. CONST. ANN. art. 8, §1-d (Supp. 1970-71).
UTAH CODE ANN. §§59-5-86--59-5-105 (Supp. 1969).

Development Rights and Easements:

FLA. STAT. ANN. §§193.201, 193.202 (Supp. 1970-71).
ORE. REV. STAT. §§308.345-308.395 (Rep. Vol. 1969).

Planning and Zoning:

CAL. CODE ANN. Rev. and Tax Code §§402.1, 421-429 (1969); Gov't Code §§51200-51201, 51240-51254, 51282-51285 (Supp. 1970).
HAWAII REV. STAT. §§205-1--205-15, 246-10 (1968); 205-2, 205-5 (Supp. 1969).
PA. STAT. ANN. tit. 16§§11941-11947 (Supp. 1970).

Classified Property Tax:

ARIZ. REV. STAT. §§42-136, 42-227 (Supp. 1970-71).
MINN. STAT. ANN. §§273.111--273.13 (Supp. 1970).
OHIO REV. STAT. tit. 57§§5713.01-5713.26, 5715.01-5715.51 (Supp. 1970).
W. VIRG. CODE ANN. Vol. 4, §§11-8-5, 11-8-6 (Supp. 1971).

APPENDIX B

HOUSE BILL NO. 4100

A bill to amend Act. No. 206 of the Public Acts of 1893, entitled as amended "The general property tax act," as amended, being sections 211.1 to 211.157 of the Compiled Laws of 1948, by adding section 5A.

Sec. 5A. On written application of the owner on forms prepared by the Department of Treasury and filed with the local assessor prior to December 31 of each year, farmland zoned exclusively to agricultural or horticultural use for 3 previous years and from which the owner derives 1/3 or more of his normal total income shall become eligible for deferred tax status. Such farmland shall be exempt from any other factor. The State Tax Commission shall establish criteria in this section and shall establish criteria for the assessment of qualified farmland on the basis of its productivity and net earning capacity for agricultural or horticultural use and capitalized at a rate representing a fair return on investment. The capitalization rate shall be predicted on a rate of return which is based on allowance for risk, interest and property taxes, which shall not be derived from sales data from other lands. The commission shall publish a range of values for land based upon these criteria. When farmland assessed under the provisions of this section is sold or used for other than agricultural or horticultural purposes, it shall be subject to a specific tax in an amount equal to the difference, if any, between the

taxes paid or payable on the basis of its assessment as farmland and the assessment based on its new use. Such specific tax shall be for 3 years, including the current year and the 2 immediate previous years. Differences between the 2 amounts of taxes on the land shall be a lien on the property until paid in full to taxing units as provided by law. This section shall take effect on December 31, 1971.

APPENDIX C

SUGGESTED SUBSTITUTE FOR SENATE BILL NO. 130-a

A bill to provide for general property taxes on certain agricultural and other lands; to create and prescribe the functions of the state open space and farmland evaluation committee; and to require the promulgation of rules.

Sec. 1. This act shall be known and may be cited as "the open space and farmland preservation act of 1971."

Sec. 2. As used in this act, "open space land" means (a) a land area so designated by an official comprehensive land use plan adopted by a city, township or county and zoned accordingly or (b) a land area, the preservation of which in its present use would (i) conserve and enhance natural or scenic resources, (ii) protect streams or water supply, (iii) promote conservation of soils, wetlands, beaches or tidal marshes, (iv) enhance the value to the public of adjoining or abutting parks, forests, wildlife preserves, nature reservations or sanctuaries (sic) or other open space, (v) enhance recreation opportunities, (vi) preserve historic sites, or (vii) retain in its natural state a tract of land of not less than five acres situated in an urban area and open to public use on such conditions as may be reasonably required by the legislative body granting the open space classification.

Sec. 3.

1. As used in this act, "farm and agricultural land" means:
   (a) Land in a contiguous ownership of twenty or more acres devoted primarily to agriculture or horticulture.
   (b) A parcel of land five acres or more but less than twenty acres devoted primarily to agriculture or horticulture, which has produced a gross income from agriculture or horticulture of $100.00 or more per acre for three of the five calendar years preceding the date of application for classification under this act.
2. "Farm and agricultural land" also includes:
   (a) A farm woodlot of less than forty acres and land on which appurtenances necessary to the production, preparation or sale of the agricultural or horticultural products exist in conjunction with the lands producing such products.
   (b) Parcels of land which are not contiguous, but which otherwise constitute an integral

part of farming operations being conducted on land qualifying under this section.

Sec. 4. As used in this act, "timber land" means the land only in a contiguous ownership of 40 acres or less which is devoted primarily to the growth and harvest of forest crops and which is not classified as land for specific taxation under Act. No. 86 of the Public Acts of 1917, as amended, being sections 320.271 to 320.281 of the Compiled Laws of 1948, and Act. No. 94, Public Acts of 1925, as amended, being sections 320.301 to 320.314 of the Compiled Laws of 1948.

Sec. 5. As used in this act:

(a) "Current use" means as of the date on which property is to be listed and valued by the local assessor.

(b) "Owner" means a person having the fee interest in land, except that where land is subject to land contract, "owner" means the contract vendee.

Sec. 6. An owner of land desiring current use assessment under this act shall make application on forms prepared by the state tax commission and filed with the state tax commission. The application shall be accompanied by a processing fee of $10.00. The application shall contain only information reasonably necessary to properly classify an area of land under this act. A current use assessment application shall not be accepted after December 31, 1974.

Sec. 7. The state tax commission shall grant, without discretion, current use assessments upon certification by: (a) a local or regional planning agency that the land is zoned or (b) similar certification that the land is part of a land use plan for open space land, farm and agricultural land, or timber land, or (c) in the absence of zoning and a land use plan, certification by the county equalization director that the land has been used as open space land, farm and agricultural land, or timber land for 3 of the preceding 5 calendar years. The state tax commission shall notify the local assessing officer, the county equalization director and the county register of deeds within 10 days after granting a current use assessment.

Sec. 8. The assessing officer, as to any such land, shall make a notation each year on the assessment roll of the assessed value of the land for the use for which it is classified in addition to the assessed value of the land if it were not so classified.

Sec. 9. In determining the current use value of open space land, farm and agricultural land, and timber land, an assessing officer shall consider only the use to which the property and improvements is currently applied. The assessing officer shall compute the assessed value of the property by using the procedures and ranges of values established by the state open space and farmland evaluation committee.

Sec. 10. Land classified pursuant to this act shall remain under its classification and shall not be applied to other use for at least 5 years after the data of classification and shall continue under such classification until withdrawn from classification after notice of request for withdrawal has been made by the owner. During any year after 3 years of the initial 5 years classification period has elapsed, notice of request for withdrawal may be given by the owner to the assessing officer and the state tax commission. The assessing officer, when 2 annual tax days have elapsed after receipt of the notice, shall withdraw the land from such classification on the next annual tax day.

Sec. 11. Upon withdrawal of land from classification, a specific rollback tax shall be imposed on the land for the 5 years preceding equal to the difference between the general property tax paid on the land as classified and the general property tax otherwise due and payable if the land had not been so classified, and the owner shall be liable therefor, and it shall be collected as in the case of any other general property tax imposed on the classified land. An application for current use assessment and certification thereof shall not be considered to be a contract and when changed, pursuant to law or as a result of condemnation at any time by the state or its political subdivisions, no penalty shall be imposed on the owner.

Sec. 12. When land which has been assessed pursuant to this act is used for some other purpose, before the initial 5 years have expired, or notice is not given in accordance with section 10, except as a result of the exercise of the power of condemnation, or except as a result of a sale to a public body, a specific rollback tax is imposed on the land in an amount equal to the sum of the following:

(a) The amount, if any, equal to the difference between the general property tax paid on the land as classified and the general property tax otherwise due and payable if

the land had not been so classified during a maximum of 5 years preceding the year in which the rollback tax is imposed:

(b) A penalty as a specific tax amounting to:

(i) 10% of the market value of the land when the land was under current use assessment for 1 year,

(ii) 8% of the market value of the land when the land was under current use assessment for 2 years,

(iii) 6% of the market value of the land when the land was under current use assessment for 3 years,

(iv) 4% of the market value of the land when the land was under current use assessment for 4 years, and

(v) 2% of the market value of the land when the land was under current use assessment for 5 years.

Sec. 13. The rollback tax and penalties, if any, provided by sections 11 and 12 of this act shall be placed on the tax roll in the calendar year following the annual tax day after which the land is withdrawn from current use assessment. Such additional tax when collected shall be distributed in accordance with law.

Sec. 14. The owner of land as to which a rollback tax is imposed shall have with respect to assessment of the land imposition of the additional tax all remedies provided by Section 211.30 and 211.52 of the general property tax law.

Sec. 15. The state open space and farmland evaluation committee is created within the department of treasury, the members of which are the director of the department of agriculture; the dean of the college of agriculture, Michigan State University; the director of the department of natural resources; and the chairman of the state tax commission. The committee shall meet on the call of the director of the department of agriculture and shall annually determine and publish a range of values for each of the several classifications of land in open space and farm and agricultural and timber land classifications in the various areas of the state. The primary objective of the committee shall be the determination of the ranges of fair value of such land based only on its productive capabilities when devoted to agricultural and open space uses. In making these annual determinations of value, the committee shall consider available evidence of agriculture capability derived from the soil survey at Michigan State

university, the national cooperative soil survey, capitalization of net earning capacity based on allowance of risk, interest and property taxes, and such other evidence of value of land devoted exclusively to agriculture and open space uses as it deems pertinent. On or before October 1 of each year, the committee shall make these ranges of fair value available to the assessing officers of governmental units in which land in open space, farm and agricultural, and timber land is located.

Sec. 16. The department of treasury shall promulgate rules and regulations consistent with this act as shall be necessary or desirable to permit its effective administration in accordance with Act 306.

Sec. 17. This act shall take effect January 1, 1972.

APPENDIX D

RELIABILITY OF FARM LAND ASSESSED VALUATION AND FARM LAND ACREAGE ESTIMATIONS

Table 27 shows the reliability of farm land assessed valuation and farm land acreage estimations for the year 1960 for the five study townships. Sample bias represents the difference between the sample estimates made of farm land assessed valuations and farm land acreage and the values of these variables based on a complete census of the sample frame. The sample frame was the 1960 Property Tax Assessment Rolls for the varying townships. No sample frame existed for the years 1961-1969, so the reliability of the estimates could only be tested for the year 1960. The standard error of estimation had been set at $\leq$ \$10 per acre with a probability of ninety percent.

Overestimation caused by individual stratum estimates of farm land assessed valuations exceeded the standard error of estimation of the sampling plan in all townships. Farm land acreage estimations contained less bias than farm land assessed valuation estimations. In fact, three townships, in terms of farm land acreage, had been underestimated, two townships overestimated, and with the exception of Washington township, were within the selected $\leq$ \$10 per acre with a probability of ninety percent.

The largest standard errors of estimation in farm land assessed valuations were generally in the three strata of each township that contained the farm improved properties (rural farm land improved, transitional farm land improved, and urban farm land improved strata).

TABLE 27

SAMPLING BIAS BETWEEN ESTIMATED FARM LAND ASSESSED VALUATIONS (FAV), ESTIMATED FARM ACREAGE (FAC), AND THE SAMPLE FRAME

Township	Sample Farm Land Assessed Valuations (Dollars)	Total Frame Farm Land Assessed Valuations (Dollars)	Sample Bias (Percentage)	Sample Farm Land Assessed Acreages (Acres)	Total Frame Farm Land Assessed Acreages (Acres)	Sample Bias (Percentage)
Chesterfield	1,258,573	1,041,150	+20.88	12,203	11,990	+1.78
Lenox	1,650,660	1,453,000	+13.60	21,619	21,782	-0.75
Macomb	1,750,017	1,641,600	+6.60	19,735	20,380	-3.16
Shelby	1,258,829	1,085,250	+15.99	12,090	11,826	+2.23
Washington	1,528,740	1,207,000	+26.66	22,250	16,931	+31.42

These strata, because of high variation in assessed valuations per acre had been sampled more heavily. This overestimation was in part created by the larger number of sample observations per stratum, but also was due to the fact that the estimation technique was strongly influenced by the ratios derived from the number of samples in a stratum in proportion to the estimated total derived from the sample frame. The improved strata also contained some structure on the farm property and the value of these structures was impossible to determine from the assessment rolls.

Table 28 shows the standard errors of estimation of farm land assessed valuations per acre in each stratum in each township in 1960. Because census observation units had been subtracted from the sample frame before farm land assessed valuations and farm land acreage had been estimated, these same census observation units had also been subtracted before the standard error of estimation could be investigated. Again, the overestimation problem is encountered on a per acre basis as well. Underestimations per acre were found generally in the farm land vacant strata (urban, transitional, and rural) of each township. The greatest overestimations occurred in the urban and transitional improved strata. Estimation per acre ranged from an overestimation of ninety-one percent in the urban farm land improved strata in one of the more

TABLE 28

STANDARD ERRORS OF ESTIMATION OF FARM LAND ASSESSED VALUATION PER ACRE FOR EACH STRATUM IN EACH TOWNSHIP IN 1960

Stratum	Chesterfield			Lenox			Macomb			Shelby			Washington		
	S.F.[a]	Est.[b]	%[c]	S.F.	Est.	%	S.F.	Est.	%	S.F.	Est.	%	S.F.	Est.	%
Urban Farm land Improved	$95	$121	27.4	$73	$78	6.9	$89	$110	23.6	$105	$141	34.3	$82	$157	91.5
Urban Farm land Vacant	74	65	-12.2	51	48	-5.9	63	90	42.9	73	97	32.9	47	37	-21.3
Transitional Farm land Improved	93	123	32.3	68	106	55.9	91	99	8.8	100	95	-5.0	77	82	6.5
Transitional Farm land Vacant	64	76	18.8	50	48	-4.0	56	51	-8.9	79	115	45.6	46	38	-17.4
Rural Farm land Improved	83	98	18.1	66	74	12.1	81	85	4.9	85	102	20.0	69	58	-15.9
Rural Farm land Vacant	60	53	-11.7	50	50	---	52	53	1.9	66	70	5.7	46	33	-28.3
Average for All Strata			12.1			10.8			12.2			22.2			2.5

[a]S.F. = sample frame. These figures represent the mean assessed valuation per acre from the sample frame.

[b]Est. = Estimated assessed valuation per acre.

[c]These figures represent percentage over or under estimation in assessed valuations per acre from the sample frame.

rural townships, to an underestimation per acre of twenty-eight percent in the rural farm land vacant stratum of this same township. In adding the percentage of over-estimations and underestimations in each township, over-estimation in all townships was the result. This varies from a low overestimation in Washington township of just under three percent to a high overestimation of twenty-two percent in Shelby township.

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