THE SIMULATED EFFECTS OF USE-VALUE ASSESSMENT ON LOCAL GOVERNMENT FINANCING IN FIVE RURAL TOWNSHIPS IN HILLSDALE COUNTY, MICHIGAN 1960-69

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ABSTRACT

THE SIMULATED EFFECTS OF USE-VALUE ASSESSMENT ON LOCAL GOVERNMENT FINANCING IN FIVE RURAL TOWNSHIPS IN HILLSDALE COUNTY, MICHIGAN 1960-69

By

Martin Edward Hanratty

Over the past 25 years, the needs of Michigan's expanding population have resulted in a number of conflicts between existing open space uses and residential development. Foremost in this array of difficulties have been the problems associated with the rapidly escalating value of agricultural lands located on the periphery of expanding urban centers. These increases and the resulting increases in property taxes have led many to demand that some form of use-value assessment be adopted by the state.

The purpose of the study is to determine the effects that various forms of use-value assessment might have on the redistribution of property tax burdens in five rural townships in Hillsdale County, Michigan. Property tax information for the years 1960 to 1969 was collected for each township by means of a stratified random sample technique. Simulation models were then used to determine the property tax rates that would result under the existing ad valorem system and those which would result from the adoption of plain use-value assessment and deferred taxation. The latter two models employed varying proportions of farmland equalized valuation to simulate changes in the redistribution of the property tax burden in the participating farmland, nonfarmland and nonparticipating farmland sectors.

Results of the models indicate that a redistribution of the tax burden from participating farmland to nonparticipating and nonfarmland would occur. Under both the deferred taxation and use-value assessment approaches redistribution tended to be highest in those townships which had large proportions of their total equalized value in the farmland

sector. The redistributive effects of the deferred taxation model tended to be slightly less than those of use-value models due to the rollback.

It was found that the tax savings offered thru either program should be sufficient to entice a farm operator into the program. However, the penalty clause incorporated into the deferred taxation system constituted such a small portion of the final selling price of property that it would not constitute a meaningful economic barrier to farmland conversion.

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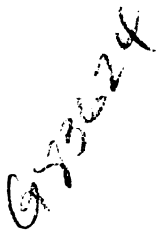

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CHAPTER I

INTRODUCTION

General Introduction

Southern Michigan, like many other areas in the United States in the last 25 years, has experienced some rather convulsive and dramatic changes in its urban-rural structure. Areas once occupied by placid grazing dairy cattle now provide homes for thousands of new suburbanites. Rural two lane highways used by farmers in years past to transport their produce to the urban markets, miles away, have been replaced by modern dual ribbons of concrete able to carry thousands of motorists per hour. The local country store, almost an institution in rural America, has been superseded by large sprawling shopping centers or malls.

Both the state's growth and distribution of population have underscored a number of these changes. In 1940 Michigan had 5,256,106 inhabitants. By 1950 this figure had risen to 6,371,766, in 1960 to 7,823,194, and in 1970 to 8,875,083.[1] Distribution of this new population has been markedly uneven with approximately 80 percent of the increase occuring in or around the 17 major urban areas in the southern third of the state.[2] These major influxes have been accommodated by the expansion of existing cities, the creation of new satelite cities and the scatteration of suburbs. Evidence of these trends can be clearly seen in the Bureau of Census calculations of areas within incorporated places with

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[1] U.S., Department of Commerce, Bureau of the Census, United States Census of Population: Characteristics of the Population. Michigan, 1960, Vol. 1, pt. 24, pp. 24-29; and U.S., Department of Commerce, Bureau of the Census, United States Census of Population: 1970. Advanced Report, Final Population Counts, Michigan p. 3.

[2] Raleigh Barlowe, "Trends in Land and Water Use in Michigan" (Michigan State University, January 1972), p.8 (Mimeograph.)

2,500 or more persons. In 1940, 653,000 acres were devoted to residential and residential supportive uses. Using 1940 as a base year, residential acreage in 1950 had increased by 132 percent or to 803,000 acres. By 1960, the acreage devoted to urban residential and supportive uses had again increased to 174 percent of the base year or to 1,133,000 acres. Preliminary estimates for 1970 indicate that this will again increase to 1.4 or 1.5 million acres. This would constitute an increase of 215 to 230 percent over the base year 1940.[3]

These trends have precipitated a number of conflicts between existing open space uses such as agriculture and residential development. As more and more urban residents relocated in scattered plats throughout rural areas, the demand for services similar to those found in urban areas increased. Improved roads and schools, more adequate police and fire protection and expanded or new water and sewer facilities were sought. To finance these new services, in addition to, providing for inflation and increased costs caused by new state and federal programs, local government units found it necessary to increase their local property tax levies. These increased levies, in accordance with the law, were assessed on all residents both new and old within the local government's tax jurisdiction.[4]

To alleviate the pressures of these increased tax levies on the agricultural sector, pressure has been placed on the state legislature to adopt an alternative property tax approach. The vehicle chosen for this approach has been use-value assessment. This type of taxing alternative necessitates that land actually devoted to agriculture shall be valued in accordance to its productivity in agriculture not at its possible future productivity in an alternative use.

In 1969 several use-value assessment bills were introduced in the legislature. One from the House and one from the Senate. By 1970, two forms of H.B. 2533 had received approval. When a formulation of a compromise bill was attempted in the Legislature's Committee of the Whole difficulties were encountered and the bill was tabled. In 1971 another version, H.B. 4100 was introduced. This has since been returned

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[3] Ibid

[4] A more in-depth analysis of these trends is given in Chapter II.

to committee where it is now undergoing revisions to tie it in closer with existing zoning and land use techniques.

Objectives of the Study

It is very likely that Michigan will in the near future adopt some form of use-value assessment. Other states that have instituted this type of tax alternative have experienced a redistribution of the incidence of taxes between participant and non-participant residents. The shifting of tax incidence normally results in a decrease in the property taxes paid via decreased assessments by the participating sectors (agriculture, open space etc.) and an equal increase in the taxes paid by non-participating sectors (urban residents, commercial interests etc.). The amount and extent of these redistributions or more precisely the cost of the tax alternative has been greatly affected by the type of use-value assessment package adopted and the urban-rural structure of the taxing unit involved. At present there is a significant lack of information concerning the redistributive affects that use-value assessment will have on rural counties in Michigan.

Therefore, it is the purpose of this study to simulate the effects of the various use-value assessment programs on five selected townships in a predominately rural agricultural county in southern Michigan. Particular emphasis will be devoted to the effect that such alternative programs have on the sectoral changes of tax incidence within the selected townships, and the overall effect each program has on increasing or decreasing tax revenues available for local government operations. It is not the intent of this study to hypothesize or examine the effects that lower property tax levies might have on the rate of conversion of farmland to higher and better uses. This conversion process is a multi-variant process in which property tax levies are only one of the variables.

Methods

Because use-value assessment does not exist in Michigan, it was necessary to use computer simulation models to forecast the effects that various forms of use-value assessment might have had on the local

government financing of five selected townships in Hillsdale County.[5] Through the use of randomly selected farms, township estimates of the average property tax and assessed value per acre were developed for each of the study townships during the period from 1960 to 1969. These estimates were then applied to a series of simulation models used to describe the effects of plain use-value assessment and deferred taxation. Six different models were used to describe the following circumstances: model one, a percentage change in township tax rates; model two, a percentage change in non-farm millage rates; model three, a change in millage rates of participating farmland; model four, a percentage change in township tax rates with deferred taxation, model five, a percentage change in non-farm millage rates with deferred taxation and, model six, a percentage change in the millage rate of participating farmland with deferred taxation.

Structure and Content of Chapters

Chapter II is concerned with the effects that increasing ad valorem taxes have on the farm cost structure, the history and structure of ad valorem system, alternative taxing approaches and the cost of alternatives which have been tried in other states. The methodology used in the study is explained in Chapters III and IV. Chapter III describes the sampling procedures and techniques used in developing the township estimates. Chapter IV is devoted to a presentation and discussion of the simulation models used in the study. An analysis of the township estimates and simulation models appear in Chapter V. Chapter VI presents a summary and recommendations for future study.

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[5] Sampling techniques, methodology and simulation models of simple use-value assessment and deferred taxation were developed by James G. Ahl in "Use Value Assessment in Macomb County Michigan; Simulated Effects on Township Finances in Five Townships in the Urban Rural Fringe 1960-69" (unpublished Ph.D. dissertation, Michigan State University, 1971); and Gordon R. Bachman in "Simulated Effects of Use-Value Assessment Alternatives on Local Government Finances in Five Townships on the Rural-Urban Fringe in Kent County, Michigan" (unpublished Ph.D. dissertation, Michigan State University, 1971.)

CHAPTER II

URBAN GROWTH, AGRICULTURE AND THE PROPERTY TAX

Urbanization and the Growth of Urban Sprawl

Changes in both land ownership and use, since 1920, have been a constant reminder of the growing population pressures brought to bear on the land use patterns of southern Michigan. This succession in land use was described by Barlowe as follows;

> 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.[1]

The conversion process, like any other change, has produced numerous widespread conflicts of interest between the various types of land use. In their study on subdivision trends in southwestern Michigan, Barlowe and Hostetler discovered that:

> . . . the appearance (of subdivions) has created problems both for cities and for agriculture. . . for 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.[2]

This outward expansion of metropolitan centers and the corresponding conflict of interests has been described by many as urban sprawl.

Gottman describes the process as that by which "rural space becomes peppered with new development."[3] Higbee describes these growth areas as either; "tight complexes with no reserves of open space for future woods

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[1] Raleigh Barlowe, Land Resource Economics (Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1958), p. 219

[2] Raleigh Barlowe and John E. Hostetler, "Subdivision Trends in Southwestern Michigan, 1944-58." Quarterly Bulletin of Michigan Agriculture Experiment Station, Vol 42., No. 2 (Nov. 1959), p. 23.

[3] Jean Gottman, Megopolis; The Urbanizing Northeastern Seaboard of the United States, (Cambridge, Mass.; the M.I.T. Press, 1964) p. 247.

or recreational areas" or as "scattered like shot from a blunderbuss without the slightest umbilical tie to their maternal metropolises."[4]

Sprawl normally occurs in one or a combination of three forms. Low density continous development which is typified by a gluttonous use of land which is the opposite of the higher density patterns many people view as appropriate; (2) ribbon development sprawl which is composed of segments compact within themselves but stretched along major transportation routes leaving interior land areas undeveloped, and (3) development which is the settlement of discontinous, although possibly compact, patches for urban uses.[5] Of this latter type of sprawl, Gottman mentions that, "This kind of leap-frogging sprawl outflanks some farms while it covers others."[6]

A number of reasons have been cited as the cause of suburban sprawl. Jack Knetsch, in a discussion of land values and the urban rural fringe, presents what he considers to be the major reason behind urban sprawl:

> . . . the chief economic motivation (behind urban sprawl) seems to be the differential preference for land located at varying distances from the urban center. Buyers continually make decisions on the basis of their relative preferences and relative costs and will often substitute the cheaper land (farther from the city) for the more expensive. The consequence of such choices is that much distant land is developed while land closer to the urban center remains unused. Meanwhile all land prices continue to rise...and purchases continue to be made at points all along the price and location schedule because of buyer's relative preferences, hence, scattering of the development continues.[7]

He goes on to mention additional reasons such as differences in the holding capacity of landholders owing to such things as varying capital positions, discount rates and taxes; the nonhomogeneous nature of land; divergent size tracts, which are important for various uses; varying location of public services such as roads, sewers and schools; changes in the controls and institutions bearing on land use; and the many

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[4]Edward Higbee, The Squeeze, Cities Without Space (New York: William Morrow and Co., 1960), p. 119.

[5]Robert O. Henry and W.A.V. Clar, "The Nature and Economics of Urban Sprawl," Land Economics, 41., 1 (Feb. 1965), 2.

[6]Gottman, "Megolopolus," p. 247.

[7]Jack L. Knetsch, "Land Values and Parks in the Urban Fringe Areas," Journal of Farm Economics, 44., 5 (Dec. 1962), 1719.

imperfections in the market generally.[8]

Sprawl and Its Effects on Agriculture

Although sprawl affects all types of land uses, it has some very specific effects on the cost and investment structure of agricultural operations located in the urban-rural fringe. As sprawl approaches there is a marked increase in the property taxes paid by the agricultural sector. Increased demand for farm acreage to be used in future residential development bids up the "true cash value" of the acreage. Since the appraised value by law must be based on the prevailing market price, appraisals rise. In the wake of rising assessments urbanization creates increases in the demand for local government services. To provide the additional revenue to pay for these services local governments are forced to raise local property tax levies.[9]

This spiraling of both assessments and taxes is described by Whyte in the following manner:

> A nearby farm is sold to a developer for $800.00 per acre, so the assessor decides to up the valuation of the other farms a bit, from $200.00 an acre, say to $300.00. Next the tax rate goes up. The developer's subdivision is producing many more children who have to be educated, and the community has to spend more for a variety of additional services-much more, probably than it gets back in taxes from the subdivision. School-district bonds are floated; mill rates are raised. Another farmer sells out, this time for $1500.00 an acre. Another subdivision goes up. The tax rate rises again, so do assessments. Another farmer sells.[10]

Although Whyte alludes to population growth as the basic factor behind tax rates, Schmandt and Stephens in their study of local government expenditures in the United States state:

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[8] Ibid.

[9] Even if a local government unit chose to retain its present level of services, increases in the property tax levies would most likely be necessary to cover rising cost due to inflation.

[10] William H. Whyte, The Last Landscape (Garden City, New York; Doubleday and Company, Inc., 1968), p. 119.

> ". . . wealth or resources (measured in terms of median family income and state aid) is far more important than population size or density in explaining variations in total per capita expenditures among local units.[11]

This view although contrary to Whyte was substantiated by Fabricant and others in earlier studies.[12] Fabricant found in his 1952 study that income was far more important than urbanization and density of population in accounting for 1942 interstate differences in local government expenditures. He states:

> Presumably the relationship between level of income and level of expenditure comes about primarily because income represents taxpaying ability. It would be expected that persons with higher incomes would desire that the government units serving them provide a higher level of services.[13]

As the above studies point out the ability to pay criterion seems to have a marked influence on local government expenditures. It would seem reasonable to assume that urbanites who have income and expectancy levels would carry these traits when they move to rural areas. If this is in fact the case, the increase in the quality of services rather than the quantity of services would provide a possible explanation for increasing local government tax levies.

A possible answer to the question of increasing assessments can also be found in the urbanites ability to pay. When an urban resident attempts to buy property in a rural area he normally pays more than the

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[11] Henry J. Schmandt and G. Ross Stephens, "Local Government Expenditure Patterns in the United State," Land Economics. 34, 4 (Nov. 1963), 382.

[12] A number of people have attempted to isolate the major cause behind increasing local government expenditures. Some of the more important studies in this area are; Solomon Fabricant, The Trend in Governmental Activity in the United States Since 1900., (New York: The National Bureau of Economic Research, Inc., 1952); John J. Masten, Jr. and Kenneth E. Quindry, "A Note on City Expenditure Determinants, "Land Economics 46, 1 (Feb. 1970), 79-81; Stanley Scott and E.L. Feder, Factors Associated with Variations in Municipal Expenditure Levels, (Berkeley, California; Bureau of Public Administration, University of California, 1959); and Harvey E. Brazer, City Expenditures in the United States. (New York: National Bureau of Economic Research, 1959)

[13] Fabricant, Trend in Governmental Activity, p. 127.

going agricultural market price.[14] A plausable reason for this might be that the urbanite views the rural land market much in the same way as he would the urban market. A similar piece of property if available in an urban setting would cost much more than he offers for a rural property. However, because of his lack of knowledge of the rural land market, his offer to buy although lower than the urban selling price is higher than the going rural agricultural land price. This situation is also fostered by a dual selling price system held by most rural farmers and real estate agents. In areas where this does exist similar pieces of land may be sold for farm operation at a lower price than for residential uses.

In the eyes of the speculator or land developer these inflated prices are justifiable since he is able to pass on the ripening costs in the form of higher prices to future buyers. Also, anticipation of rather large future profits on the part of the speculator, can further bid up the price per acre. Even though a relatively small percent of acreage in an area may be converted, local tax assessors confronted with a noticeable lack of conflicting sales data are inclined to interpretet these higher prices as indicative of a rising land market. Assessment of all properties in the area whether held for speculative purposes or employed in agriculture are then carried out using the new market prices.

Because of the nature of the agricultural market within which the farmer operates, he is forced to carry these increases in his property tax levies as a fixed cost. Stocker in a work on property taxes and the farm cost situation mentions that:

> . . . property taxes are a fixed cost of agriculture. 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, his taxes are not affected. . . 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.[15]

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[14] This trend has been substantiated through interviews with the County Equalization Director and Township Supervisors in the area under study.

[15] Frederick Stocker, "How High Are Farm Property Taxes," in The Farm Cost Situation (Washington, D.C.; Government Printing Office, 1958), p. 36.

On this latter point Robert Sinclair in speaking about the rural landowners in Vermont mentions that, "Annual increases in property taxes are not shifted by farmers; they must be paid out of net farm income."[16] In an earlier study Sinclair and an associate found that the tax itself was significantly regressive in nature toward the farmer. They stated that, "An analysis of the burden of the property tax on a sample of Vermont farmers indicates that their relative burden is over twice that of the sample of homeowners."[17]

If a farmer is sincere in his desire to remain in a competitive position in farming, it is necessary for him to find some way of dissipating the effects of increasing fixed costs on the farm cost structure. This normally can be accomplished by readjusting the revenue-cost position of the farm operation through increased production. Increasing output can be achieved in a number of ways. The most commonly employed are increased efficiency within the farm operation, additional investments in new and more productive machinery, facilities and/or technology, or an increase in the acreage of the farm operation.

The parameters within which the farmer can make these decisions, under conditions of sprawl are significantly limited. In many instances further expansion of the farm operation requires rather large, long term investments. However, because of the size of the loans needed and the price-cost structure of many farms, credit in sufficient quantity, is hard to obtain. Furthermore, the uncertainty associated with the process or urban sprawl significantly limits the farmer's planning horizon. Any desire he may have to enter into long term investments in land, equipment or facilities is detered. This is contingent not only on the uncertainty associated with such investments but the realization that increased real property means an increase in the already disproportionate property tax burden.

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[16] Robert O. Sinclair, Property Taxes and Rural Landowners (Burlington: Vermont Agricultural Experiment Station, MP-55), p. 12.

[17] Ibid p. 1. Similar results concerning the property tax structure in Michigan were founded by Richard A. Musgrave and Darwin W. Daicoff in "Who Pays the Michigan Taxes?" Michigan Tax Study, Staff Papers (Lansing, Michigan 1958), p. 138.

As the prevailing market price for property in the area is bid up, many farmers because of the marginal condition of their operations, their age, or the opportunity for off farm employment will immediately sell. Others will hold off sale in anticipation of higher land price in the future. The type of sales pattern which develops equates very well with the generally accepted theory of supply. As prices rise, more and more land is offered for sale in the market.

The results of such a conversion process, however, are not always advantageous to proper land use management. Sales of land although occuring according to a well defined economic law of supply and demand generally are geographically scattered in location. This is due to the fact that there is little correlation between the location of property and the price at which an owner will sell. The uncoordinated sales pattern that appears is in itself a major impetus for future sprawl patterns. This condition leads Clawson to the belief that if the structure of real estate markets around urban centers cannot be modified in some way to control urban sprawl then the only possible solution may be to eliminate one of the major causative factors, agriculture.[18]

The Ad Valorem Property Tax

Although the ad valorem tax represents only one of a number of variables that affect the conversion of rural agriculture land to urban and speculative uses, it has been acknowledged by many groups as the single most important issue in the farm conversion problem. These groups feel that a decrease in the property tax rates presently levied on the farm sector would provide a sufficient inducement to farm operators to remain in farming. However, this belief is not universally held. Many believe that such an approach only provides a partial solution to the problem. On this point Sinclair states:

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[18] Marion Clawson, "Urban Sprawl and Speculation in Suburban Land," Land Economics, 38, 2 (May 1962), 100.

> ". . . It is doubtful if a slower rate of exodus would be statistically measurable even if property taxes were half their present rate. Those who argue that lower assessments and lower taxes are necessary on land which has greater value in non-agricultural uses than it has in agriculture are trying to treat a symptom rather than the cause. If we think it socially desirable to keep such land in farming we may have to revert to more rigid land use controls as well as lower taxes, an alternative not yet generally acceptable to the rural landowner.[19]

However questionable this approach may be, any alteration in the present property tax system or the adoption of an alternative taxing structure should be discussed in light of the historical development and importance of the ad valorem system in both Michigan and the United States.

Historically, the property tax has been a reality in one form or another in the United States since its founding. Jensen states:

> The general property tax, in fact, probably never existed in Europe and certainly did not prevail in England when the colonial settlers transplanted her tax structure to the new world. The American property tax, in fact, is to a large extent indigenous.[20]

The development of the tax since its early beginnings has been characterized by an experimental nature. All statutory requirements and administrative practices, however, have conformed rather loosely to the constitutional requirements for universality and uniformity. The former demands that all property within a specific tax jurisdiction unless otherwise exempted by law, shall be held taxable, while the latter necessitates that property within each tax classification be taxed at an equal rate.

Michigan, like most other states has developed its property tax structure in accordance with the concepts of universality and uniformity. The 1963 Michigan Constitution states:

> The legislature shall provide for the uniform general ad valorem taxation of real and tangible personal property not exempted by law. The legislature shall provide for the determination of true cash value at which such property shall be uniformly assessed; which shall not exceed 50 percent; and for a system of equalization of assessments. . .[21]

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[19] Sinclair, Property Taxes and Rural Landowners, p. 10.

[20] Jens Peter Jensen, Property Taxation in the United States, (Chicago; University of Chicago Press, 1931), p. 19-26.

[21] Michigan, Constitution, art. 9, sec. 3, 1963.

As designated by the legislature, ad valorem tax is, in essence, a tax on wealth in the form of the true cash value of tangible and real property held by a person on the day of assessment. More specifically, it does not attempt to tax intangible assets such as stocks or bonds which are taxed separately nor the income accrued from the ownership of property. It bases its assessment of wealth on tangible personal property such as harvested agricultural produce, manufacturer's inventories, royalties and the equipment of quasi-public corporations and on real property in the form of land and improvements and buildings on land. The true cash value of these assets is designated as:

> . . . the usual selling price at the place where 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.[22]

The continued acceptance of the property tax for a period of more than a century and a half has made it a traditional fixture in the American farm operation. Barlowe states:

> The initial acceptance of the tax by the agricultural community was favored by three important factors a) tax levies were ordinarily low; b) most of the tax revenues were used for local government services and improvements; and c) land ownership was closely correlated in most instances with individual wealth and tax paying ability.[23]

This acceptance, however, has not been as unanimous as one might envisage. Rearrangements in the amount and source of local government finances due to increased population, changes in the forms of wealth and changes in the ability to pay have all been major factors in dampening agricultures acceptance of the tax. As far back as 1837 it was evident that in periods of national economic depression and subsequent farm slumps, taxes were often considered confisicatory. Barlowe mentions: "Delinquencies were common and many properties were forfeited for non-payment of taxes, particularly in the periods following the depressions of 1837, 1857, 1872 and 1893."[24]

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[22] Michigan, Act 206 of Public Acts of 1893, sec. 211.8 as amended by Public Act 275, Michigan Public Acts of 1964.

[23] Raleigh Barlowe, "Taxation of Agriculture" in Property Taxation-U.S.A. (ed.), Richard W. Lindholm, (Madison: University of Wisconsin Press, 1967), p. 83.

[24] Ibid, p. 84.

A noticeable trend in land forfeitures became evident in the marginal land of the Lake States in the 1920's. Riding the wake of a boom period in rising farm income and farm value, farm operators were plunged into the agricultural depression of the 20's. During this period farm incomes dropped drastically while farmland values and tax rates continued to rise. Faced with the acute problem of decreasing income and increasing fixed costs, in the form of land taxes, many farmers were forced to sell or forfeit their land. In Barlowe's judgment:

> This trend led to widespread tax delinquency during the 1920's. By the 1930's, inability to pay property taxes made tax delinquency a common phenomenon in most agricultural communities, and millions of acres of agricultural land were actually forfeited for non-payment of taxes.[25]

Since 1930, farm property values and taxes have consistently continued to rise with taxes taking a larger and larger proportion of net farm income. By 1970, 12.6 percent of all net farm income before payment of taxes went to satisfy property tax levies. In Michigan, this figure was 21.7 percent, substantially higher than that of the nation. Michigan's average tax per acre during that year was $5.67, more than two times the national average of $2.47 per acre.[26]

Paralleling these developments in the property tax structure and rates, there has been a growing tendency for the basic local government unit in Michigan, the township, to place heavier emphasis on the property tax as their major souce of operating income. These units have been the sole collectors of the tax since 1934.[27] It represented their only source of revenue up until 1964 when the City of Detroit instituted the personal income tax.[28] Even though eleven other cities have instituted such local taxes, the property tax has retained its position of eminence.

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[25] Ibid.

[26] U.S., Department of Agriculture, Economic Research Service, Farm Real Estate Taxes (Washington, D.C.: U.S. Government Printing Office, January, 1972) Tables 3 and 6.

[27] Prior to 1934, both the state and local government units were authorized to collect taxes.

[28] Act 284, P.A. 1964, permits cities to levy income taxes at a rate of 1 percent on residents and 1/2 percent on nonresidents.

In 1967, 41.9 percent of all local government revenues were generated through property tax levies. The tax has increased from $1.41 million in 1941 to $1.109 billion in 1967.[29]

Because of increasing tax levies and the tendencies of local governments to depend heavily on the property tax as a source of revenue, the ad valorem tax system has acquired a growing number of critics. Barlowe states. . ."like most taxes, the property tax has both its strong and weak points." When discussing the advantages of property taxation he places his emphasis on the fact that the revenues collected through the tax do not fluxuate with the business cycle thus providing a relatively stable source of funds for local governments. He also cites the cost of administering the tax as comparing very favorably with other forms of taxation and its long tradition of acceptance makes it an acceptable part of the economic system.[30] Miller, when speaking specifically of Michigan, argued that the tax's greatest advantage lies in its capacity to yield great revenues without bringing about substantial aggregrate changes in income distribution.[31] Grove, in discussing these weaknesses formulates them as follows: (1) it is a poor measure of benefits received, (2) double taxation is encountered, (3) there are alternative procedures with debits 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 property tax and the income from property.[32] This latter point has special significance to agricultural lands where its productive return

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[29]Michigan Statistical Abstract, (ed.) David I. Verway, (Michigan State University, Graduate School of Business, Division of Research, 1972), p. 503-505.

[30]Barlowe, Land Resource Economics, p. 588.

[31]Gerald Miller, "The Property Tax as Part of a System of Taxes," (unpublished paper prepared by G. Miller, Chief of Research, Bureau of the Budget, Executive Office of the Governor, State of Michigan, 1970) p. 1.

cannot equal that which would be generated by residential use. Critics of the ad valorem system have presented a number of alternative methods of taxing agricultural land which they feel will alleviate the above inequities. These are briefly discussed below.

Use-Value Assessment and Agriculture[33]

Over the past fifteen years various states have sought partial solutions to the problem of rural land conversion by amending or replacing the ad valorem tax system with some form of use-value assessment. The supporters of such legislation have felt that it would alleviate the excess tax burden on bona fide farmers, check the disorganized conversion of land from rural to urban use and encourage the preservation of open space in urban-rural fringe areas.

Although varying from state to state, the new techniques can be generally catagorized into five sub-groups. These are (1) simple use-value assessments, (2) deferred or roll-back taxation, (3) contractual agreements for easement or development rights, (4) use-value assessment combined with planning and zoning, and (5) the classified property tax.

Simple Use-Value Assessment

This type of approach stipulates that land actually devoted to agriculture (or other uses stipulated in the legislation)[34] shall be valued in accordance to its productivity in agriculture and not to its possible future productivity in an alternative use. This type of assessment focuses in on the net income producing potential of land used in agriculture and ignores the effect of nearby land use changes. In essence it eliminates the all too imperfect market value or true cash value techniques from the

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[33]This section draws on a number of sources for its content. Some of the more important sources are: U.S. Department of Agriculture, Economic Research Service, Taxation of Farmland on the Rural-Urban Fringe: A Summary of State Preferential Assessment Activity (Washington, D.C.: Government Printing Office, September 1967); Richard E. Friday, Summaries of State Legislation Dealing with the Preservation of Farmland. Agricultural Economics Extension Bulletin 547, (Ithaca, N.Y.; Cornell University, October, 1969) and Raleigh Barlowe, James Ahl and Gordon Bachman, "Use-Value Assessment Legislation in the United States," Land Economics, 49, 2. (May 1973), 206.

[34]In addition to agriculture, use-value legislation normally protects other uses such as forestry and open space.

assessment procedure.

Those that qualify under such a system with its corresponding lower assessments and tax levies are under no obligation to retain the land in its present use. However, if the land is converted to a use not protected under the particular legislation, assessment reverts back to the ad valorem approach. Loss in taxes incured during the period while the property is on the use-value assessment roles is absorbed by the local taxing authority. Critics of such an approach have observed that while it provides a tax break to the farmer it doesn't obligate him to retain his land in any particular use and that it can be equally used by farmer and speculator alike.[35] As of January 1971, Arkansas, Colorado, Connecticut, Delaware, Indiana, and New Mexico had this type of use-value assessment.

Deferred or Rollback Taxation

This technique, although very similar to simple use-value assessment, attempts to regain a portion or all of the tax loss incurred by the local taxing authority. To accomplish this the authority must keep a dual set of assessment rolls, one for use-value assessment and one for ad valorem assessment. As long as land remains in an acceptable use it is assessed using use-value techniques. If and when the land is converted to a use not included within the legislation the local taxing authority calculates the taxes which were lost while using use-value assessment techniques instead of ad valorem techniques. The actual amount varies from state to state due to differences in the number of years for which the deferred taxes are due, the percentage of taxes deferred and the amount of the yearly differential. This sum is then payable to the local taxing authority by the seller. Through such a procedure, local taxing authorities postpone yearly increases in farm taxes due to increased assessments to a time when the farmer is in a better cash flow position. States having this type of use-value legislation as of January 1971, were Alaska, Maryland, Minnesota, New Jersey, Rhode Island, Texas and Utah.

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[35] This condition arose in Maryland because of ambiguities in the accepted statutory definition of what constitutes a bona fide farmer.

Contract Agreements for Easements or Developmental Rights

These agreements normally take a number of different forms. They generally include conditions, whereby, the non-agricultural development rights for a specific piece of property are surrendered by the farmer-owner to the state or local taxing authority in return for the right to have this property assessed in accordance with its value in agricultural use. These contracts may or may not stipulate a cash payment and are for a specified period or in perpetuity. If in either case the farmer-owner breaks the contract within the specified time period, by either sale or changing use, he is penalized. Penalties normally take the form of a fine, payment of deferred taxes due or a capital gains tax. States currently having this form of legislation currently are Florida and Oregon.

The Combination of Use-Value Assessment with Zoning and/or Planning

This approach integrates use-value assessment with existing land use controls such as zoning and planning. Under such legislation only those farmers whose operations are located in an exclusively zoned agricultural district may participate in a use-value assessment program. The value of applying use-value or deferred assessment to such areas is that it reinforces implemented decisions concerning the desired future use in the areas. In most instances such zoning is carried out at the local government level under authority of a state zoning enabling law. California, Hawaii, and Pennsylvania are currently following this type of approach.

Classified Property Tax

The fifth approach, the classified property tax has been in existence in a small number of states for some time. The essence of this approach is the suspension of the condition of uniformity normally found in most state constitutions. It allows different classes of property to be taxed at different rates. Unlike the four preceeding approaches it is not designed to protect agricultural or open space land per se but applied to all different classes of property at the legislatures discretion.

Arizona, Minnesota, Ohio, and West Virginia currently employ this type of tax structure.

The Cost of Use-Value Assessment

Each passing month sees the list of states that have adopted some form of alternative tax approach grow. The speed by which the various states have accepted use value legislation has far exceeded research on the effects of such legislation. At present four states, (Michigan, New Hampshire, Connecticut and Maryland) have conducted research aimed at measuring the effect of use-value-assessment on the shift in the incidence of the real property tax. Ching states:

> "The important issue underlying use-value-assessment legislation is not the change in tax base, but the redistribution of tax liabilities. Town expenditures remain unchanged regardless of assessment procedures, and use-value assessments will increase the tax burdens of those landowners not enjoying reductions in assessed valuations."[36]

This shifting of incidence in effect represents a cost to those not participating in the program. The amount of the cost and who shall bear it is dependent on the type of tax package adopted, the land use make up of the individual taxing jurisdicion and the participation rate of those landowners who qualify under the guidelines set down by a particular use-value-assessment bill. In the four states which have conducted research in the area of redistributive effects, all have found that there, is or would be, some decrease in the property tax base and a corresponding increase in tax rates brought on by use-value assessment. As anticipated, the amount and extent of these shifts has differed from state to state and from county to county in each of the states. In Maryland, House found that there was a significant difference in the amount of tax base lost between counties in the Baltimore area and the Washington area. He states:

> In relative terms (loss in tax base as a percentage of total tax base in the county), the variation in loss in the tax base appears to be greater in the Baltimore area. In the Washington area, the revenue loss is estimated to have been around 4.5 percent in each of the three counties of Montgomery, Prince George and Frederick. In the Baltimore

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[36] Chaucey T.K. Ching, "Effects of Alternatives to Ad Valorem Taxation on Land Use," Research Report Number 4 (Durham: The New Hampshire Agricultural Experiment Station, September, 1968), p. 5.

> area, the range was greater, from 0.7 percent in Baltimore County to 12.8 percent in Howard County.[37]

Another measure of cost employed by House was to determine the amount that the property tax rate would be decreased if use-value assessment were removed. He found that a decrease of $.09 to $.14 per $100 of assessed valuation could be anticipated if no use-value assessment had existed.[38] He also discovered that there seemed to be a uniformity in the subsidies which counties paid to participating landowners. He states:

> . . .although the more urban counties actually pay more per acre in use-value assessment subsidies to their local farmland owners than do the more rural counties, their costs are about the same (or possibly even less) in terms of increased property tax rates or percentage tax base lost. This suggests that the actual financial burden born by owners of nonfarm land is about equal, regardless of where the county lies in a metropolitan area.[39]

Ahl, in his study of the possible redistributive effects of use-value assessment in Macomb County, Michigan, experienced results similar to those found in Maryland.[40] Using a selected use-value of $100 per acre, he found that millage rates would decrease in all townships examined in the study for farmers participating in use-value assessment. These decreases ranged from 25 percent to 13 percent at a 25 percent participation level. At the same use-value and participation rate an increase of 0.40 percent to 2.32 percent in millage rates would be experienced by non-participating land owners if use-value assessment were adopted.[41]

Bachman, in a similar simulation study carried out in Lake County, Michigan, discovered comparable results. Using a $100 per acre use-value and a 25 percent participation rate, he found the mean percentage increases

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[37] Peter W. House, Differential Assessment of Farmland Near Cities Experience in Maryland Through 1965, (Washington, D.C.: Government Printing Office, October, 1967), p. 22.

[38] Ibid., p. 24.

[39] Ibid., p. 40.

[40] Ahl, "Use-Value Assessment in Macomb County," p. 89.

[41] Ibid., p. 82.

in township property tax rates to be from 1.5 percent to 5.3 percent.[42] In real dollar terms this meant an increase of $.48 to $1.76 in nonfarm and nonparticipating farmland millage rates given the presence of a use-value assessment approach.[43] These millage rate changes if applied to a property having a cash value of $40,000 would have resulted in an increase from $9.60 to $35.50 in real taxes paid by nonparticipating landowners and a decrease ranging from $238.00 to $363.00 in real taxes paid by participating landowners.[44]

In another simulation study, done by Ching and Frick in New Hampshire, results in concurrence with the other studies were recorded.[45] The authors found that under a use-value assessment program with a 50 percent abatement and assuming 50 percent participation, the tax rate would increase from $26.54 to $26.83 per $1000 of equalized valuation.[46] Although this change constituted only a 1 percent increase in the overall state tax rate, sharp changes in tax rates were experienced in small towns relative to large towns in the state. The authors state:

> This results from the fact that the rural valuation percentage is inversely related to population. Assuming 50 percent abatement and 50 percent participation the tax rate increased by 8.3 percent in the smallest group of towns (80,000 to 100,000)[47]

From these results they concluded that nonparticipants in the larger towns would be required to make only nominal additional tax payments; whereas, nonparticipants in the smaller rural towns would be required to make relatively larger additional payments under a use-value assessment system.[48]

The results which were discovered in the above studies, generally

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[42] Bachman, "Simulated Affects of Use-Value Assessment," p. 107.

[43] Ibid., p. 112.

[44] Ibid., p. 121.

[45] Chauncey T.K. Ching and G.E. Frick, "The Impact of Use-Value Assessment on the Property Tax Rate," (Durham: New Hampshire. (mimeographed.)

[46] Ibid., p. 12.

[47] Ibid., p. 13.

[48] Ibid., p. 14.

agree that use-value assessment when instituted causes a decrease in the property tax levies paid by participating landowners at the expense of nonparticipating landowners. The redistribution of the increase borne by nonparticipants seems to be a function of town size. Very little is known other than what was discovered in the New Hampshire study, on the effect of use-value assessment on sparsely populated rural areas. To correct this lack of information the remainder of this study will be devoted to determining the effects of use-value assessment on local government tax revenues in a rural area.

CHAPTER III

SAMPLING DESIGN AND FORMULATION OF TOWNSHIP ESTIMATES

This study is the third in a four part research effort sponsored by the Michigan Agricultural Experiment Station to determine the overall effects of use-value assessment on land use patterns and local government financing. The techniques used are largely those formulated by James G. Ahl and Gordon Bachman in their studies of use-value assessment and its effects on local government financing in urbanizing areas.[1] Presentation of the theory and background behind the development of the techniques have been kept to a minimum in this study due to the excellent and detailed presentation provided by Ahl and Bachman in their studies. Minor alterations have been found necessary due to the rural, non-growth nature of the study area and limitations created by the non-accessability or non-existence of data sources used in the two prior studies.

Selection of Study Area

One of the major objectives of the four part research program sponsored by the Michigan Agricultural Experiment Station was to determine the effects of preferential taxation on a wide range of areas throughout the state. Because extensive work had already been carried out by Ahl and Bachman in two of the state's high-growth, urban fringe areas, it was decided that information should be gathered from an area that was the converse of those already examined. It was believed that such information would provide the lower bound on the set of possible outcomes that could be expected if a form of preferential taxation were adopted. To fit the above parameter it was decided that the study area would have to be both agrarian in nature

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[1] Ahl, "Use-Value Assessment in Macomb County Michigan"; and "Simulated Effects of Use-Value Assessment Alternatives on Local Government Finances in Five Townships on the Rural-Urban Fringe in Kent County, Michigan."

and have demonstrated a relatively low growth rate over the last ten to twenty years. Twenty-four counties in southern Michigan[2] were compared using the following variables; the percentage change of land in agricultural use (1954-1969), population density changes (1950-70), population changes (1950-70). Using data from the U.S. Census of Population and the U.S. Census of Agriculture[3] it was found that Hillsdale County, while having a large portion of its land area in agricultural production, had experienced the most static overall growth patterns of the counties under consideration.

Description of the Study Area

Hillsdale County is located in the extreme south central part of Michigan, on the border with Ohio. Its total land area is approximately 601 square miles or 384,640 acres. Topographically the area is characterized by low rolling hills and wide valleys occasionally spotted with swamp or wetland. Soil quality generally ranges from very good in the south and southeast to medium to poor in the north and northwest. The climate is characterized by cold winters and mild, humid summers with a growing season of approximately 145 days.

The county's rather static growth pattern, mentioned above, is dramatized by minor changes in population and land use. From 1950 to 1970 population increased 16.4 percent, substantially less than the average regional[4] increase of 49.9 percent.[5] Land use changes were also below the regional average. In 1954 the county had 327,122 acres or 85.5 percent

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[2]Only those counties that were within daily driving range (approximately 70 miles) from Michigan State University were considered.

[3]U.S. Department of Commerce, Bureau of the Census, Census of Agriculture: Preliminary Report, 1969, (Washington, D.C.: U.S. Government Printing Office) p. 233.

[4]Regional is used to designate the twenty-four counties which were compared in the selection of the study area.

[5]U.S., Department of Commerce, Bureau of the Census, United States Census of Population: 1960, Vol. 1, Characteristics of the Population, pt. 24, Michigan p. 24-9 and U.S., Department of Commerce, Bureau of the Census, United States Census of Population: 1970, Advanced Report, Final Population Counts, Michigan, p.3.

of its land area in agricultural use.[6] By 1969, this had dropped to 278,865 acres or 72.6 percent of the total land area.[7] The decrease of 12.9 percent was again significantly below the regional average of 16.5 percent.

Economically, the county looks to four major sectors; manufacturing, retail sales and services, extractive industries and agriculture. The manufacturing sector is to a large extent concentrated in and around the cities of Hillsdale and Jonesville in the center of the county. In 1967, this sector was composed of 72 firms and employed 3250 people.[8] Products ranged from fabricated metal products, dies, motor vehicles and equipment to non-electrical machinery and foundry products.[9] Total value added sales during 1967 were estimated to be $39.6 million.[10]

Retail sales and services have also played a prominent role in the economic life of the county. In 1967 there were 336 active retail establishments, employing over 1300 people. Total sales for the year were $52.2 million dollars with $5.1 million being paid in salaries.[11] Major sales concentrations were found in the areas of food, automotive sales and services, food catering, building material sales and farm equipment sales and services.[12]

Since the drilling of the first oil well in the county in 1959, mineral extraction has gained an important position in the county's economy. In 1967 this sector involved 21 firms that employed 300 people. Sales of oil,

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[6]U.S. Department of Commerce, Bureau of the Census, United States Census of Agriculture: 1960, (Washington, D.C.: U.S. Government Printing Office) Vol. 1, pt. 13, p. 261.

[7]U.S., Department of Census, Bureau of the Census, United States Census of Agriculture: Preliminary Report: 1969, (Washington, D.C.: U.S. Government Printing Office) p. 233.

[8]Michigan Statistical Abstract, (ed.) David I. Verway, (Michigan State University, Graduate School of Business, Division of Research, 1972), p. 267.

[9]U.S., Department of Commerce, Bureau of the Census, County Business Patterns: Michigan 1967, (Washington, D.C. : U.S. Government Printing Office) p. 49.

[10]Michigan Statistical Abstract, p. 287.

[11]Ibid. p. 236.

[12]U.S., Department of Commerce, County Business Patterns: Michigan, 1967, p. 49.

natural gas, sand and gravel and stone approximated 13.8 million dollars during the year.[13]

Agriculture, although on the decline, still remains the most prominent occupation in the county. In 1969 over 2,000 farms were in operation.[14] While this number is slightly less than that of 1959, both size and value of the remaining operations had increased. In 1959, the average size of the farm operations in the county was 127.2 acres. This grew to 137.5 acres by 1969.[15] The average value of individual farms increased from $22,635.00 to $37,880.00 during the same period. Sales of corn, wheat, soybeans, alfalfa and hay, the major crops in the county, provided over 16.9 million dollars in gross receipts to the farm sector.[16]

Township Selection

When attempting to measure the redistribution of taxes resulting from use-value assessment, the researcher must choose which tax jurisdiction he is to use in his research. Normally, the assessed value of a particular piece of property is used by three to five different governmental subdivisions to calculate their particular tax. When added together these component taxes represent the general tax package which is levied on a particular land owner. Components of the package can include the property tax which is collected for school districts, villages, or municipalities; the county tax and any number of special levies for drainage districts, community colleges and capital expansion or debt retirement. Problems in uniformity arise when each of the taxing jurisdictions, the county, the township, the city or village and the school district do not cover the same geographical area. School districts, generally, do no adhere to either township or county boundries. Village and municipal taxes are only levied

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[13] Michigan Statistical Abstract, p. 254.

[14] U.S. Department of Commerce, Census of Agriculture: Preliminary Report, 1969, p. 233.

[15] Ibid.

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

on residents living within their corporate boundaries. In most instances, these areas contain little or no agriculture and would, therefore, provide a poor indication of the redistributive effects of the new tax. Special assessments, like the school taxes, do not adhere to any fixed governmental boundary. This type of tax is normally levied to pay for a specific project or service. Its area of coverage is determined by those who benefit from the services. In many instances it may encompass extremely divergent areas such as a school district, a drainage district or an area along a new sewer extension. In all cases the levies differ in both time duration and rate from area to area. They would at best provide a questionable base for determining the effects of the new tax.

The above problems led to the selection of the township as the basic taxing jurisdiction to be used in the study. The reasons for this choice are as follows; (1) the township is the smallest uniform unit upon which the study could be based; (2) it has the longest and most consistent history of all the jurisdictions examined; (3) property tax assessment as carried out by the township supervisor generally adheres to township boundaries and (4) the township is both the recorder and collector of all the different tax levies in the property tax bundle. The choice of the township as the base for the study provided the researcher with a readily available source of data which when analyzed could be compared with areas of like size and governmental makeup.

Five townships were chosen in Hillsdale county for the study. Their selection was based on the slow growth and percentage of land in agriculture criterion used in the county selection process. The major growth indicators which were used in the township process were; (1) population growth from 1960 to 1970; (2) population density changes from 1960 to 1970; (3) changes in assessed value from 1960 to 1970; (4) percentage changes in urbanization between 1954 and 1968; and (5) the percentage of land in urban use in 1968. Using these indicators the townships of Cambria, Ransom, Wheatland, Wright and Camden were chosen.[17] Their location with

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[17]The original selection included the townships of Woodbridge and Moscow. These were eventually dropped and replaced by Cambria and Wright when it was found that their respective property tax assessment rolls did not contain data which was essential to the study design.

respect to each other and the county as a whole is shown in Appendix A.

Having completed this initial step it was decided that a period of ten years (1960-69) would be used for the study. The choice of this time span was dictated by the following constraints. First, the township tax assessment rolls prior to 1960 were found in most cases to be unavailable.[18] Second, Michigan like other states, finds it necessary to periodically change its tax codes. The farther one goes back into the states' tax policy the more one is plagued by changes in the policy. During the 60's only two changes, i.e. revision of the land classification system, and enactment of county equalization were carried out. This made it a relatively consistent period on which to base the study. Third, it was felt that if a comparison of the results of this study were to be made in the future with those of James Ahl and Gordon Bachman,[19] it would be essential to employ a similar time period. This latter reason also proved to be the major justification of the sample design used. It is presented below.

The Sample Design[20]

The Universe of the Sample

The universe of the sample was composed of all land in the townships of Cambria, Ransom, Wheatland, Wright and Camden which was classified as "land in farms" by the 1959 Census of Agriculture. The decision to use the 1959 census was dictated by the fact that it was the latest publication to break down agricultural land use figures to the township level.

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[18] Under normal circumstances the property tax assessment rolls were centrally held at the County Treasurer's Office. In the case of Hillsdale, however, land use classifications, which were essential to the study design were only entered in the township rolls held by the respective township supervisors. This necessitated traveling to each township to collect the information desired.

[19] Ahl, "Use-Value Assessment in Macomb County;" Bachman, "Simulated Effects of Use-Value Assessment".

[20] The sample designed is based on two sources; statistical sampling techniques presented by W. Edward Deming, Sample Design in Business Research (New York: John Wiley and Sons, Inc. 1960) and modifications suggested to Ahl and Bachman by Daniel E. Chappelle, Professor of Resource Development, Michigan State University, East Lansing, Michigan.

Subsequent years, i.e. 1964 and 1969, are only broken down as far as the county level. The figures for 1959 are given in Table 1.

The Sample Unit

After defining the universe of the sample as "land in agriculture," the sample unit became the assessed value per acre for all properties exhibiting the following characteristics; (1), the property was not less than ten acres in size, (2) it was classified as "farm improved" or "farm vacant" in the 1960 tax assessment rolls; and (3), it was located in the five township area under study. The acreage constraint of ten acres was chosen because farms falling under this parameter constituted only a minor percentage of the total number of farms in the county. In 1959, 269 acres or less than one tenth of one percent of all land in farms were held in farms of less than ten acres. These small farms harvested only twenty-one acres as opposed to 177,159 acres harvested by all farms.[21] It was felt that these acreages did not constitute a viable agricultural enterprise and were therefore dropped from further consideration.

Construction of the Sample Frame

The construction of the sample frame was done following steps devised by Ahl and Bachman. The initial phase was the transcribing of all properties in the five township study area designated as "farm improved" or "farm vacant"[22] by the 1960 property tax rolls. Information which was transcribed from the rolls included; (1) the owner's name; (2) the legal description of the property; (3) the section in which the property was located (4) the acreage of the property; and (5) the property's assessed value.

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[21] U.S. Department of Commerce, Census of Agriculture: 1964 p. 1972-3.

[22] In 1960 the Michigan Treasury Department employed a land-use classification system using the following descriptions, farm improved, farm vacant, residential improved, residential vacant, business improved, business vacant, industrial, suburban improved, suburban vacant and utilities. The only distinguishing feature between the improved and vacant classification is the presence on the property of some sort of man-made dwelling with reference to farm property. These dwellings may range from a simple tool shed to an ultra modern dairy barn.

TABLE 1

ACREAGES OF ALL LAND IN FARMS IN THE STUDY AREA: 1969

County/ Township	No. of Farms	ALL LAND IN FARMS BY USE									
			CROPLAND				WOODLAND		OTHER PASTURE		OTHER LAND
		Total	Harvested	Pastured	Soil Improved	Other	Pasture	Non-Pasture	Total	Improved	
Hillsdale Co.	2,526	321,259	177,159	28,147	6,914	18,065	13,506	24,012	18,918	1,118	34,528
Cambria	149	19,133	10,028	1,826	636	787	881	1,315	877	45	2,669
Ransom	152	17,525	9,899	942	316	946	736	1,669	1,372	40	1,645
Wheatland	172	20,721	11,311	1,456	353	1,281	602	1,765	1,154	81	2,799
Wright	183	23,665	16,910	1,256	56	928	1,066	1,097	643	78	1,719
Camden	156	20,667	10,619	1,390	940	1,635	1,201	1,536	1,381	41	1,965

Source: U.S. Department of Commerce, Bureau of the Census 1959 Census of Agriculture: Michigan (County and Minor Civil Divisions) (Washington, D.C. U.S. Government Printing Office, 1962) p. 45.

The list of properties that evolved from this procedure was then divided into groups by townships, by section and by land-use classification. Each section in the five townships was then examined to determine whether it was primarily rural, urban or transitional (changing from rural to urban) in nature. The subdivision of the township section was done using the following indicators; (1) the percentage of land in agriculture in 1958 and 1964, (2) the amount of land in platted tracts in each section in 1954, 1964 and 1968; and (3) the changes in property tax classification which occured in each section from 1960-1968.[23] Application of this procedure produced six strata: farm improved urban, farm vacant urban, farm improved transitional, farm vacant transitional, farm improved rural, and farm vacant rural. A list of the sections by township and stratum is given in Appendix B.

Sample Size of Each Township

The natural stratification which was exhibited by the data lent itself not only to a comparison based upon the two land-use classifications, "farm vacant" and "farm improved" but also to the differences and/or similarities which existed between the six strata. To retain this stratification in the sampling procedure the Neyman allocation method of stratified sampling was used. The sample size for each of the townships was derived using the following formula:

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

where:

N = number of observations in sample frame.

n = number of sample observations.

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[23] Information concerning the makeup of the townships was almost nonexistent due to the fact that land-use studies had never been carried out in any of the five townships. The indicators which were used were devised using the township tax assessment rolls and the Triennial Atlas and Plat Book: Hillsdale County, Michigan, (Rockford, Illinois: Rockford Map Publishers.)

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

$\bar{\sigma}_w$ = the weighted average standard deviation within the strata
$= P_1\sigma_1 + P_2\sigma_2 + \ldots + P_i\sigma_i$ where i = 1 to 6.

$P_i = n_i/N$ = proportion of observations in the sample frame that are contained within stratum i.

$\bar{\sigma}_w^2$ = the weighted average variance of the observation within the strata $= P_1\sigma_1^2 + P_2\sigma_2^2 + \ldots + P_i\sigma_i^2$ where i = 1 to 6.

σ_i = standard deviation of the observations within the stratum i.

Sample size derived using the above formula are presented in Table 2 below.

The standard deviation of the observations in the sample frame within each stratum was calculated by the following formula:

$$\sigma_i = \sqrt{\frac{(x_i - \bar{x}_i)^2}{N_i}} \quad \text{where:} \quad (x_i - \bar{x}_i)^2 = x_i^2 - \frac{(x_i)^2}{N_i}$$

where:

σ_i = the standard deviation of the samples within stratum i.

N_i = the number of observations in the sample frame of stratum i.

X_i = the assessed valuation per acre of each observation in the sample frame of stratum i.

The standard error of the sampling procedure was then determined by setting the standard error of estimation of $5.00 with a probability of 90 percent. The standard error of the sampling procedure then became:

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

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

$\sigma_{\bar{x}}^2 = \$37.21$

A rather low standard error of estimation was necessitated by the fact that the estimated per acre valuation obtained from sampling in each strata was

multiplied by the average acreage of the sample units in that strata. Through this procedure it was possible for errors which existed in the initial estimates to be greatly magnified. Use of a higher standard of error would have enhanced the possibility to an unacceptable level when calculating the expected value of the estimate. A reliability coefficient of 1.64 (90 percent) was selected in order to decrease sample size as much as possible.

TABLE 2

NUMBER OF SAMPLE UNITS PER TOWNSHIP AND STRATUM

STRATUM	TOWNSHIPS					
	CAMBRIA	RANSOM	WHEATLAND	WRIGHT	CAMDEN	TOTAL
Rural Farm Improved	6 (203)[a]	4 (212)	5 (251)	27 (293)	4 (249)	46 (1,208)
Rural Farm Vacant	1 (42)	2 (125)	2 (153)	3 (106)	2 (139)	10 (565)
Transitional Farm Improved	3 (24)	-	-	2 (21)	1 (11)	6 (56)
Transitional Farm Vacent	1 (5)	-	-	1 (8)	1 (3)	3 (16)
Urban Farm Improved	1 (7)	-	-	-	1 (2)	2 (9)
Urban Farm Vacant	-	-	-	-	1 (4)	1 (4)
Total	12 (281)	6 (337)	7 (404)	33 (428)	10 (408)	68 (1,858)

[a]Figures in parentheses are the total number of sample units in a stratum for a given township.

Allocation of Samples to Strata

Having determined the sample size which would be drawn from each township the next step in the sampling procedure was to allocate the random sample units to each of the strata in each of the five townships. This was done by using the Newman allocation method. The method bases

the proportion of the sample to be drawn from any on strata on the standard deviation of the sample units within the strata. The larger the standard deviation of a strata the heavier it will be sampled. The sample size of each strata in each township was determined by using the following formula:

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

where:

n_i = sample size of stratum i.

n = number of sample observations in the total sample of the township.

P_i = the proportion of observations in the sample frame that are contained within stratum i.

σ_i = the standard deviation of the observations within stratum i.

$\bar{\sigma}_w$ = the weighted average standard deviation of the observations within the strata = $P_1\sigma_1 + P_2\sigma_2 + \ldots + P_i\sigma_i$.

Selection of Sample Units

The number of samples per stratum per township, designated by the Neyman allocation method, were selected from the list of sample units transcribed from the 1960 property tax rolls. A table of random numbers from 1 to Z_i was used in the selection process.[24] Random numbers were equated to the rank order of properties as they appeared in the tax rolls for each township and stratum. Sample units thus chosen were assigned an identification number.[25] This was done to facilitate coding of the information during analysis, to provide a method of identifying each property as to stratum and county and to provide a way of showing possible subdivision of the original property during the study period. A three-part code number was used. For example the code number E12 when broken

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[24] Bernard Ostle, Statistics in Research, (2nd ed.; Ames: Iowa State University Press, 1963), pp. 544-47.

[25] In the two earlier studies by Ahl and Bachman, identification numbers had been entered in the township tax rolls by local government personnel. In Hillsdale they were omitted and had to be assigned by the researcher.

down into its component parts read as follows: township E, stratum one, sample unit two. This designates the second sample chosen from the rural farm improved stratum of Cambria Township. A breakdown of the coding system is given in Appendix C.

Formulation of Sample Estimates by Stratum

The next step in the sample procedure was to calculate estimates of the farmland assessed valuation and farmland acreage for each stratum in each township for each year in the study period. These estimates were then incorporated into the simulation models described in Chapter IV. Estimates were developed following a seven step procedure.

1. The assessed valuation per acre for each observation in each stratum was calculated by dividing the observations assessed value by the observations acreage.

$$x_{ity} = \frac{av_{ity}}{ac_{ity}}$$

where:

- i = stratum.
- t = township.
- y = year.
- x_{ity} = assessed valuation per acre for each sample observation.
- av_{ity} = assessed valuation of the sample observation.
- ac_{ity} = acreage of the sample observation.

2. The mean assessed valuation per acre was then calculated by summing the assessed valuation per acre in each stratum and dividing the number of observations in the stratum.

$$\bar{x}_{ity} = \frac{\Sigma x_{ity}}{n_{ity}}$$

where:

- $\bar{x}_{ity}$ = the mean assessed valuation per acre of all sample stratum in the stratum.

x_{ity} = the sum of the assessed valuation per acre in the stratum.

n_{ity} = the number of sample observations in the stratum.

3. The mean acreage of observations in each stratum was then calculated by summing the acreages of all sample observations in a stratum and dividing this by the number of observations in each stratum.

$$\overline{ac}_{ity} = \frac{\Sigma ac_{ity}}{n_{ity}}$$

where:

$\overline{ac}_{ity}$ = the mean acreage of the sample observations in a stratum.

Σac_{ity} = the sum of the acreages of all sample observation in a stratum.

n_{ity} = the number of sample observations in the stratum.

4. The mean assessed value of an observation in a stratum was then determined by multiplying the mean assessed valuation per acre by the mean acreage estimates.

$$\bar{X}_{ity} = (\overline{ac}_{ity}) \quad (\overline{av}_{ity})$$

where:

$\bar{X}_{ity}$ = the mean assessed valuation of an observation in a stratum.

$\overline{ac}_{ity}$ = the mean acreage of a sample observation in a stratum.

$\overline{av}_{ity}$ = the mean assessed valuation per acre of the sample observation in the stratum = X_{ity}.

5. To calculate estimates for the period from 1961 to 1969 the number of observations in the sample frame had to be estimated for each year. It was assumed that since the observations in the sample for 1960 were randomly selected from all the observations in the sample frame, that these would be representative of changes in the observations in the sample frame in subsequent years. This assumption lead to the adoption of a fixed ratio which represented the relationship of the number of sample observations to the number of observations in the sample frame for the years 1961 to 1969. By holding this relationship constant the number of

observations in the sample frame for the years 1961 to 1969 were estimated using the following ratio:

$$\frac{n_{ity(1960}}{N_{ity(1960}} = \frac{n_{ity}}{N'_{ity}}$$

where:

$n_{ity(1960)}$ = the number of sample observations in the stratum in 1960.

$N_{ity(1960)}$ = the number of sample observations in the sample frame in 1960.

n_{ity} = the number of sample observations in the stratum in year y.

N'_{ity} = the estimated number of observations in the sample frame in year y.

6. The total assessed valuation of farmland in the stratum was derived by multiplying the mean assessed valuation of the sample observation in the stratum by the estimated number of observations in the sample frame of the strata for a given year. This generated an estimated total assessed valuation by strata, township and year. The formula used to carry out this procedure was as follows:

$$FAV_{ity} = (\bar{X}_{ity})\ (N'_{ity})$$

where:

FAV_{ity} = total farmland assessed valuation in the stratum.

$\bar{X}_{ity}$ = the mean assessed valuation per observation in the stratum.

N'_{ity} = the estimated number of observations in the sample frame of the stratum.

7. The total farmland acreage in the stratum was then calculated by multiplying the mean acreage of the sample observation in the stratum by the estimated number of observations in the sample frame of the stratum.

$$FAC_{ity} = (\overline{ac}_{ity})(N'_{ity})$$

where:

FAC_{ity} = total farmland acreage in stratum.

$\overline{ac}_{ity}$ = the mean acreage of the sample observations in the stratum.

N'_{ity} = the estimated number of observations in the sample frame of the stratum.

Formulation of Sample Estimates by Township

The estimates of farmland acreage and farmland assessed valuation were then used to develop estimates of township farmland acreage and township assessed valuation. This was done rather simply by summing across stratum in each township. In estimating these components the following formulas were employed.

$$FAV_{ity} = \sum_{i=1}^{6} FAV_{ity}$$

$$FEV_{ity} = \sum_{i=1}^{6} FEV_{ity}$$

Having completed the estimation process it was then possible to proceed into the formal analysis of the redistribution effects of property taxation under simple and deferred use-value assessment.

CHAPTER IV

THE SIMULATION MODELS

The estimates of township assessed valuation and farmland acreage derived through the sample design described in Chapter III were incorporated into three sets of models. These were designed to represent the internal operations of the ad valorem, use-value and deferred taxation systems. An ad valorem model was developed to facilitate comparison of the effects of the two alternate approaches as opposed to the present ad valorem system. A simulation approach was chosen because it proved to be the most efficient method of analysis given the fact that the alternative taxing approaches were not in operation in Michigan at the time.

The Ad Valorem Models

A series of equations, largely developed by Ching and Frick in their New Hampshire study,[1] were used to describe the ad valorem tax structure. They were designed to provide estimates of equalized value, tax rates, tax revenues and acreages both for the farm and nonfarm sectors in each township and for the township as a whole.

Information required for the models was obtained from the Hillsdale County Equalization Office and the township supervisors in the five townships under study. This input data included the total township equalized valuation ($TOEV_{ty}$), the total township tax revenues ($TORV_{ty}$), the township equalization factor (e_{ty}) and the township acreage ($TOAC_{ty}$) for each year from 1960 through 1969.

The township equalized values were used in these and other models in the study rather than the actual assessed value as it appeared on the township tax roles. By using this data, a basis of comparison was

[1] Chauncey T.K. Ching, "The Effects of Use-Value Assessment on Assessed Valuation and Tax Rates," (Durham: The New Hampshire Agricultural Experiment Station, April, 1966).

established between the years (1960-1965) when equalization was not in effect and the years (1966-1969) when it was. Also, since equalization was initiated to assure that townships pay their equitable share of the property tax load as dictated by the principal of uniformity, it was felt that only data which had been equalized should be used.

The township equalized valuation ($TOEV_{ty}$) when divided by the township property tax revenue ($TORV_{ty}$) produced the township property tax rate ($TORT_{ty}$). Tax rates were calculated for each township for each year using the following formula:

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

where:

$TORT_{ty}$ = the township tax rate.

$TORV_{ty}$ = the total township tax revenue.

$TOEV_{ty}$ = the total township equalized valuation.

y = the year.

t = the township

The tax rate, so derived, represented a composite rate which included not only the property tax rate but also the school tax rate and any special rates which might have been levied during the year. This aggregate rate approach was chosen primarily because of its simplicity. The only alternative approach, i.e. assigning the various separate rates to each property for each year, presented some rather complex problems in terms of equating the various taxing districts with each other and in finding applicable sources of data.[2]

The next step in the model was to determine the portions of the total township tax revenues generated by the farm sector in each of the townships for each of the study years. This was done in two steps. First, farmland equalized value (FEV_{ty}) was determined for each township by multiplying the

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[2]A much fuller explanation concerning the complex problems associated with choosing one of the taxing jurisdictions as the basis for the tax rate is presented in Chapter III p. 27.

farmland assessed value (FAV_{ty}) by the township equalization factor according to the following formula:

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

where:

FEV_{ty} = farmland equalized value.

FAV_{ty} = farmland assessed value.

e_{ty} = township equalization factor.

The second step was to determine the tax revenue that would be generated by the farm equalized value derived above. This is done by simply multiplying the township tax rate ($TORT_{ty}$) by the farmland equalized value (FEV_{ty}). The formula presented below was used in this step.

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

where:

FRV_{ty} = farmland tax revenue.

FEV_{ty} = farmland equalized value.

$TORT_{ty}$ = total township tax rate.

With the estimates of the farm sector completed attention was turned to the non-farm sector. Here, estimates of equalized value, property tax revenue and acreage were derived by subtracting the corresponding farmland estimates from the appropriate total township estimates for each township for each of the study years. This phase of the model was accomplished in three separate steps. First, the estimates of nonfarmland equalized valuation ($NFEV_{ty}$) were obtained by subtracting the farmland equalized valuation (FEV_{ty}) from the total township equalized valuation ($TOEV_{ty}$).

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

where:

$NFEV_{ty}$ = nonfarmland equalized valuation.

$TOEV_{ty}$ = total township equalized valuation.

FEV_{ty} = farmland equalized valuation.

The second step involved determining the nonfarmland property tax revenue ($NFRV_{ty}$). This was done by subtracting the farmland property tax revenue (FRV_{ty}) from the total township tax revenues ($TORV_{ty}$)

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

where:

$NFRV_{ty}$ = nonfarmland tax revenue.

$TORV_{ty}$ = total township tax revenue.

FRV_{ty} = farmland tax revenue.

The third and final step carried out was the determination of the nonfarm acreage ($NFAC_{ty}$) for each township for each year. This was accomplished by subtracting farmland acreage (FAC_{ty}) from the total adjusted township acreage ($TOAC_{ty}$).[3]

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

where:

$NFAC_{ty}$ = nonfarmland acreage.

$TOAC_{ty}$ = township adjusted acreage.

FAC_{ty} = farm acreage.

These six equations constituted the ad valorem taxation model. When united with the appropriate data obtained from the township sources previously mentioned they provide a base against which the effects of use-value assessment and deferred taxation could be drawn.

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[3]Township acreage was adjusted to include only land area (not surface water area).

Simple Use-Value Assessment and Deferred Taxation Simulation Models

The operation of both the simple use-value and deferred taxation models generally fall within two broad areas. Using the basic data derived from the ad valorem models both attempted to simulate the new property tax rates which would result under various simple use value and deferred taxation alternatives. These rates were then applied against the equalized valuation of various sectors in each of the townships to produce the tax revenues which might be generated under the alternative taxing approaches under consideration. Three sectors were designated in each of the townships. They were: (1) participating farmland, (2) nonparticipating farmland, and (3) nonfarmland.

All models used in the study, are based on the assumption that the only source of township budget funds are those generated through the township tax rates. This means that there is a direct correlation between changes in township property tax rates and the effects of use value and deferred taxation. It was also assumed that any changes in the township farmland acreage and the township assessed value per acre would be accounted for in the models by the calculations in the sample plan.

Determination of Farmland Use Value

An integral part of both the use value assessment and deferred taxation models was the determination of a range of use values which would equate favorably with the net productive value of farmland in the five townships. Theoretically, this value represents the net return that would be generated by a specific crop on a specific piece of land. This approach attempts to exclude the effects that external variables, such as, land speculation, expanding growth, potential future land uses and sale of neighboring land would have on the price of farmland.

The determination of agricultural use value is normally done by using an assessing technique called income capitalization.[4] This approach requires an appraisor, first, to estimate the average annual net agricultural

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[4] A fuller explanation of this approach can be found in Barlowe, Land Resource Economics, pp. 188-194.

income that could be generated by a specific piece of land; and, second, to capitalize this return at a set rate of interest. Three states, Maryland, Connecticut and New Jersey, have incorporated modified income capitalization approaches into their property tax appraisal system. In Connecticut, average gross rental incomes for particular crops have been used as a method of estimating net return. In Maryland, use values are based upon a capitalization of net income resulting from corn production with adjustments made for soil fertility. New Jersey used both U.S. Department of Agriculture state data on costs and returns from farming operations and census data to estimate net farm income on a county basis. These estimates are then adjusted on a local basis for soil fertility ratings. This process produces an estimate of net farm income per acre for general categories of land use, such as; cropland harvested, pastureland and woodland. These incomes are then capitalized to obtain a final estimate of use value per acre.[5]

Earlier studies in Michigan by Ahl and Bachman[6] attempted to determine use value by employing the New Jersey techniques outlined above. However, because of a number of difficulties in data collection both authors abandoned this approach in favor of using a series of use values.[7] Justification for this choice can be found in the fact that no single piece of land has only one "true" use value. In reality it may have many depending on the particular type of agricultural use, the intensity of the use, and the possible alternative types of agricultural land uses available.

In view of the preceding results this study adopted the approach

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[5]Bachman, "Simulated Effects of Use Value Assessment," p. 66.

[6]Ahl, "Use Value Assessment in Macomb County" and Bachman, "Simulated Effects of Use Value Assessment."

[7]In view of the preceding results this major problem encountered by Ahl and Bachman included the following: (1) inconsistencies in the data needed to determine costs and returns associated with particular crops; (2) inability to break down state costs and returns data to the township level; and (3) inconsistencies between the actual crop production rates in the separate townships and the hypothetical rate of return projected for the particular soil types.

of estimating a series of use values rather than trying to calculate the "true" use value of a given land use. The values of $50, $150, and $250 per acre were selected as the use values per acre to be used in the tax simulation models. These values were selected after studying the U.S. Census of Agriculture data on the value of farmland per acre and consultations with local appraisors, county officials and real estate agents.[8]

Conversion of these use value estimates (UV/AC) to estimates of farmland use values on a township basis (FUV_{ty}) was accomplished by multiplying them by the estimates of farmland acreage in each township (FAC_{ty}).

$$FUV_{nty} = (UV_n/AC)\ (FAC_{ty})$$

where:

FUV_{ty} = township farmland use value.

UV/AC = use value per acre.

FAC_{ty} = estimated farmland acreage.

Simple Use-Value Assessment Tax Simulation Models

The effects that might be expected to occur upon the adoption of simple use value assessment techniques were determined by using four tax simulation models. The first model was developed to simulate the changes in the tax rates that would occur. Models 2 and 3 deal with the changes in property tax levies which would result in each of the three sectors in each township. More specifically, Model 2, deals with changes in property tax levies in the nonfarmland sector; and Model 3 with changes in tax levies in the nonparticipating farmland sector.

Model 1

The first model which was designed to determine the new property tax rates is as follows:

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[8] U.S., Department of Commerce, 1964 Census of Agriculture, p. 247.

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

where:

$TORT_{ty(uv)}$ = new township property tax rates from simple use-value assessment in township t and year y.

$TORV_{ty(av)}$ = township property tax revenue in township t and year y.

FEV_{ty} = farmland equalized value in township t and year y.

FUV_{ty} = farmland use valuation in township t and year y.

$NFEV_{ty}$ = nonfarmland equalized valuation in township t and year y.

P_1 = proportion of township farmland equalized valuation not participating in use-value assessment program.

P_2 = proportion of township farmland use valuation participating in use-value assessment program.

P_3 = proportion of township nonfarmland equalized valuation not participating in use-value assessment program.

Three participation rates were employed for each township and year throughout the study. The adoption of such an approach was done to determine the effects of varying rates of participation in use value assessment programs on the present property tax rates. It was assumed that varying participation rates would have a direct effect on the formulation of a new tax rate. As farmland classified in the nonparticipating sector moves into the participating sector, a portion of the property tax base previously held by them would be shifted to the farmland which remains in the nonparticipating sector and the land in the nonfarmland sector. As the rate of participation increases the amount of the tax burden shifted would also increase. This in turn would cause an adjustment in the property tax rates.

The levels of participation and the corresponding levels of P_1 and P_2 that were used are given in Table 3. The participation rates of the nonfarmland sector (P_3) remained at 1.00 since those who didn't own farmland could not participate under any circumstances in the program. Farmland participation rates in the remaining two sectors, however, were moved from 25 to 75 percent. These participation rates being compliments

always totaled 100 percent. For example, if 25 percent of the farmland sector was participating in a program then 75 percent would not be participating.

TABLE 3

LEVELS OF PARTICIPATION RATES IN TAX SIMULATION MODELS

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

These three participation rates when combined with the three values of farmland use valuation (FUV_{ty}) used in Model 1 produced nine new property tax rates for each township for each year. A listing of these are given in Table 4.

TABLE 4

COMBINATIONS OF VALUES FOR PARTICIPATION LEVELS AND FARMLAND USE VALUE VARIABLES IN MODEL 1

UV/AC	Participation Levels	Value of P_1	Value of P_2	Value of P_3	$TORT_{ty(uv)}$ ID No.
$50	1	.75	.25	1.00	1
$50	2	.50	.50	1.00	2
$50	3	.25	.75	1.00	3
$150	1	.75	.25	1.00	4
$150	2	.50	.50	1.00	5
$150	3	.25	.75	1.00	6
$250	1	.75	.25	1.00	7
$250	2	.50	.50	1.00	8
$250	3	.25	.75	1.00	9

The nine possible combinations of the variables FUV_{ty}, P_1, P_2 and P_3 were then combined with single values of the variables $TORV_{ty(av)}$ FEV_{ty} and $NFEV_{ty}$ to calculate the new property tax rates resulting from simple use value assessment ($TORT_{ty(uv)}$) for each township for each year. Each of the new property tax rates were assigned identification numbers in preparation for their use in the remaining simulation models.

Model 2

With the derivation of the new tax rates completed, the next step in the study was to estimate the changes that would occur in property tax revenues in the nonfarmland sector as a result of simple use value assessment. Measurement of these changes was done by comparing the property tax revenues generated by the nonfarmland sector under ad valorem assessment with those revenues that would have to be generated under simple use value assessment if the same level of total township property tax revenues were to be maintained. These additional revenues from the nonfarm sector would be necessary to offset the loss in property tax base that would occur as a result of granting simple use value assessment status to varying proportions of farmland in each township. The model used to carry out these comparisons is as follows:

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

where:

$NFRV_{ty(av)}$ = nonfarmland property tax revenue produced under ad valorem assessment in township t and year y.

$NFRV_{ty(uv)}$ = nonfarmland property tax revenue produced under simple use value assessment in township t and year y.

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

$TORT_{ty(uv)}$ = new township property tax rates resulting from simple use value assessment in township t and year y.

$NFEV_{ty}$ = nonfarmland equalized valuation in township t and year y.

P_3 = proportion of township nonfarmland equalized valuation not participating in simple use value assessment program.

The two (P_3) $(NFEV_{ty})$ components used in the model are the same as those used in Model 1. The $TORT_{ty(uv)}$ variable was composed of the nine new property tax rates developed in Model 1.

Model 3

The third and last model developed to simulate simple use-value assessment used the nine new property tax rates to determine the changes in the property tax revenues generated by the participating farmland sector if use-value assessment were adopted. The model used in this stage of the analysis is presented below:

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

where:

$FRV_{ty(uv)}$ = participating farmland property tax revenue produced under simple use-value assessment in township t and year y.

$FRV_{ty(av)}$ = participating farmland property tax revenue produced under ad valorem assessment in township t and year y.

$TORT_{ty(uv)}$ = township property tax rates resulting from simple use value assessment in township t and year y.

$TORT_{ty(av)}$ = township property tax rates resulting from ad valorem assessment in township t and year y.

FUV_{ty} = farmland use valuation in township t and year y.

FEV_{ty} = farmland equalized valuation in township t and year y.

P_2 = proportion of township farmland equalized valuation participating in simple use value assessment program.

In the above model the $(TORT_{ty(av)})$ and (FEV_{ty}) variables have only $(TORT_{ty(uv)})$ variables, however, have nine different combinations which can be produced in each township for each year. A list of these combinations can be seen below in Table 5.

As can be seen in the last column of Table 5, each of the nine

combinations has been given an identification number. This was done to facilitate their incorporation in the deferred taxation models which are discussed below.

TABLE 5

COMBINATIONS OF VALUES FOR THE VARIABLES IN MODEL 3

Participation Level	Value of P_2	Farmland use value	$TORT_{ty(uv)}$ [a]	$FRV_{ty(uv)} - FRV_{ty(av)}$ ID. No.
1	.25	$50	1	1
1	.25	$150	4	2
1	.25	$250	7	3
2	.50	$50	2	4
2	.50	$150	5	5
2	.50	$250	8	6
3	.75	$50	3	7
3	.75	$150	6	8
3	.75	$250	9	9

[a]Identification number of solutions to Model 1 are presented in Table 4.

The Deferred Taxation Simulation Models

A series of three deferred taxation models (models four through six) were designed to determine the effects that deferred taxation alternatives would have on the local township property tax rate and tax burden. The models, except for an added deferred taxation component, were identical to those used in the simple use value assessment series. Model 4 was designed to simulate the new property tax rates that would result from the application of deferred taxation to varying proportions of farmland in the township. Models 5 and 6 were designed to measure the redistributive effects that deferred taxation would have on the property tax burden held by the participating farmland, non-participating farmland and nonfarmland sectors in each township. All three models employed data that was used in the previous simple use value assessment series.

Model 4

Model 4 which was developed to simulate the new township property tax rates is presented below.

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

where:

$TORT_{ty(df)}$ = new township property tax rates resulting from deferred taxation in township t and year y.

$TORV_{ty(av)}$ = township property tax revenue under ad valorem assessment in township t and year y.

$FRV_{ty(av)}$ = property tax revenue produced by participating farmland under ad valorem assessment in township t and year y.

$FRV_{ty(uv)}$ = property tax revenue produced by participating farmland under simple use value assessment in township t and year y.

FEV_{ty} = farmland equalized valuation in township t and year y.

FUV_{ty} = farmland use valuation in township t and year y.

$NFEV_{ty}$ = nonfarmland equalized valuation in township t and year y.

r = number of years in rollback.

w = proportion of the difference in participating farmland property tax revenue that is collectable as rollback.

s = proportion of farmland participating in deferred taxation program to which the rollback would apply.

P_1 = proportion of township farmland equalized valuation not participating in deferred taxation program.

P_2 = proportion of township farmland use valuation participating in deferred taxation program.

P_3 = proportion of township nonfarmland equalized valuation not participating in deferred taxation program.

As mentioned, Model 4 differed from Model 1, only in the inclusion of a rollback component in the numerator of the model. This component was designed to simulate the additional revenues which would be made available

to a township if a rollback or penalty clause were added to a use value assessment approach.

Under the assumption that total township tax revenue equals total township budget requirements, any increase in rollback revenue generated in a given year and township was inversely proportional to the decrease in the total township tax revenues necessary to fulfill budget requirements for that year and township.

If, for instance, revenue generated through a rollback clause were to increase by $10,000, a decrease of $10,000 would be expected to occur in the total township tax revenues in order to retain the present budget level. In lieu of this inverse relationship the rollback variable in Model 4, r=3,5 $(FRV_{ty(av)}) - (FRV_{ty(uv)})$ (w) (s) was subtracted from the township property tax revenue variable.

The amount of revenues that could be generated through a rollback clause were determined through the interaction of a number of variables. Those that were incorporated in the model were; (1) the differential revenues generated by the farmland sector under use value and ad valorem assessment $(FRV_{ty(av)}) - FRV_{ty(uv)})$; (2) the proportion of this differential which would be considered rollback (w); (3) the number of years for which the rollback was inacted (r); and (4) the proportion of farmland which while participating in the deferred taxation program converted to nonfarmland uses.

The calculation of differences between farmland revenue generated under use value and ad valorem taxation approaches were done using the $(FRV_{ty(av)}) - FRV_{ty(uv)})$ solutions produced by Model 3 for each township and year. Only those solutions in which farmland tax revenue under simple use value assessment was lower than under ad valorem assessment were used. In those solutions where this condition was reversed there was no rollback.

The negative solutions thus chosen were then converted to positive solutions for incorporation into Model 4. This was done by rearranging the farmland revenue variables in the following form $(FRV_{ty(av)}) - (FRV_{ty(uv)})$.

The second variable which effected the amount of rollback revenue which might be generated was the proportion of the differential farmland tax revenues that were to be considered as rollback. In this study it was decided that 1.00 of the differentials would be considered as rollback. This proportion was chosen because it conformed with the requirement set

down by those states that had already enacted deferred taxation and it agreed with the rollback clause in the proposed deferred taxation bill presently under consideration in Michigan.

These reasons also influenced the choice of a rollback period in the model. Both three and five years were chosen, primarily because they are the most commonly used in deferred taxation programs in other states and have been sighted in various Michigan proposals.

The fourth variable in the rollback component represented the proportion of farmland participating in deferred taxation that the rollback would apply to because of a change to a nonfarm or non-qualifying land use. The values of this variable were set at 10 and 20 percent. These values were applied not to all farmland but to only that farmland participating in the deferred taxation program. The actual proportion of farmland which rollback applied was therefore very small. It ranged from 2.5 percent ((.25) (.10) (100%) = 2.5) to 15 percent ((.75) (.20) (100%) = 15) of all farmland. These rates although small were felt to realistically cover the true rate of conversion of land from farm to nonfarm uses in each year during the study period.

These variables when consolidated with those in Model 3 produced a number of combinations upon which the rollbacks were based. These combinations of value for Model 4 are presented in Table 6.

The incorporation of the two rollback periods necessitated an adjustment in the years for which Model 4 could be calculated. Using the three year rollback period calculations could only be made for eight of the ten years. The five year rollback limited the calculations to six years. These adjustments were necessary because the rollbacks could not be calculated for the first two and four years of the study period. Table 7 gives the years that were used for the values of the variables in Model 4.

The combinations of values presented in Table 7 were incorporated into the model according to the year combinations presented above. This produced tax rates for the deferred taxation program which were incorporated into the remaining three models to determine any sectorial changes in tax burden that might occur under deferred taxation.

TABLE 6

POSSIBLE VALUES OF VARIABLES IN MODEL 4

UV/AC	P_1	P_2	P_3	$FRV_{ty(av)}$ / $FRV_{ty(uv)}$ Id. No.[a]	(w)	(r)	(s)
$50.00	.75	.25	1.00	1	1.00	3	.10
							.20
						5	.10
							.20
	.50	.50	1.00	4	1.00	3	.10
							.20
						5	.10
							.20
	.25	.75	1.00	7	1.00	3	.10
							.20
						5	.10
							.20
$150.00	.75	.25	1.00	2	1.00	3	.10
							.20
						5	.10
							.20
	.50	.50	1.00	5	1.00	3	.10
							.20
						5	.10
							.20
	.25	.75	1.00	8	1.00	3	.10
							.20
						5	.10
							.20
$250.00	.75	.25	1.00	3	1.00	3	.10
							.20
						5	.10
							.20
	.50	.50	1.00	6	1.00	3	.10
							.20
						5	.10
							.20
	.25	.75	1.00	9	1.00	3	.10
							.20
						5	.10
							.20

[a]Identification number of solutions to Model 4 as presented in Table 4.

TABLE 7

YEARS USED FOR VARIABLES IN MODEL 4

Three Year Rollback		Five Year Rollback	
Years used for FRV_{av} - FRV_{uv} Variables	Years used for FEV, NFEV, FUV TORV Variables	Years used for FRV_{av} - FRV_{uv} Variables	Years used for FEV, NFEV, FUV TORV Variables
1960-2	1962	1960-64	1964
1961-3	1963	1961-65	1965
1962-4	1964	1962-66	1966
1963-5	1965	1963-67	1967
1964-6	1966	1964-68	1968
1965-7	1967	1965-69	1969
1966-8	1968		
1967-9	1969		

Model 5

Model 5 employed these new tax rates to simulate the change in property tax revenues generated by the nonfarmland sector that might result from the adoption of deferred taxation. Its operations were identical to those of Model 2 which simulated the same redistributive effects under simple use value assessment. This model is presented below.

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

where:

$NFRV_{ty(df)}$ = nonfarmland property tax revenue produced under deferred taxation in township t and year y.

$NFRV_{ty(av)}$ = nonfarmland property tax revenue produced under ad valorem assessment in township t and year y.

$TORT_{ty(df)}$ = new township property tax rates resulting from deferred taxation in township t and year y.

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

$NFEV_{ty}$ = nonfarmland equalized valuation in township t and year y.

P_3 = proportion of nonfarmland equalized valuation not participating in deferred taxation program.

The $(TORT_{ty(df)})$ (P_3) $(NFEV_{ty})$ component in the model was the same as the corresponding component in Model 2. The values of the $(TORT_{ty(df)})$ component were the new property tax rates as developed in Model 4.

Model 6

The third and last model in the deferred taxation series was designed to simulate the change that might be expected to occur in property tax revenues generated by the farmland sector participating in the deferred taxation program. This model is essentially the same as Model 3 which simulated the same effect under simple use value assessment. This model is presented below.

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

where:

$FRV_{ty(df)}$ = participating farmland property tax revenue produced under deferred taxation in township t and year y.

$FRV_{ty(av)}$ = participating farmland property tax revenue produced under ad valorem assessment in township t and year y.

$TORT_{ty(df)}$ = new township property tax rates resulting from deferred taxation in township t and year y.

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

FUV_{ty} = farmland use valuation in township t and year y.

FEV_{ty} = farmland equalized valuation in township t and year y.

P_2 = proportion of township farmland equalized valuation that participates in deferred taxation.

The $(TORT_{ty(av)})$ (P_2) (FEV_{ty}) component of the model was the same as the corresponding component in Model 4. The combinations of values for the variables $TORT_{ty(df)}$, P_2 and FUV_{ty} were taken from those presented in Table 4.

CHAPTER V

ANALYSIS OF THE SIMULATION MODELS

The formal analysis of the data obtained through the sample plan was incorporated into the eight simulation models, described in Chapter IV, using a CDC 6500 computer. Data inputs broke down into two general categories. Information concerning assessed value, acreage and land use classification obtained from the individual sample units was entered into the simulation models on individual sample observation cards. The information contained on these cards, which represented seventy-two different observations, was manipulated using the analysis techniques presented in Chapter III to produce estimates of farmland assessed valuation and farmland acreage for each township for each year.

The second category of data inputs was composed of information relating to township equalized valuation, township property tax revenues, township equalization factors and township tax rates. These inputs were incorporated into the ad valorem, simple use value and deferred taxation models through a group of township data cards. These township data cards along with the various parameter estimates set in the simulation models were combined with the individual sample unit data to produce estimates of the effects that might occur if one of the alternative tax programs was initiated.

Analysis of the computer output focused on the inter and intra-township redistributive effects of the alternative tax proposals. The analysis attempted to discern general trends rather than specific changes in a given township during a particular year. It was hoped that this type of approach would point out those trends that otherwise might not be readily apparent in the large amount of data generated by the models.

Calculation of Sample Bias and Standard Errors of Estimation

To determine how closely data obtained from the samples correlated with that from all the farms in the five townships, estimates for each strata and township were calculated for the year 1960. The year 1960 was chosen because it was the only year in which both census and sample data of farmland acreage and valuation were compiled.

Calculation of sample bias was done for farmland assessed value and farmland acreage for each township in 1960. The results are presented in Table 8. As shown, there was a general tendency for the sample estimates to overstate both farmland assessed valuation and farmland acreage. Average over-estimations for all five townships for each category farmland assessed valuation and farmland acreage, proved to be almost identical. The average over-estimation for the farmland assessed valuation was 11.73 percent while the farmland acreage exhibited an 11.11 percent over-estimation. Individually, the percentage of sample bias for farmland assessed valuation ranged from 2.72 percent in Wright Township to 24.68 percent in Cambria Township. A slightly smaller range was exhibited in the farmland acreage category with Wheatland Township leading with 18.17 percent and Wright Township with a low 6.51 percent bias.

In all townships, the estimates of farmland assessed valuation and acreage exceeded the census assessed valuation and acreage. To investigate these deviations a little more closely Table 9, was developed. It presents the standard error of estimation of farmland assessed valuation per acre for each stratum in each township in 1960. In all of the townships where the transitional and urban stratum appeared large deviations in the error of estimation appeared. The deviations can best be attributed to the small sample size drawn from each of these stratum and to the high variability of assessed valuation within each of these stratum due to their location and the types of buildings associated with the acreages. The deviations, although having some affect on the differentials exhibited between the township census and sample assessed valuations, were not deemed to be sufficient to explain the variations since these stratums only encompassed a relatively small portion of the total township farm acreage. Over-estimations in the farm improved stratum, however, seemed to be a

direct cause in all cases except Wheatland by the over-estimation of sample farmland assessed valuation. This conclusion flows directly from the fact that although the over-estimates within this stratum was lower than those in the other stratums they fell over a much larger portion of the total farm acreage in each township. This in turn magnified the effect that each over-estimation had on the sample farmland assessed valuation as compared to that of the other stratum. For example, in Cambria Township where 60 percent of all farmland fell into the farm improved stratum, a 9.68 over-estimation in farmland assessed valuation per acre not only compensated for under-estimations in the other stratums but resulted in an over-estimation in the sample farmland assessed valuation of 24.69 percent. The over-estimation in Wheatland can be attributed in part to over-estimation in the rural farm improved stratum and to a relatively high over-estimation in the farm acreage estimate.

TABLE 8

SAMPLE BIAS FOR ESTIMATES OF
FARMLAND ASSESSED VALUATION AND FARMLAND ACREAGE IN
ALL TOWNSHIPS FOR 1960

	Sample FAV_{ty}	Census FAV_{ty}	Sample Bias	Sample FAC_{ty}	Census FAC_{ty}	Sample Bias
Cambria	1316930	1056200	260730 +(.246857)	22899	20187	2712 +(.134344)
Ransom	1034942	933250	101692 +(.108965)	20472	18851	1621 +(.085990)
Wheatland	1490775	1231300	259475 +(.210733)	26200	22172	4028 +(.181671)
Wright	1818839	1770650	48189 +(.027215)	28577	26830	1747 +(.065114)
Camden	1361733	1285450	76283 +(.059343)	27559	25605	1955 +(.076355)

TABLE 9

STANDARD ERROR OF ESTIMATION OF FARMLAND ASSESSED VALUATION PER ACRE FOR EACH STRATUM IN EACH TOWNSHIP IN 1960

	Cambria	Ransom	Wheatland	Wright	Camden
Rural Farm Improved	9.68	31.14	15.00	34.18	-14.74
Rural Farm Vacant	-7.28	2.62	-14.30	-12.40	-18.93
Transitional Farm Improved	-63.18	-	-	-39.99	-39.52
Transitional Farm Vacant	-72.55	-	-	- .54	- 2.31
Urban Farm Improved	-44.09	-	-	-	.01
Urban Farm Vacant	-	-	-	-	- 3.58

Results from the Ad Valorem Model

The simulation of the effects of the ad valorem property tax system was undertaken for two specific purposes; (1),to incorporate into the ad valorem tax structure the biases mentioned above, and (2), to develop a base against which the simple use value and deferred taxation models could be compared. To develop a basic pool of data for purposes of comparison the means of selected variables in the ad valorem model were calculated. These are presented in Table 10.

As can be seen from the Table, both Camden and Cambria contain the highest percentages of nonfarmland equalized valuation to total equalized value. This can be explained by the fact that the former is adjacent to Hillsdale Township which is the most heavily urbanized township in the county, while the latter contains two small villages and a moderate amount of recreational development. Wheatland Township ranked the lowest in terms

TABLE 10

TEN YEAR MEANS OF SELECTED VARIABLES
IN THE AD VALOREM MODEL

TWS	TOEV	NFEV	FEV	TORV	NFRV	FRV	TORT	FAC	NFEV TOEV	FEV TOEV	FEV FAC
Cambria	$4,219,869 (2)	$2,392,581 (1)	$1,827,291 (3)	$124,114 (2)	$71,194 (1)	$52,920 (3)	28.56 (2)	19,518 (4)	56.70% (1)	43.30% (5)	$93.62 (3)
Ransom	2,048,290 (5)	405,100 (5)	1,614,090 (5)	53,879 (5)	11,074 (5)	42,800 (4)	26.75 (5)	18,712 (5)	19.78 (4)	78.80 (2)	86.26 (4)
Wheatland	2,675,862 (4)	439,475 (4)	2,236,387 (2)	78,274 (4)	11,400 (4)	66,874 (2)	29.22 (1)	21,440 (3)	16.43 (5)	83.58 (1)	104.31 (2)
Wright	4,751,156 (1)	1,450,570 (3)	3,299,586 (1)	134,966 (1)	41,280 (3)	93,686 (1)	28.39 (3)	24,029 (1)	30.53 (3)	69.45 (3)	137.32 (1)
Camden	3,717,650 (3)	2,075,425 (2)	1,643,225 (4)	90,331 (3)	50,384 (2)	39,947 (5)	24.85 (4)	23,814 (2)	55.83 (2)	44.20 (4)	69.00 (5)

Note: Numbers in parenthesis refer to the township's ranking for each variable.

of the percentage of nonfarmland equalized valuation to total equalized valuation. This is not surprising since the township has no villages or populated areas within it.

It is interesting to note that both Camden and Cambria Townships which rank high in the percentage of nonfarm equalized valuation, also rank relatively high in total equalized valuation. Both are displaced by Wright Township which has the highest total equalized valuation. This is understandable since Wright contains some of the best farmland in the county. This is brought out by the fact that it has the highest equalized value per farm acre of the five townships studied.

The data tends to indicate that the farmland equalized valuation per acre is inversely related to the percentage of total equalized valuation in a nonfarmland classification. For example, as nonfarmland acreage increases the value of acreage classified as farmland generally decreases. In other words, those townships which have a high portion of their total equalized value in the nonfarm category tend to have the lowest per acre farm equalized valuations. At closer inspection this relationship would seem to be in direct opposition to the premise that as areas urbanize land prices are bid up and the assessed value of farmland increases. This condition may be caused by deficiencies in the townships assessment programs or in the fact that rural township assessors differentiate between farm and nonfarm acreage when assessing property. Whatever the reason, it would prove an interesting topic for further research.

The comparison of mean values, although helpful in discussing the interrelationships exhibited by the variables, does not address itself to the rather dynamic growth which some of the variables have undergone from 1960 to 1969. For this reason the ranges and percentage change in selected variables is presented in Table 11.

In Cambria, Wright and Camden townships, percentage increases in nonfarm revenue exceed those in farm revenue. These differential growth rates can be attributed to relatively larger increases in the nonfarm equalized valuation as opposed to rather modest increases in the farmland equalized value. In Ransom and Wheatland townships there was a decline in nonfarm revenue accompanied by rather substantial increases in farmland revenue.

TABLE 11

RANGES AND PERCENTAGE CHANGES IN SELECTED VARIABLES IN THE AD VALOREM MODELS FROM 1960 TO 1969

		Cambria	Ransom	Wright	Wheat.	Camden
NFRV	1960	40517	10772	41889	15996	45833
	1969	127075	9526	54757	3706	68763
		213.6%[a]	-11.6	30.7	-76.8	50.0
TORV	1960	75682	43344	135441	61726	81171
	1969	204754	71351	166945	114246	120298
		170.5	64.6	23.3	85.1	48.2
FRV	1960	35165	32572	93552	45730	35338
	1969	77679	61825	112188	110540	51536
		120.9	89.8	19.9	141.7	45.8
NFEV	1960	1894781	519633	1384363	701111	2191026
	1969	3258642	280415	1713204	95091	2313541
		72.0	-46.0	23.8	-86.4	5.6
TOEV	1960	3539246	2090734	2276283	2705482	3880324
	1969	5250620	2100356	5223014	2932076	4047466
		48.4	0.5	16.7	8.3	4.3
FEV	1960	164465	1571101	3091920	2004371	1689298
	1969	1991978	1819941	3509810	2836985	1733925
		21.1	15.8	13.5	41.5	2.6
TORT	1960	21.384	20.732	30.257	22.815	20.919
	1969	38.996	33.971	31.964	38.964	29.722
		82.4	63.9	5.6	70.8	42.1
FAC	1960	19823	18712	26716	21440	23815
	1969	19178	19712	26655	21440	23810
		-3.3	0.0	-.2	0.0	0.0
NFAC	1960	2833	168	868	1920	2297
	1969	3478	165	929	1920	2302

[a]These numbers indicate percentage increases and decreases in the appropriate variables from 1960 to 1969.

In all five townships the above changes occured rather abruptly during the period from 1967 to 1969 as a result of property tax equalization efforts. In Cambria, Camden, and Wright reassessment of properties caused a shift in property tax burden from the farm to the nonfarm sector. This is readily apparent from the fact that in all three cases nonfarmland equalized value increased substantially while farmland equalized value remained constant. These shifts resulted in the nonfarm sector providing a much larger proportion of total tax revenue bill than the farm sector. In Ransom and Wheatland townships this shift was reversed. In both townships there was a decline in nonfarm revenue and equalized value and a corresponding increase in farmland revenue and equalized value. This change implies that prior to 1967 nonfarm properties in the two townships were over assessed in relation to their true market value while farm properties were under assessed. Readjustments during the 1967 to 1969 period altered the assessed value of each property type so that they were more in line with their prevailing market price. This re-evaluation caused a shift in property tax burden from the nonfarm to the farm sector. The adjustment was roughly equal to a two to one shift in the property tax burden. For example, ever $2.00 decrease in nonfarmland equalized valuation was accompanied by $1.00 increase in the farmland equalized valuation.

In all townships the percentage increase in property tax revenue exceeded the relative increases in total equalized valuation. This differential in the growth rate between the variables was due to positive changes in the property tax rates in each township. If property tax rates had remained constant then changes in total equalization would have been proportional to the changes in total tax revenue. However, as was the case, increases in property tax rates when multiplied by the changes in the total equalized valuation produced more than proportional increases in total property tax revenues.[1]

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[1]These interrelationships can be seen more clearly if Ransom Township is examined. Total equalized valuation remained almost constant due to offsetting decreases and increases in nonfarm and farm equalized valuation. Because of this increase in the property tax rate (63.9 percent) resulted in proportional increases in total property tax revenues (64.6 percent).

In only one township, Cambria, was there a significant increase in nonfarm acreage (22.8 percent). The effect of this increase is clearly evident in the rather significant increase registered in both the nonfarm equalized valuation and nonfarm revenue variables. Increases were also felt in the property tax rate, which would tend to indicate that as more land was converted into nonfarm uses nonfarm equalized value naturally rose but not at a rate sufficient to preclude a rise in the real property tax rate. Implied in these fluctuations is a possible causal relationship between nonfarm equalized valuation and township property tax rates. The data provides some rather strong evidence to indicate that in Cambria as the nonfarm sector grew, the demand for local government services increased and tax rates were forced upward to provide revenues to cover the cost of these new services. It should be noted that, although this increase demand for local government services is a necessary condition for the increase in taxes it is not a sufficient condition to explain the total increase.

These results tend to focus attention on the question; "Are increases in the nonfarm equalized valuation and township tax rate more sensitive indicators of urban growth (i.e., increase demand for public services) than the traditionally accepted land use change criterion?" Although the former conditions would seem to be necessary for urban growth they are not sufficient to measure it. This point becomes clearer if one examines the possible conditions under which growth in the two variables occur. Increases in local government property tax rates may not only be caused by the increased demand for local services as a result of urbanization but by such exogenous variables as inflation and state and federal regulations. These regulations in many instances dictate the minimum quantity and quality of services required to be provided by the local government to make it eligible for state or federal monies. Such programs have in effect forced many local governments to increase local property tax rates to pay for up-grading and/or expansion of present services to acquire new outside money. The extent to which these exogenous variables effect local tax rates will determine how sensitive local increases in tax rates are in explaining urban growth.

Problems also arise when considering the nonfarm equalized valuation as a sensitive indicator of urban growth. Increases in this variable may not only be attributed to the increased trend toward urbanization but also to the effect that inflation has in increasing the market price of nonfarm properties and to shifts of land use within the nonfarm sector itself. This latter point addresses itself to the possibility that shifts in land use, for example, from a residential to a commercial classification may not be caused by an increase in population but by a simple increase in the services required by the residents of the area. This would not indicate a trend toward urban growth but a change in the preference structure of the local residents.

For the above reasons it is difficult to ascertain from the variables alone the precise rate of urban growth in any of the five townships. The data would tend to indicate that Ransom, Wheatland, Wright, and Camden remained essentially static with minor changes being due to inflation and changes in the local resident's preferences for services. There was a tendency for nonfarm growth in Cambria Township.

Results from the Simple Use-Value Assessment Models

Results from Model 1

The first model was used to provide data on the effects that simple use-value assessment under varying levels of participation have on the property tax rates in the five townships. Output from the model indicates the percentage change in the township property tax rate which could be expected in a given year if plain use-value assessment were adopted. Table 12 consolidates the percentage changes for the ten year period into a mean change which is given for each township and level of participation.

The results of the model tend to indicate that the ten year mean property tax rate would be higher in all townships if a use-value assessment figure of $50.00/per acre were adopted. This general increase in the property tax rates in all the townships at each of the participation levels would connote that the use-value figure has a significant effect on the township's tax base. In effect, such a low assessment figure would decrease the tax base of each township to such an extent that the townships

would find it necessary to increase tax rates to retain their present levels of tax revenues.

TABLE 12

MEAN PERCENTAGE CHANGES IN TOWNSHIP PROPERTY TAX RATES RESULTING FROM SIMPLE USE-VALUE ASSESSMENT

Alternative	FUV/AC	P_2	Cambria	Ransom	Wheatland	Wright	Camden
1	$ 50	.25	8.65	16.29	18.94	16.07	7.57
2	50	.50	18.95	38.98	47.07	38.32	16.40
3	50	.75	31.43	72.82	93.87	71.14	26.79
4	150	.25	- .86	-3.04	.89	3.27	-4.77
5	150	.50	-1.67	-5.89	1.90	7.06	-9.09
6	150	.75	-2.45	-8.57	3.07	11.00	13.03
7	250	.25	-8.81	-16.86	-12.40	-6.77	-14.56
8	250	.50	-16.41	-28.85	-22.01	-12.66	-25.40
9	250	.75	-22.33	-37.81	-29.69	-17.84	-34.10

Such increases are also evident in Wheatland and Wright townships when the use-value assessment per acre is increased to $150. This use-value figure, however, causes a decrease in the tax rate for Camden, Cambria, and Ransom Townships. This would indicate that such a use-value figure is above the present per acre ad valorem assessment rate. The initiation of such a rate would cause an increase in the townships property tax base. If the townships were to retain their present levels of tax revenues this would necessitate a decrease in the property tax rates.

The trend of decreasing property tax rates is intensified as the use-value assessment per acre is increased to $250. At this use-value assessment rate all five townships show varying decreases in the property tax rates. Under these conditions it is unlikely that many farmers would voluntarily enter a use-value assessment program since it would be uneconomical for them to do so. Participation in the program would require that their property be assessed at a rate higher than that under the ad valorem system. This in essence would mean that they would be paying a greater absolute amount for property taxes under the use-value system than under the ad valorem system.

Where the results of the model indicate increases in the township property tax rate participation in a use-value assessment program would be indicated. Under these lower use-value assessment rates the farm owner would be paying a smaller absolute amount for property taxes under the use-value system than under the ad valorem system. In effect those in the township who do not participate in the program effectively subsidize, through higher tax payments, those who participate in it.

The fluctuation of use-values and participation rates have some very definite effects on the results of the model. In general, the higher the participation rate the greater the effect a use-value will have on the new township tax rate. In other words, as a greater number of farm operators participate in a use-value program more shifting incidence takes place. In the case of property tax rate increases the shift would be from participants to non-participants while with property tax decreases the shift would be from non-participating to participating residents. Changes in the farm use-value tend to affect the magnitude of the rate changes. For example, as the use-value was increased from $50 to $150 there was a decrease in the percentage differential between the old and new property tax rates. Increases in the use-value from $150 to $250 caused subsequent increases between the old and new tax rates. This would seem to indicate that the average market price (ad valorem assessed value) was somewhere in the general neighborhood of $150 per acre in each of the five townships. In Wright and Wheatland the actual figure would be above the $150/acre while in Camden, Cambria and Ransom it would be less.

Results from Model 2

Results from Model 2 indicated what changes could be expected in nonfarmland and non-participating farmland revenue if use-value assessment were initiated. It should be noted that the mean percentage changes in nonfarmland property tax revenues were equal to those values presented in Table 13. This equality is explained by the fact that in Model 2 the only value which is different between the use-value component and the ad valorem component is the property tax rate. Because of this the mean percentage changes in nonfarmland property tax revenues were the same as the mean percentage changes in township property tax rates.

Subsequently, the relationships discussed with Model 1 hold for the results generated by Model 2.

In addition to simulating the percentage changes in nonfarmland revenue, Model 2 transcribed these changes into the language of millage rate changes that could be expected because of a change to use-value assessment. The equation for computing this conversion is as follows;

$$\frac{NFRV_{ty(uv)} - NFRV_{ty(av)}}{NFEV_{ty}} x1000$$

The resulting millage rate change when converted into dollars per thousand indicate the increase or decrease in the tax burden that would be shifted to the nonfarmland or non-participating farmland sector if use-value were initiated. These mean changes are presented in Table 13.

TABLE 13

MEAN CHANGES IN NONFARMLAND AND NON-PARTICIPATING FARMLAND MILLAGE RATES RESULTING FROM SIMPLE USE-VALUE ASSESSMENT

Alternative	FUV/AC	P_2	Cambria	Ransom	Wheatland	Wright	Camden
1	$ 50	.25	0.24	0.43	0.57	0.46	0.19
2	50	.50	0.54	1.04	1.44	1.09	0.40
3	50	.75	0.89	1.96	2.91	2.02	0.65
4	150	.25	-0.01	-0.08	0.04	0.03	-0.12
5	150	.50	-0.04	-0.15	0.09	0.20	-0.22
6	150	.75	-0.05	-0.22	0.14	0.31	-0.32
7	150	.25	-0.24	-0.44	-0.35	-0.19	-0.36
8	150	.50	-0.44	-0.76	-0.63	-0.36	-0.62
9	150	.75	-0.60	-1.00	-0.85	-0.51	-0.83

With the initiation of the $50 use-value assessment rate a general increase in the millage rate could be expected in all five of the townships. This rise would be the cost to the nonfarmland and non-participating farmland sectors of allowing those participating farm operators to be assessed at the lower assessment rate. If a $250 use-value assessment rate were used the opposite would be true in all five townships participating. The farm operator would be paying a higher tax than he would

under ad valorem assessment. He would in effect be subsidizing the lower millage rate experienced by the nonfarmland and non-participating farmland sectors at this use-value rate. If the $150 rate were used a mixed reaction would occur. In Wheatland and Wright there would be a slight rise in the nonfarmland and non-participating farmland sectors. In Camden, Cambria, and Ransom there would be a slight decrease.

Results from Model 3

Model 3 was designed to simulate two of the effects which would have occured under a simple use-value assessment program. First it generated the percentage change in participating farmland property tax revenues and secondly, changes in the millage rate of participating farmland under the program. The results of the former are presented in Table 14.

TABLE 14

MEAN PERCENTAGE CHANGES IN PARTICIPATING FARMLAND PROPERTY TAX REVENUES UNDER THE SIMPLE USE-VALUE ASSESSMENT ALTERNATIVES

Alternative	FUV/AC	P_2	Cambria	Ransom	Wheatland	Wright	Camden
1	$ 50	.25	-70.71	-66.24	-71.25	-76.47	-60.93
2	50	.50	-67.94	-59.68	-64.58	-71.97	-57.72
3	50	.75	-64.58	-49.91	-53.61	-65.33	-53.95
4	150	.25	6.78	6.07	- 2.43	-16.18	38.35
5	150	.50	5.77	9.21	- 1.69	-13.25	32.03
6	150	.75	4.82	12.56	- 0.83	-10.08	26.27
7	250	.25	68.91	68.91	48.27	32.21	117.20
8	250	.50	44.52	44.52	31.77	23.81	89.53
9	250	.75	26.29	26.29	18.62	16.42	68.15

As can be seen from the table some rather substantial changes could be expected if use-value assessment were adopted.

Wheatland and Wright Townships experienced the largest mean percentage decrease in tax revenue. This was due to the fact that these townships had the highest farmland equalized valuation per acre ($104.31 and $137.32 respectively) which results in a relative large differential between the farmland use valuation and farmland assessed or equalized valuation. These large differentials resulted in the large percentage

decreases shown on the table. This trend continued throughout the remaining townships. As the farmland equalized evaluation per acre decreased, the mean percentage change in farmland revenue also decreased in magnitude.

There also tended to be a direct correlation between the changes in property tax revenues and changes in the townships' property tax rates resulting from use-value assessment. In those townships where the latter was high the former was also substantial. In these townships use-value assessment resulted in the granting of rather large tax subsidies to participating farm operators. These subsidies if paid for by the non-farmland and non-participating farmland sectors would result in increased tax rates. It should be noted that the extent of the subsidy is dependent on the differential which exists between the farmland equalized valuation per acre and the use-valuation per acre. Changes in the tax rate although partially dependent on the above are greatly affected by the percentage of the total equalized valuation participating in the use-value program. The greater the participation the higher the tax rate must be to make up the revenue lost through use-value assessment.

The second operation of the model was to simulate the change in the millage rate levied on participating farmland under a use-value program. These figures were calculated using the same formula employed in Model 2. The results are shown below in Table 15.

Results from the second step of the model were generally similar to the results shown in Table 15. Townships with relatively high farmland equalized valuation per acre and large changes in the township tax rate (i.e. Wheatland and Wright) experienced relatively large changes in participating farmland millage rate.

To put the above figures in a more useful context an example is in order. Assuming that the millage rate changes associated with the nonfarmland and non-participating farmland sectors and those associated with the farmland sector were translated into dollar amounts by using a property valued at $40,000, the effects of use-value assessment would be

readily evident. Such a hypothetical analysis[1] using values generated in Table 15 is presented in Table 16.

TABLE 15

MEAN CHANGES IN PARTICIPATING FARMLAND MILLAGE RATES UNDER SIMPLE USE-VALUE ASSESSMENT

Alternative	FUV/AC	P_2	Cambria	Ransom	Wheatland	Wright	Camden
1	$ 50	.25	-2.03	-1.75	-2.10	-2.17	-1.48
2	50	.50	-1.96	-1.58	-1.90	-2.04	-1.40
3	50	.75	-1.86	-1.31	-1.56	-1.86	-1.31
4	150	.25	0.15	0.32	-0.12	-0.46	0.94
5	150	.50	0.13	0.23	-0.09	-0.38	0.79
6	150	.75	0.11	0.15	-0.05	-0.29	0.64
7	250	.25	1.99	1.80	1.34	0.91	2.84
8	250	.50	1.61	1.16	0.87	0.68	2.19
9	250	.75	1.28	0.68	0.50	0.44	1.66

Table 16 indicates some substantial differences between the taxes paid between the participating and non-participating property. This difference ranges from approximately $90.00 in Wheatland Township under alternative three to $1.20 in the same township under alternative four. It is these tax costs or savings which would provide the incentive for farm operators to join the program. It is also interesting to note that the greatest tax savings again would be experienced in Wheatland and Wright Townships with the least savings in Camden Township.

The calculation of the benefit received by participating farmland with reference to a $1.00 increase associated with the non-participating sectors was done by comparing the decrease in millage rates associated with the participating sector with the increases in millage rates felt in the non-participating sectors. Results of this analysis appear as the mean decrease in participating farmland millage rates for each dollar increase in non-participating millage rates. They are given in Table 17.

[1]The figure used in the analysis is not the true cash value (i.e., $40,000) but the equalized valuation of the property which is ½ the cash value (i.e., $20,000).

TABLE 16

MEAN CHANGES IN PROPERTY TAXES ON PARTICIPATING AND NON-PARTICIPATING PROPERTY WORTH A CASH VALUE OF $40,000

Alternative	FUV/AC	P_2	Cambria	Ransom	Wheatland	Wright	Camden
1	$ 50	.25	4.80	8.60	11.40[a]	9.20	3.80
			-40.60	-35.00	-42.00	-43.40	-29.60
2	50	.50	10.80	20.80	28.80	21.80	8.00
			-39.20	-31.60	-38.00	-40.80	-28.00
3	50	.75	17.80	39.20	58.20	40.40	13.00
			-37.20	-26.20	-31.20	-37.20	-26.00
4	150	.25	-	-	0.80	0.60	-
			-	-	-2.40	- 9.20	-
5	150	.50	-	-	1.80	4.00	-
			-	-	-1.80	- 7.60	-
6	150	.75	-	-	2.80	6.20	-
			-	-	-1.00	- 5.80	-

[a]The top number in the table is the increase in taxes that the non-farmland and non-participating sectors would pay under simple use-value assessment while the lower figure is the decrease in taxes the participating farmland sector would experience.

Note: Only those alternatives which resulted in a decrease in the taxes paid by the participating farmland sector were used in the analysis.

Table 17 indicates that in a few instances the benefits derived from a use-value assessment program would be less or equal to the costs to the non-participating sector of such a program. In these cases an increase of one dollar in the non-participating sector's millage rates would generate a benefit in the form of a rate decrease, of less than one dollar in the participating sector.

The data seems to indicate that such results generally occur only at the higher participation levels. At the $50.00 farm use value negative cost benefit ratios appear in Wheatland, Ransom and Wright at the 75 percent participation level. This would seem logical since at these higher participation rates the amount of per capita subsidy that

must be paid by the non-participating sector in the form of higher tax rates to maintain current township tax revenues is relatively high. Negative cost-benefit ratios also appeard in the $150 farm use-value categories in Wheatland and Wright Townships at the 75 percent level. The cost benefit ratios for all the townships in the $250 use-value category and for Camden, Cambria and Ransom in the $150 use-value category were not calculated, since these use values were above the existing ad valorem assessed values. If adopted these use values would cause an increase in the tax burden carried by the participating farmland sector. It is therefore questionable whether any farm operators could participate in the program under these use-value rates.

TABLE 17

MEAN DECREASE IN PARTICIPATING FARMLAND MILLAGE RATES FOR EACH DOLLAR INCREASE IN NON-PARTICIPATING MILLAGE RATES

Alternative	FUV/AC	P_2	Cambria	Ransom	Wheatland	Wright	Camden
1	$ 50	.25	$ -8.46	$ - 4.07	$ -3.68	$- 4.72	$ -7.80
2	50	.50	-3.63	- 1.52	-1.32	- 1.87	-3.50
3	50	.75	-2.09	- 0.67	-0.54	- 0.92	-2.02
4	150	.25	-	-	-3.00	-15.33	-
5	150	.50	-	-	-1.00	- 1.90	-
6	150	.75	-	-	-0.36	- 0.66	-

The appearance of negative cost-benefit ratios tends to correspond with the percentage of the township equalized value which falls into non-farm and farm sectors. As the percentage of farmland equalized value increases the liklihood of a negative cost-benefit ratio at the higher participation rate also increases. This seems only reasonable since the larger the farm equalized valuation the smaller the nonfarm equalized valuation will be that must absorb tax shifts. A decrease in the assessed valuation over a large portion of the farm sector will have to be compensated by an increase in the tax rate or equalized value of the relatively small nonfarm sector if the townships tax revenues are to remain constant.

For example, the cost or the shift in tax incidence caused by a use-value assessment in townships such as Wright and Wheatland which have high proportions of their township equalized valuation in the farmland sector (69.45 percent and 83.58 percent respectively) would have to be borne by a relatively small non-participating and nonfarm sector. Because of the small size of the nonfarm sector in each township (30.53 percent in Wright and 16.43 percent Wheatland) as more and more farm operators participate in the program the cost to the nonfarm sector increases to the point where negative cost benefit ratios occur.

The above discussion points to the fact that the applicability of a simple use-value assessment program to a predominately rural area is limited by the expected participation rates. If these are high, in the 75 percent range, serious consideration must be given to the value of such a tax program.

Results from the Deferred Taxation Models

The deferred taxation models differ only slightly from those used in the use-value assessment section. They have an added component which allows a township to regain a portion of the tax revenues which they would loose under simple use-value assessment. These savings appear in the form of a general reduction in the townships property tax rates under deferred taxation. The extent of these savings or the amount of rollback was determined by three variables (1) the length of time over which the rollback applies (r); (2), the extent of the differential between normal tax revenues and deferred taxation revenues (w); and (3), the proportion of participating farmland equalized value which falls under the rollback provision (s).

Before continuing on to a discussion of the results a few words of caution are in order concerning the methods used to aggregrate the data. To develop a valid basis for comparing the results of the three taxing approaches (deferred taxation with the three and five year rollback periods and simple use-value assessment) it was necessary to use only those years in which results were generated for all three approaches. This meant that results from the years 1960 through 1963 generated in the simple use-value models and the results for the years 1962 and 1963 generated by the deferred taxation models with the three year rollback

were disregarded. This purging of data was necessitated by the fact the deferred taxation models with the five year rollback only began generating results in 1964. With this in mind the analysis of the results of the deferred taxation models is presented below.

Results from Model 4

The mean effects of deferred taxation on township property tax rates and nonfarmland and non-participating farmland property tax revenues are presented in Table 18. It should be noted that only those results which were positive were used in calculating the means presented in the table. Negative results would indicate that lower tax rates for farm operators would be available under the existing ad valorem system than under any one of the three alternatives. Under such conditions there would be a rather strong tendency for farm operators not to participate in any of the programs since to do so would mean additions to operating costs.

Referring to the table, the figures in the PUV column, represent the mean percentage increase in township property tax rates which could be expected under simple use-value assessment. Figures appearing in columns labeled r=3 and r=5 represent the mean percentage increase in township property tax rates which would occur under deferred taxation with a three year rollback and deferred taxation with a five year rollback respectively. Two figures are given for each deferred approach as indicated in column s. Each of these represent the results which might be expected to occur given varying proportions (10 and 20 percent) of those participating in a deferred taxation program who are effected by the rollback clause. In essence these percentages attempt to simulate the amount of money in deferred taxes which would have to be returned to the taxing authorities by a farm operator if he defaults on his agreement and shifts his land out of agricultural use.

The overall results from the table indicate that the severity of the tax shift decreases from a maximum under the simple use-value assessment approach to a minimum under the five year deferred taxation approach. Under simple use-value assessment no funds are returned to the taxing authority so the total cost of the program must be borne by the nonfarmland and the non-participating farmland sectors. Under both the

TABLE 18

THE EFFECT OF MEAN PERCENTAGE CHANGES IN TOWNSHIP PROPERTY TAX RATES ON NONFARMLAND AND NON-PARTICIPATING FARMLAND PROPERTY TAX REVENUES RESULTING FROM DEFERRED TAXATION

Alternative	FUV/AC	P_2	S	Cambria			Ransom			Wheatland			Wright			Camden		
				PUV	r=3	r=5	PUV	r=3	r=5	PUV	r=3	r=5	PUV	r=3	r=5	PUV	r=3	r=5
1	$50	.25	.10	$ 5.65	$ 6.44	$ 5.36	$16.87	$12.52	$10.05	$20.67	$15.58	$13.00	$16.34	$11.83	$ 8.99	$ 7.54	$ 5.52	$ 4.31
2	50	.25	.20	-	3.45	2.07	-	8.06	3.23	-	10.47	5.33	-	7.03	1.61	-	3.40	1.08
3	50	.50	.10	18.96	14.28	12.04	39.55	31.25	25.85	52.41	40.75	34.86	39.13	28.93	22.54	16.34	14.68	9.71
4	50	.50	.20	-	9.60	5.61	-	20.51	11.05	-	29.11	17.61	-	18.84	5.94	-	8.04	3.09
5	50	.75	.10	31.45	24.07	20.54	73.96	61.98	53.35	107.87	88.36	78.17	73.01	55.75	44.92	26.67	20.38	16.58
6	50	.75	.20	-	16.67	9.62	-	47.78	29.98	-	68.86	48.45	-	38.47	16.82	-	14.08	6.50
7	150	.25	.10	.44[a]	.37[a]	.37[a]	-	-	-	2.13	1.84	1.83	3.92	2.99	2.48	-	-	-
8	150	.25	.20	-	1.27[a]	.27[a]	-	-	-	-	1.55	1.54	-	2.05	1.04	-	-	-
9	150	.50	.10	.88[a]	.75[a]	.73[a]	-	-	-	4.46	4.36	4.01	8.18	6.61	5.73	-	-	-
10	150	.50	.20	-	.62[a]	.58[a]	-	-	-	-	3.59	3.56	-	5.01	3.37	-	-	-
11	150	.75	.10	1.42[a]	1.16[a]	1.14[a]	-	-	-	7.02	6.63	6.62	12.80	10.94	9.89	-	-	-
12	150	.75	.20	-	1.00[a]	.94[a]	-	-	-	-	6.25	6.21	-	8.85	6.97	-	-	-

[a]Mean calculated for only those years which generated positive results (1965-67 and 1969)

deferred taxation approaches a portion of the taxes foregone by the taxing authorities are returned. This results in a depression of the township property tax rates and a subsequent decrease in the shift of tax burden. It should be noted that the effect of the five year rollback is more pronounced than the three year rollback on the decrease in property tax rates. This differential effect is caused by the fact that under the five year rollback returns to the taxing authority are accrued over a five year period and are thus larger than those accrued over a three year period as stipulated under the three year rollback clause.

Similarily, the amount of rollback and subsequent tax shift is effected by the proportion of the tax differential which comes under a rollback clause. Taxes and thus tax shift was higher using a 10 percent s value than those generated using an s value of .20. This inverse relationship was caused by the fact that using an s value of 10 percent meant that less would be paid to the taxing authority in the form of rollback than would be the case when using a 20 percent rollback. This would mean higher tax rates under an s of 10 percent than under one of 20 percent.

There was a general tendency for taxes to increase as the participation percentage increased. As more and more farm operators took advantage of the lower assessed values per acre offered under the three programs the more the burden of taxation shifted from the participating to non-participating sectors.

In terms of individual townships the greatest difference between the effects of use-value assessment and deferred taxation tend to occur in those townships which had the highest percentage of farm equalized value to total township equalized value. This is very important since it seems to indicate that the greatest effect of deferred taxation occurs in those townships which are predominately rural, such as, Wheatland, Ransom and Wright. This may have some effect on the decision of which approach should be chosen, if any, for predominately rural areas. It should be noted that this same relationship was experienced under the simple use-value assessment approach.

Results from Model 5

Model 5 attempts to simulate the changes which would occur in non-farmland and in non-participating farmland assessed valuation if various deferred taxation programs were incorporated into local tax structures. Structurally the model is essentially the same as Model 4 except for the fact that it uses tax rates which were generated in Model 4.

The changes in millage rates generated by the model when multiplied by 1000 represent the dollar changes per thousand of assessed valuation which would occur. These changes are presented in Table 19.

Increases in nonfarmland and non-participating farmland tended to follow the same general pattern exhibited in Model 4. The greatest increase in millage occured in those townships which had the highest ratio of farmland equalized value to total township equalized value. The severity of each taxing approach differed. In all five townships the greatest effect or the largest increases in millage rates per thousand were caused by the simple use-value approach. This was followed by the deferred taxation approach with a three year rollback and then the five year rollback approach. The explanation of the differentials is essentially the same as that found in the discussion of Model 4. The simple use-value approach calls for the largest decrease in farmland equalized value which in turn requires the greatest increase in nonfarmland and non-participating farmland tax rates. In both the three and five year deferred taxation approach varying amounts of the increase in tax rates are absorbed by the rollback. The effect of the rollback on the tax increments tends to change as the years involved in rollback increases and as the percentage of equalized value coming under the rollback increases. As in Model 4, this means that the deterent effect of the rollback on tax rates is felt much more substantially in the five than three year approach and under the application of a higher s value rather than a low one.

Before continuing to a discussion of Model 6 it should be noted that the increase in s value, from .10 to .20 has a greater effect on tax rates than the increase in rollback period from three to five years. For example, in Wheatland Township under alternatives 1 and 2 the decrease in millage rates caused by shifting from the three to five year rollback under a .10 s value was $.09 per thousand assessed value. This decrease became much

TABLE 19

MEAN CHANGES IN NONFARMLAND AND NON-PARTICIPATING FARMLAND MILLAGE RATES FROM DEFERRED TAXATION

Alternative	FUV/AC	P_2	S	Cambria			Ransom			Wheatland			Wright			Camden		
				FUV	r=3	r=5	FUV	r=3	r=5	FUV	r=3	r=5	FUV	r=3	r=5	FUV	r=3	r=5
1	$50	.25	.10	.28	.21	.17	.49	.37	.30	.70	.53	.44	.48	.40	.30	.21	.15	.12
2	50	.25	.20	-	.14	.07	-	.24	.10	-	.36	.19	-	.25	.05	-	.10	.03
3	50	.50	.10	.61	.46	.39	1.19	.92	.76	1.78	1.39	1.20	1.12	.98	.65	.44	.33	.27
4	50	.50	.20	-	.31	.16	-	.65	.33	-	1.00	.62	-	.64	.18	-	.22	.09
5	50	.75	.10	1.02	.78	.66	2.26	1.83	1.53	3.69	3.04	2.70	2.09	1.89	1.29	.72	.55	.45
6	50	.75	.20	-	.54	.31	-	1.40	.90	-	2.38	1.72	-	1.31	.49	-	.38	.18
7	150	.25	.10	.015[a]	.012[a]	.011[a]	-	-	-	.08	.07	.07	.11	.10	.07	-	-	-
8	150	.25	.20	-	.009	.008[a]	-	-	-	-	.06	.05	-	.07	.03	-	-	-
9	150	.50	.10	.029[a]	.025[a]	.024[a]	-	-	-	.17	.16	.15	.23	.22	.16	-	-	-
10	150	.50	.20	-	.020	.019[a]	-	-	-	-	.14	.13	-	.17	.09	-	-	-
11	150	.75	.10	.044[a]	.038[a]	.037[a]	-	-	-	.27	.26	.25	.37	.368	.28	-	-	-
12	150	.75	.20	-	.033[a]	.031[a]	-	-	-	-	.24	.24	-	.30	.20	-	-	-

[a]Mean calculated for only those years which generated positive results (1965-67 and 1969)

more significant ($.17) if increases in the s value in the three year rollback approach are considered. Such shifts in the five year rollback causes even greater decreases in tax shifts ($.25 per thousand of assessed value).

The Results of Model 6

Model 6 attempts to generate the mean changes in participating farmland millage rates which could be expected under a deferred taxation approach. The results of this model are presented in Table 20.

Under close scrutiny it is evident that these results are similar in general character to those generated by Model 5. The results presented here represent in effect the mirror image of those appearing in Table 20. This is due to the fact that in any given township revenues foregone because of decrease in participating farmland millage rates (shown in Table 21) are recouped via increases in the millage rates of nonfarmland and non-participating farmland millage rates (shown in Table 20) Because of this, relationships discussed with respect to Model 5 also apply here. The largest decreases in participating farmland are found in townships that have a high percentage of farm equalized valuation to total township equalized valuation. Also, savings tend to; (1) decrease as farmland use-value per acre increases toward the present market valuation; (2) increase from a low under simple use-value assessment to a high under deferred taxation with a five year rollback; and (3) increase as the percentage of farmland equalized valuation falling under the rollback clause increases. Also, as was the case in Model 4 and 5, the effects of increases in the percentage of equalized valuation falling under the rollback clause has a much more significant effect than the length of rollback period on tax savings accrued to those participating in the program.

The Effect of Simple Use-Value Assessment and Deferred Taxation on the Conversion of Participating Farmland to Nonfarm Uses

To achieve a more realistic appraisal of the effects of simple use-value and deferred taxation it is necessary to examine each program in the light of the costs which would be borne by the farm operator for converting his land to a nonfarm use.

TABLE 20

MEAN CHANGE IN PARTICIPATING FARMLAND PROPERTY TAX REVENUES
RESULTING FROM DEFERRED TAXATION

Alternative	FUV/AC	P_2	S	Cambria			Ransom			Wheatland			Wright			Camden		
				PUV	r=3	r=5	PUV	r=3	r=5	PUV	r=3	r=5	PUV	r=3	r=5	PUV	r=3	r=5
1	$50	.25	.10	-72.99	-73.54	-73.81	-66.66	-67.90	-68.60	-72.48	-73.64	-74.23	-77.21	-78.09	-78.65	-60.29	-60.80	-61.24
2	50	.25	.20	-	-74.10	-78.62	-	-69.12	-70.55	-	-74.79	-75.98	-	-78.97	-80.09	-	-61.53	-62.44
3	50	.50	.10	-70.43	-71.60	-72.16	-59.89	-62.57	-64.12	-65.20	-67.99	-69.34	-72.75	-74.74	-76.00	-57.10	-58.32	-59.24
4	50	.50	.20	-	-72.76	-73.88	-	-65.26	-68.34	-	-70.62	-73.33	-	-76.73	-79.25	-	-59.86	-61.71
5	50	.75	.10	-67.49	-69.23	-70.05	-49.65	-53.85	-56.32	-52.90	-57.39	-59.73	-66.11	-69.48	-71.61	-53.35	-55.29	-56.70
6	50	.75	.20	-	-71.01	-72.76	-	-58.07	-62.98	-	-61.79	-66.47	-	-72.87	-77.11	-	-57.62	-60.45
7	150	.25	.10	- 3.59[a]	- 3.66[a]	- 3.67[a]	-	-	-	- 6.67	- 7.07	- 7.08	-18.57	-19.30	-19.70	-	-	-
8	150	.25	.20	-	- 3.73[a]	- 3.75[a]	-	-	-	-	- 7.31	- 7.33	-	-20.03	-20.83	-	-	-
9	150	.50	.10	- 3.16[a]	- 3.29[a]	- 3.31[a]	-	-	-	- 4.93	- 5.28	- 5.29	-15.24	-16.54	-17.16	-	-	-
10	150	.50	.20	-	- 3.41[a]	- 3.45[a]	-	-	-	-	- 5.64	- 5.66	-	-17.72	-19.09	-	-	-
11	150	.75	.10	- 2.73[a]	- 2.90[a]	- 2.92[a]	-	-	-	- 2.83	- 3.15	- 3.16	-11.62	-13.10	-13.91	-	-	-
12	150	.75	.20	-	- 3.06[a]	- 3.10[a]	-	-	-	-	- 3.47	- 3.49	-	-14.05	-16.20	-	-	-

[a]Mean calculated for only those years which generated negative results (1965-67 and 1969)

One method of doing so would be to calculate the number of years a farm operator would have to participate in a deferred taxation program before the costs associated with the rollback would be equal to the cumulative increase in yearly benefits accrued under deferred taxation as opposed to simple use-value assessment. Table 20 indicates that the greatest differential between the simple use-value approach and the five year deferred taxation approach occurred in Ransom Township under alternative one. Here a farm operator would save $1.94 per thousand of assessed valuation if he participated in the five year deferred taxation program. However, if he wished to withdraw from the program he would incur a cost of $68.60 per thousand dollars of assessed valuation due to the rollback. This would mean that he would have to remain in the five year deferred program 34.36 years before accumulating enough benefits to cover the rollback costs. As the differential between simple use-value and deferred taxation decreases, the time period increases. It reaches its maximum in Cambria Township, where an operator would have to remain in the program 89.01 years to accrue enough benefits to cover the rollback costs. This evidence would tend to indicate that farm operators would desire a use-value assessment program without a rollback rather than with it.

Another indication of the effects of deferred taxation and simple use-value assessment on farm operators can be seen by determining the rollback costs which would be incurred on an average 40 acre tract of land. To put this figure into perspective, it is compared to the market value of the property in 1969.[2] The calculation of true cash values per acre were only calculated for 1969 because of the lack of consistent sales data in other years of the study. This information along with the assessed value and assessed to sales ratio is presented in Table 21.

Sales data indicate that the cash value of a 40 acre parcel in 1969 varied from $5,937.20 in Camden Township to $12,492.40 in Wright Township. On the other hand, the assessed value of a 40 acre parcel ranged from $2,912.80 in Camden to $5,292.80 in Wheatland Township. It is interesting

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[2]Cash sales figures used in this analysis were obtained from the Michigan Department of the Treasury, Local Government Services Division; Lansing, Michigan.

to note that only one township, Camden, comes close to valuing their land at 50 percent of its true cash value. Ratios in the remaining townships vary from .378 to .444. This variability is possibly due to the divergent abilities of the tax assessors in each township.

TABLE 21

MARKET AND ASSESSED VALUE
PER 40-ACRE PARCEL IN 1969

Township	Market Value	Assessed Value	Ratio of Market To Assessed
Cambria	$ 274.93	$ 103.87	
	10,997.20	4,154.80	.378
Ransom	248.86	97.26	
	9,954.50	3,890.40	.391
Wheatland	297.85	132.32	
	11,914.00	5,292.80	.444
Wright	312.31	131.68	
	12,492.40	5,267.20	.422
Camden	148.43	72.82	
	5,937.20	2,912.80	.491

Note: The top number is the per acre value while the bottom number is the value per 40 acre parcel.

The second step in the analysis was to calculate the amount of rollback which would be incurred by the owner of a 40 acre plot if he left the the deferred program. These results are given in Table 22.

Rollbacks were higher in all townships as was expected, under the five year period. This was due to the fact that they represented the tax benefits accrued to the farm operator over a longer period than the three year rollback. In the three year period, the largest rollback cost $470.95, would have been incurred in Wheatland Township while the lowest, $163.32, would have occured in Camden Township. In the five year rollback period, the largest rollback penalty, $682.11, occurred again in Wheatland Township while the lowest $250.58, occurred in Camden Township.

Although these figures may seem quite substantial in and of themselves, when combined with the sales value of the property they take on a diminished

stature. For example, in Wheatland Township where the three and five year rollbacks were the highest of those recorded they represented 3.95 and 5.73 percent respectively of the cash sale value of the property. In Camden Township these percentages were even lower. The three year rollback was 2.75 percent and the five year rollback was 4.22 percent of the 1969 cash sales value of the property. This information would tend to indicate that the rollback while it may have an effect on the selling price (inflate it to cover the rollback costs) there is little indication that it would deter an owner from converting his property. This would seem to be true since it is so small in relation to the cash sale price of the property.

TABLE 22

THE ROLLBACK AS A PERCENTAGE OF TRUE CASH VALUE PAYABLE ON A 40-ACRE TRACT OF LAND IN 1969

Township	r=3	r=5
Cambria	$362.03 (3.29)	$528.99 (4.81)
Ransom	260.65 (2.62)	398.90 (3.92)
Wheatland	270.95 (3.95)	682.11 (5.73)
Wright	381.92 (3.06)	599.01 (4.79)
Camden	163.22 (2.75)	250.58 (4.22)

Note: The numbers appearing in parentheses are the rollback as a percentage of true cash value.

The final analysis of the deferred taxation approaches is concerned with comparing the maximum benefits a farm operator could accrue if he participated in the program from 1960 to 1969 as opposed to the benefits accrued to a farm operator if he didn't participate in the program. Again, calculations were done by employing alternative one in both the three and five year deferred tax models and the hypothetical 40 acre parcel of land. Results of this analysis are presented in Table 23.

TABLE 23

THE MINIMUM AND MAXIMUM ECONOMIC BENEFITS ACCRUED TO A 40-ACRE PARCEL OF LAND DUE TO THE APPRECIATION IN LAND VALUE AND PARTICIPATION OR NON-PARTICIPATION IN A DEFERRED TAXATION PROGRAM

Township	(1) Appreciation in Cash Value (1960-69)	(2) Tax Benefits		(3) Net Tax Benefits Tax Benefits Rollback		(4) Maximum Benefits (columns 1+3)		(5) Minimum Benefits (columns 1-2)		(6) Maximum Minus Minimum Benefits	
		r=3	r=5	r=3	r=5	r=3	r=5	r=3	r=5	r=3	r=5
Cambria	7214.40 (180.36)[a]	1066.45	941.59	704.42	412.60	7918.82	7627.00	6147.95	6272.81	1770.87	1354.19
Ransom	5955.60 (148.89)	718.17	695.20	457.52	296.30	6413.12	6251.90	5237.43	5260.40	1175.69	991.50
Wheatland	6918.00 (172.95)	1178.09	1222.57	707.13	540.46	7625.13	7458.46	5739.91	5695.43	1885.22	1763.03
Wright	7650.40 (191.26)	1153.67	1171.76	771.76	572.91	8422.16	8223.31	6496.73	6478.48	1925.43	1744.83
Camden	2510.80 (62.77)	447.98	462.91	284.66	215.24	2795.46	2726.04	2062.83	2047.89	732.64	678.15

[a]The numbers in parenthesis represent the appreciation in land value per acre for the period 1960-1969.

The largest increase in land value occurred in Wright Township where a per acre increase of $191.26 was felt. This meant that a 40 acre parcel would have increased in value by $7650.40 from 1960 to 1969. The smallest increase was experienced in Camden Township where cash value increased $62.77 per acre or $2510.80 per 40 acre parcel. Additional benefits, in the form of tax savings, would have been accrued to the farm operator if he participated in one of the deferred tax programs. In the case of the three year rollback program a maximum of $1178.09 in tax savings would have been captured by a farm operator in Wheatland Township. These savings decreased to a low of $447.98 in Camden Township. The five year rollback program produced similar results. Farm operators in Wheatland Township experienced the greatest tax savings, $1222.57, due to the tax program while operators in Camden experienced the least, $462.91.

If a farm operator decided to convert his 40 acre parcel to nonfarm use in 1969 he would have received over the ten year period an increase in benefits equal to the appreciation in property value (increase in the selling price) plus the total tax saving on the property minus the rollback he would be required to pay. The largest maximum benefit experienced by farm operators under the three and five year rollback period occurred in Wright Township. Here, farm operators captured economic benefits amounting to $8422.16 under the three year rollback program and $8223.31 under the five year program. These dropped off to a low of $2795.46 under the three year rollback program and $2726.04 under the five year rollback program in Camden Township.

Minimum benefits occurred to a hypothetical 40 acre tract were also calculated. These would be equivalent to the increase in land value due to appreciation minus the tax savings a farm operator would have foregone by not participating in either the three or five year programs. Wright Township, again, had the greatest benefits with $6496.73 occurring under the three year program and $6478.48 under the five year program. These again drop off to a low in Camden Township which experiences benefits of $2062.83 in the three year program and $2047.89 in the five year program.

The difference between the minimum and maximum benefits indicates the economic benefits which would be accrued to a farm operation if it participated in the deferred taxation program. The greatest benefits under the three year rollback program were felt by a farm operator in Wright Township.

Here an overall benefit of $1925.43 was captured by a 40 acre parcel during the ten year period. Farm units of 40 acres in Camden Township, captured $732.64 or the least amount of benefits under the three year program. Under a five year program maximum benefits shifted from Wright to Wheatland Township. Here, $1763.03 was captured by a 40 acre parcel for participating in a five year deferred taxation program. Again this figure dropped off to a low of $678.15 in Camden Township. These figures would tend to indicate that the rollback might not deter farm operators from remaining in the program, the tax savings associated with either the three or five year deferred taxation program would produce a very strong economic incentive for entering the program.

CHAPTER VI

SUMMARY AND CONCLUSIONS

The major purpose of this concluding chapter is to consolidate some of the more significant results generated in the study into a more understandable whole. To do this the chapter has been divided into three sections, one which summarizes the major results generated by the two sets of models, a second which briefly discusses these results in the light of possible policy implications and a third closing section which addresses itself to the whole area of future research opportunities. The first of these sections, the summary and conclusions is presented below.

Summary of the Results

The purpose of the study was to develop a base of knowledge concerning the effects that simple use-value assessment and deferred taxation would have on the tax structure in rural townships in Michigan. Particular emphasis was given to the effects that each alternative program would have on the sectoral changes in tax incidence.

Five predominately agricultural townships in Hillsdale County were chosen to provide a data base for the study. In each township information randomly selected from the township property tax roles by means of a stratified random sampling technique was used to develop estimates of farmland acreage and assessed valuation per farmland acre. These estimates were then incorporated into a series of simulation models which were designed to generate the new township property tax rates that might be expected to occur if simple use-value assessment or deferred taxation measures were initiated. These models also provided information on the changes in tax revenue that would be generated by each sector under the alternative tax program.

To provide a base against which the result of the simple use valuation and deferred taxation models could be compared, results of the ad valorem valuation system were calculated for the period from 1960-1969. The

results indicate that property tax revenues increased in each of the five townships during the study period. These increases were caused by increases in both the equalized value of farm and nonfarm properties and by increases in the township property tax rates.

Increases in nonfarm equalized value occurred in three of the five townships. Increases in Cambria Township, alone, after allowing for inflation, were thought sufficient to indicate an increase in nonfarm development. The remaining two townships as a result of equalization would experience decreases in their nonfarm evaluation and corresponding increases in their farmland evaluation. The net effect of this redistribution of assessment was to keep total township equalized valuation in two townships at a constant level throughout the study period.

In each township except those where equalization caused major shifts in assessed valuation, nonfarm equalized value increased more than farmland equalized valuation. Increases in two of the townships were so slight that they may have been caused by slight shifts in the quantity or quality of public services provided or by the increases in costs of local government services caused by inflation. Increases in Cambria Township, however, were substantial enough to indicate either the quality and/or quantity of services demanded increased. This increase was accented by moderate increase in the demand for nonfarmland acreage in the township during the period.

Increases in township equalization rates and township tax rates precipitated increases in township tax revenues in each of the five townships. As expected, the increases were dampered in those townships which experienced a redistribution of assessed valuation because of equalization. In Cambria, large increases in property tax revenues were experienced because of significant increases in tax rates and property equalized valuation.

In each township very little change occurred in the distribution of acreage between farm and nonfarm use. The static nature of this variable was offset by moderate to large increases in township equalized valuation and property tax rates. The non-responsiveness of the acreage variable would tend to lead to the hypothesis that the intensity of land use or growth may be more acutely associated with the township equalization

variable rather than the more traditionally accepted land conversion variable.

Under a simple use-value assessment of $50 per acre the mean property tax rates in all five townships increased. Increases also occurred in two of the townships at a use-value of $150 per acre. The general increase in mean tax rates in each township was caused by the decrease in township assessed valuation caused by simple use-value assessment. These lower assessment figures decreased the tax base in each township to such an extent that the townships would have found that to retain their existing levels of tax revenue it was necessary to raise tax rates. The extent of the tax increase was found in all five townships to depend on the level of use-value assessment chosen and the amount of farmland participating in the program. As farm use-value per acre was increased it became more comparable to the existing ad valorem assessment and the mean percentage change in tax rates decreased. However, as the participation rate increased under each use-value assessment level the mean percentage change in township taxes increased.

The decrease in the assessment of participating farmland acreage caused increases in the millage rates levied on non-participating and nonfarmland acreages. The increase in rates tended to be highest in those townships which had large proportions of their total equalized value in the farmland sector.

At the lower use-value and participation rates, farmland in all of the five townships experienced more than proportional savings to the costs incurred by the nonfarm and non-participating sectors. However, as the participation rate began to rise this ratio was reversed. This meant for every one dollar decrease in participating farmland property taxes there was a more than one dollar increase in non-participating the nonfarmland property taxes. The point where the benefits to the farm sector just equaled the cost to the nonfarm sector tended to occur sooner in those townships with high ratios of farmland equalized value to total township equalized value.

Results obtained from the deferred tax models paralleled quite closely those generated by the simple use-value assessment models. Under a use-value assessment of $50 per acre all five townships experienced general increases in their property tax millage. At the $150 per acre

use-value figure only two townships experienced these increases. The later results would indicate that the larger use-value assessment exceeded the present ad valorem assessment on farmland in three of the five townships. The higher use-value in effect caused the higher assessment of farmland which lead to decreases on the general tax millage in the three townships. The greatest increases in taxes and millage rates were found to occur in those townships where the ratio of farmland equalized valuation to total township equalization were highest. In these townships tax subsidies borne by the relatively small non-participating farmland and nonfarmland sectors were relatively large because of the absolute size of the farmland sector. This relationship caused noticable differentials in property tax rate increases to occur from township to township.

In those instances where deferred taxation generated positive increases in millage rates the increases were significantly less than those under use-value assessment. This was understandable since under simple use-value assessment no funds were returned to the taxing authority. This meant that the total cost of operating the program had to be borne by the non-participating farmland and non-farmland sectors. However, under the deferred taxation approaches a portion of the costs (tax subsidies granted to the farmland sector under use-value assessment) were recaptured through the rollback. The inclusion of a rollback in the model both decreased the size of the subsidy granted to the participating farmland sector but also decreased the necessity of increasing millage rates as much as was experienced under simple use-value assessment.

The amount of rollback incorporated into the models was dependent on the length of time over which the rollback took effect and the proportion of tax subsidies which fell under the rollback clause. The effect of the five year rollback was more pronounced than that of the three year rollback on the decrease in property tax rates. This result was caused by the fact that under the five year rollback, returns to the taxing authority were accrued for a longer period and were thus larger than those accrued over a three year period, as stipulated under the three year rollback clause.

Similarily, the amount of rollback and subsequent tax shift was also affected by the proportion of the tax subsidies which came under a rollback clause. This proportion attempted to simulate those farm operators who

would shift their land out of agricultural production to a higher and better use while participating in the program. As this proportion increases (from 10 to 20 percent) general millage rates and subsequently property taxes decrease. This inverse relationship is caused by the fact that at the lower percentage rate less is paid to the taxing authority in the form of rollback than would be the case using a higher percentage rate. As was anticipated the greater the rollback the less the manipulation of the rollback within the program.

When comparing the effects of the deferred taxation and use-value assessment programs on farm operator participation it was found that the incentive offered to a farm operator to adopt deferred taxation over use-value assessment was very small. Using the largest tax savings generated by the two approaches it was calculated that the farm operator would have to participate in the deferred program for a little over thirty-four years before he would have accrued enough in tax savings to pay for the rollback he would incur if he converted his farm acreage to a nonfarm use.

Further calculations tended to indicate that the incorporation of a three or five year rollback into the models would have a relatively small economic effect on the farm operator's decision to sell his property for a nonfarm use. Using estimates of the 1969 cash sale value of a hypothetical forty acre parcel it was found that the rollback would constitute such a small proportion of the selling price as to be non-effective. At most, under a five year rollback, the penalty would have constituted a little less than six percent of the mean selling price of the property. This amount was deemed too small enough that it could have been either absorbed by the farmer and paid out of capital gains or passed on to the new buyer via higher prices with little or no diffuclty.

In conclusion, it was found that the tax savings offered to a farm operator over a ten-year period could be enough to entice him into the program. These tax savings reached a maximum of just over $1100.00 under a three year rollback and a little over $1200.00 per 40 acre parcel under a five year rollback (under a simple use-value assessment program they were even higher). The rollback, however, constituted such a small portion of the final selling price that it would not have produced an economically strong barrier to farmland conversion. The deferred tax program would have

enticed farm operators into the program but would not have produced the economic sanctions strong enough to keep them there.

Policy Implications

The adoption of use-value or deferred taxation legislation by a state or similar taxing authority in its approach to land use controls constitutes a major policy decision. In making such a decision the taxing authority should recognize the fact that both programs constitute the granting of a subsidy to one sector of society at the expense of another. In Michigan the importance of such a step is compounded by the fact that both programs are in opposition to the constitutionally guaranteed right to uniformity of tax treatment on all taxpayers and classes of property. This weakness represents the major policy drawback to the adoption of a use-value or deferred taxation program.

Because of the serious nature of such a policy decision, the taxing authority, prior to drafting or promolgating any legislation, should clearly lay out the goals and objectives it hopes to obtain. If well designed, these goals should have a definite impact on the form of tax program the tax authority will adopt. For example, if the taxing authority wishes to affect the speed at which prime agricultural and open space lands are shifted to residential or commercial uses, then a combined program of land use regulations and deferred taxation would be more appropriate than land use regulations combined with simple use-value assessment. The latter program with its lack of a rollback clause would provide a less than equitable solution to non-agricultural taxpayers and could likely provide an outright grant to land speculators. The greater the length of rollback, the more equitable the program will be for non-participating taxpayers and the more likely its control over speculation.

Prior to the passage of any use-value or deferred taxation package particular attention should be placed on the availability of data needed in determining the range of use-values to be used in any given tax jurisdiction. Under normal conditions it will likely be necessary to replace the arbitrarily chosen use-values used in this study with ones based on more solid criteria such as net personal income generated per crop per acre or the value of crop production per acre per soil type. To assure a relatively smooth and efficient transition from a taxing system based

on ad valorem assessment techniques to one based on use-value assessment techniques such information should be available to the taxing jurisdiction at a reasonable cost. This may require the state taxing authority to either modify or develop new data reterival systems. Consideration should be given in the development of such systems to both their operating costs and to the distribution of these costs over the participating taxing authorities. For example, to determine the amount of rollback due on a particular piece of property the taxing authority will be obligated to conduct both an ad valorem and a use-value assessment. The cost of the latter assessment technique, in the absence of any policy to the contrary, would be borne by the local taxing authorities. Such costs should be evaluated in light of the possible increases they may cause in operating costs borne by local governments.

In addition, the state when drafting deferred taxation legislation should pay particular attention to entry limitations. Unless very stringent entry requirements are adopted, the program may become a haven for land speculators. To avoid this, adequate definitions of who is and is not a farmer must be devised. These will have to be narrow enough to distinguish between the farmer and speculator while broad enough to allow the largest number of farm operations to participate.

In the more rural areas, which provided the basis for this study, participation in a deferred taxation program may be somewhat limited. The tax savings experienced by farm operators in these areas could be almost negligible. In many instances rural farmland because of a number of factors is demanded only as farmland. Under these market conditions the ad valorem system appraises the land at a de facto use-value. It is not likely under such circumstances that farm operators would embrace any optional taxing system which would offer little benefit at some cost to their staunchly held independence.

The possible lack of participation of rural farm operators in a deferred tax program should not be regarded as indicative of the farm population as a whole. In those areas bordering urban centers where large differentials exist between ad valorem and use-value assessment, participation rates should be higher. It is these areas where deferred taxation has its most pressingly need and where it could generate the greatest impact if used in conjunction with other land use programs.

When adopting a deferred tax program it should be recognized that deferred taxation in and of itself will not deter land conversion. Only if it is supplemented by other land use regulations will it prove to be a powerful long term tool against land conversion. The reason for this is obvious. Deferred taxation is designed to decrease the tax burden levied annually on the farm operation. It has little or no effect on the true or fabricated appreciation in land values which may occur outside the farm operation. If a comprehensive land use program is to be adopted these external fluctuations in market value must be coped with. In this area a number of concepts such as agricultural zoning and the purchase of developmental easements have been tried and have proven somewhat successful. In the final analysis, however, the conversion of agricultural lands into other uses can only be combatted by attaching the motivating force behind the conversion profit. As long as exorbitant profits are available to the landowner for converting his property to a non-agricultural use the unordered process of agricultural land conversion will continue. An unused but theoretically effective deterrent to this process would be the use of a capital gains tax to decrease the profitability of land conversion. Only when both the internal and external pressures have to be eased on the conversion of rural land will the governmental authorities have some control over rural land conversion.

Recommendations for Future Research

Throughout this study it has been assumed that property taxes have played a major role in the conversion of farmland to nonfarm uses. It is extremely important to determine to what extent this assumption is true. If taxes prove to have little effect on the conversion process then legislation directed at limiting property taxes will have similar limited effects. In general, research is needed to determine those factors which play a significant role in a farmer's decision to hold or convert his land to nonfarm uses.

Future consideration should be given to employing the simulation techniques used in the study to test the effects of alternative tax measures. Special attention should be devoted to measing the effects of zoning or alternative land use measures coupled with use-value assessment or the effect of shifting the property tax to a personal income tax. If

the models used in the study are employed in the future some minor modifications are in order. The models assume a constant rate of land conversion. This rate was developed using data from the first year of the study. Future work in the area should attempt to develop a dynamic conversion rate which can be introduced into the system. To do this consideration must be given to the effect that alternative tax programs have on land use.

In future work the whole question of predicting land use changes must be squarely faced. Some serious thought should be given to prediction models which use township equalized value as an indicator of change rather than the presently accepted land use survey techniques. Special attention should be given to developing a simple method of dividing increases in equalized value into their component parts. Examples include increases due to inflation, increases due to the sheer number of new residents in an area, and increases due to increase in the demand for quality services rather than quantity. Also, future studies should consider the incorporation of a dynamic conversion ratio into the simulation models. Such a component would provide a method of entering year-to-year changes in the ratio of nonfarm to farm land in each tax jurisdiction. This in turn would provide a more realistic simulation of the effects of use-value assessment.

Finally, some consideration should be given to measuring the effect that poor assessment practices have on local government financing. If a quantitative cause and effect relationship could be developed between assessment practices and tax revenues this would be the first long needed step in the development of uniform assessment practices for the State.

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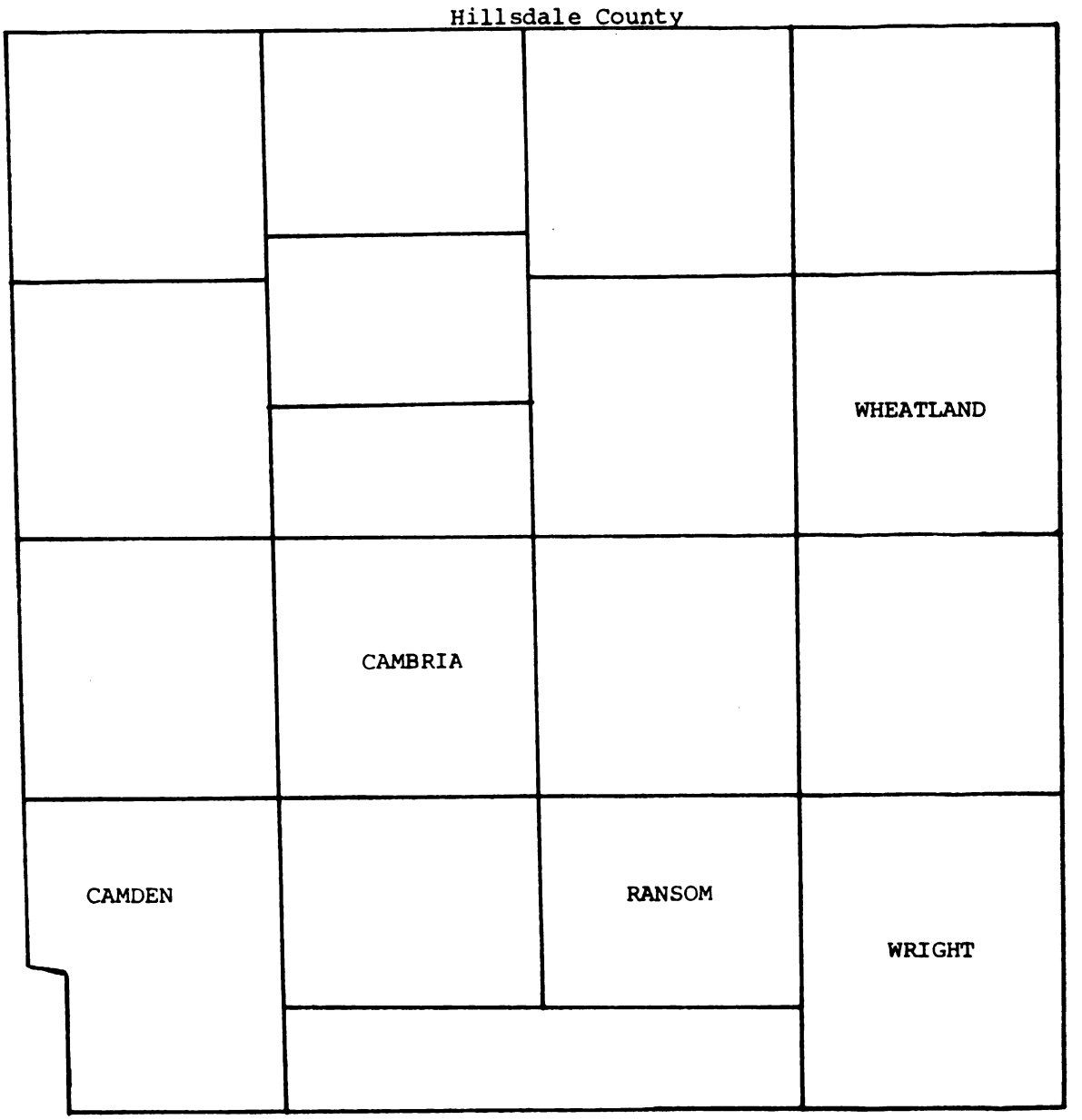
APPENDICES

APPENDIX A

LOCATION OF STUDY AREA



APPENDIX B

CLASSIFICATION OF LEGAL SECTIONS IN THE STUDY AREA INTO RURAL, TRANSITIONAL OR URBAN

Township	Rural Sections	Transitional Sections	Urban Sections
Cambria	4,5,7,9,10,11, 12,13,14,15,16, 18,19,20,21,22, 23,24,25,26,27, 28,29,30,31,32, 34,35,36	1,2,3,6,33	8.17
Ransom[b]	1 through 30		
Wheatland	1 through 36		
Wright[b]	1,2,3,4,5,6,7, 8,9,10,11,12, 13,14,15,16,17, 18,19,20,21,22, 23,24,25,26,27, 28,29,30,31,32, 35,36,1,2,5,6, 7,8,9,10,11,12	33,34,3,4	
Camden[b]	1,2,3,4,5,6,7, 8,9,10,11,12, 13,14,15,16,17, 19,20,21,23,24, 25,26,28,29,30, 31,32,33,34,35, 36,1,2,3,4,5,8, 9,10,11,12	18,27	22

[a]Because of the rural nature of the township studied very few of the sections fell outside of the rural classification.

[b]Only two of the five townships studied contained the standard 36 sections. Ransom 30 sections, Wright has 48 sections, and Camden had 44 sections.

APPENDIX C
CODING OF RANDOMLY SELECTED PROPERTIES
BY STRATUM AND TOWNSHIP

		Cambria		Ransom		Wheatland		Wright		Camden	
Stratum	Code No. Per Stratum	TWS & Stratum Code	No. of Samples	TWS & Stratum Code	No. of Samples	TWS & Stratum Code	No. of Samples	TWS & Stratum Code	No. of Samples	TWS & Stratum Code	No. of Samples
Rural Farm Improved	1	A 1	1-6	B 1	1-4	C 1	1-5	D 1	1-27	E 1	1-4
Rural Farm Vacant	2	A 2	1	B 1	1-2	C 2	1-2	D 2	1-3	E 2	1-2
Transitional Farm Improved	3	A 3	1-3					D 3	1	E 3	1
Transitional Farm Vacant	4	A 4	1					D 4	1	E 4	1
Urban Farm Improved	5	A 5	1							E 5	1
Urban Farm Vacant	6									E 6	1