Research On

Economic and Social Effects
of
Highway Improvements

LAND AND PROPERTY VALUES IN RELATION TO DORT HIGHWAY IMPROVEMENTS

by

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THE RESEARCH PROGRAM

This report represents one study which was part of a joint research program on the Economic and Social Effects of Highway Improvements made possible through financial support from Highway Planning Survey funds, under an agreement between Michigan State University Highway Traffic Safety Center and the Michigan State Highway Department with the participation of the U. S. Department of Commerce Bureau of Public Roads. The research program was administered by the Michigan State University Highway Traffic Safety Center and was made possible through the cooperation and interest of a large number of university departments both in planning the research and in making available competent research staff qualified in different subject matter areas.

The research program included some 17 studies in the following areas:

An Inventory of the Economic Factors Influenced by a Highway Development Program

Effects of Highway Development on Rural Lands and Communities

Land and Property Values in Relation to an Urban Highway Improvement

Small Communities and Controlled Access Highways

Effects on Businesses in Small Cities of By-Pass Highways

Effects of Highway Development on Social Groups and Interactions

Geographical Analysis of Land Use Changes in Relation to Highway Development

P R E F A C E

The Highway Revenue Act of 1956 sets forth the manner in which funds will be derived for the greatly increased program of federal aid for highways authorized by the Federal Aid Highway Act of 1956. In addition, its Section 210 directs the Secretary of Commerce to make a study and investigation of: (1) The effects on design, construction, and maintenance of federal aid highways of (a) the use of vehicles of different dimensions, weights, and other specifications, and (b) the frequency of occurrences of such vehicles in traffic streams; (2) the proportionate share of the design, construction, and maintenance cost of the federal aid highways attributable to each class of persons using such highways such proportionate share to be based on the effects referred to in paragraph 1 and the benefits derived from the use of such highways; and (3) any direct and indirect benefits occurring to any class which derives benefits from federal aid highways, in addition to benefits from actual use of such highways, which are attributable to public expenditures for such highways.

A request from the Bureau of Public Roads to state highway departments for research on such topics resulted in a contract for research between the Michigan State University Highway Traffic Safety Center and the Michigan State Highway Department with the participation of the Bureau of Public Roads. This study is a part of that research carried out through the interest and cooperation of the Michigan State University Departments of Economics and Real Estate, Law and Insurance.

This study examines the influence of highways on land values and land uses. As such, it is an ambitious study, because the magnitude of highway influences are difficult to assess. Each highway and its location seem to provide many varied interrelationships and analyses of one situation, of one particular length of highway, while contributing valuable and useful information does not immediately present a basis for imputing these influences to other situations.

The ensuing chapters deal with the historical background of the study area, the theoretical and methodological problems, methods used to obtain and analyze the data, a discussion of changing land uses in the study area, and analysis of the data. The key points of emphasis involve the relationship of fluctuations in economic growth to changes in land values, and a consideration of the theoretical and methodological problems encountered by studies of this nature.

The many individuals and organizations who contributed to this study are identified in the acknowledgements. Some portions of the report were prepared by various members of the research team working on the project. Dr. Eric Schenker prepared Chapter 4 and helped revise the other chapters. Mr. Carl Goldschmidt guided the study of land use and ably presents the results in Chapter 5. Mr. Donald Bowersox prepared the initial draft of the discussion on methodology.

Ronald R. Larson

A C K N O W L E D G E M E N T S

A study of this scope would not be possible without the cooperation and contributions of many organizations, groups, and individuals. The following contributors have played important roles in the production of this report. Staff members of the Highway Planning Division of the Michigan State Highway Department, of the Bureau of Public Roads, and University departments individually and as members of the Project Advisory Committee have been most generous as a source of advice, information, and support. Mr. Donald Cruise contributed much as Chairman of this Committee.

The Guarantee Title and Mortgage of Flint, Michigan, made available their voluminous records which were absolutely necessary in the undertaking of this study.

The cooperation of the assessors' offices in the City of Flint and in Burton and Genesee Townships was appreciated. They permitted extensive use of the assessment rolls for determination of the assessed values and aid in identifying the type of land use for each parcel.

A great many realtors in Flint made their records available or provided the desired information at their own expense.

Special mention is due Dr. Arthur Warner of the College of Business and Public Service whose early investigation of highway benefit studies led to this particular research effort. He guided this study in its initial stages until more pressing responsibilities developed, and he is responsible for its early progress.

To Dr. T. W. Forbes of the Michigan State University Highway Traffic Safety Center a note of appreciation for his advice on many phases of the project. His role as research director of the broad study of highway benefits being conducted at this University has been an important one.

There were many people on the research staff during this study. The research assistants were instrumental in accomplishing the task at hand. Donald Bowersox was particularly helpful in assuming direction of the data collection process. James Buchanan was also instrumental in this task. Rebecca Sullivan of the Department of Statistics gave patient guidance to this phase of the study. Dr. Charles Kraft was extensively consulted on

statistical methods in the final stages of the study. Adrian Gross performed much of the latter data compilation.

This project has benefited immeasurably by the contributions of those mentioned above. It is hoped that their efforts were not short-circuited by the limitations of the authors.

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CHAPTER I

INTRODUCTION

The need for greater knowledge of the many varied implications of highway improvement programs was accentuated by the action of Congress in the Highway Act of 1956. In accordance with the terms of the Act an integrated limited access highway system of some 41,000 miles in length will be created. There is no doubt that this highway construction will have a significant and long-lasting effect on the communities served by the highways-- but what are these effects? what are their magnitudes? and how can they be directed so to maximize the benefits from federal, state and local points of view?

The significance of understanding the nature of the impact of highway growth is indicated by the continuing effects that a highway has upon land utilization. Roads built in yesteryear influence the manner in which adjacent properties are used for years, even for decades and centuries. Once put in place, the highway and the adjacent developments tend to perpetuate the arrangement of land use within the community. Street patterns, in particular, are difficult to erase, and new buildings may be erected on the ashes of old structures rather than disturb the established network of improvements in common. For example, roads and improvements developed by the Romans in England are perpetuated today in parts of London. Cow paths, Indian trails, wagon trails--roads which reflected the requirements and conditions of early years in this country are still used today in improved stages. The framework established by these roads exists because of the costliness of change and probably because the pressures exerted by local interest groups. State and local governments have been the primary instruments carrying out previous highway improvement programs and the lack of an overall guiding highway policy has been one of the major factors leading to the failure of the total highway system to provide an adequate means of through transportation.*

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*See an article by Bernard DeVotto titled, "The American Road" in Freedom of the American Road, published by the Ford Motor Company, for further discussion of this point.

This study endeavors to provide information about one aspect of highway development--the economic benefits. More specifically, the investigation probes the impact of the highway on land values and land uses. It is part of a broader study sponsored by the Michigan State Highway Department in cooperation with the Bureau of Public Roads which examines the overall social and economic benefits of highway developments.

One of the reasons for measuring the economic benefits of highway improvements is to provide information that will be helpful in deciding how highway programs are to be financed. The question of cost allocation between users and non-users has not been resolved and research pertaining to the economic benefits accruing to non-users will aid in showing the plausibility of tapping non-users as a source of revenue for road building programs. It is not the objective of this study to examine the question of allocation of highway costs--a rather controversial topic--but to assess the extent of the benefits accruing from highway improvements.

Studies of the impact of highways on land values and land uses will also be helpful in understanding the problems encountered when appraising property for acquisition purposes and in locating the highway improvement relative to urban communities.

The inquiry into the quantitative effects of highway improvements on land value is in its incipient stage from the point of view of methodology and, to a lesser extent, number of research efforts. Much trial and error is being encountered in these early stages as different approaches to the problem are employed, but this is expected and necessary if a firm foundation for continuing efforts is to be provided. For the person seeking exact quantification of highway influences, there is disappointment, because this type of information is not being obtained to date and probably will not be available in the immediate future. However, correlation of past and current studies should provide a real basis for more thoroughly understanding the economic impact of highways and provide information for future research efforts which can more clearly probe the varied influences of highways on community development.

THE PURPOSES AND SCOPE OF THE STUDY

This study of land values is part of a broader investigation of the economic and social effect of highway improvements. The purpose of this particular phase of the study was to examine the influence of highway improvements on land values and land uses. More specifically, the objective has been to:

1. Ascertain the changes in property values and uses which occur in

   (a) the properties which abut a highway and
   (b) the properties located in areas serviced by a highway;

2. To test certain hypotheses concerning the reasons for the above changes;

3. To test methods of research and to develop insofar as possible new research methods applicable to such studies.

Examination of highway influences in this study was limited to one particular area and the results are not immediately applicable to other situations because of variances in types of highway (direct versus limited access, two lane versus four lane, etc.) and in the different physical and economic environment of highway location. Studies of the other types of highway situations are needed before a thorough understanding of highway influences is to be realized.

A section of the Dort Highway and adjacent land was selected as the object of this study. The Dort Highway is a fifteen mile, uncontrolled access by-pass of Flint, Michigan. Part of this road lies within the Flint city limits and direct access to the highway has facilitated intensive commercial and industrial improvements in this area as well as others. The segment of the road selected for observation is ten miles long and one and one-half miles wide. The east-west boundaries were selected on the basis of the growth of land usage in the study area and tend to approximate the sphere of the immediate highway influence on land use.

The Dort Highway, previously called Western Road, was paved and converted to a cutoff for M-10 around Flint in 1926-27. Initial construction of two lanes was completed in 1927 with subsequent additions and repairs being made over the years. Presently, the by-pass has three and four lanes. In order to assure an adequate basis for evaluating the impact of these highway improvements, data dating back to 1920 were collected.

METHOD OF INQUIRY

Changes in land value commensurate with the development of the highway were to be obtained by examining the prices of properties purchased in the period 1920 to 1957. These prices were reduced to a common denominator--dollars per square foot--to facilitate comparison between the various years. Transactions in ten

two-year periods were used, rather than taking all transactions for each of the thirty-eight years, because the pattern of land value changes would still be evident without an unnecessarily large expenditure of resources. The years selected were (1920-21, 1923-24), (1926-27, 1929-30), (1932-33, 1935-36), (1940-41, 1945-46), (1950-51 and 1956-57). These time periods would show land values at significant points of highway development and illustrate any changes accompanying long term economic trends. Because of the lack of data in some time periods and areas, the years were later combined into five groups for analytical purposes. The years combined were 1920-1-3-4, 1926-7-9-30, 1932-3-5-6, 1940-1-5-6, and 1950-1-6-7.

In each time period, a random sample by geographical stratum (10) and zones (5) was taken of all transactions that had occurred. A census of transactions was not used because of the difficult task of tracking down the price of each transaction. The geographical strata were arbitrarily selected to show possible variations of the highway impact on different locations. The study area was initially subdivided into ten one-mile sections and five different zones as shown in Figure 1. These zones include property abutting the highway and on streets leading to the highway, among others.* For analytical purposes, it was necessary to combine the stratum into three groups and the zones into three groups.

Initially, the sales price of each transaction was to be used as basic data for the study. This objective was not achieved because real estate brokers had disposed of their older records and in some cases were not involved in the desired transactions. The task of tracking down individual buyers and sellers was, in most instances, considered to be impractical. An alternate measure was obtained from the number of United States Revenue Stamps affixed to each deed. Revenue stamps appear to provide the best substitute measure for actual prices. They are sufficiently reliable as an index of unimproved land values to show actual changes that take place. However, since revenue stamps are only applied in $500 increments and sometimes improperly used, there are limitations to this measure. This is particularly true when improved property is examined and/or a small number of transactions are involved.**

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*For further description and discussion of these geographical strata, please refer to Appendix A.

**Please refer to the discussion of market prices and revenue stamps for further analysis of this problem.

FIGURE 1 AND KEY

Study Area on Dort Highway,

showing strata as used in final analyses

and arrangement of zones

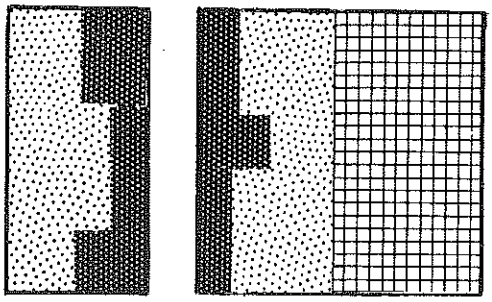
KEY

STUDY AREA BOUNDARY

A STRATUM LETTERS

STRATUM BOUNDARIES

LOCATION OF STRATA ZONES

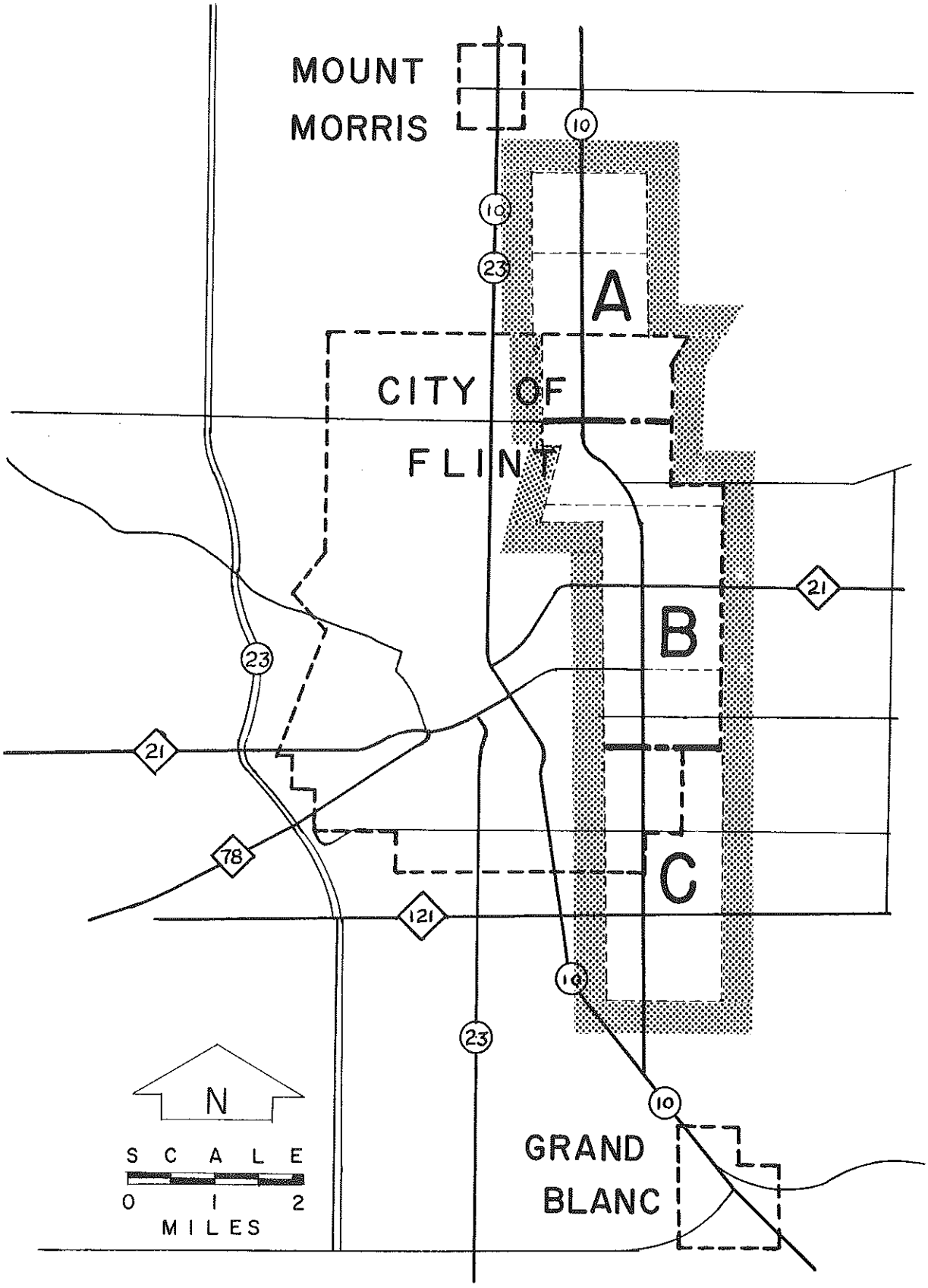


ZONE A FRONTAGE ON DORT HIGHWAY

ZONE B AREA WITHIN ONE-HALF MILE OF DORT EXCLUDING ZONE A

ZONE C AREA ONE-HALF MILE TO ONE MILE EAST OF DORT HIGHWAY

Figure 1


MOUNT
MORRIS
10
10
23
A
CITY OF
FLINT
21
B
23
21
78
C
121
10
23
10
N
SCALE
0 1 2
MILES
GRAND
BLANC

Isolation of the highway impact on land values was attempted by correlating changes in the major factors influencing changes in land values. Such factors as the highway, amount of business activity (economic base), land use, location, zoning, and presence of railroad connections were analyzed. Particular attention was given to the relationships between fluctuations in land values and the economic activity in the community.* With the help of mathematical techniques--regression time series and other analyses--an effort was made to identify changes in value attributable to the highway. Control areas, i.e., identical study areas except for the highway factor, were not used because there did not seem to be any satisfactorily comparable areas available.

Primary attention is given to changes of unimproved or vacant land values. This index provides the purest measure of land value available. Improved property was given a secondary role because depreciation and separation of land and building values was too difficult to handle.

Assessed values of all parcels studied were collected to see if a consistent relationship between market prices and assessed values could be established. If there was an observable relationship, the assessed values would provide a convenient source of basic data which might be validly used in land value studies.

The manner in which a parcel of property is used helps to explain the changes in value that take place. To this end a land use description of the entire area was obtained. The current picture of land usage was based upon an examination of the property itself. Previous patterns of land usage were described on the basis of aerial photographs taken in 1950 and 1938, and from actual land use surveys in 1924 and 1958.

LIMITATIONS TO THE STUDY

In a study of land values there are a number of limitations that must be placed on the interpretation of the data due to the nature of the inquiry. There are many specific problems and most of them will be alluded to by identifying the three following limitations. However, the reader will not have given sufficient consideration to these limitations until the theoretical and methodological problems discussed in Chapter III have been examined.

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*For further discussion of this point, please consult Chapter IV.

1. The contributions of land and the improvements thereon are difficult to distinguish in the total value of an improved parcel of property. This is a study of land values, of the influence of the highway as a location factor on the value of the land. This objective is relatively easy to achieve when analyzing unimproved property because the market price is a good indicator of land value. The typical parcel of urban land, however, has some type of improvement on it, and this raises the question of how to differentiate the changes in value due to (a) the improvement and (b) the land itself. This is a difficult problem at best when appraising an individual parcel of property. For a study involving hundreds of property units, a situation is created in which it is virtually impossible to identify the portion of value attributable to land and to improvements.

   In this study there is no effort made to identify the relative contributions of land and improvements to total value when the property has been improved. This unsatisfactory recourse is allowed because there seems to be no practical, and possibly no theoretical, way of identifying each element. The presence of this unknown condition means that the interpretation of changes in value of improved property must be approached cautiously to avoid incorrectly attributing changes in value to the improvement.

2. In some time periods there are a relatively small number of transactions to serve as the analytical basis for estimating the value of all property in the area at that time. This problem is inherent in most studies that require sales data dating back to the 1920's. The degree of difficulty increases with the length of the study and grows quite serious in the 1920's and 1930's. This lack of information is the result of (a) many realtors having destroyed their older sales records; (b) there were only a small number of sales in some time periods--such as the 1920's when the area was not subdivided and large parcels of property changed hands infrequently, and in the 1930's the general economic decline drastically reduced the number of real estate transactions; and (c) the difficulty of tracking down the buyers or sellers in the early transactions.

   The shortage of information in these periods reduces to some extent the reliability of sales prices as the indicator of land value. Reliance on market prices to

represent the land values at any given time requires that a number of bona fide transactions be used. If not, there is a greater opportunity for idiosyncrasies of particular buyers and sellers to creep into the sales picture and thus destroy the representativeness of that sale.

3. There are so many variable factors influencing land values that are hard to quantify that the identification of all of them is a difficult task. Every parcel of property is unique in at least one respect--location. In addition, parcels of land vary in terrain (level, hilly, swamps), type of neighborhood, size of parcel, type of highway, etc. In any study of land values these factors combine to make it difficult to lump various transactions together, average them, and to yield an accurate picture of average land values. To some extent these many variables can be identified and codified, but in this study, or any other study preceding it, these variables have not in any absolute sense been identified or controlled in such a manner as to clearly quantify and distinguish the influence of the highway from the many other influences on land value.

The above limitations, and others examined in Chapter III. combine to cast shadows of doubt over the interpretations of data in highway benefit studies. It is necessary that these difficulties be realized before the conclusions from the various studies are used as a basis for formulating policies.

DEFINITIONS

Land value -- in this study land value is regarded as being synonymous with sale or market prices for any land that does not have any buildings erected on it.

Property value -- the sales price or market price of land that has been improved by the erection of buildings for residential, commercial or industrial purposes.

Unimproved land -- used synonymously with the term vacant to indicate land which had no buildings erected on it at the time the property was sold.

United States Revenue Stamps -- stamps purchased from the Federal Government and affixed to the deed when property is transferred. The number of stamps used generally depends on the price at which the property is sold and each stamp represents a $500 increment.

A Review of Related Literature

There have been a number of empirical studies which have investigated the effects of highway improvements on land values and land uses, plus many, many books and articles hypothesizing about these effects. An investigation of these publications was conducted by Dr. Arthur E. Warner of Michigan State University prior to the formal development of this study of highway benefits. His review[1] summarizes a few of the studies and provides an extensive bibliography of the many publications in this area.[2] This work is available in published form and constitutes the review of related literature which provided guidance and perspective in this particular study of highway benefits.

Dr. Warner's review led to the proposal for a multidisciplinary study of economic and social effects of highway improvements, which is now underway at this university with the cooperation of a number of different departments and under the overall charge of the Highway Traffic Safety Center. The study is being sponsored by the Michigan State Highway Department with participation of the Bureau of Public Roads.

References

1. Warner, A. E., The Impact of Highways on Land Uses and Property Values, (East Lansing, Michigan: Highway Traffic Safety Center and College of Business and Public Service, Michigan State University, 1958).

2. Adkins, William G., Effects of the Dallas Central Expressway on Land Values and Land Use, Bulletin 6; College Station, Texas: Texas Transportation Institute, Texas A & M College, 1957.

3. Branham, A. K., May. A. D., and Michael, H. L., Economic Evaluation of Two Indiana Bypasses, Highway Research Bulletin 67, Washington, D.C., 1953.

4. Breese, Gerald, Industrial Site Selection Burlington, County, N.J.: "A Case Study of Existing and Potential Industrial Location", (Princeton, New Jersey: Bureau of Urban Research, Princeton University, 1951).

5. Brownlee, O. H. and Heller, W. W., American Economic Review: "Economic Growth: Highway Development and Financing", Vol. XLVI, No. 2: Papers and Proceedings of the Sixty-Eighth Annual Meeting of the American Economic Association, May 1956.

6. Curtiss, W. M., Use and Value of Highways in Rural New York. (Ithaca, New York: Cornell Agr. Ext. Farm Econ. Bull. 88, Cornell University, 1936).

7. Hennes, R. G.; Wheeler, B. O.; Winter, E. P.; and Garrison, W. L.; Nature of Highway Benefits Sections 6 & 7; (Seattle, Washington: Washington State Council for Highway Research, 1956).

8. Maryland State Planning Commission, Probable Economic Effects of Chesapeake Bay Bridge on the Eastern Shore Counties of Maryland: (Annapolis, Maryland: Maryland State Planning Commission, 1950).

9. Mitchell, Robert B. and Rapkin, Chester, Urban Traffic--A Function of Land Use; "The Influence of Movement on Land Use Pattern", (New York, New York: Columbia University Press, 1954).

10. Nolan, John and Hubbard, Henry V., Parkways and Land Values; (Cambridge, Mass.: Harvard City Planning Studies, XI, Harvard University Press, 1937).

11. Ross, William D., Financing Highway Improvements in Louisiana; (Baton Rouge, Louisiana: Division of Research, College of Commerce, Louisiana State University, 1955).

12. Winter, E. P., The Effects of the Relocation of a Cross-Country Highway on Land Values, Land Transfers and Land Uses, (Madison: The University of Wisconsin, Unpublished Ph. D. Thesis, 1954).

13. The Effect of Expressway Construction on Surrounding Properties, (Providence, Rhode Island: Providence City Planning Commission, 1953).

14. The Gulf Freeway Economic Study, (Proceedings, Convention Group Meetings, American Association of State Highway Officials, Washington, D. C., 1952).

15. California Highways and Public Works. This bi-monthly publication presents a large number of studies and articles covering the topic of the economic impact of highways on land use and land values in the State of California.

CHAPTER II

SUMMARY AND CONCLUSIONS

Highways are intended to be a benefit to a community. They are expected to contribute to the effective arrangement of land use patterns and thus to influence land values. Many of these benefits can be seen by the penetrating and even casual observer. However, not all benefits, and certainly not the magnitude of these benefits, can be determined without supporting data and analysis. This study of the Dort Highway influences on land values reinforces many existing conclusions and suggests some new hypotheses.

The Dort Highway, like most other highways, has been a powerful force molding and developing the area in which the highway is located. The net influence of the highway is not entirely clear but trends, measures of central tendency, benefits and disbenefits are identified. Conclusions, impressions, and findings of this study are summarized in the following paragraphs.

Each highway does not have the same impact on land values. The nature and extent of the impact probably varies with the type of highway (two lane, four lane, controlled or uncontrolled access, etc.) and the kind of service it provides. A bypass, such as the Dort, would not seem to yield the same benefits as a highway connecting the downtown area to the suburbs. Further, service to residential, industrial, commercial, or farm areas would tend to create different benefits. This essentially means that interstudy comparisons should be approached with an understanding of these different conditions if results and conclusions in one are to be assigned to other areas.

Economic growth and change are so closely allied with changing land values that complete isolation of highway benefits cannot be achieved. Since the highway is both a cause and effect of economic growth, the line between the two cannot be precisely drawn even though approximations can be made.

Data, and interpretation of data, in land value studies needs to be tempered by the knowledge that close measurement of land value changes, and the highway influence on these changes is difficult to obtain. Methodological problems, scarcity of data in narrowly defined geographical areas, and data variability combine to reduce the conclusions to generalizations. These generalizations provide important information about trends, but their application to specific cases should be avoided.

Changes of real (not actual unless so identified) land values in the Dort Highway area were:

a. Land values in the various stratum and zones did not change in the same amount, proportion, or direction.

b. Real value of all unimproved property abutting the highway increased three times from the early 1920's (before the highway was paved) to the early 1950's. The impact of the 1950's was not fully identified because few transactions along the highway were reported during 1956-57.

c. The value of small parcels of property abutting the highway enjoyed a twofold increase during the same period.

d. Unimproved property not abutting the highway increased less than the highway property. Some areas showed no increase in real value and others actually gave evidence of a slight decline.

e. Land values appeared to rise sharply following the paving of the highway in 1926. This rise was followed by a decline in the 1930's.

f. Land values appeared to have increased ten, twenty, and even thirty times in individual cases. These phenominal increases seemed to take place when the property was subdivided for more intensive use.

g. The level of economic activity in the community doubled between the 1920's and the early 1950's.

h. Measurement of land values in real terms understates the actual dollar changes that have taken place because of changes in the price level.

The Dort Highway has clearly had a different impact on land values in various parts of the study area. Property abutting the highway exhibited substantially greater increases in value than other areas studied. Further, all land not abutting the highway showed mixed trends in value.

Land values appeared to increase sharply after the highway was paved in 1926-7. The highway, and increased economic activity, in the community contributed strongly to this rapid rise. Further increases in land values were interrupted by the depression years.

This interruption may have significantly curtailed the potential expansion of real land values in the area because industrial and commercial developments would probably have occurred in a more orderly fashion if economic growth had continued for a number of years after the highway was paved.

The manner in which commercial and industrial developments took place in the Dort area may have forestalled, to some extent, area-wide growth. The commercial-industrial complex has made the area relatively unattractive for residential purposes--the area is about 50 per cent unimproved--and repressed increases in land values for this reason.

Changes in land value--both the level and the rate of change--were a function of the distance of the property from the highway. That is, Zones One, Two, and Three ranked in that order in terms of level of value and the changes in value that had taken place.

The biggest changes in land values took place when large tracts of land were subdivided for more intensive use. In this study, the highway seemed to have its greatest influence on land values when this subdividing of large parcels took place because there was relatively little change in real value for smaller or already subdivided parcels of land.

Changes in the land values of particular neighborhoods in a community will not necessarily be closely correlated to changes in the economic base of the entire community. Local factors can and do exert countervailing or reinforcing influences. In this case, the industrial and commercial developments may have been the countervailing force for residential development. The depression years and later highway congestion may have emasculated more extensive industrial and commercial growth in later years.

Many measures of land value and changes in land value are available, e.g., revenue stamps, sale prices, assessed values, improved and unimproved land, large or small parcels. Each measure does not necessarily show the same thing. In this study, the interpretations vary in extent and direction if measures other than revenue stamps on unimproved were used. This latter index was considered to be most reliable for purposes of this investigation.

CHAPTER III

THEORETICAL AND METHODOLOGICAL CONSIDERATIONS

The purpose of this chapter is to examine some of the theoretical and methodological problems encountered in studies of highway benefits to land values. Inspection of other highway studies will reveal that most of these topics have been broached in the efforts to investigate highway benefits. However, it is felt that critical consideration of these topics is necessary if this and other studies are to be adequately interpreted and future efforts are to bring greater rewards. For the impatient reader, these observations are briefly summarized at the conclusion of the chapter (page 16).

INTERSTUDY COMPARISONS

The question raised in this section is "does each highway influence land use and land value to the same extent in all situations, or is the impact of the highway unique in every instance?". The answer is quite important if the results of the various highway studies are to be used for policy purposes and imputed to other highway situations. To the extent these studies influence decisions in the area of finance, highway location appraising or public relations, the answer can have a far reaching impact. We do not pretend to know the answer. It will probably become more apparent when the results of the many land value studies in progress become available and their collective conclusions analyzed and synthesized. Until that time, a few observations about the problem are in order.

There seem to be at least three major situations in which the impact of a highway improvement would yield different results. The type of highway constructed; the nature of the service provided by the highway; and the economic base of the community in which the highway is located, or combinations of any of these conditions, could yield different highway benefits.

In the first instance, obvious differences in land use have developed along direct access highways as contrasted with the limited access highway. The nature and extent of the highway impact seems to differ between improvements and changes for existing highways and new roads in new locations. In either case there might be additional sub-classifications of highway characteristics which would further increase the variety of impacts on land use and land value. For instance, the access points to the highway might be located at one-half, one, two, three, four, or five mile intervals or the number of lanes might vary from two to three, four or six.

The nature of the service provided is the second condition to consider. In the Gulf Freeway, Dallas, and Washington projects, the highway provided service to citizens by improving their access to the downtown area.* Would the impact on land values be the same if the highway provides a by-pass facility? The latter case is the situation in this study in which the highway provides a by-pass of Flint, Michigan. The extent of the benefits would also seem to vary if the access or service is provided for residential, industrial, farming, or commercial purposes. The provision of access to urban or rural communities would also tend to create different benefits. These are substantially different types of highway services which need to be investigated before a thorough analysis of highway benefits is possible.

Varying economic conditions is a third factor to consider. Fluctuations in a community's economic base has a tremendous impact on land values. Since there are differences between economic bases, this variable may interfere with inter-study comparisons unless satisfactorily accounted for. Land value studies should include some detail of the community's level of economic activity in order to facilitate this inter-study comparison. Such a practice would more clearly identify the environment of land value fluctuations and help to understand the reasons for these fluctuations.

There seems to be little doubt that the impact of the highway varies with time, place, or circumstance. However, the evidence is not sufficient to say that each situation is unique in itself and that inter-study comparisons are invalid. A reasonable conclusion would suggest that extremely useful generalizations can be made about the benefits of various types of highways but varying conditions must be recognized if adequate inter-study comparisons are to be made.

ECONOMIC GROWTH

Land economists generally agree that the major influence on land values or changes in land values is the structure of the economic

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*The Gulf Freeway Economic Study; The Texas Highway Department in cooperation with the Bureau of Public Roads.

Adkins, William G., Effects of the Dallas Central Expressway on Land Values and Land Use; Bulletin 6, Texas Transportation Institute.

Wheeler, B. O.; The Effect of Freeway Access Upon Suburban Real Property Values; Washington State Council for Highway Research, Seattle, Washington.

base of the community. When changes in the economic base or local business activity occur, there tend to be shifts in local land values depending upon the nature and degree of the change in the economic base.

Perhaps the basic problem in studying the effects of highways on land values and land use is that of divorcing, if possible, the effects of economic growth from shifts in values resulting from highway improvement or development. These two forces are probably inseparable because the highway influences land value through location benefits as well as being a factor in economic growth. A highway is both a cause and effect of economic growth.

Unless the economic growth attributable to the highway can be discerned from other growth factors, the net effect of the highway influence on land value cannot be accurately estimated. If the economic growth increment in land values could be identified, the highway location benefits, as they contribute to property values, could also be more closely identified. Some efforts can be made in this direction, but it is questionable that the economic growth factor can be successfully isolated because economic growth does not generally affect all sections of the city to the same degree, and measures of economic growth are generally available only on a communitywide basis.

An example of this interaction of economic growth and highway improvement is found in this study in the Dort Highway area. Just prior to 1920, when decisions to develop the Dort area industrially were being made, there were no highways and only a few roads in the entire area. The highway, or lack of a highway, did not appear as a basic factor in these decisions. However, another form of transportation--the railroad--was a basic requirement for this development. Even though the highway did not appear as an initiating factor in the initial growth of this industrial area, there is little question that the lack of an accompanying road system would have hindered future growth. In this instance, the highway was the result of the community's economic growth and at the same time a factor facilitating continued development of the area.* In this type of circumstance how are the values attributable to the highway to be distinguished from other contributors?

*Mr. Richard M. Zettel made the same point in a speech before a meeting of the American Association of State Highway Officials in 1957, when he said "and the living patterns of economic activity and land use are affected by, as well as being an influence upon, the transportation system." For an interesting discussion along these lines and the relationship of highway finance to measuring the impact of highways on land values, the reprint of this speech might be examined.

This problem might be spelled out a little more clearly with the use of two analytical models. The first model is a static one in which economic growth is not taking place and technology and human preferences are constant. With these assumptions given, and if resources are not perfectly allocated, a shift in a highway location could increase the efficiency of the community from a transportation standpoint. Traffic would be re-routed. The re-routing of traffic through the new highway improvement would tend to induce people to seek property in the new highway area because of increased transportation efficiency or the opportunity to trade with people using the new highway. The increase in demand for property near the highway would tend to be at the expense of properties in the vicinity of the road systems previously used by these people. As a result of the increased efficiency of the road system, the total land value of the community would tend to remain constant because the loss of value in one place would offset the gain in values in another. Average land values, and possibly total land value, would decline because the supply of land available at existing transportation costs would be increased (demand schedule shifted to the right) due to the increased efficiency of the transportation network. The changes in land value in the vicinity of the new highway would be directly attributable to the highway itself. The task of isolating the impact of the highway improvement would be a relatively simple though not an easy one.

The static state does not typify the situation as cities are in a continual state of changes in technology, human preferences, and economic conditions or growth. These factors are additional forces which influence land values. The second model is a dynamic one--representing actual conditions--in which changing preferences, technology, and economic growth are in operation. Changes in technology and preferences, such as the replacement of multi-story factories with one-story buildings, suburban living, shopping centers, and so on, will enforce or inhibit demand shifts that take place as the result of highway relocation or improvement.

When economic expansion occurs land values are affected regardless of the highway improvement. With the supply of land fixed, economic growth will usually move the demand schedule to the right, and as a result, prices or values will be forced upward. Values would generally move downward if economic activity in the community declines.

Any depressing effects the highway might have on land values can be offset by economic growth, or positive benefits can be exaggerated. A serious economic decline may cause all values of

land adjacent to the new highway improvements to fall. Probably the values of land near the improvement will decline relatively less than for other parts of the community. The major dilemma is thus posed--what proportion of the changes in land value is to be attributed to economic growth and what proportion to the highway improvement?

It might be argued that the highway improvement makes it possible to use the land in the vicinity of the improvement and thus changes in land value may be wholly attributed to the highway. Consequently, economic growth can take place only with an available highway system and thus is entirely a benefit of highway improvement. This position would seem to be no more acceptable than one in which all values would be attributed to the presence of water which indirectly makes possible the use of this land through human activity. The same rationale could be employed for vehicles, types of fuel, and various resources. These factors all contribute to make the changes in land value possible but the entire change certainly cannot be attributed to any one of them.

The problem is posed but what can be done about it? Some help can be obtained by correlating fluctuations in the economic base with changing land values, but since all segments of the community do not participate to the same extent in economic growth a clear-cut correlation cannot be achieved. Besides, correlation doesn't show cause and effect necessarily. Theoretically, this problem could be solved by using control areas which are identical with the study area in all respects except for the highway. This might be the best way of handling this matter except that highway improvements contribute to overall economic growth and to overall increases in land values. Thus, the total effect of the highway is still not being determined. In addition, it is extremely difficult to find identical areas which can be used for control purposes, if they exist. If identical control areas are not found, the highway factor becomes only one of the influences causing value differences between the control and highway area.

On balance, it would appear that it is impossible to find an exact measure of the influence of the highway on land value. However, with extensive consideration of the use of mathematical techniques; the isolation of many difficult variables; and in conjunction with the use of control areas, a close approximation of the measure of the influence of highway on land values may eventually be provided.

VARIABLES INFLUENCING LAND VALUE

Investigation of the effect of any one factor on land value is made difficult by the heterogeneous character of the parcels of land under observation. Differences in location, size, type, age, and amount of improvement increase the difficulty of attributing value changes to any of these factors because it is necessary to measure or control all of them if a significant analysis is to be made. Identification of these influences is not too difficult but measuring them quantitatively is an arduous, and maybe an impossible, task.

The heterogeneity of the land parcels presents an additional problem. The many variables require extensive stratification of the sample if the highway factor is to be found for the various types of land use. In most communities there are only a few transactions for each parcel type that can be used as a basis for estimating the land value of some area at a particular point in time. It also means that a substantially larger sample must be extracted if meaningful relationships are to be found. The net result of the heterogeneity of land parcels is to increase the margin of error encountered in the interpretation of the study. Even if the many variables can be identified and quantified, there tends to be an insufficient basis for showing changes of the influence of the highway with a high degree of accuracy. In essence, the inability to control the variables in this kind of study raises the question about the margin of error inherent in any quantitative estimate of the influence of the highway on land value.

The many highway studies examined give indication that the various research groups were aware of this difficult problem. However, there seems to be a tendency to assume that this difficulty had been adequately handled when the final results of the study were printed. In most studies, the major variables seem to have been considered with the exception of the economic base which was generally handled implicitly. But none of the studies have been able to handle all of the variables which influenced changes in land value.

MARKET PRICES -- INDICATORS OF PROPERTY VALUE?

Studies of the highway impact on land values have almost unanimously used sale or market prices as the indicators of land value.

This practice is a logical one because the information most frequently sought is the market price. The purpose of this note is not to criticize this objective but to raise some obvious questions about the difficulties inherent in this technique and the validity placed on this type of information.

Market prices are considered valid indicators of value because equal market prices for comparable properties would be established in competitive markets for real estate.* The apparent simplicity of this observation is misleading because real estate with its bulk, high unit value, and individuality is not bought and sold like many other commodities. Knowledge of buyers and sellers is not equal, and considerable time is generally required to effect a real estate transaction. These imperfections in the various real estate markets are responsible for the wide variations that are observed in the market prices of identical properties over short periods of time. The presence of these variances has required appraisers to examine the terms and conditions of comparable sales before allowing such sales as evidence of value.

In the various highway studies this examination of the terms and conditions of each sale, i.e., financing terms, knowledge of buyers and sellers, time of sale, condition of land and buildings, has not been very extensive because of the scope of the inquiry. As a result, the comparability of properties is never firmly established. The lack of comparability that exists between the properties sold and those unsold can be responsible for erroneous measures of value in specific geographical areas which will distort the effects of the highway. This is particularly true for small areas in which only a few transactions have taken place and these transactions involve property with substantial differences in size, accessibility and other variances.

The distortion of results is reduced by extensive stratification by location, types of land use, improvements, and so on, but these are only minimum considerations which do not account for significant differences in physical condition and terms of sale. The direction and magnitude of this distortion is unknown and could be ascertained only by very extensive comparison of parcels in the study area.

PROPERTY VS. LAND VALUE

Initially, the objective of this study was to ascertain the influence of a highway on land value. This objective would be

*The underlying assumptions here are those of pure competition.

much easier to attain if property was not improved because changes in land prices would be easier to identify. However, urban land is characterized by extensive improvements. The presence of the improvements creates important and difficult problems which make it extremely hard to determine the benefits accruing from highway improvements. It is quite possible that the highway benefits vary between vacant and improved land, or between different types of land improvements, i.e., industrial, residential or commercial. It is thus desirable to measure the benefits accruing to property value as well as land values.

The basic problem encountered when using property values is that of controlling fluctuations in the property value due to improvements. The net benefits accruing to other influences cannot be found if this is not done. There is also the difficulty of computing the amount of depreciation of the property improvement. One approach to this problem is to take the sales prices of the property and assume that the average value of the improvements do not change substantially over a period of years. Such an assumption is subject to some criticism but appears to be one procedure for a study of this sort.

The problem of adjusting for changes and improvements might best be handled by using the case history approach in sample design.* Using this approach it would be possible to consult public records and obtain the approximate dollar value of the improvement and then make a corresponding adjustment in either the price of the property or the interpretation of the results.

An additional difficulty related to the improvement value problem is that of depreciation. Property value declines relatively over the years due to physical and economic depreciation of the improvement. This negative influence on property value offsets, to some extent, increases in values due to other causes--highway, et al.--making the job of measuring the highway benefit more difficult. To some extent depreciation due to physical factors (age in this case) would not vary if the ages of the properties were about the same in each time period, but other depreciation factors would still be in effect and to a different degree between time periods. It is doubtful that the depreciation shortcoming can be removed. Depreciation rates vary with the type of property; they are difficult to measure; and efforts to set up arbitrary rates would probably only confuse the interpretation of reasons for land value changes.

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*Discussion of the case history method is found in the section "Case Histories vs. Random Selection of Transactions."

The measurement of highway benefits requires that vacant and improved property be examined. The force of the benefits may be different for vacant and improved property. The benefits are more difficult to obtain for improved property because it is hard to adjust for variations in the improvements. In the final analysis, there does not appear to be a complete solution for making the necessary adjustments for changes in improvement values though steps toward more accurate approximation of these adjustments can be made.

CONTROL AREAS AND CORRELATION OF VARIABLES

There are two distinct methods which can be used to measure the extent of highway benefits to land values. The first technique requires the selection of two areas alike in all respects except for the highway. In this case the highway would be the variable factor and differences in land value changes between the two areas would be attributed to it. This approach has been most frequently used in highway non-user benefits studies. The second method is to select a single study area, measure all the factors influencing the land values in that area, and by mathematical variance or regression analysis arrive at an approximation of the highway influence. The Washington Study seems to be the only one that has attempted this latter approach, and it was not entirely successful.*

Method number one--involving the use of control areas--is quite popular because the complex variables influencing land value are, for the most part, seemingly held constant. The major problem is finding two areas alike except for the highway. Once the control areas have been selected, there is little question as to the net influence of the highway. The apparent accuracy of the results obtained using this method is probably its most serious shortcoming because the value changes attributed to the highway actually include the impact of other forces influencing land value. If an identical control area cannot be selected, then factors other than the highway are also responsible for the observable differences in land value trends between the control and study areas. To identify the highway as the only causal factor for the difference when the control areas are not identical is misleading. The authors of various studies have noted the difficulty of locating control areas which fulfill the necessary requirements and have suggested that the areas selected, while not perfect, were the best obtainable. Such factors as location, patterns of city growth, age of development, neighborhood influences, parcel size, and so on, are difficult to duplicate. The lack of duplication has probably distorted the measure of the highway benefits to land value.

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*Wheeler, op. cit., p. 2.

The area selected for study in this project did not appear to have a satisfactory control area. The Dort Highway area appeared to be somewhat unique--particularly in terms of industrial development. Control areas were therefore not employed to obtain a measure of the highway influence on land value.

The use of control areas as a methodological technique raises still another question. Assuming that adequate control areas do exist, there is still the question of the selection process. Can the area be satisfactorily identified, or is the selection of the control area frequently biased by the objectives of the study? This problem may not exist except as a probability, but methods and results in a few studies seem to have a built-in bias. To the extent that the researcher fails to select an identical control area there tends to be a distortion of the highway influence.

Method number two--the correlation of variables--presents formidable analytical problems but is the basic methodological approach used in this study. The identification and quantification of the many factors influencing land values is quite difficult and has not been satisfactorily achieved to date--in the Washington Study or in this one.* In either case, some of the major and minor factors have been observed but measuring all of the influences sufficiently to clearly identify the highway benefits is another matter. In addition to the problem of identifying and measuring the variables, this approach accentuates the difficulty of obtaining a sufficient number of sales prices to provide an adequate analytical base in any one time period. The heterogeneous character of the universe requires transactions representing the many types of real estate. A larger number of categories requires even more transactions which are not always too abundant.

Method two was selected for use in this study because the use of control areas was considered undesirable because of the potential bias in the selection of the area, and the conviction that no two areas were alike except for the highway. Even so, the initial plan was to combine this approach with the correlation of variables. When observations of Dort area seemed to indicate that it was unique in Flint, the control area approach area was discarded.**

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*Wheeler, op. cit., p. 2.

**Strong consideration was given to checking land value trends of the entire community but the magnitude of this job and the questionability of the results caused this approach to be discarded. Such an analysis would certainly be helpful in evaluating land value trends but would not necessarily help to identify the influence of the highway in a specific location.

The difficulties encountered in measuring all of the variables influencing the land values in the study area have subsequently caused the authors to look more favorably on the control area approach to the problem--even with its many shortcomings.

It appears that the use of the control area approach may eventually provide the best single measure of highway influence. However, the closest approximation of highway benefits will be achieved by combining two approaches. The use of control areas and the correlation of variables should eventually provide the most meaningful methodological approach to the problem.

CASE HISTORIES VS RANDOM SELECTION OF TRANSACTIONS

In general, there are two distinct procedures or techniques which are used to obtain indexes of land value--the transactions approach and the case history approach. The former involves collecting all or part of the transaction prices in the study period; the latter only investigates the prices of land parcels which have been sold more than once during the years under study. The purpose of this section is to discuss some of the problems accompanying the use of the two procedures.

The transactions approach involves taking all transactions, or a sample of all transactions, that have taken place in the desired time periods within prescribed geographical strata. The sale prices for these transactions provide the basic indicators of market value for the property. The sale prices in each time period are averaged together to represent the property value in the prescribed geographical area. Problems to consider when employing this technique are:

1. Some parcels of property are bought and sold more frequently than others. A random sample of all transactions in any period of time gives those parcels which have been purchased more frequently than others a greater opportunity of being included in the sample. To include a relatively greater number of these parcels would tend to bias the results of the study in the direction of the characteristics of these parcels if the frequently transferred parcels have different characteristics than the rest of the parcels in the universe. There is no bias unless there are significant differences between these groups. However, since market prices or values are extensively determined or influenced by other transactions, this bias may be minimized because the values of the infrequently sold parcels would be influenced by those parcels which frequently change hands.

2. The major problem in the transactions approach is the comparability of data between time periods. Parcel A might appear in the 1940-1 period but not in the 1950-1 period. A parcel of property with a $10,000 improvement may be sold in the "before" time period, and a parcel with a $100,000 improvement may be included in the "after" time period. There might be relatively more small, unimproved parcels of land in the "after" time periods because more of the land would have been subdivided during this time.

Substantial variances in values between the before and after periods resulting from varying amounts of improvements, and varying property size, distorts the picture of value changes due to the highway. If the sample were sufficiently large, the number of large and small properties in each time period might be about the same. The average value from changes in improvements might then be of little consequence. However, the sample base is not large, particularly for some of the smaller geographical areas, and the "averaging out" process does not work effectively. In addition, there is probably an observable shift to larger houses, larger commercial buildings, and perhaps larger factories over the years. The presence of these shifts would further distort the picture even if a large number of transactions were used.

3. The sample is not as biased in the direction of the characteristics of smaller properties as found in the case history approach to sample design.* This type of bias is reduced because the properties are weighted by size in computing the mean value. A fourth (4) factor which is quite important from a pragmatic standpoint is the relative ease in which transactions can be found. Sampling the transactions is less laborious than checking case histories. This factor should not be understated because it becomes increasingly important with each additional year covered in the study.

The case history method involves taking all or a sample of the existing parcels of land in the study area and checking the value history of each parcel for transactions that have taken place. Analysis of these transactions can proceed in two directions: a) Percentage changes of values for individual parcels can be averaged together to obtain the change in land value representative of the study area. b) The sales price for all transactions in the specific time periods would be averaged to represent existing property value. Differences in the yearly averages would be used to show fluctuations in property value for the period studied.

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*Please refer to the following discussion of the case history method for further detail on this point.

There are a number of important advantages and disadvantages which are to be considered with these approaches. One disadvantage appears to be the presence of bias in the direction of smaller properties because all of the parcels are not of the same size, and the unit of measure (square foot) in the larger parcels does not have the same opportunity of being chosen as one in the smaller parcel.* The problem could be rectified by measuring the size of each parcel and giving each parcel the opportunity of selection based upon its size. Measuring each parcel is a time consuming task and the job of checking the 16,681 parcels in the Dort Highway Study area would have been tremendous. This element of bias would be unimportant if there were no differences in characteristics between large and small parcels. However, subdivision of properties tends to precede intensive improvements and a note of bias does exist. The extent of this bias can be substantial because value per square foot is closely related to area.

An important advantage of the case history method is that adjustments can be made for changes in value resulting from the construction of improvements on the land. The amount of improvement between sales can be identified, and the appropriate adjustments made by checking the assessor's records. Actually, a similar adjustment can be made when using the transaction method but the task is much greater because many more parcels of property must be checked to ascertain changes in improvements.

A study encompassing several years would encounter difficulty using a straight case history approach. A good deal of research time is spent recording transactions of property for periods in which there is already an adequate number of transactions recorded. In order to concentrate on time periods for which a small number of transactions have taken place, i.e. 1930's, there is generally a need to incorporate both the transaction and case history methods for purposes of economy.

The case history approach would be the most desirable method to use if the selection of sample design were based strictly on sampling considerations. The disadvantage of biasing a sample in the direction of smaller properties seems to be outweighed by the

*A possible biasing of results in the direction of larger properties should also be noted. Whenever transactions of extremely large parcels are used, the very magnitude of the sale causes the average value per square foot to be weighted heavily in the direction of the single sale. Thus a single sale can dominate the average value computation and not be "representative" of values in that specific area.

disadvantage of distortion due to varying amount of improvements in the transactions approach. As noted, the case history approach does not entirely avoid this bias but seems to encounter it to a lesser degree. In any event, any statistical shortcomings are probably minor relative to the task encountered when checking case histories for two or three decades. In the final analysis, the case history approach should probably be used for studies involving the last 10 or 15 years and some phase of the transaction approach for longer periods of time.

TIME PERIODS

The typical land value study has depicted changes in land value before and after the highway improvement by averaging sales prices for a period of five years prior to and subsequent to the highway improvement. For example, in the Washington Study the "before" period included prices from 1935 to 1940. The post highway improvement period included prices from 1940-1949. Land prices covered a 15-year period in the Dallas study. The base period was 1941-45 with measures of changes in 1946-50 and 1951-55. It is suggested that this practice tends to distort what actually has occurred.

Presumably, this practice is followed because of the lack of transaction prices in the study area for shorter periods of time. Reliance on market prices to represent values of other properties requires several comparable sales in order to obtain a clear concept of the land value at any one time. In most study areas geographic limitations are such that the number of property transfers that take place in any one time period is not very great. This is particularly true during periods of recession, or at times when the parcels have not been extensively subdivided. The lack of a sufficient number of sales to provide an indication of land value at any one time requires that the geographical area be expanded or the time periods be enlarged. Expansion of the geographical area is somewhat undesirable because the highway influence probably varys with the distance from the highway, and large study areas might introduce undesirable mixtures of strong and weak highway benefits. Enlargement of the area to be examined also increases the cost of operation. As a result, the time periods are usually enlarged.

It is conceivable that a five year average of market prices might conceal changes in the rates of change of land values and even obscure the direction of highway benefits; that is, value changes attributed to the highway might increase rapidly following the opening of the highway improvement and then decline after three or four years. There are, however, at least two reasons why long

term averages might be used: (1) There is a greater number of transactions per geographical area which increases the reliability of the sample in terms of numbers but also increase the possibility of error due to changing market conditions; (2) Long term averages tend to show basic trends at the expense of short term fluctuations. The balance of the evidence favors the use of shorter time periods--one year, if possible, or two years at the most--to present a clearer picture of the land value trends. In this study, two-year averages were used initially because one-year periods did not provide an adequate number of transactions for analytical evaluation. It later became necessary to use four-year averages to obtain enough data for analysis of the smaller geographical areas. Thus at times, the exigencies of the situation tend to overrule preferred approaches.

ZONES OF INFLUENCE

Since a highway contributes to the economic growth of a community, it also contributes to communitywide changes in land values. The influence of the highway on land values thus transcends the area in which it is located. Measurement of these citywide changes in land value would be necessary if the entire highway influence on values was to be identified. The measure of this benefit is extremely difficult, if not impossible, to obtain. However, the fact that these benefits do accrue is important if highway costs are to be allocated to non-users. This would mean that general tax revenues, in addition to those levied for specific purposes, would necessarily be considered.

Logically enough, empirical studies have been primarily concerned with measuring the special location benefits accruing because proximity to the highway. The techniques used to delineate the zone or spheres of highway influence have drawn on various geographic relationships to the highway. The selection of the study zone requires the arbitrary decision of which zones are used to show the varying degrees of highway influence. This arbitrary decision is a difficult one at best and certainly opens the door for bias in the study if the researcher explicitly or implicitly selects zones which will prove predetermined hypotheses. The typical practice has been to select zones which parallel the highway and to examine the changes in land values that have taken place therein. These areas are necessarily limited in scope due to the tremendous job that arises when the size of the study area is increased. This practice may overlook some of the areas benefited which might not be in the immediate proximity of the highway. It also introduces the possibility that land areas might be selected in which factors other than the highway are responsible for major changes in land value. Further, these zones of

influence need to be stratified so that unlike areas of benefit may be separated to show their particular relationship to the highway development.

The selection of zones of influence is dictated to a large extent by the conditions in the area studied, but there are some approaches which may help to better display variances in highway benefits. Extensive division of the study area into many zones of influence is desirable even though there is a paucity of data for some zones. Zones of influence paralleling the highway as well as perpendicular the road is desirable. Frequently these divisions have been made in one-half and one mile measures. Even though other divisions are practical, interstudy analysis would be facilitated if some basic division, such as above, are practiced. The importance of some interstudy consistency cannot be overstated if a complete picture of highway benefits is to be obtained.

SUMMARY AND A CONCLUDING NOTE

The following summary to this chapter is offered to reiterate in a more concise manner some of the major points that have been introduced.

Interstudy comparisons should be made cautiously because differences in the type of highway, the services provided, and the economic environment suggest that the extent of the highway impact on land values may vary considerably with these conditions.

Highway improvements are a cause and effect of economic growth. This dual capacity makes it seemingly impossible to measure the total impact of a highway development on land values in a community though an approximation of specific location benefits may be obtained.

The extreme heterogeneity of the real estate universe, coupled with the small number of transactions available in small geographical areas, causes much difficulty in measuring land value changes and highway benefits for the many kinds of property.

The value of improvements to property must be discounted before measurement of highway benefits can be achieved. The procedures involved require the use of somewhat arbitrary controls which reduce the accuracy of estimates of property value changes.

The comparison of value changes in properties identical save for the highway factor (control areas) is perhaps the easiest method

of measuring highway benefits. This approach assumes away many of the difficulties encountered when correlation of the variables is attempted. The use of control areas may appear to be the obvious solution to the problem, but the selection of an identical control area also requires the identification of the many variables influencing land values. Inability to identify these variables may lead to incorrect conclusions regarding highway benefits.

The most fruitful method of measuring changes in land values seems to involve the use of the case history approach to data collection. This method is, however, costly and time consuming if transactions dating back two or three decades are sought.

The market price of a parcel of property only gives an indication of the value of that property, and comparable properties, at that point in time. The prevalent practice of averaging market prices over time periods of several years tends to disguise variations in values that do occur. Time periods of some length must be used, but the averaging of prices in years of unlike economic conditions should be avoided.

The approach in this chapter has been somewhat negative in order to accent some of the many difficulties involved in land value studies which might not otherwise be apparent except to the sophisticated observer. The difficulties appear to be formidable --too much so if exact quantification of data is sought--but substantial contributions to the knowledge of highway benefits to property owners can still be obtained.

CHAPTER IV

THE ECONOMIC AND HISTORICAL DEVELOPMENT OF THE STUDY AREA

The examination of the development of a particular segment of a highway for the purpose of measuring its influence on property values in the area which the highway serves necessitates a knowledge of the general pattern of economic activity for the whole area. This is necessary because economic fluctuations are a major influence on land values and need to be distinguished from the effects of the highway. The procedure followed in this study was to investigate the historical development of Flint and to portray this development in economic terms for correlation with land value trends in the study area.

The Development of the Flint Area

The City of Flint was first established near the Flint River. Its first industry was lumbering, and it was natural that the lumber mills should dominate the scene and be located along the Flint River. In 1859, they were mainly located east of Saginaw Street along both sides of the river. At this time, a large number of persons were employed as carpenters, joiners, cabinet-makers, carriage, and wagon makers. Indeed, between the lumber era and the automobile era, Flint became one of the leading producers of carriages and wagons with its industrial area still centered along the river.

With the advent of the automobile, industrial development increased tremendously in Flint. During the early expansion of the automobile industry, the plants were located on or near the existing sites of other factories and, thus, still close to the river and the railroads. The role of the river in determining the sites lay in the significance of its attraction for the lumber mills and in the construction of the railroad along the course of the river valley. In 1907, there were in Flint three main industrial and commercial centers stretched in an arc along the Flint River and the adjacent railroads. The largest of these was the one in the northern edge of the city just west of the river. Today this is part of the vast Buick Motor Car plant. The second industrial area was concentrated north and south of the river located almost in the geographical center of the city. The third area lay in the southwestern part of Flint, likewise adjacent to the river and the railroad.

As the automobile became a permanent part of the American scene, Flint experienced a great expansion of its manufacturing plants; this expansion took place within the above-mentioned area. In 1917, the industrial situation was summed up thus:

> The present industrial development in Flint is confined to the valley along the railroad right of ways. The largest single plant is Buick, and between there and the Chevrolet Motor Company to the south are most of the smaller concerns. There is little available land for factory expansion, but the new industrial district will solve this problem.*

The first location of any industrial plant outside of the "Chevrolet-Buick arc" occurred about 1923, when two such variations were established. One was the Fisher Body plant located on the southern city limits just west of South Saginaw Street. The second was the construction of the Dort automobile plant on the east side of Dort Highway just south of Davison Road. This plant was later occupied by the AC Spark Plug Company.

Today, Flint has developed two broad industrial areas. The more compact one has been called the "Chevrolet-Buick arc". Although considerable expansion has occurred at various times within this area, it has by now reached its maximum density. Hemmed in by commercial and residential developments, it is further subject in part to costly damage by floods. Further expansion must occur elsewhere as is exemplified by the construction of the new Chevrolet assembly plant on the southwestern edge of Flint just south of the Grand Trunk Railroad. Thus, the second area can be visualized as an outer arc extending around the eastern and southern edge of Flint from the AC Spark Plug plant on Dort Highway to this new Chevrolet plant. This area is by no means continuous; still it would not require very much expansion to fill in the gaps sufficiently to have a pronounced effect upon Flint.

Indications of a shift in the location of heavy commercial sites in Flint have become apparent. It was along the railroad sites close to the central business area that the wholesale businesses were first established. This concentration remained true in 1917 even after many years of growth. "The wholesale business, of course, follows the railroad and seeks location

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*John Nolen and Bion, J. Arnold, City Plan of Flint, Michigan. Published by the Planning Board, Flint, Michigan, 1920, p. 22.

central to the city area."* With the continued growth of the city, this central warehouse area has proved very costly in traffic delays. With the development of truck transportation, terminals were oftentimes established at or near the edge of the downtown business district. In 1947, this was still the pattern with a single important exception. There is a small but definite indication that some truck terminals are locating along the Dort Highway.** There is also some shifting of other heavy commercial business from the central downtown area towards the periphery of the city and especially along the Dort Highway.

The distribution of the light commercial development in Flint assumes a linear pattern which closely corresponds to the main routes of local traffic. North and South Saginaw Street has by far the greatest development; with varying degrees of density, it stretches from the southern to the northern city limits. This is an outgrowth of the original settlement near the Saginaw Street Bridge. There are similar developments along Fenton Road, Davison Road, Court Street, and several other important routes.

As indicated by the above paragraphs, Flint is a city which has passed through a period of rapid expansion in response to the impact of a dynamic industry--the automobile. The impact of this industry can best be seen when one investigates the historical development of the Dort area.

The Development of the Dort Area

The heart of the Dort Area was entirely farmland as late as 1920 though some residential development had taken place on the western fringes by 1909. Significant changes were in the offing, however, as a result of the ideas and decisions by such men as James Welch, J. D. Dort, William Durant, and others around 1917. These decisions foreshadowed the acquisition of large land areas for purposes of industrial and commercial development.

By 1921, the section between Franklin Avenue and the Dort Highway had been platted; however, it was not until 1923 and 1926 that major changes in the land use of the area occurred. The most striking of these was the large industrial tract located in the center of the area, between Dort Highway and the Pere Marquette Railroad. This area is the present AC Spark Plug plant (the old Dort Motor Car Company) and was built in 1923. Another important

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*City Plan of Flint, op. cit. p. 22.

**Report on Federal Aid Project AE-FAP-403 (1), Flint, Michigan State Highway Department, Lansing, Michigan, 1947, p. 16.

change was due to the appearance of the Pere Marquette Railroad in 1923; later this railroad became a part of the C & O Railroad. The railroad parallels the Dort Highway as far north as Davison Road and then swings in a broad curve to the west, eventually intersecting the highway.

Changes in land use continued with the appearance of extensive commercial activity over the years. Two large centers of commerce are located north of the AC plant: one opposite the plant on the north side of Davison Road, the other north of Davison Road between the Pere Marquette Railroad and the Branch Road. Other heavy commercial sites are west of Dort Highway just north of the Grand Trunk Railroad. Still another change has taken place in the increase in the amount of land devoted to light commercial use and a new location of this use. The Franklin Avenue Retail Center has been firmly established. Additional retail establishments are now beginning to move eastward along the north side of Davison Road with two sides already established east of Dort Highway.

Paved roads were conspicuous by their absence in the area before 1920. In 1921, Davison Road was the first road in the area to be paved. In 1947, it was widened to four lanes in the section east of Dort Highway. The next street to be surfaced was the part of Franklin Avenue north of Davison Road; this was paved in 1923. The west-most block of East Court Street was paved in 1924, and by 1931, Franklin Avenue had also been paved; Arlington and Maplewood Avenues, just east of Franklin Avenue and south of Davison Road, along the East Court Street had also been surfaced between 1924 and 1931.

In 1926-27, Western Road became the Dort Highway and the cut-off for M-10, Dixie Highway, around Flint. Six miles of the Dort -- from the junction of U.S. 10 south of Flint to Davison Road -- was paved for two lane traffic at this time; the remaining nine miles were paved in 1929. The road was subsequently widened to four lanes in 1934, 1938, and 1947, except for a short stretch of three lane paving north of the study area. Thus, a paved north-south route skirting the eastern edge of Flint was established. Paving of streets crossing the Dort included Lapeer Road in 1933 and Brookside in 1941 prior to World War II. Postwar improvements have largely taken place in the southwestern section of the area. It appears that in most cases paving has followed initial residential, commercial, and industrial development.

ECONOMIC ACTIVITY AND LAND VALUES

The major factor associated with changing prices and values of real property is the level of economic or business activity or the amount of income generated from all sources in the community. Increased incomes accruing to business, workers, government, etc., precipitate changes in industrial activity, employment, and population, which generally accompany changes in the intensity with which real property is used. The demand for industrial, commercial, and residential properties intensifies, and prices of both improved and unimproved land tends to rise or fall.

Property values in the various sections of the community are supported by the economic strength of the entire city. Weakening of these supports adversely influences all real property values. Conversely, strengthening the economic base tends to produce advances in real estate prices. Each section of the community is not affected to the same degree since other factors hinder or enforce trends exerted by the communities' overall economic change.

A major objective of this study was to give appropriate consideration to the relationship between the community economic base and the changes in the value of property located near the highway improvement. This relationship has been frequently noted but not generally subjected to rigorous analysis. It is a relationship that should receive important emphasis when making interstudy comparisons; it is of paramount importance when analysis of land value trends proceed along the lines discussed in Correlation of Variables.*

In this chapter the various measures of the economic base are brought together and examined. All types of business activity do not enjoy equal prosperity at the same time and to obtain a comprehensive measure of a community's prosperity requires consideration of the individual components as well as the composite picture. The following indicators of business activity in Flint were selected: population, building permits, sales tax collected, employment, total assets of state banks, and deeds, instruments recorded. For purposes of this study, the single measure most closely related to changing land values is possibly the number of building permits issued, but there is no assurance as to the degree of correlation to be expected.

The individual indices were combined to present a composite measure of Flint's economic activity. Those measures involving monetary considerations were further adjusted for changes in the price level

*See Chapter II

to show more clearly the actual changes in the level of physical activity that have taken place. The measures of the economic base used in this study are discussed on the following pages.

Population*

There are five distinct phases in the development of population in the City of Flint: in the first period, from 1860 to 1880, the population of Flint grew rapidly with a 116 per cent increase from 1860 to 1870 and a 56 per cent increase from 1870 to 1880. A definite decrease in the rate of population expansion took place in the second phase from 1880 to 1900; this 20 year period is considered a transitory one during which the economic base of Flint shifted from dependence upon carriage manufacturing and its related small industrial activities to reliance upon the present important industry--automobile manufacturing. The third phase of Flint's population curve comprises the period from 1900 to 1930; this period shows a phenomenal rise in population concomitant with the growth of the automobile industry in Flint**, the fourth phase of the city's population curve is the slight decrease in population which occurred from 1930 to 1940 even though the population of the entire county shows a slight increase; and the final phase of the city's population curve which shows a substantial increase of 52 per cent--approximately 120,000 people--by 1956 to 1957.***

*Source: U.S. Bureau of Census; Michigan Secretary of State; statistical methods section, Michigan Department of Health.

**From 1900 to 1910, Flint enjoyed a 194 per cent increase; and while the per cent of increase for 1910 to 1920 was somewhat smaller, it is still registered at 138 per cent. From 1920 to 1930, the population grew by 71 per cent, an increase almost small in comparison with those cited previously; however, taken in sheer numbers, the increase from 1920 to 1930 represents a rise of over 64,000 inhabitants, while the increase in total number of individuals from 1910 to 1920 was one of slightly over 53,000 persons. Thus, as a city which has grown in population, the use of per cent of increase or rate increase must be compared with the increase in actual numbers of individuals in order to assure a more rounded picture of the population changes taking place.

***This seems to be a temporary downward trend of very small proportions caused by the centrifugal movement of the population toward the urban fringe during the depression years.

Population data for the City of Flint and the metropolitan area of which it is part are examined because part of the Dort Highway is found beyond the city limits, and measures of the metropolitan area give a clearer picture of the area as an economic unit. The Bureau of Census recognizes Genesee County as the Flint Metropolitan Area. Population data for Flint can be found in the Appendix.

Building Permits*

The number of building permits issued is one indicator of economic activity which is perhaps most closely associated with land values. Typically, the volume of real estate activity fluctuates more violently than for other types of business and in Flint this same relationship exists. A large volume of housing was added to the community inventory in the boom years of the 1920s, followed by a near cessation of building activity in the great depression of the 1930s. Building activity declined during World War II, but construction has increased sharply in the post war years. Building activity by years for both the city and the metropolitan area is found in the Appendix.

A word should be said about the limitations of building permit data. All statistics prior to 1940 are from the census of 1940. Construction dates in this period were ascertained by asking the owner or occupant the year the house was built. There will be errors due to the inaccurate answers, also due to the fact that no allowance could be made by this method for houses which had been built in prior years, but had disappeared before the date of the census. The figures from 1940 to 1956 are from city building permit records. Building permits do not provide a complete record of building construction. They simply indicate the number of applications for construction purposes, i.e., new units and repair of existing ones. Some permits are taken out for buildings which are never built. On the other hand, few residences in the city are constructed without permission of the Building Inspector. Therefore, it can be concluded that the city figures might overestimate the amount of building to some degree. Also, since permits are applied for before building, there is a time lag between the application date and construction date. Taking into account the possibility of error in statistics, it may be concluded that over a period of years, they give a fair picture of building activity in the city and the county.

Employment

Another important measure of the economic activity of any area is the amount of employment. There have been numerous studies on

*Dinell, Tom, The Influence of Federal, State, and Local Legislation on Residential Building in the Flint Metropolitan Area (Ann Arbor: University of Michigan, 1951), p. 13.

employment in the United States, and most have shown that generally about one-half the labor force is engaged in producing goods, while the other half is busy in service industries such as professions, transportation, and other occupations of a similar nature. Analysis has shown that there would be little if any unemployment in this latter group if the producing group could be kept employed. The census divides producers into two groups: producers of consumer goods and producers of durable goods. Consumer goods include fuel, food, textiles and other goods of like nature, while durable goods include building, machinery, automobiles, highways, bridges, and other similar commodities.

As one might suspect, the Flint area is engaged primarily in producing durable goods. The automotive industry employs approximately 95 per cent of the total of all manufacturing industries. Estimates of the average number of employees in manufacturing industries in the Flint area were made by C. M. Bullard, Secretary, Flint Manufacturing Association. This estimate was based on the number of employees employed by the automotive industry in the area. Estimates after 1946 were obtained from the Michigan Employment Security Commission. These estimates are found in the table following and include only this important group and not the total number employed in the Flint area.

In an analysis of unemployment figures of all groups, it was found that during a depression period 75 per cent of the total unemployment occurred in the group producing durable goods and that most of the remainder is dependent on this group.* According to this analysis, if the producers of durable goods are kept fully employed, the entire labor force will have full employment. These facts concerning employment groups are pointed out to show that the Flint area, which plays an important part in the durable goods industry, is subjected to a large percentage of unemployment during a depression period. This fact was again substantiated in 1958. Wide fluctuations in unemployment would have a pronounced effect on land values in the area and this relationship helps to explain the very wide fluctuations in building activity as indicated by the number of building permits issued.

Other economic indicators used were total assets of state banks in Genesee County, deed instruments recorded, and sales tax collected in the county. Complete tables of all of these economic indicators can be found in the Appendix. As indicated before, the Bureau of Census recognizes Genesee County as the Flint Metropolitan Area.

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*Ayres, L. P., "The Chief Causes of this and other Depressions," Railway Age, May, 1935.

Wage and Salary Employees in Manufacturing Industries
Metropolitan Flint

Year	All Manufacturing Industries
1920	31302
1921	20224
1923	33379
1924	27655
1926	36550
1927	44500
1929	49800
1930	37400
1932	24600
1933	27700
1935	38800
1936	41900
1940	42200
1941	48300
1945	48600
1946	53100
1950	62800
1951	70400
1956	91000
1957	87000

Source: Manufacturing Association of Flint and the Michigan Employment Security Commission.

The economic base data is interpreted more easily by reducing the actual data to a series of percentages of some base. In this study, the raw series was computed with a 1956 to 1957 base as 100 per cent. These percentages give a series of relative numbers which facilitate comparison and combination of the data.

To show "real" changes in economic activity those indices which are in monetary terms were deflated to compensate for changes in the price level. The deflation process is accomplished by dividing the pertinent data by a price index. The Detroit Consumer Price Index was chosen for use because no index is computed for Flint.* Detroit closely resembles Flint in geographical and economic terms as there is a mutual emphasis on the automotive industry. The Detroit Consumer Price Index for selected years follows:

Year	Consumer Price Index - Detroit 1920 to 1957
1920	75.6
1921	66.0
1923	62.3
1924	62.4
1926	63.4
1927	61.8
1929	60.9
1930	58.4
1932	44.3
1933	41.8
1935	46.2
1936	47.9
1940	48.8
1941	51.8
1945	63.3
1946	68.3
1950	85.0
1951	91.8
1956	97.6
1957	100.0

Sources: U. S. Bureau of Labor Statistics

*The Consumer Price Index measures changes in price of a fixed market basket of goods chosen to represent consumer spending patterns.

The individual and composite economic indicators* are presented graphically in Figure 2 to more clearly portray the relationships between them and to show overall trends. Very rapid growth in the 1920s is followed by the precipitous declines of the 1930s and increasing economic activity during World War II is followed by more intense expansion during the 1950s. In its annual report in 1955, the Federal Reserve Bank of Chicago reported that Flint's post development has been greater than the nationwide economic expansion. The area's future expansion, like its past, is inevitably tied up with the automobile. One might go a step further and state that the area is tied up with the production of two specific automobiles, Buick and Chevrolet. Thus, the future of Flint is mostly dependent on the sales of Buicks and Chevrolets.** The production figures for Buicks and Chevrolets for selected years follow:

Buick and Chevrolet Production Figures (in thousands)

Year	Buick	Chevrolet
1946	156	397
1947	277	696
1948	276	776
1949	398	1110
1950	553	1521
1951	405	1118
1952	321	878
1953	485	1477
1954	531	1414
1955	781	1830
1956	535	1621
1957	407	1522

Source: Statistical Department, American Automobile Manufacturing Association.

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*A composite index number is designed to show the relative change in whole groups of related time series which pertain to the same kind of activity. This type of index was used to express economic activity, because a composite index number enables one to get some idea of a magnitude that cannot be known by any direct observation. Since all the individual indices are related to each other, a composite measure gives one a more reliable measure of Flint's economic activity as any weighted index.

**Federal Reserve Bank of Chicago, Annual Report 1955, pp. 27-32.

The object of this section has been to determine the general pattern of economic activity for the area in order to assure an adequate basis for evaluating the changes in land values. This is essential since changes in the economic base of an area influences land values; for example, increases in population, building activity, etc., might cause a shift in the demand for land, and the market price of land would tend to increase with a given supply.

From the evidence presented the following hypotheses can be tested: land values should show a marked increase from period I to period II due to increased economic activity; period III which covers the depression years should show a substantial decrease; in period IV the recovery should be evident; and period V should show the post war expansion of the area.

FIGURE 2

Indicators of Economic Activity of Genesee County for Selected Years as a Percentage of Group V

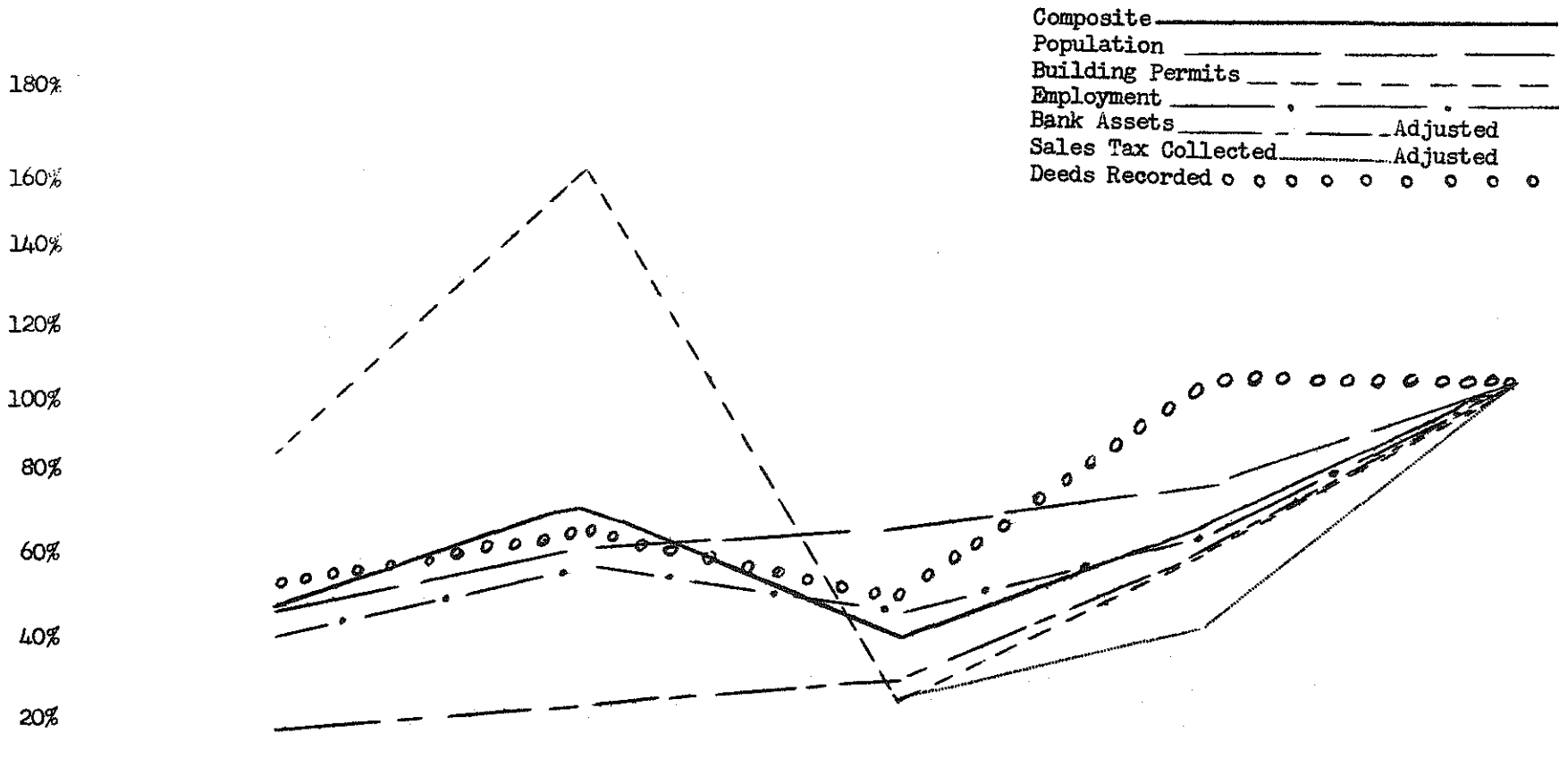


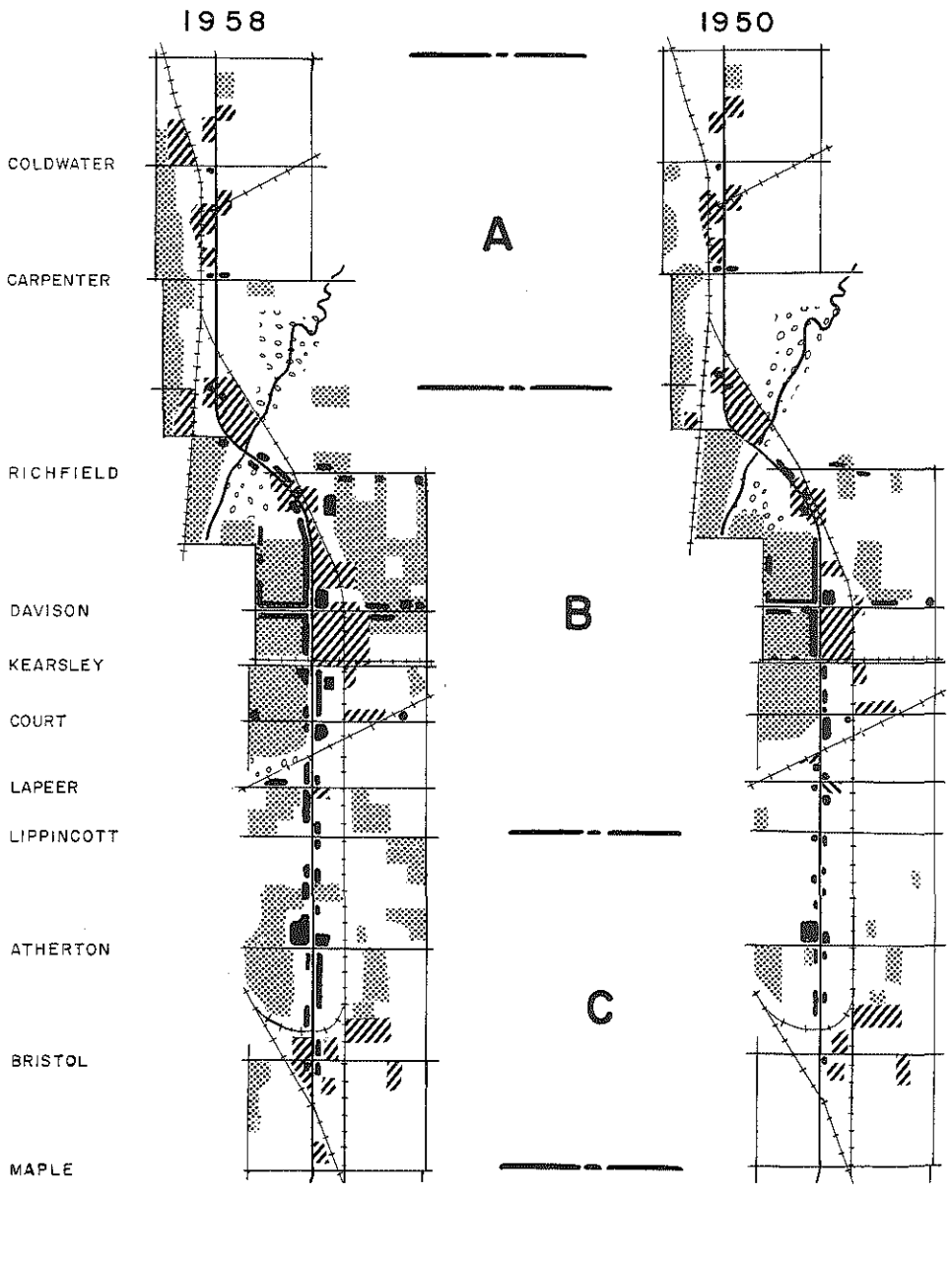
FIGURE 2

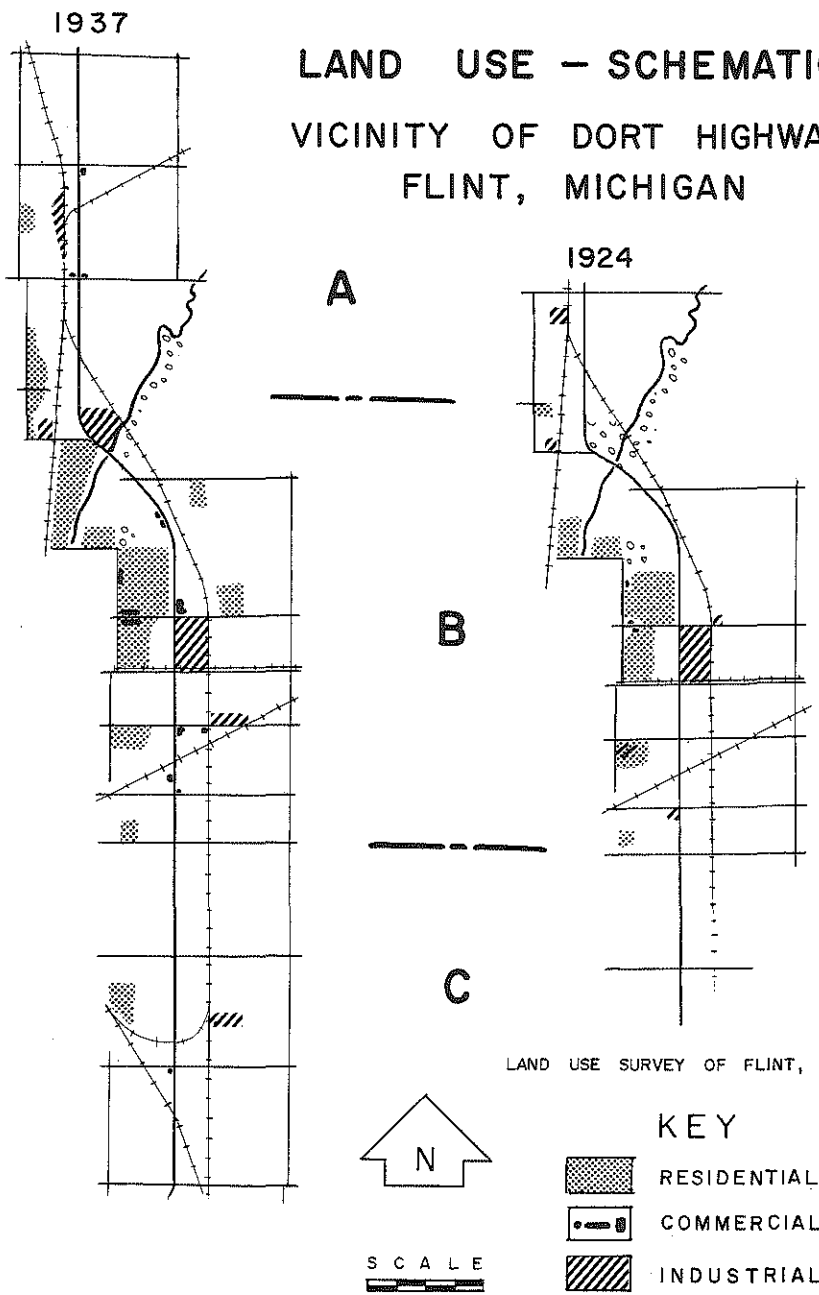
Land Use - Schematic,

vicinity Dort Highway, Flint.

LAND USE – SCHEMATIC

VICINITY OF DORT HIGHWAY
FLINT, MICHIGAN





LAND USE SURVEY OF FLINT, 1924.

N

SCALE
1 MILE

KEY
- RESIDENTIAL
- COMMERCIAL
- INDUSTRIAL
- PUBLIC
- VACANT

FIELD SURVEY OF CITY OF FLINT BY CLASS IN URBAN PLANNING 410, M.S.U., 1958.

FIELD SURVEY OUTSIDE OF FLINT BY PROJECT STAFF, 1958.

AERIAL SURVEY, 1950

AERIAL SURVEY, 1937

HIGHWAY TRAFFIC SAFETY CENTER, MICHIGAN STATE UNIVERSITY
RESEARCH PROJECT ON ECONOMIC AND SOCIAL EFFECTS OF HIGHWAY IMPROVEMENTS, AUGUST, 1958.

CHAPTER V

LAND USE IN THE DORT HIGHWAY STUDY AREA

The land use patterns in the study area, as portrayed on the maps at four points in time during the past thirty years, indicate a good deal about the past development trends on Flint's east edge. When this information is combined with other facts about the city's physical history, there emerge some of the reasons underlying today's pattern.

Flint began life as a lumber town in the middle of the 19th century. This industry attracted wood-consuming enterprises, and thus by 1900 the city of 13,000 people had become probably the leading center of carriage manufacturing.

As the motor car grew in importance, the city readily embraced this new industry, and as the carriage gave way to the auto, Flint maintained its position as a leading manufacturing center.

Concurrently industry tended to concentrate in three general areas of the town--one near the center, one along the Flint River in the southwestern part of the city, and one along the Dort Highway.

The year 1924 was used as the first indication of land use since it is also the time of the first known, fairly comprehensive, land use survey of Flint during the period covered by this study.* The pattern indicates that development was just beginning to reach the Dort Highway, with the only significant industry being what is now the AC Spark Plug plant. There was virtually no commercial development in the area. This was a time prior to the existence of Dort Highway as such, and the map shows the tendency to develop first the areas which are closest to the center of the city. Residential areas are quite solid, and the beginnings of the park area along the Flint River already exist.

By 1937 a few significant changes can be noticed. Some commercial uses had been established along with the increasing residential building. The latter still tended to cluster around older development, probably since utilities were available there. The attraction of the Dort Highway itself has not as yet become apparent, in spite of the fact that the road had been in existence for several years.

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*The land use information for 1924 was done at the time as a part of the studies for the "City Plan of Flint".

The real change is evident in the 1950 pattern. The widening of the highway, completed in 1938, and the post World War II development spurt have combined to start destroying the usefulness of Dort Highway by throttling it with strip development. Commercial uses have increased tremendously, and it is apparent that the highway had started to become an attraction to industrial uses. Residential development outside of the larger clusters is still quite sporadic, although more of it has jumped the highway in spite of ample vacant land to the west of Dort Highway. Here is seen what may well be an additional result of the blighting influence of the highway and its parasitic development: contrary to trends which started some twenty years earlier, residential development has now begun to shy away from the highway, but traffic has not yet reached the volume which makes the road a serious barrier.

This influence of the Dort Highway is further indicated by the pattern of fringe development around Flint. On all sides of the city, except the east, there had built up, as early as 1940, notable development outside the city. On the east, however, the deterrents to development were apparently so strong that south of Lapeer Road there was virtually no increase in residential use of the land from 1937 to 1950.

By 1958 the strip development is almost solid along Dort Highway and Davison Road, yet roughly half the study area is still vacant land. In spite of the proximity of the area to downtown Flint and to other industrial areas, residential building has continued to be spotty, and the land use pattern indicates that it has tended to keep clear of the highway and its frontage development. The gradual tendency for residential areas to fill in the vacant land west of Dort Highway indicates that the highway has now become a barrier, to autos and pedestrians, of serious proportions.

The four land use maps illustrate, better than any other single feature, the life cycle of a highway. In 1924, without the highway, what development there was lacked definite orientation, except to the center of the city. Thirteen years later the north-south axis of the highway was beginning to show its effect, and travel along the highway likely constituted a vast improvement over the alternate city route.

By 1950 there were definite signs pointing to the inevitable reversion of this "bypass route" to another city street: while the majority of the frontage was still vacant, some development existed along all parts of the highway in the study area. In 1958 the reversion process was complete; strip development was nearly solid and, as a coup de grace, a new limited access bypass was opened to traffic on the west of Flint.

CHAPTER VI

CHANGES IN LAND VALUE

Measurement of the highway influence on land values presumes that some kind of index of land values can be constructed. In fact, the accuracy and preciseness with which the value trends are interpreted depends on the ability to construct this index. As indicated earlier, a number of problems are encountered in obtaining data for a land value study which makes the measures obtained rather unrefined instruments for examining the highway influence on land value. Even with the problems created by the inexactness of the available information it is still possible to capture measures of central tendency, to see trends, and to draw revealing conclusions.

In this study, chief reliance is placed on the prices of vacant land as estimated by the number of revenue stamps affixed to the deed. These estimates appear to provide the best available measure of land values. However, additional measures were developed in the course of the study and consideration of their interrelationships is discussed in another part of this report.

For clarity of analysis and to facilitate in identifying countervailing trends, the transactions are grouped by all vacant parcels and vacant parcels under 30,000 square feet--approximately three-fourths of an acre. Data is reported in constant dollars per square foot in order to identify "real" changes in value. Occasional reference is made to actual dollar prices.

Vacant Parcels Under 30,000 Square Feet

Perhaps the most surprising result was that the level of property values for this group was approximately the same in 1940-5, 1950-7, as it was prior to the paving of the highway in 1926. Interim fluctuations had occurred and the actual price per square foot had risen from $.10 to $.15, but the real value was at the same level. There is some evidence that an increase in real value of approximately 65 per cent took place in the four or five years following the paving of the highway but values subsided during the depression as shown in Table A.

TABLE A

REAL AND ACTUAL VALUE PER SQUARE FOOT OF UNIMPROVED PROPERTY LESS THAN 30,000 SQUARE FEET

	Zone 1			Zone 2		Zone 3		All Zones		
		Value			Value		Value		Value	
Year*	No.	Real	Actual	No.	Real	No.	Real	No.	Real	Actual
1	10	.193	.129	67	.170	16	.103	93	.156	.107
2	2	.163	.104	12	.427	8	.114	22	.254	.159
3	6	.327	.154	21	.126	13	.216	40	.182	.085
4	27	.207	.122	53	.162	27	.114	107	.156	.091
5	13	.363	.340	39	.151	23	.087	75	.154	.144
Total/Av.	28	.250		192	.170	87	.118	337	.164	

In contrast with the average value of all small parcels in the study area, land values of property abutting the highway (Zone 1) had doubled while the other two zones were at the same level or perhaps slightly lower. These different trends are suggestive of the relative desirability of property abutting the highway.

Proximity to the highway was also associated with the level of value in each zone. The value of small parcels appeared to vary inversely with the distance from the highway. Average value of all Zone 1 property was $.25/sq. ft. as compared with $.17 and $.12 for Zones 2 and 3 respectively.

The pattern of values in each stratum showed similar trends. Land values in each stratum were found to be at the same level after World War II as they had been immediately prior to the paving of the highway. Data is shown in Table B. Here, too, there was some evidence of an appreciable rise in values following the paving of the highway, and a falling back during the economically inactive years of the '30's.

*Year one includes transactions in the years 1920-1-3-4; year two is equivalent to years 1926-7-9-30; year three equals years 1932-3-5-6; year four equals 1940-1-5-6; year five equals 1950-1-6-7.

TABLE B

REAL VALUE PER SQUARE FOOT OF UNIMPROVED PROPERTY LESS THAN 30,000 SQUARE FEET

	Stratum A		Stratum B		Stratum C		All Strata	
Year	No.	Value	No.	Value	No.	Value	No.	Value
1	14	.091	56	.212	23	.120	93	.156
2	1	.140	17	.294	4	.118	22	.254
3	5	.099	21	.177	14	.252	40	.182
4	12	.105	53	.175	42	.151	107	.156
5	10	.087	39	.206	26	.121	75	.154
Total/Av.	42	.096	186	.202	109	.145	337	.164

Even though the value levels in each stratum had not changed appreciably, there were distinct differences between the average values in each stratum. The most expensive land was found to correspond with the center of economic activity in the area--Stratum B. The southern and northern sections ranked in that order with a 4-3-2 ratio between the stratum. These values appeared to correlate with the relative intensity with which the area was being used.

Trends similar to those for the entire study area were found in the individual stratum with minor exceptions. Values of land abutting the highway in Stratum B and C enjoyed a twofold increase. However, the Zones 2 and 3 in Stratum B appeared to decline in value as shown in Table C. This somewhat cautious observation suggests that the residential property in these zones may have been in too close proximity to the conglomerate of industrial and commercial activity in the area. This condition appears to be more dominate in Stratum B than in A or C. Extensive analysis of data in specific stratum or zones is not possible due to the small number of transactions recorded in these smaller geographical areas.

TABLE C

REAL VALUE PER SQUARE FOOT OF UNIMPROVED PROPERTY
LESS THAN 30,000 SQUARE FEET

Stratum B

	Zone 1		Zone 2		Zone 3		All Zones	
Year	No.	Value	No.	Value	No.	Value	No.	Value
1	8	.188	37	.244	11	.150	56	.212
2	2	.163	10	.488	5	.118	17	.294
3	3	.333	11	.117	7	.201	21	.177
4	18	.323	20	.170	15	.090	53	.175
5	9	.420	20	.196	10	.098	39	.206
Total/Av.	40	.317	98	.218	48	.119	186	.202

A rather interesting phenomena was observed when the transactions were regrouped by the ten major streets crossing the Dort Highway in the study area. Since many of these streets provide access to the downtown area and would be heavily traveled, it might be expected that increases in values would be found. A contrary trend was observed. The average value of the small parcels along these streets declined in real value for all strata. This decline took place even though there had been an average increase by these properties in the years immediately following the paving of the highway. The remainder of the property in the study area, i.e., not abutting these streets or the Dort Highway, showed different trends in the various strata. Stratum A increased in value, Stratum B decreased, and Stratum C was the same value level in the reference years.

Remember that this data refers to parcels under 30,000 square feet and the changes noted here do not tell the whole story. However, an important segment of the market is here identified. The significant point is that the average smaller property did not enjoy appreciation in real value terms from pre-highway days to the early 1950's even though immediately after the highway was paved a relatively sharp rise in average land values seemed to take place.

All Vacant Property

The data on small parcels understates many changes in value that have taken place. When the frame of reference is expanded to include vacant property of all sizes--one-tenth acre to several hundred acres, from subdivided property to unplatted

property--it is immediately apparent that land values, real and actual, have increased appreciably though not all to the same degree. Average increases of two to three times--two to five times in actual prices--are noted in Table D. Average increases for property in most locations appear to have taken place with Zone 1 tripling in value while Zones 2 and 3 increased 1.5 and 2 times respectively in real dollar terms.

TABLE D

REAL AND ACTUAL VALUE PER SQUARE FOOT OF ALL UNIMPROVED PROPERTY

	Zone 1			Zone 2		Zone 3		All Zones		
		Value			Value		Value		Value	
Year	No.	Real	Actual	No.	Real	No.	Real	No.	Real	Actual
1	13	.016	.010	81	.021	21	.007	115	.014	.010
2	5	.007	.004	17	.176	10	.136	32	.032	.020
3	9	.012	.006	28	.007	24	.041	61	.013	.006
4	52	.034	.020	75	.024	46	.016	173	.024	.014
5	26	.052	.047	55	.036	36	.016	117	.033	.031
Total/Av.	105	.024		256	.026	137	.015	498	.022	

Appreciation of the value of property abutting the highway was even greater when measured by the value per front foot--a measure frequently employed by appraisers. As indicated in Table E the average value per front foot increased three times--from $16 to $43. In actual dollars this change represented a fourfold increase of $10 to $39. It is worthy of note that most of the transactions in year five occurred in 1950-1 and thus the full impact of the increased economic activity in the middle 1950's is not reflected in this statistic.

TABLE E

REAL AND ACTUAL VALUE PER FRONT FOOT OF UNIMPROVED PROPERTY ABUTTING THE DORT HIGHWAY

			Value per Frt. Ft.	
Year	No. Parcels	No. Frt. Ft.	Actual	Real
1	12	763	10	16
2	5	3225	5	8
3	8	2917	4	9
4	45	6696	12	20
5	25	5211	39	43

The use of averages for all vacant property creates interpretive problems. Data in this table hides some of the more extensive changes in land values that have occurred--namely, the change in value accompanying a change in land use. The change in value that can accompany a shift from farmland to residential, commercial, or industrial property. This type of change typically results in value increases of the greatest magnitude. There is some evidence to the effect that changes of 10, 20, and even 30 times the pre-highway values have taken place for some property. The extent of changes in these specific parcels dwarfs those indicated by the averages and gives an indication of the wide differences that appear to exist between properties.

This phenomenal growth is partly evidenced by the unplatted parcels that were selling for .005 to .015 per square foot in the '20's. Property in a similar location which has since been subdivided was sold for as much as $.071, or $.241, or $.350 per square foot in the 1950's. It should be patently clear that these are not case studies but prices of property in similar locations in the reference periods. The other side of the coin is also observed. Some property in similar locations sold for $.011 or $.021 or $.024 per square foot in the early 1950's indicating that some areas have enjoyed little or no appreciation in real values. This data is further developed in Appendix C.

Interpretation of the data on average land values for all vacant property is exceedingly difficult because the averages may represent parcels of substantially different sizes. To the extent this is true--since average property value is much larger for the small properties than for large properties--variations in average values may represent differences in parcel size rather than real changes in property values. Statistical tests were applied to this data to remove the value variation due to size alone, but these efforts did not appear to be entirely successful. Refer to Appendix E for further discussion of this problem.

There was distinct evidence of an appreciable rise in land values in the years immediately following the paving of the highway as there was for smaller parcels. In fact, values appear to have risen rather sharply only to decline during the depression and then to reach new heights after 1940. The overall increase in values in the all vacant classification does not appear in the small parcel classification because the increase in values due to changing land use is not present as in the all vacant group.

All strata and zones did not participate equally in the value increases. For instance, as shown in Table F, stratum A

apparently declined slightly in real value while Stratum B and C increased in different proportions and amounts. Further analysis showed that Zones 2 and 3, in Stratum A and B, did not appreciate in value, while in Stratum C there were striking increases over the period studied. Here again the variability of values stemming from parcel size makes the data analysis somewhat difficult.

TABLE F

REAL VALUE PER SQUARE FOOT OF
ALL UNIMPROVED PROPERTY

	Stratum A		Stratum B		Stratum C		All Strata	
Year	No.	Value	No.	Value	No.	Value	No.	Value
1	21	.044	65	.019	29	.004	115	.014
2	4	.200	21	.042	7	.006	32	.032
3	10	.017	26	.095	25	.006	61	.013
4	37	.017	69	.028	67	.024	173	.024
5	25	.033	56	.036	36	.029	117	.033
Total/Av.	97	.030	237	.029	164	.013	498	.022

In general, there is substantial evidence that value increases in the study area are spotty, but the factors responsible for variations are not adequately identified.*

*Data by all groups, strata, and zones can be found in Appendix B.

CHAPTER VII

REASONS FOR LAND VALUE CHANGES

A definitive answer to the question of the influence of the Dort Highway on land values in the area served by the highway has not been achieved in this study. However, some of the major forces affecting land values have been identified and approximations of the highway impact have been obtained. Economic growth, location, and size factors were identified and analyzed. Zoning, financing, railroad access, land terrain, etc., were either not measured or workable in this analysis. The lack of adequate data and the nature of the problem made it impossible for multiple correlation techniques and other statistical tools to effectively isolate the highway influence alone or in combination with the forces of economic growth.

Economic Growth and Land Values

Some increase in land values would be expected to take place in the study area because of the increase in economic activity in the community over the years and the resultant increase in the total demand for land. Since much of the Dort area was undeveloped prior to the post World War II expansion, it would seem probable that this area might enjoy more than an "average" increase in demand and in prices.

The exact relationship or correlation between changes in economic activity and land value levels in a community is not known in quantitative terms. This void is even greater when the relationship to specific neighborhoods is examined. For example, a 10 per cent increase in business activity does not necessarily mean that a corresponding increase in all parcels will take place. Some areas where much of the city expansion takes place may increase by 20 or 30 per cent, while others experience little change at all.

A reasonable question would be, "Of what use is the correlation of the economic base with the land value trends?". The immediate benefit is to give some quantitative concept to economic changes that have taken place. Further, comparison with other studies makes this a mandatory ingredient in the study if the results are to be imputed to other highway locations or studies.

As noted in an earlier chapter, the level of economic activity in Genesee County has doubled since the early 1920's. The same pattern was observed for the City of Flint. The interim period

between the terminal points of the study was characterized by substantially increased business activity in the late 1920s, decline in the '30s, and extensive recovery during the 1940s and early 1950s. Both similar and somewhat contradictory trends were observed in the indices of land values discussed in the first part of this chapter.

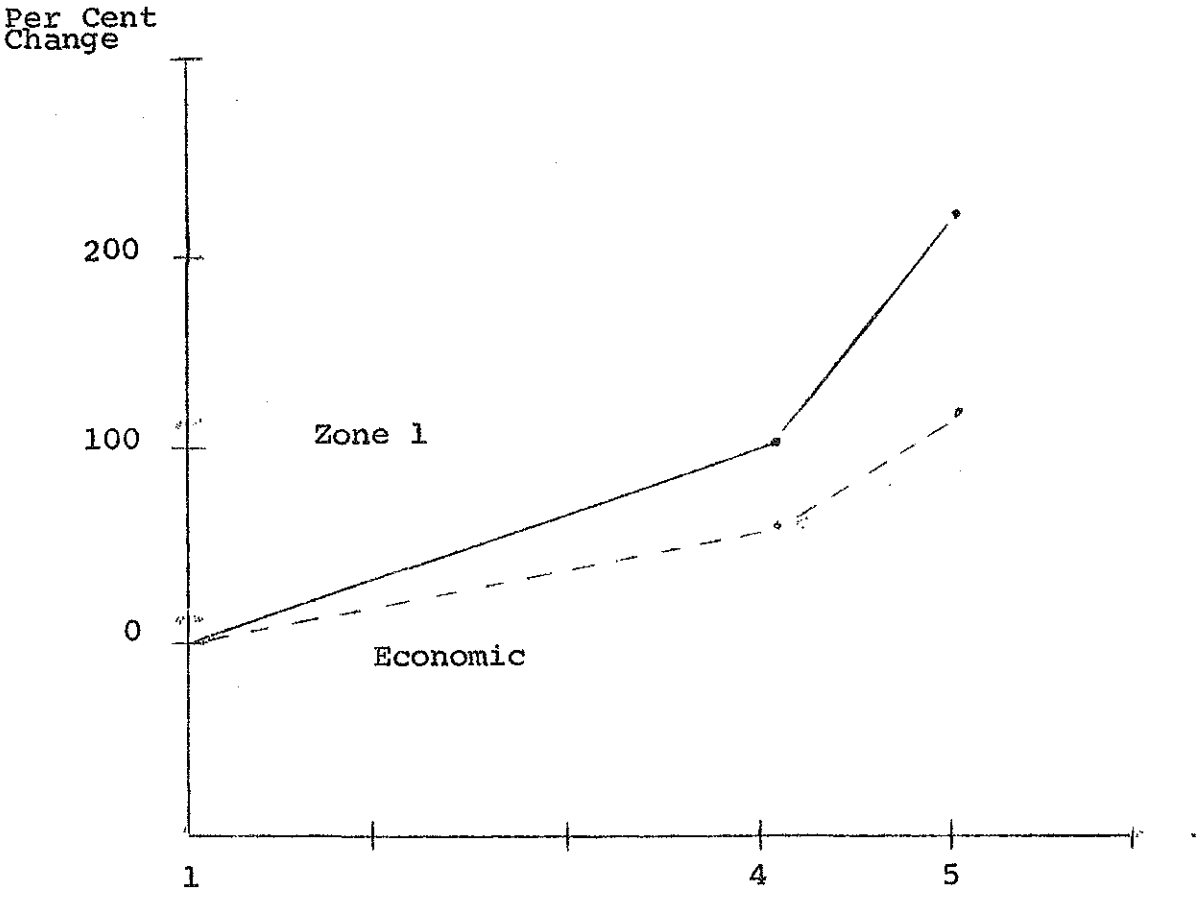
Economic Growth and All Vacant Property

A rather close correlation exists between the index of real land values for all vacant property and the economic base. Each index has doubled between the early 1920s--prior to the paving of the highway--and the early 1950s. This correlation strongly suggests that the land value changes that have taken place cannot be entirely attributed to the highway. Only if the highway was the causal factor for the community's economic growth could the highway have been primarily responsible for the changes. Further, the relatively sharp rise in land values following the paving of the highway was not necessarily caused by that development because the level of economic activity in the community had increased in similar proportions during those years.

Comparison with the indices of the various zones reveals that the property abutting the highway enjoyed a proportionately greater increase in real value than there was expansion of economic activity. Property abutting the highway had increased in value slightly over 200 per cent while economic activity had expanded about 100 per cent as shown in Figure 1. This relationship further indicated the relative attractiveness of location on the highway as opposed to other property in the study area. The other zones had increased in value about 70 and 130 per cent respectively as shown in Figure 2.

Figure 1

PER CENT CHANGE IN ECONOMIC ACTIVITY AND ZONE 1 REAL LAND VALUES FOR SELECTED YEARS[1,2]

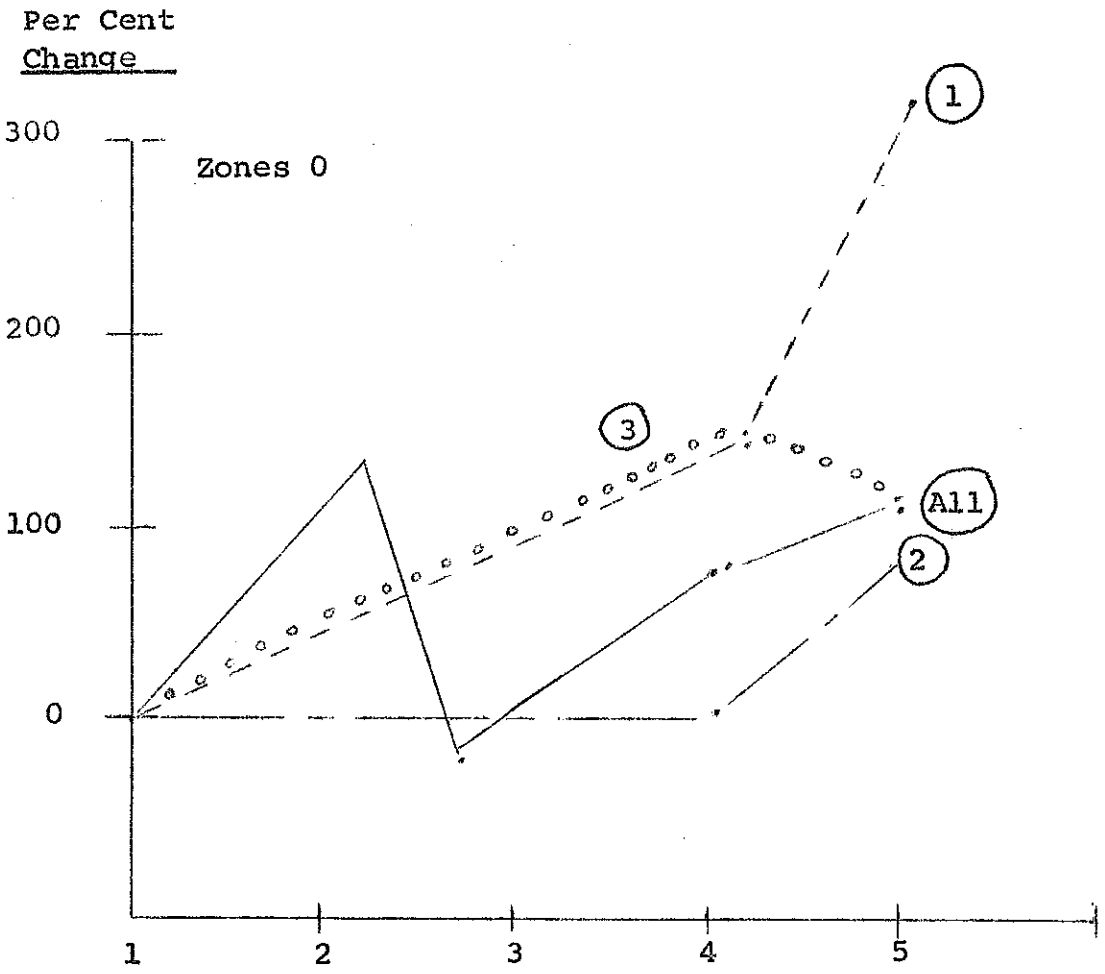


[1] Computed as a per cent of year one.

[2] Years 2 and 3 are not recorded due to the small number of transactions recorded.

Figure 2

PER CENT CHANGE REAL LAND VALUE
FOR ALL UNIMPROVED PROPERTY



[1]Years 2 and 3 are not recorded in the individual zones due to the small number of transactions recorded.

The high degree of correlation does not hold for all subsections because the value trends in the various strata and zones varied considerably. As noted earlier, some of the variations must be attributed to the small sample size in the subsections which make it difficult to get a clear picture of the changes actually taking place. Even with the close correlation it is not possible to identify this relationship as one of cause and effect because with many forces involved this may only be a spurious correlation.

Economic Growth and Small Parcels--Under 30,000 Square Feet

It has already been observed that the average land values of the small parcels were at the same level in the early 1950's as they were before the highway was paved. Property abutting the highway doubled in real value while all other property was at the same value level, or slightly lower. This lack of an increase in real value is surprising in view of the increase in economic activity in the same period. The reasons for this pattern are not immediately apparent, but at least two possibilities exist:

1. Subdivided property does not generally appreciate greatly in real value. Specific cases will contradict this conclusion, but it seems to be true when a cross section of parcels is observed. The greatest changes in land value typically take place when a more intensive use for land is found--particularly from raw farm land to residential, commercial, or industrial.

2. In this study, the depression years may have stymied the expansion of the area so long that it has prevented the area from achieving its potential growth by orderly development in the more formative years.

Conclusions

Analysis of the economic activity in a community is a vital element in land value studies and must be accomplished if a clear understanding of the problem is to be obtained. However, the tools employed to establish the relationship between land values and economic activity do not accurately identify the magnitude of the influence of economic growth pressures. This interpretative problem is further clouded by neighborhood differences in land value trends. These shortcomings do not waive the necessity of using economic base analysis because closer estimates of highway influences are made when it is employed.

Statistical indicators of economic trends in the community need to be augmented by qualitative observations about the specific areas or neighborhoods in question. The combination of this information helps to give added insight into the effect that economic growth has on a cross section of land values in a community.

It is dangerous and probably inaccurate to say that a doubling of economic activity causes land values to double because this hypothesis has not been tested or proved. Declines in real land value would not be expected in the face of expanded economic activity. When growth has taken place other factors should be suspected for causing the decline, or even for preventing a rise, in real values. In this case, the highway, the traffic congestion on it, and the accompanying commercial and industrial uses have probably deterred residential construction in the area. In spite of the proximity to the downtown area, and terrain suitable for development, approximately one-half of the study area is vacant while other sides of the city have been built up.

The effect of economic growth on land values is in contrast between small parcels and all vacant land. In the latter case, subdivision of larger parcels for commercial and residential purposes has forecast more intensive use for the land and has caused substantial increases in real land values. Economic growth is a prime force behind this increased need for land. On the other hand, the smaller parcels had already increased in value from subdividing for more intense use. It appears that continued economic growth did not increase the real value of these smaller parcels.

Location Influence on Value

Location of a parcel of property is one of the more important factors influencing property values. This is particularly true for commercial property and to a somewhat lesser degree for residential and industrial usage. Recognizing this fact, the study area was initially divided into narrowly defined zones and stratum in an effort to isolate the location effect. Limitations of the data forced these areas to be combined for analytical purposes, but a measure of the location influence was still obtained. Value trends of particular stratum and zones were identified earlier and are here re-examined to give emphasis to the nature and importance of location in land values.

The desirability of some interests--mostly commercial and industrial--to locate on the highway is clearly evident from the land use analysis and the value trends in the study area. Property abutting the highway had a higher average value than the property in the rest of the study area as well as showing significantly greater proportionate increases in real value.

The small parcel analysis indicated that property abutting the highway doubled in value during the reference period while the remainder of the study area had not changed appreciably--Figure 3.

In fact, some areas, Zones 2 and 3 in Stratum B, appeared to actually decline in average value--Figure 4. For all unimproved property the story is the same in part. Property abutting the highway showed a greater increase than other areas as it more than tripled in real value. However, Zones 2 and 3 also increased in value--doubled--which contrasts with the lack of change in the small parcel group. This increase in value of the all vacant group is attributed to changes in land use--platting and subdividing the large parcels for commercial and residential purposes. The small parcels were already subdivided indicating that they had previously enjoyed the increase in value generally accompanying more intensive land use.

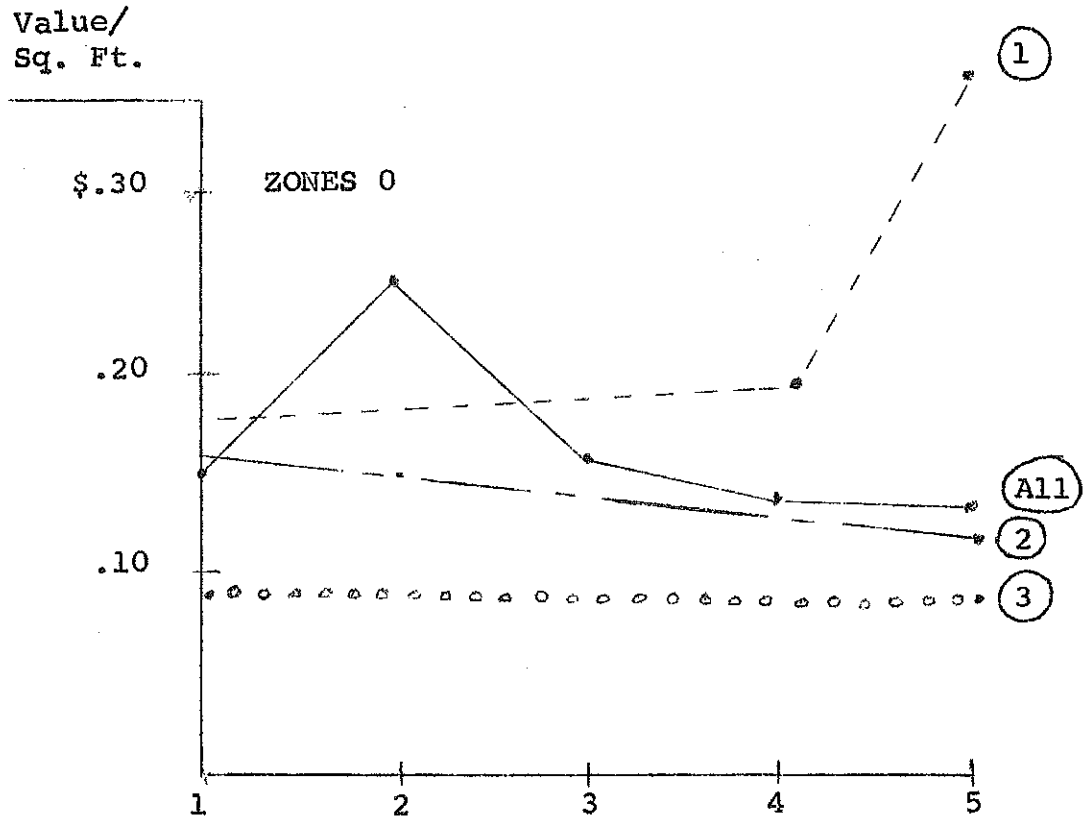
Land use in Zone 1 was predominantly commercial and industrial while other zones had a higher residential concentrate. Since the former are more intensive uses of land, it might be argued that the higher value is a function of use rather than location. This is possibly true, but the use is a function of location and thus is probably the governing factor.

A reasonable conclusion would suggest that the highway has caused property abutting the highway to increase in value relative to property in the rest of the study area. The net effect of the highway influence has not been to double the real land values for small parcels abutting the highway, but it probably does approach that magnitude. The average effect of the highway on all vacant land abutting the highway appears to be somewhat smaller. This observation is based on the fact that highway property increased about fifty per cent more than all other vacant land in the study area.

Values in Zones 2 and 3 appear to develop different trends in the various stratum. In the small parcel group some zones give evidence of increases while others show decreases in real value. A similar diversity of trends appears in the all vacant group. This evidence is somewhat sketchy due to the small sample size

Figure 3

REAL VALUE PER SQUARE FOOT OF ALL
UNIMPROVED PROPERTY UNDER 30,000 SQUARE FEET

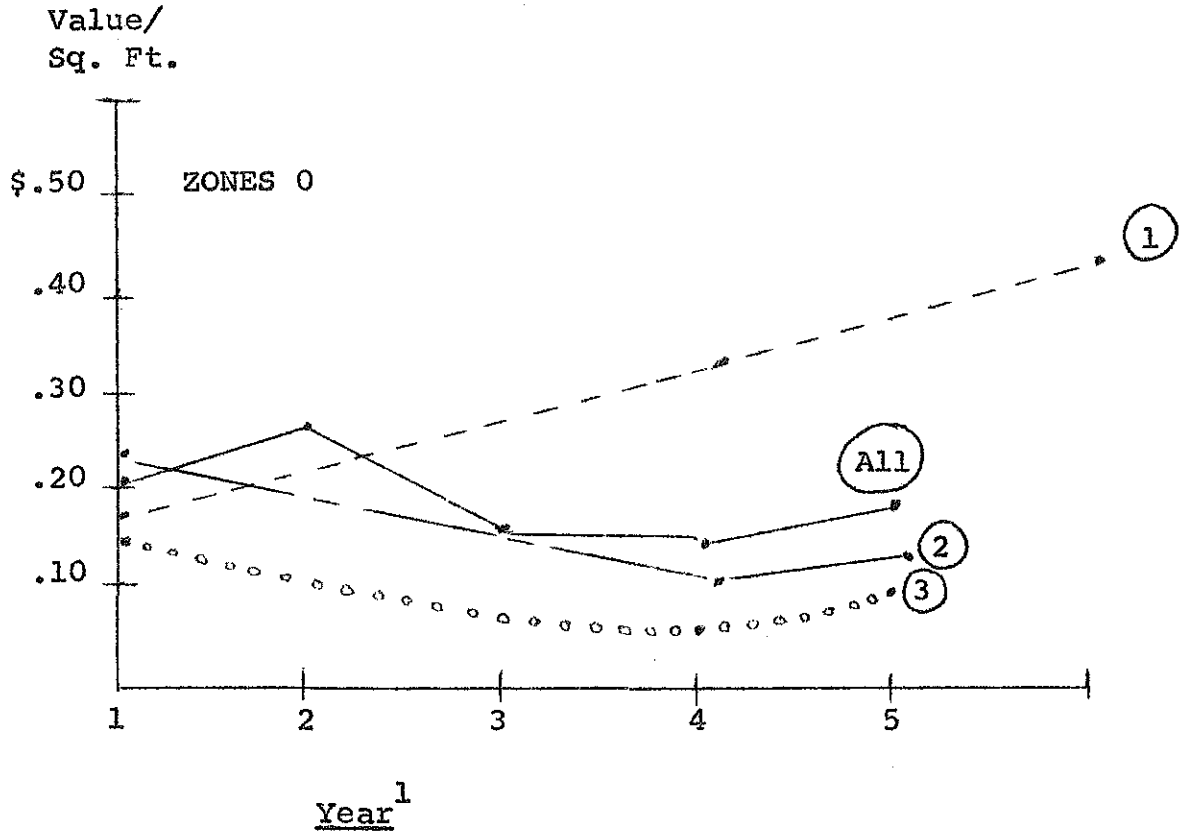


[1]Years 2 and 3 are not recorded in the individual zones due to the small number of transactions recorded.

Refer to Table B, Chapter VI-3 for data.

Figure 4

REAL VALUE PER SQUARE FOOT OF ALL UNIMPROVED PROPERTY
UNDER 30,000 SQUARE FEET IN STRATUM B



[1]Years 2 and 3 are not recorded in the individual zones due to the small number of transactions recorded.

Refer to Table C, Chapter VI-4 for data.

in those zones, but strongly indicates that either the highway is a mixed blessing or that other factors overbalance the highway influence.

The location influence is also apparent as the average value of the property in the study area declines with the distance from the "center" of economic activity (roughly defined as Stratum B and Zone 1). The decline is quite marked in year five as a 4-2-1 ratio in Zones 1, 2, and 3 exists for the small parcel group. A 3-2-1 relationship exists in year five for the all vacant group. Generally, similar relationships were found in the specific stratum indicating that the desirability of highway property over other property in the area is significant. This relative desirability of Zone 1 over the other zones has increased through the years.

Value differences due to location are also apparent between the three strata. The value levels seem to vary with the intensity of land use in the strata. The land use studies indicate that Strata B-C-A are most intensively used in that order. For the small parcels there is a 5-3-2 value relationship in years four and five. For the all vacant property, the results were varied with some indication that the above trend also existed for this group.

In conclusion, the highway seems to have had a twofold effect on land values in the study area. The benefits accruing from location on the highway have caused these properties to be more valuable than other property in the study area. However, the highway and the developments accompanying it--commerce, industry, traffic congestion--has also had a restraining influence on the real values of the rest of the property in the study area even though the actual prices paid for the property have increased. This highway has thus had a varied effect on land values in the study area as varying degrees of positive and negative benefits have been observed.

Other Influences on Land Value

The foregoing factors are not the only ones which influence property values. Zoning, accessability to the railroad, financing, condition of the land, i.e., sewers, water, terrain, as well as other elements are also determinants of property values. In specific cases these factors have an extensive influence on value and need to be measured if the highway benefits are to be identified accurately.

Their absence from this analysis, while regrettable, does not nullify the conclusions that are drawn here. These factors may tend to be offsetting when a large number of sales provides a reasonably sound basis for "average" statistics. As a result, central tendencies and trends are still identifiable even though their magnitudes and causes cannot be precisely determined.

APPENDIX A

METHODOLOGY

I. OBJECTIVES OF FIELD WORK

The field work, in line with the overall objectives of the Dort Highway Project, which is a segment of the Social and Economic Impact Study, was concerned with the gathering of data that might measure the influence of the Dort Highway in Flint, Michigan, on property values in the area which the highway serves. As this objective was pursued, areas lying a considerable distance from the highway were included in the study area on the premise that the highway serves as an artery of commerce and that there is much capillary action along side streets extending a considerable distance from the main stream of traffic. Therefore, field work has been designed to gather as much information as possible about the area that was considered pertinent for the purposes of the overall study. This has entailed scrutiny of abstracts, deeds, tax assessment records, zoning ordinances, and real estate records, not only of the contemporary time period, but records for a period before the highway was completed. The Dort Highway was paved in 1926 and 1927 and presence of many intervening years has made it difficult to obtain satisfactory information. The following is a digest of the methodology employed to find the primary data for this study.

II. STUDY AREA UNDER CONSIDERATION

The study area represents the land around the Dort Highway that might have been significantly influenced by the highway. Delineation of the area was made arbitrarily following observation of the entire vicinity. The boundaries selected generally tend to approximate land area that had developed subsequent to the paving of the highway. In total, the geographical area is ten miles north and south by one and one-half miles east and west. Two major east-west roads provide the north and south boundaries -- Stanley Road on the north and Maple Road on the south. The east-west boundaries are defined by two lines drawn parallel to the Dort Highway. On the east, a line was drawn one mile from the highway. On the west, a line was drawn one-half mile from the highway. The major portion of the Dort Highway runs north and south, but at one point the road angles for approximately one mile. Slight distortions are reflected in the study area because of this angle.

The study area is divided into ten stratum, each of which includes one mile of the north-south dimensions. The total land encompassed

is under the political jurisdiction of three governmental units -- City of Flint, Genesee Township and Burton Township. Based on the model of ten miles by one and one-half miles, the study area consists of fifteen square miles. Based on political units of jurisdiction, 9.75 square miles are located within the City of Flint, 3 square miles in Genesee Township, and 2.25 square miles in Burton Township.

III. DEFINITION OF TERMS

Prior to consideration of the methodology utilized during field work, a few comments regarding the terminology used appears appropriate. The following terms represent standard definitions used throughout the field work and in preparation of the study.

A. SECTION

A section is a governmental geographic division which is one mile square. A township is six miles square and is divided into thirty-six equal sections. Each section is assigned a number, which is determined consecutively starting from the upper left hand corner of the township and proceeding to the lower right. In total, parts of twenty governmental sections are included in the study area.

B. STRATA

A stratum is an artificial geographic division conceived for purposes of the project at hand. The primary purpose of stratum divisions is to provide a representative coverage of the study area in sample selection. The stratum is also used as a base for classifying and comparing study data. The dimension of each stratum are one and one-half miles by one mile, being one mile in width in a north-south direction thereby having the northern and southern boundaries of the strata in community with northern and southern section boundaries. The one and one-half mile width in an easterly and westerly direction is designated so that the westernmost boundary of the strata lies one-half mile west of the Dort Highway and the easternmost boundary lies one mile east of the Dort. In total ten strata are represented in the study area, each of which contains parts of two governmental sections. Based on the study area model of ten miles by one and one-half miles, each stratum contains one and one-half square miles.

C. STUDY ZONE

The study zones were selected for the purposes of analysis and classification. There are five zones whose distinguishing properties are enumerated below.

1. Zone 1

   Includes all properties that abut on the Dort Highway.

2. Zone 2

   Includes all properties adjacent to east-west through streets within one-half mile on either side of the Dort.

3. Zone 3

   Includes all properties that are not adjacent to the east-west through streets or adjacent to the Dort Highway yet fall within one-half mile of the Dort Highway.

4. Zone 4

   Includes all properties that are adjacent to east-west through streets that are more than one-half mile east of the Dort Highway.

5. Zone 5

   Includes all properties non-adjacent to east-west through streets lying more than one-half mile east of the Dort Highway.

For purposes of this study the following streets were designated as east-west through streets: Atherton Road; Bristol Road; Carpenter Road; Coldwater Road; East Court Street; Davison Road; Kearsley Road; Lapeer Road; Lippincott Boulevard; Maple Road; Richfield Road; and Stanley Road.

D. LEGAL ZONE

Legal zones are created by municipal ordinances and restrict the different methods of land utilization. There are three zoning ordinances which are of concern in this study -- Genesee Township, revised zoning

ordinance number 11; Burton Township ordinance number 30, and the City of Flint zoning ordinance. For purposes of this study three zoning classifications were adopted -- industrial, commercial, and residential. All of the more complicated provisions of each ordinance were incorporated into these categories for purposes of simplicity.

E. TIME PERIODS

In order to portray trends in land values in the Dort Highway area, values in ten time periods were obtained. Each of these periods corresponds to significant times in the history of the highway and to changes in economic conditions. The time periods selected are as follows: (1) 1920-1921; (2) 1923-1924; (3) 1926-1927; (4) 1929-1930; (5) 1932-1933; (6) 1935-1936; (7) 1940-1941; (8) 1945-1946; (9) 1950-1951; (10) 1956-1957.

F. PLATTED PARCELS OF LAND

A platted parcel of land is defined as a parcel that is included in a recorded subdivision. At time of platting the legal description of the property is usually altered to include reference to the lot number in the subdivision.

G. UNPLATTED LAND

Unplatted parcels of land are those parcels that have not been subdivided. Normally, the original legal description based upon governmental sections is used to identify these parcels. The property may be divided for sales purposes numerous times. The main distinction being that it is not subdivided into particular subdivisions which are recorded.

H. PROPERTY TRANSACTIONS

In order to be included in the study sample, a parcel had to meet certain prerequisites. First of all, the transaction had to represent a <u>bona fide</u> sale. Bona fide sale is defined to mean that the property exchanged hands for consideration of a financially measurable remuneration. In accordance with this definition, the following transactions were disqualified: family gifts, rights-of-way, personal gifts, transfers utilizing a non-interested third party, government sales, and tax sales. In some cases rejections were warranted where

the areas transferred could not be defined. All sales selected as bona fide transactions required inclusion of United States revenue stamps on the deed, or the actual sale price must have been obtained from the deed or another reliable source.

I. UNITED STATES REVENUE STAMPS

United States revenue stamps are stamps that are purchased and attached to the deed at the time of property transfer. The legal prescribed rate has varied over the years since initial legislation was enacted in 1914. This study is concerned with tax stamp legislation starting with the year of 1920. From 1920 to 1926 stamps were attached at the rate of $.50 per $500 of sales price or fraction thereof. During the years of 1926-1932 no stamps were required. In 1932 the legislation was re-enacted at the prior rate. In 1942 the rate of attachment was increased to $.55 per $500 of sales price and this rate is still in effect.

J. TRANSACTION DATES

Three different dates can appear on land sales records. Each of these dates has particular significance depending on the information that is desired. In all cases the objective of this study was to isolate the date that the agreement to transfer was made final. The price paid at that time represents the market price which is of primary concern. The three different dates that appear on land sales records are as follow:

1. Transfer date

   Represents the date that the sale took place, if a sales contract was not involved in the transaction.

2. Land contract date

   Represents the date that the agreement to sell was made. It may be different from the transfer date depending on the length of the contract.

3. Recording date

   Recording date represents the date that the instruments of transaction were registered at the place of

public record. It may be different from the other two dates noted above because the deeds are not always recorded promptly.

IV. DATA COLLECTION PROCEDURE

The first prerequisite in the collection of data was to obtain information concerning property transactions that have taken place over the years in the study area. Two main sources of information were available that would provide this data. First, the County Registrar of Deeds has a record of all property transactions that have been recorded over the years. After careful examination of these records, it was clear that the deeds would not provide all the information required. The reason for this was that all deeds are recorded by proper names of the parties rather than in a tract or legal description manner. Classification by location is necessary to isolate the sale of property in the study area. The second available source of records was found in the office of an abstract company.* Here, all property transactions recorded were classified by legal descriptions. Utilizing a system of maps, which provided information concerning sales of all unplatted parcels, and a system of subdivision books, which provided information concerning sales of all platted parcels, the transactions that had taken place over the years in the study could be isolated with a minimum amount of difficulty.

A pilot study was conducted to establish the size of the universe under consideration. This study revealed that there were 15,509 platted parcels of land and 1,172 unplatted parcels of land, which combined to make a total of 16,681 parcels in the study area. Based on this information, a decision was made to sample the transactions, rather than to take a complete census of all transactions for detailed study.

After consideration of the problems involved, three possible methods of sampling were observed. First, a sample of the parcels of property could be taken and each parcel checked for transactions in the study time periods. In essence this would provide a case study type of approach. A small sample was selected to test the adequacy of this method. This approach did not seem to be appropriate because transactions in all study zones were not provided for each time period unless an extremely large sample was drawn. Consequently, the case history method was rejected as a primary method of sampling. The second method available was to list all transactions of property within the study area and to take the sample from this universe. This method provided the basic sampling technique used.

*The Guarantee Title and Mortgage Company, Flint, Michigan.

A trial run indicated that the transactions could not readily be classified into strata and zones from the available records. Consequently, the pure transactions approach was modified to include a systematic sampling of lots. A systematic sample was taken of all lots from each zone. These lots were then checked for transactions in all time periods. The total number of transactions were randomly sampled until four transactions were obtained for each zone in each time period, or until all of the transactions that had taken place in each time period had been selected. The procedure used was slightly different for zones 1, 2, and 4 than for zones 3 and 5. The complete sampling procedure is outlined in Section V of this chapter.

The next step was to obtain the street addresses of all properties included in the study sample. At this point legal descriptions were the only available means of identifying the lots. Addresses were sought in order to expedite the collection of data as land use and market prices were generally classified by address. Addresses were obtained from two sources: 1) The County Road Commissioner for all property located outside the city; 2) Office of the City Engineer for parcels located within the city.

The next step was to obtain the assessed values for each parcel of property at the time the sale was made. Assessed values are one measure of market value and <u>if</u> the assessments changed directly with market prices they would provide a convenient source of data for measurement of highway benefits. The assessed values were to be correlated with the market prices to ascertain the feasibility of using assessed values as basic raw data. The assessments were obtained from three sources: 1) The Genesee Township Assessor's Office; 2) The Burton Township Assessor's Office; 3) The City of Flint Assessor's Office.

The selling price of each parcel of property in the sample was to be obtained from the records of realtors or participants in the transactions. The realtors dealing with property in the Dort area were contacted but an inadequate number of prices were found. Destruction of older records, and sales not handled by realtors, were the most important reasons for not being able to find more prices. Some of the major property owners were contacted directly but this approach proved to be impractical for transactions taking place years ago. The prices found were correlated with prices estimated from revenue stamps to provide a better basis for interpreting the accuracy of the stamps.

Two additional steps completed the field work. First, the land use of each property was determined in order to identify any variations in highway benefits between types of land use. Land use information was obtained from three sources: 1) land use

maps for various years that were available;* 2) city directories for each of the years; 3) actual observation of the property involved in recent transactions. Assessment records also provided information about the land use for some of the properties. It should be noted that correct identification of the land use is quite difficult -- particularly for unimproved property -- because the available records do not clearly show the type of land usage at the time the transaction occurred. Second, the legal zoning for each parcel in the study area was determined. Zoning maps, prepared from zoning ordinances applying to the study area, provided this information.

V. SAMPLING PROCEDURE

The following outline presents the details of the sampling procedure that was used in the Dort Highway Study. The reader's attention is called to three considerations prior to a study of the outline. (1) The total procedure outlined below was completed for each stratum in the study area. As noted earlier the stratum was utilized in order to assure a representative coverage of all land in the study area during sample selection. (2) The sampling procedure used varied according to the study zone under consideration. In Zones 1, 2, and 4 it was not necessary to take a systematic sample of lots prior to selecting a random sample of transactions for observation. The total number of parcels of land in these zones was small, so all lots were checked for transactions. In Zones 3 and 5 the abundance of properties to be considered required that a sample be taken. Consequently, a systematic sample was used to reduce the total universe to approximately the same size as that in Zones 1, 2, and 4. The resultant lots were then handled in the same manner as the lots in Zones 1, 2, and 4. (3) The sample used in this study is representative of the study area in regard to numbers of lots, but some unmeasurable bias is contained in respect to size of lots. Normally the unplatted parcels of land are larger in size or total square feet than platted parcels. No attempt was made to reduce this bias because of the difficulty of comparison.

A. Classification of all property in each stratum

1. Based on the results of the pilot survey completed prior to selection of a sampling procedure, all property was classified into the following categories:

*The land use maps were developed for the years 1924, 1938, 1950, and 1958. The 1924 map was based on a land use map prepared by a consultant to the City of Flint. The 1938 and 1950 maps were based on aerial photographs. The 1958 map was developed from a survey by a class in Urban Planning at Michigan State University.

a. Stratum

b. Each of the five study zones in each stratum

c. Subdivisions were listed according to platting date, oldest first.*

2. The above classification provided the basic data that was sampled.

B. Sampling procedure of platted and unplatted properties

1. Zones 1, 2, and 4.

a. All parcels in these three zones constituted the universe from which the random sample of transactions was drawn. In other words, no reduction sample was used prior to random sampling of transactions.

b. All platted parcels were listed starting with the lowest number lot in the oldest subdivision and proceeding to the highest number lot in the newest subdivision. This list was compiled separately for each zone under consideration.

c. All unplatted parcels classified in each zone were listed on the end of the list of platted properties for their respective zones.

d. All transactions for each lot on the list for each zone was checked for all time periods under consideration in the study.

e. From the list of transactions for each time period, 10 transactions were drawn at random for each time period in each zone.

f. Starting with the first transaction that was randomly drawn, the first four bona fide transactions were recorded.

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*This provided a constant method of considering all properties that were platted in each stratum, limiting any possible preference between older and newer plattings.

g. If the list of ten transactions did not provide four bona fide transactions, additional groups of ten transactions were randomly selected until four bona fide transactions were obtained or until all transactions in the time period had been exhausted.*

2. Zones 3 and 5. (Systematic Sampling Used These Zones)

a. Systematic Sample (To obtain lots to be checked for transaction)

(1) All parcels that were classified in these two zones were included in a list that was systematically sampled.

(2) All platted parcels were listed starting with the lowest number lot in the oldest subdivision and proceeding to the highest number lot in the newest subdivision. This list was completed for each zone.

(3) Total number of lots was ascertained.

(4) Based upon experience obtained during pilot study, it was determined that 100 lots would provide a sample which would normally yield the desired number of transactions for each time period.

(5) The number was obtained to be used in selection of the systematic sample by dividing 100 into the number of lots in each zone.

(6) A systematic sample was drawn by starting with the oldest subdivision and proceeding to the latest, each lot was selected that appeared on the resultant number.

(7) This provided a sample of 100 lots to check for property transactions.

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*There are five zones in each stratum, ten stratum in each time period, and ten time periods. Of the grand total of 500 zones, 300 are numbered 1, 2, or 4. All of the transactions in 191 of the 300 zones were obtained. Thus, a complete census of 63 per cent of zones 1, 2, and 4 was obtained.

b. Random Sample

(1) All lots obtained from the systematic sample were listed according to the oldest-newest classification outlined above.

(2) All unplatted parcels classified in each zone were listed on the end of the list of platted properties for their respective zones.*

(3) All transactions for each lot on the list for each zone were obtained for all time periods under consideration in the study.

(4) From the list of transactions for each time period, ten transactions were drawn at random for each time period and in each zone.

(5) Starting with the first transaction that was randomly drawn the first four bona fide transactions were recorded.

(6) If the list of ten transactions did not provide four bona fide transactions, additional groups of ten transactions were randomly selected until four bona fide transactions were obtained or until all transactions in that time period available for the 100 lot systematic sample had been checked.

(7) In Zones 3 and 5, if this list of 100 lots did not provide the desired four transactions for any time period, additional substitution was possible. In such cases an additional systematic sample was drawn.

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*Blanket inclusion of unplatted properties after platted properties had been sampled introduces a bias that is peculiar to only Zones 3 and 5. This decision was made to consider all unplatted properties for three reasons: (1) Small number of total unplatted properties in each zone; (2) Desire to be sure that some unplatted transactions would be included in the transactions studied; (3) Large amount of land area included in the few unplatted parcels -- this in effect helps to off-set the area bias for these two zones noted earlier.

(8) The additional systematic sample was obtained by adding one to the original resultant number. This provided maximum geographical consistency, normally lots assigned consecutive numbers are located next to each other.

(9) The additional sample of 100 lots was processed in the manner outlined above. (Steps 3-6). The total process was only carried out for the time periods which were short of bona fide transactions.*

*All of the bona fide transactions were obtained in 102 of the 200 zones numbered 3 and 5. (Please note that there is a zone 3 and 5 for each of the ten strata in each of the ten time periods totaling 200 zones).

APPENDIX B-1

Real* Value Per Square Foot of Unimproved Property Less than 30,000 Square Feet -- By Zones --

	Zone							
	1		2		3		All	
Year	No.**	Value	No.	Value	No.	Value	No.	Value
1	10	.193	67	.170	16	.103	93	.156
2	2	.163	12	.427	8	.114	22	.254
3	6	.327	21	.126	13	.216	40	.182
4	27	.207	53	.162	27	.114	107	.156
5	13	.363	39	.151	23	.087	75	.154
Total/Av.	28	.250	192	.170	87	.118	337	.164

*Data adjusted for changes in the price level.
**Number of transactions on which the value is based.

Table B-1-2

Real* Value Per Square Foot of Unimproved Property
Less than 30,000 Square Feet
-- By Strata --

Stratum

	A		B		C		All	
Year	No.**	Value	No.	Value	No.	Value	No.	Value
1	14	.091	56	.212	23	.120	93	.156
2	1	.140	17	.294	4	.118	22	.254
3	5	.099	21	.177	14	.252	40	.182
4	12	.105	53	.175	42	.151	107	.156
5	10	.087	39	.206	26	.121	75	.154
Total/Av.	42	.096	186	.202	109	.145	337	.164

*Data adjusted for changes in the price level.
**Number of transactions on which the value is based.

Table B-1-3

Real* Value Per Square Foot of Unimproved Property
Less than 30,000 Square Feet
-- Stratum A, By Zones --

	Zone							
	1		2		3		All	
Year	No.**	Value	No.	Value	No.	Value	No.	Value
1	0	---	14	.091	0	---	14	.091
2	0	---	1	.140	0	---	1	.140
3	0	---	5	.099	0	---	5	.099
4	1	.050	10	.105	1	.382	12	.105
5	1	.078	8	.087	1	.142	10	.087
Total/Av.	2	.064	38	.096	2	.262	42	.096

*Data adjusted for changes in the price level.
**Number of transactions on which the value is based.

Table B-1-4

Real* Value Per Square Foot of Unimproved Property
Less than 30,000 Square Feet
-- Stratum B, By Zones --

	Zone							
	1		2		3		All	
Year	No.**	Value	No.	Value	No.	Value	No.	Value
1	8	.188	37	.244	11	.150	56	.212
2	2	.163	10	.488	5	.118	17	.294
3	3	.333	11	.117	7	.201	21	.177
4	18	.323	20	.170	15	.090	53	.175
5	9	.420	20	.196	10	.098	39	.206
Total/Av.	40	.317	98	.218	48	.119	186	.202

*Data adjusted for changes in the price level.
**Number of transactions on which the value is based.

Table B-1-5

Real* Value Per Square Foot of Unimproved Property
Less than 30,000 Square Feet
-- Stratum C, By Zones --

	Zone							
	1		2		3		All	
Year	No.**	Value	No.	Value	No.	Value	No.	Value
1	2	.225	16	.151	5	.054	23	.120
2	0	---	1	.196	3	.107	4	.118
3	3	.316	5	.268	6	.230	14	.252
4	8	.094	23	.192	11	.138	42	.151
5	3	.498	11	.144	12	.079	26	.121
Total/Av.	16	.165	56	.170	37	.116	109	.145

*Data adjusted for changes in the price level.
**Number of transactions on which the value is based.

Table B-1-6

Real* Value Per Square Foot of Unimproved Property
Less than 30,000 Square Feet
-- Zone 1, By Stratum

	A		B		C		All	
Year	No.**	Value	No.	Value	No.	Value	No.	Value
1	0	---	8	.188	2	.225	10	.193
2	0	---	2	.163	0	---	2	.163
3	0	---	3	.333	3	.316	6	.327
4	1	.050	18	.323	8	.094	27	.207
5	1	.078	9	.420	3	.498	13	.363
Total/Av.	2	.064	40	.317	16	.165	58	.250

*Data adjusted for changes in the price level.
**Number of transactions on which the value is based.

Table B-1-7

Real* Value Per Square Foot of Unimproved Property
Less than 30,000 Square Feet
-- Zone 2, By Stratum

	A		B		C		ALL	
Year	No.**	Value	No.	Value	No.	Value	No.	Value
1	14	.091	37	.244	16	.151	67	.170
2	1	.140	10	.488	1	.196	12	.427
3	5	.099	11	.117	5	.268	21	.126
4	10	.105	20	.170	23	.192	53	.162
5	8	.087	20	.196	11	.144	39	.151
Total/Av.	38	.096	98	.218	56	.170	192	.170

*Data adjusted for changes in the price level.
**Number of transactions on which the value is based.

Table B-1-8

Real* Value Per Square Foot of Unimproved Property
Less than 30,000 Square Feet
-- Zone 3, by Stratum

	A		B		C		ALL	
Year	No.**	Value	No.	Value	No.	Value	No.	Value
1	0	---	11	.150	5	.054	16	.103
2	0	---	5	.118	3	.107	8	.114
3	0	---	7	.201	6	.230	13	.216
4	1	.382	15	.090	11	.138	27	.114
5	1	.142	10	.098	12	.079	23	.087
Total/Av.	2	.262	48	.119	37	.116	87	.118

*Data adjusted for changes in the price level.
**Number of transactions on which the value is based.

APPENDIX B-2-1

Real* Value Per Square Foot of All Unimproved Property
-- By Zones --

Zone

Year	1 No.**	1 Value	2 No.	2 Value	3 No.	3 Value	ALL No.	ALL Value
1	13	.016	81	.021	21	.007	115	.014
2	5	.007	17	.176	10	.136	32	.032
3	9	.012	28	.007	24	.041	61	.013
4	52	.034	75	.024	46	.016	173	.024
5	26	.052	55	.036	36	.016	117	.033
Total/ Av.	105	.024	256	.026	137	.015	498	.022

*Data adjusted for changes in the price level.
**Number of transactions on which the value is based.

Table B-2-2

Real* Value Per Square Foot of All Unimproved Property
-- By Strata --

	Stratum							
	A		B		C		ALL	
Year	No.**	Value	No.	Value	No.	Value	No.	Value
1	21	.044	65	.019	29	.004	115	.014
2	4	.200	21	.042	7	.006	32	.032
3	10	.017	26	.095	25	.006	61	.013
4	37	.017	69	.028	67	.024	173	.024
5	25	.033	56	.036	36	.029	117	.033
Total/Av.	97	.030	237	.029	164	.013	498	.022

*Data adjusted for changes in the price level.
**Number of transactions on which the value is based.

Table B-2-3

Real* Value Per Square Foot of All Unimproved Property
-- Stratum A, By Zones --

	Zone							
	1		2		3		ALL	
Year	No.**	Value	No.	Value	No.	Value	No.	Value
1	1	.009	20	.048	0	---	21	.044
2	0	-----	4	.200	0	---	4	.200
3	2	.016	6	.075	2	.055	10	.017
4	11	.012	21	.020	5	.051	37	.017
5	5	.039	16	.033	4	.033	25	.033
Total/Av.	19	.016	67	.035	11	.020	97	.030

*Data adjusted for changes in the price level.
**Number of transactions on which the value is based.

Table B-2-4

Real* Value Per Square Foot of All Unimproved Property
-- Stratum B, By Zones --

	Zone							
	1		2		3		ALL	
Year	No.**	Value	No.	Value	No.	Value	No.	Value
1	10	.014	41	.176	14	.011	65	.018
2	3	.010	12	.160	6	.187	21	.042
3	3	.333	12	.076	11	.008	26	.095
4	25	.107	25	.035	19	.010	69	.028
5	15	.050	25	.113	16	.015	56	.036
Total/Av.	56	.030	115	.087	66	.014	237	.029

*Data adjusted for changes in the price level.
**Number of transactions on which the value is based.

Table B-2-5

Real* Value Per Square Foot of All Unimproved Property
-- Stratum C, By Zones --

	Zone							
	1		2		3		ALL	
Year	No.**	Value	No.	Value	No.	Value	No.	Value
1	2	.225	20	.005	7	.002	29	.004
2	2	.004	1	.196	4	.065	7	.006
3	4	.007	10	.003	11	.043	25	.006
4	16	.036	29	.022	22	.022	67	.024
5	6	.070	14	.023	16	.023	36	.029
Total/Av.	30	.018	74	.010	60	.015	164	.013

*Data adjusted for changes in the price level.
**Number of transactions on which the value is based.

Table B-2-6

Real* Value Per Square Foot of All Unimproved Property
-- Zone 1, by Stratum --

	Stratum							
	A		B		C		ALL	
Year	No.**	Value	No.	Value	No.	Value	No.	Value
1	1	.009	10	.014	2	.225	13	.014
2	0	---	3	.010	2	.004	5	.007
3	2	.016	3	.333	4	.007	9	.012
4	11	.012	25	.107	16	.036	52	.034
5	5	.039	15	.050	6	.070	26	.052
Total/Av.	19	.016	56	.030	30	.018	105	.024

*Data adjusted for changes in the price level.
**Number of transactions on which the value is based.

Table B-2-7

Real* Value Per Square Foot of All Unimproved Property
-- Zone 2, By Stratum --

	Stratum							
	A		B		C		ALL	
Year	No.**	Value	No.	Value	No.	Value	No.	Value
1	20	.048	41	.176	20	.005	81	.021
2	4	.200	12	.160	1	.196	17	.176
3	6	.075	12	.076	10	.003	28	.007
4	21	.020	25	.035	29	.022	75	.024
5	16	.033	25	.113	14	.023	55	.036
Total/Av.	67	.035	115	.087	74	.010	256	.026

*Data adjusted for changes in the price level.
**Number of transactions on which the value is based.

Table B-2-8

Real* Value Per Square Foot of All Unimproved Property
-- Zone 3, By Stratum --

	Stratum							
	A		B		C		ALL	
Year	No.**	Value	No.	Value	No.	Value	No.	Value
1	0	---	14	.011	7	.002	21	.007
2	0	---	6	.187	4	.065	10	.136
3	2	.005	11	.088	11	.043	24	.041
4	5	.051	19	.010	22	.022	46	.016
5	4	.033	16	.015	16	.023	36	.016
Total/Av.	11	.020	66	.014	60	.015	137	.015

*Data adjusted for changes in the price level.
**Number of transactions on which the value is based.

APPENDIX B-3-1

Actual Value* Per Square Foot of Unimproved Property Under 30,000 Square Feet

-- By Zones --

Year	1 No.**	1 Value	2 No.	2 Value	3 No.	3 Value	All No.	All Value
1	10	.129	67	.118	16	.070	93	.107
2	2	.104	12	.266	8	.072	22	.159
3	6	.154	21	.059	13	.098	40	.085
4	27	.122	53	.093	27	.069	107	.091
5	13	.340	39	.142	23	.082	75	.144
Total	58		192		87		337	.111

*Data is based on prices paid; unadjusted for changes in the price level.

**Number of transactions on which the value is based.

Table B-3-2

Actual Value* Per Square Foot of Unimproved Property Under 30,000 Square Feet

-- By Stratum --

	A		B		C		All	
Year	No.**	Value	No.	Value	No.	Value	No.	Value
1	14	.062	56	.147	23	.081	93	.107
2	1	.089	17	.184	4	.074	22	.159
3	5	.046	21	.083	14	.115	40	.085
4	12	.065	53	.101	42	.089	107	.091
5	10	.084	39	.191	26	.116	75	.144
Total	42		186		109		337	.111

*Data is based on prices paid; unadjusted for changes in the price level.
**Number of transactions on which the value is based.

Table B-3-3

Actual Value* Per Square Foot
of All Unimproved Property
-- By Stratum --

	A		B		C		All	
Year	No.**	Value	No.	Value	No.	Value	No.	Value
1	21	.029	65	.014	29	.003	115	.010
2	4	.128	21	.027	7	.004	32	.020
3	10	.008	26	.044	25	.003	61	.006
4	37	.011	69	.017	67	.014	173	.014
5	25	.030	56	.033	36	.028	117	.031
Total	97		237		164		498	.016

*Data is based on prices paid; unadjusted for changes in the price level.
**Number of transactions on which the value is based.

Table B-3-4

Actual Value* Per Square Foot
of All Unimproved Property
-- By Zones --

	1		2		3		All	
Year	No.**	Value	No.	Value	No.	Value	No.	Value
1	13	.010	81	.014	21	.006	115	.010
2	5	.004	17	.113	10	.087	32	.020
3	9	.006	28	.003	24	.018	61	.006
4	52	.020	75	.014	46	.010	173	.014
5	26	.047	55	.033	36	.015	117	.031
Total	105		256		137		498	.016

*Data is based on prices paid; unadjusted for changes in the price level.
**Number of transactions on which the value is based.

APPENDIX B-4-1

Indicators of Economic Activity of Genesee County for Selected Years Expressed as a Percentage of Group V. Adjusted for Price Level.

Years and Group	Total Adjusted	Population	Building Permits	Employment	Bank Assets	Sales Tax Collected	Deeds Recorded
I 1920-21 1923-24	44.9	43.4	83.3	36.2	12.8		48.6
II 1926-27 1929-30	69.9	58.5	155.1	54.1	19.7		62.0
III 1932-33 1935-36	36.0	63.6	19.8	42.7	24.5	20.4	44.7
IV 1940-41 1945-46	65.1	73.2	57.6	61.8	57.2	39.8	100.9
V 1950-51 1956-57	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Table B-4-2

Indicators of Economic Activity of Genesee County for Selected Years Expressed as a Percentage of Group V. Unadjusted for price level.

Years and Group	Total Unadjusted	Population	Building Permits	Employment	Bank Assets	Sales Tax Collected	Deeds Recorded
I 1920-21 1923-24	44.1	43.4	83.3	36.2	9.0		48.6
II 1926-27 1929-30	68.5	58.5	155.1	54.1	12.7		62.0
III 1932-33 1935-36	32.1	63.6	19.8	42.7	11.8	10.1	44.7
IV 1940-41 1945-46	59.3	73.2	57.6	61.8	36.9	25.3	100.9
V 1950-51 1956-57	100.0	100.0	100.0	100.0	100.0	100.0	100.0

APPENDIX C

CHANGES IN LAND VALUE OF SPECIFIC PROPERTIES

There is some evidence indicating that, for specific individual properties, the proportionate increases in real land values between the early 1920's and the 1950's was substantially greater than the two or threefold increase evidenced by the changes in average values. Specifically, the increases in real value were ten, twenty, and thirty times or more. The data is not sufficient to draw definite conclusions but it is indicative of changes that have taken place in some instances.

The reason for these marked increases in real values is attributed to the subdivision of property in preparation for more intensive land use. For example, transactions involving relatively large parcels of property--100,000 square feet (approximately two acres) or larger--had a real value of one to two cents per square foot. This amount is in sharp contrast with values of twenty to thirty cents per square foot for smaller lots--around 10,000 square feet. This data is consistent with the observation frequently made in real estate circles that the biggest changes in land values occur when changes in land use take place. In this case, much of the land had changed from farm use to proposed residential or commercial use, or from planned residential to commercial and industrial use.

The method of data selection in this study yielded case studies of land value changes only by chance and the information is thus limited in scope.* In addition, most of the data involves the use of stamp prices which are not always accurate for individual cases. However, the following "case" studies were gleaned from the data in this study to provide an approximation of the extent to which land values did change in specific cases.

The data in Table D-1 gives a thumbnail sketch of some parcels of land sold in the early 1920's and data about the subsequent sale of part of that land in later years. The later land sales were not always pieces of the original property. In some cases, adjacent land parcels, or those in the immediate vicinity, were used to supplement other data. Needless to say, this information provides only partial insight into what happened to real values of specific land parcels in the study area.

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*Random selection of transactions in specific years.

TABLE C-1

CHANGES IN REAL VALUE OF SPECIFIC LAND PARCELS
IN AREA SERVED BY THE DORT HIGHWAY

Data Involving Actual Prices

	Year	Size	Price Actual	Price Stamp	Adjusted Price Per Sq.Ft.	Location	Change
1)	1920	115 acres 4,986,400 sq. ft. unplatted	X		.012	750' frontage on Dort, near Western Road. Industrial	----
	1950	2.87 acres 124,443 sq. ft. unplatted		X	.071	Part of above land 368' frontage on Dort Industrial	6X
	1950	4,800 sq. ft. subdivided	X		.347-.463	One block south across Dort Highway Commercial	29-38X
	1956	13,699 sq. ft. subdivided		X	.620	Across Dort 105' frontage Commercial	51X
2)	1920	135 acres 5,853,600 sq. ft. unplatted	X		.006	West of Center Rd., Between Court and Kearsly Residential	

759-729

TABLE C-1 CONTINUED

Year	Size	Price Actual	Price Stamp	Adjusted Price Per Sq.Ft.	Location	Change
Data Involving Actual Prices						
1926	45,000 sq. ft. subdivided	X		.279	Part of above land	46X
1926	13,500 sq. ft. subdivided	X		.139	Part of above land	32X
1940	27,000 sq. ft. subdivided	X		.079	Part of above land	13X
1950	27,000 sq. ft. subdivided		X	.021	Part of above land	4X
3) 1923	1,734,400 sq. ft. unplatted	X		.019	Near Davison and Center-Residential	____
	26,970 sq. ft. unplatted		X	.008-.021	Part of above land Commercial	0
Stamp Prices						
4) 1920	326,700 sq. ft. unplatted		X	.005-.007	Near Fern and Judd Unzoned	____
1956	4019 sq. ft.		X	.125-.250	Just south of above land. Residential	18-50X
5) 1923	4.5 a 195,120 sq. ft. Unplatted		X	.049	Carpenter Rd. East of Dort	____

759-729

TABLE C-1 CONTINUED

Data Involving Stamp Prices

	Year	Size	Price Actual	Price Stamp	Adjusted Price Per Sq.Ft.	Location	Change
	1950	23,170 sq. ft. Unplatted		X	.010-.024	Contiguous to above on Carpenter	1/5-1/2X
6)	1924	211,978 sq. ft. Subdivided		X	.041	On Davison, just east of Dort Industrial	____
	1929	211,978 sq. ft. Subdivided	X		.046	Same as above	0
	1945	102,428 sq. ft. Subdivided		X	.100	Adjacent to above. Industrial	2X
7)	1920	80a 3,468,800 sq. ft. Unplatted		X	.001	Near Bristol and Center. Not zoned	____
	1950	13,800 sq. ft. Subdivided		X	.016-.040	Near subject property. Not zoned	16-40X
	1956	11,500 sq. ft. Subdivided		X	.018-.043	Near subject property. Residential	18-43X
8)	1923	104,800 sq. ft. Subdivided		X	.008-.016	Harvard and Harry	____

TABLE C-1 CONCLUSION

Data Involving Stamp Prices

Year	Size	Price Actual Stamp	Adjusted Price Per Sq.Ft.	Location	Change
1945	50,880 sq. ft. Subdivided	X	.088	One block away. Different Subdivision	6-11X
1950	11,200 sq. ft. Subdivided	X	.020-.050	Approx. two blocks away. Different subdiv.	1-6X
1956	13,515 sq. ft. Subdivided	X	.037-.074	One block away. Different subdivision	2-9X

APPENDIX D

COMPARISON OF ACTUAL PRICES AND PRICES ESTIMATED WITH FEDERAL REVENUE STAMPS

One of the best measures of property value is the price paid when property is sold. Price information is not easily accessible and when a large amount of data is required, substitute measures are used. An estimate of the price can be obtained by checking the amount of Federal Revenue Stamps affixed to the deed when the transaction takes place. Data in this study is from this source.

United States Revenue Tax Stamps are intended to be a token tax on all transfers of property. Currently, the tax is $.55 for each $500 in property value. The tax was initially imposed in 1917, discontinued in 1926, and reassessed beginning in 1932.

This section examines the relationship between actual prices and stamp prices* to determine whether or not the latter can be safely used as a measure of land value for identifying changes in these land values. The conclusions of this investigation were:

1. Revenue stamps provide an acceptable measure of average land value of unimproved property when a large number of transactions are represented.

2. Revenue stamps should not be relied on in specific cases, or to accurately represent a small number of transactions. Substantial variations between stamp prices and actual prices for individual transactions occur.

3. Revenue stamps should not be used as a price estimate for improved property. Many and extreme variations between stamp prices and actual prices were observed in this group.

4. The following data and the above conclusions need to be further tested in order to substantiate these observations because of differences in community practices and the limited amount of price information in this analysis.

The use of revenue stamps as a substitute for actual prices presents two problems:

1. The correct amount of stamps is not always used.
2. Revenue stamps are applied for each $500 increment in price.

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* Price estimated on the basis of the amount of revenue stamps on the deed.

The accuracy with which revenue stamps are affixed to the deed varies with the type of property. Unimproved property sellers put the correct amount of stamps on the deed 76 per cent of the time--56 times out of 73--Table D-1. Fifteen of the 17 "errors" were only off by one or two stamps. Actual regression analysis shows a high correlation between actual market price and the amount of tax stamps.

The situation was substantially different for sellers of improved property as they put the correct amount of stamps on the deed only 41 per cent of the time--38 cases out of 92--Table D-2. Not only was there a high percentage of errors, but the errors were of a far greater magnitude than for unimproved property. Mistakes of two to eight stamps were typical. On this basis, revenue stamps estimates of actual prices for improved land were rejected in this study.

Additional research is needed before completely rejecting the use of stamp prices for estimating values of improved property. Data collection problems may have caused some of the deviations, and these techniques could be improved. The following factors have contributed to the inaccuracies of stamp values for improved property.

1. A slightly different selection method was used to obtain the prices of unimproved property.

2. A relatively large number of land contracts and mortgages were employed with the sale of improved property. The number of revenue stamps used with these instruments was subject to differences in practice and interpretation.

3. Sources of price information for improved property was not as accurate as for unimproved property.

4. Matching of prices to appropriate deed was subject to greater errors for improved property.

The second factor which reduces the ability of revenue stamps to provide an accurate index of land values, and changes in land value, is the $500 increments in which the stamps are used. Since the number of stamps put on the deed will change only when the price change passes a $500 increment, it is possible that price changes of several hundreds of dollars will not be identified. For example, a parcel would increase in value from $200 to $400 and the stamp price would be $500 in either case.

This problem is particularly important when property values are less than $1,000 or $2,000 because the percentage error can be substantial at these levels. It is this issue which seriously questions the use of revenue stamps as a measure of land value even though the correct number of stamps are used. A large number of vacant property sales are less than $1,500, so the problem is an important one.

The average price of transactions with one $500 revenue stamp was $279.* An average increase in land values of eighty per cent could take place if all prices increased to $500. This change would go unnoticed by the revenue stamp index. Similiarly, an average increase of twenty-nine per cent could take place in land selling between $500-$1,000 without being registered on the stamp index. The percentage error varies inversely with the sale price level. At the $5,000 level the maximum error from this source is eight per cent.

The possibility that errors of the above magnitudes have taken place is not likely for the following reasons:

1. Some of the changes in price would pass the $500 levels and require an additional stamp on the deed. The increase in the stamp index would then be in excess of the actual change. For example, a price change from $450 to $550 would mean a price increase of twenty-four per cent. The revenue stamp index would change from $500 to $1,000--one to two stamps--for an increase of 100 per cent. If all increases were of this nature, the change would be substantially overstated. Since some price changes will pass the $500 levels, and some will not, these two forces tend to offset each other.

2. Errors in the number of stamps affixed to the deed also tend to offset the lack of sensitiveness of the stamp index. People frequently put too few stamps on the deed which means that prices in excess of the stamp price are paid for the property. This proclivity increases the average <u>actual</u> price of all property with a $500 stamp, and generally averages of property up to $2,000 in stamps. This practice seems to bring the average stamp price and the average actual price closer together.

As noted in Table D-3, the percentage deviation of the stamp price from the actual price is substantially less than indicated in one above. Deviations of two to thirty per cent appear in the data. These variations are relatively small when contrasted with the eighty and twenty-nine per cent variations which could theoretically occur.

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* Average price for transactions with correct number of stamps only--twelve in number.

In conclusion, revenue stamps are a workable substitute for actual land prices. Available data indicates that the bias inherent in stamp prices work in opposite directions to yield a useful index of land value changes. Supplemental investigation of these hypotheses is desirable in view of the size of the sample and problems involved.

TABLE D-1

ACTUAL PRICES AND PRICES ESTIMATED
FROM REVENUE STAMPS FOR UNIMPROVED PROPERTY

Year	Amount of stamps on deed	Stamp Value	Actual price	Difference Stamp - Actual	Error in number of stamps
1956-57	11.55	10,500	10,500	0	X
	11.55	10,500	10,010	490	X
	5.50	5,000	5,000	0	X
	14.30	13,000	13,000	0	X
	3.30	3,000	2,600	400	X
1950-51	14.30	13,000	13,000	0	X
	1.10	1,000	700	300	X
	7.70	7,000	7,000	0	X
	.55	500	3,500	-3,000	-6
	3.85	3,500	3,400	100	X
	2.20	2,000	1,650	350	X
	49.50	45,000	45,000	0	X
	27.50	25,000	25,000	0	X
	2.20	2,000	1,900	100	X
	1.65	1,500	1,500	0	X
	7.70	7,000	7,000	0	X
1945-46	1.10	1,000	1,000	0	X
	6.05	5,500	5,500	0	X
	3.30	3,000	4,000	-1,000	-2
	4.40	4,000	3,750	250	X
	7.70	7,000	6,600	400	X
	3.85	3,500	3,500	0	X
	1.65	1,500	1,500	0	X
	3.30	3,000	3,750	-750	-2
	1.65	1,500	1,500	0	X
	3.85	3,500	3,500	0	X
	13.20	12,000	12,000	0	X
	55.00	50,000	50,000	0	X
	2.20	2,000	2,000	0	X
1940-41	2.20	2,000	2,000	0	X
	.50	500	135	365	X
	.55	500	175	325	X
	4.40	4,000	3,800	200	X
	4.40	4,000	4,000	0	X
	1.10	1,000	596	404	X
	1.10	1,000	1,200	-200	-1
	.55	500	1,100	-600	-2

TABLE D-1 (Concl.)

Year	Amount of stamps on deed	Stamp value	Actual price	Difference Stamp - Actual	Error in number of stamps
1940-41	6.60	6,000	5,000	1,000	≠2
	3.30	3,000	3,250	-250	-1
1935-36	.50	500	333	167	X
	1.50	1,500	1,380	120	X
	.50	500	150	350	X
	2.00	2,000	2,000	0	X
	.50	500	300	200	X
	.50	500	500	0	X
	1.10	1,000	1,100	-100	-1
	1.65	1,500	1,100	400	X
	.50	500	300	200	X
	.50	500	250	250	X
	3.30	3,000	4,500	-1,500	-3
	1.65	1,500	1,500	0	X
1932-33	1.50	1,500	1,500	0	X
	2.50	2,500	2,500	0	X
	1.10	1,000	750	250	X
1923-24	1.00	1,000	800	200	X
	5.00	5,000	4,700	300	X
	1.00	1,000	1,300	-300	-1
	1.50	1,500	2,150	-650	-2
	20.00	20,000	20,000	0	X
	1.50	1,500	2,150	-650	-2
	1.50	1,500	2,150	-650	-2
	1.50	1,500	2,150	-650	-2
	.55	500	400	100	X
1920-21	18.00	18,000	18,000	0	X
	.50	500	100	400	X
	.50	500	250	250	X
	1.00	1,000	450	550	1
	1.00	1,000	750	250	X
	1.50	1,500	1,250	250	X
	.50	500	600	-100	-1
	.50	500	750	-250	-1
	.50	500	450	50	X
	1.00	1,000	850	150	X

Total Number Transactions 73
Total With Correct Number Stamps . . . 56
Per cent with Correct Number Stamps . . 76

TABLE D-2

ACTUAL PRICES AND PRICES ESTIMATED
FROM REVENUE STAMPS FOR IMPROVED PROPERTY

Year	Amount of stamps on deed	Stamp value	Actual price	Difference Stamp - Actual	Error in number of stamps
1956-57	7.15	6,500	11,000	-4,500	-9
	6.60	6,000	8,750	-2,750	-6
	6.60	6,000	7,750	-1,750	-4
	13.75	12,500	13,000	-500	-1
	3.30	3,000	5,950	-2,950	-6
	11.00	10,000	9,950	0	X
	11.55	10,500	10,010	490	X
	29.70	27,000	26,750	250	X
	41.25	37,500	37,500	0	X
	4.40	4,000	4,950	-950	-2
	3.85	3,500	3,500	0	X
	4.40	4,000	7,950	-3,950	-8
	15.40	14,000	14,000	0	X
	3.30	3,000	4,750	-1,750	-4
	2.75	2,500	4,259	-1,759	-4
	5.50	5,000	8,250	-3,250	-7
	6.60	6,000	6,900	-900	-2
	14.85	13,500	15,100	-1,600	-4
	3.30	3,000	6,950	-3,950	-8
	16.50	15,000	15,300	-300	-1
	27.50	25,000	25,000	0	X
	22.55	20,500	20,500	0	X
	18.15	16,500	17,950	-1,450	-3
	15.95	14,500	17,000	-2,500	-5
	6.60	6,000	9,400	-3,400	-7
	3.85	3,500	4,600	-1,100	-3
	6.60	6,000	11,000	-5,000	-10
	6.60	6,000	11,500	-5,500	-11
	8.25	7,500	8,950	-1,450	-3
	6.60	6,000	6,500	-500	-1
	2.20	2,000	7,250	-5,250	-11
	15.95	14,500	15,900	-1,400	-3
	2.20	2,000	5,500	-3,500	-7
	23.65	21,500	21,500	0	X
	6.60	6,000	7,000	-1,000	-2
	4.40	4,000	14,000	-10,000	-20
	21.45	19,500	20,500	-1,000	-2
	9.35	8,500	8,750	-250	-1

TABLE D-2 (Cont'd.)

Year	Amount of Stamps on deed	Stamp value	Actual price	Difference Stamp - Actual	Error in number of stamps
1950-51	1.65	1,500	12,000	-10,500	-21
	1.10	1,000	5,250	-4,250	-9
	5.50	5,000	3,000	2,000	≠4
	5.50	5,000	4,940	-60	X
	9.35	8,500	8,250	250	X
	17.60	16,000	16,250	-250	-1
	.55	500	1,050	-650	-2
	9.35	8,500	8,400	100	X
	1.10	1,000	3,050	-2,050	-5
	8.80	8,000	7,950	50	X
	18.70	17,000	16,650	350	X
	3.30	3,000	3,950	-950	-2
	4.95	4,500	8,000	-3,500	-7
	2.20	2,000	1,800	200	X
	8.80	8,000	7,750	250	X
	2.75	2,500	7,000	-4,500	-9
	4.95	4,500	4,100	400	X
	2.20	2,000	2,535	-535	-2
	2.20	2,000	7,950	-5,950	-12
	6.60	6,000	5,600	400	X
	7.70	7,000	6,900	100	X
	4.95	4,500	5,750	-1,250	-3
	18.15	16,500	16,500	0	X
	9.90	9,000	9,200	-200	-1
	.55	500	3,918	-3,418	-7
	.55	500	4,850	-4,350	-9
	15.40	14,000	14,000	0	X
	27.50	25,000	25,000	0	X
	1.65	1,500	1,350	150	X
	1.65	1,500	1,500	0	X
	8.80	8,000	9,000	-1,000	-2
	3.30	3,000	3,750	-750	-2
1945-46	17.60	16,000	16,000	0	X
	5.50	5,000	7,950	-2,950	-6
	5.50	5,000	6,600	-1,600	-4
	11.55	10,500	10,500	0	X
	14.85	13,500	13,500	0	X
	4.40	4,000	3,700	300	X
	4.40	4,000	3,600	400	X
	8.80	8,000	7,900	100	X
	14.85	13,500	13,500	0	X
	2.75	2,500	3,800	-1,300	-3
	6.60	6,000	7,700	-1,700	-4
	5.50	5,000	5,250	-250	-1

TABLE D-2 (Concl.)

Year	Amount of stamps on deed	Stamp value	Actual price	Difference Stamp - Actual	Error in number of stamps
1940-41	3.30	3,000	8,000	-5,000	-10
	7.15	6,500	6,500	0	X
	.50	500	450	50	X
	1.10	1,000	550	450	X
	1.10	1,000	500	500	1
	.55	500	550	-50	-1
	1.10	1,000	550	450	X
1935-36	1.50	1,500	1,500	0	X
	.50	500	183	317	X
	.50	500	500	0	X

Total Number Transactions 92
Total with Correct Number Stamps 38
Per Cent with Correct Number of Stamps..41

TABLE D-3

DEVIATION OF ACTUAL PRICE FROM STAMP VALUE FOR UNIMPROVED PROPERTY BY STAMP VALUE

Number Transactions	Stamp Value	Average Actual Price	Percent* Deviation
16	500	581	14
15	500	386**	30
11	1,000	909	10
12	1,500	1,653	9
5	2,000	1,910	5
6	3,000	3,517	15
6	4,000	3,908	2
2	5,000	4,850	3
2	6,000	5,500	9
3	7,000	6,877	2
2	11,000	10,765	2
1	12,000	12,000	0
2	13,000	13,000	0
1	18,000	18,000	0
1	20,000	20,000	0
1	25,000	25,000	0
1	45,000	45,000	0
1	50,000	50,000	0
Total 73			

*Per cent of actual price.
**Average with one exceptionally large deviation dropped.

APPENDIX E

Statistical Evaluation of Data

Once the data in this study was tabulated it was necessary to determine whether or not the trends in land values were evidence of actual changes, or simply statistical variations in the data. Averages, means, or ratio estimates, like those employed in this study, can be misleading. When a value represents widely divergent values there is a possibility that apparent differences in data are illusory rather than real. For example, land values of all vacant land increased from $.11 to $.16 per square foot between the early 1920's and the latter part of that decade. This increase may not represent a change in land values. The data variability in each case may be sufficiently great that the difference was the result of sampling fluctuations. Chance selection of available data, rather than actual differences, could be responsible for the differences in the two figures.

Early examination of individual dataum for all vacant property showed that the data did represent divergent values. The values per square foot appeared to vary with the size of the property. The larger the property the smaller the land value per square foot. Variations in data not associated with size were also noted. The tests discussed here were used to determine that the data did show real trends.

The data was regrouped and reanalyzed to reduce the effect of extreme variations due to parcel size or unusual cases. Medians and arithmetic means were computed. The data was grouped by size in several combinations--central ninety percent, lower ninety percent, and 25-50-25 percentiles. The values were finally stratified by parcel size to compensate for variations from this source. Parcels of vacant land smaller than 30,000 square feet and all vacant parcels were grouped rogether. The sub-populations were pooled on this basis because the means and medians in these groups were similar---Table E-1.

Median and mean values for land parcels less than 10,000 square feet also demonstrated a high degree of similarity. However, the data were not further stratified at this level because the number of transactions in each group would be so small that analysis of subgroups would be difficult.

In testing for significant differences in real values, two alternative methods of statistical evaluation were employed. Analysis of ratio estimates--the basic data in this study*--

*The ratio estimates were computed by dividing the combined prices of all transactions in a particular area by the combined number of square feet represented by these sales.

was considered to be too unwieldy and regression estimates were computed and tested instead. The regression lines--two in this case--were used in place of the ratio estimates for the following reasons:

1. There are not as many tests devised for answering questions about ratio estimates as there are for answering questions based on regression estimates.

2. Tests involving ratio estimates are more sensitive to disagreement between the sampling theory on which they are based, and on the sampling methods which were actually used.

3. It was possible that apparent differences between ratio estimates were primarily due to variation in parcel size rather than differences between years and zones.

Evaluation 1

It was assumed that, on the average, the price of a land parcel "Y" was linearly related to the size of the parcel "X". A line, $Y=aX$, was fitted to the parcels within each year and zone, and an estimate of "a" was obtained. This number, "a", is an estimate of the price per square foot for the land in a given zone and year and, although not exactly equal to it, is comparable with the ratio estimate $R=\frac{\text{Total Price}}{\text{Total Area}}$ and has the same interpretation.

An F-test was performed to determine whether the data was consistent with the hypothesis that "a" was the same for all combinations of years and zones. The data was not consistent with such a hypothesis as indicated by an F ratio of 5.60 (d.f.=12,322). Thus it is reasonable to state that the variations in price per square foot are a function of the year and zone (time and location) and not variations in parcel size.

These substitute estimates of price per square foot are presented in Table E-2,3. Substantial similarity in direction and magnitude of the changes in ratio and regression estimates are apparent. This comparison indicated that, if significant differences in data did exist, the ratio estimates would provide an adequate index of value trends in the Dort Highway area. This was important because computation of regression estimates for each combination of data in the under and over 30,000 square foot groups required forty to fifty hours.

Significant Differences:

The next step was to determine whether or not the observed differences in the regression estimates were significant. Two methods were used:

1. The first method involved the use of multiple comparisons, or simultaneous confidence intervals, due to Scheffe. This seems to be a conservative test of differences and is useful because it permits asking many questions of the same data, even though it does not give precise answers.

   This approach consists of computing a confidence interval for the difference between the price per square foot (a of Y=aX) in two different years and/or zones. If this interval does not contain zero then the data rather clearly indicates that there actually is a difference between these values in the population, i.e., the apparent differences in the data are too large to be a result of sampling fluctuations. Significant differences were present for some of these intervals and nearly so for several others--Table E-4. Since this seems to be a conservative test of significance it seems to be safe to say that the data has shown differences in land value for the comparisons where the interval doesn't cover zero. This is particularly true when attention is also given to method two.

2. Method two. It is usual (although not theoretically justified) to find important differences by computing a students' "t" values between various pairs of year-zone combinations. This was accomplished by using the estimates of "a" (and the sum of squares from the regression line). The α's represent the levels of significance of the most conservative test that would have rejected the null hypothesis of no difference in land value between the groups compared--Table E-5.

   This method is not conservative enough in that it exaggerates the reality of differences in the data. However, with such extremely significant differences in the data it seems safe to say that there are population differences--that the land value trends are not simply statistical fluctuations.

Evaluation 2

It was assumed in the first evaluation that the price of the land was linearly related to its size. There is good reason to believe that this increase is not entirely linear, i.e., the price of the parcel does not double if the size doubles. Another analysis was made assuming that the price per square foot $\frac{"Y"}{X}$ was linearly related with the area "X" and, again, within each year and zone an equation $\frac{Y}{X} = aX+b$ was fitted to each year and zone resulting in estimates of "a" and "b". "a" measures the decrease in the price per square foot due to size alone. "b" measures the residual price per square foot of a parcel of land.

This analysis was undertaken in the hope that "a" would be approximately the same for all zones and years, and "b" could then be used to assess the differences between zones and years. This was not quite the case. The F-test for the hypothesis that "a" is constant is barely significant at the .05 level and hence it cannot be assumed, with comfort that "a" is constant. However, it is still interesting to compare the "b" values between years and zones and to observe the agreement of this measure "b" with the measures of "a" in Y=aX and with the ratio estimates---Table E-2, 3.

The statistical evaluations discussed above were applied to vacant land parcels under 30,000 square feet and to all vacant land parcels. The all vacant analysis is considered to be less valid than the vacant under 30,000 for two reasons.

1. The decline in value per square foot appears to be somewhat discontinuous as the size of the parcel increases.

2. The all vacant group is much more heterogenous by size between years and zones.

TABLE E-1

MEDIAN AND MEAN LAND VALUES (REAL) BY SIZE OF PARCEL

Size (Sq.ft.)[3]	1920-27			1929-36			1940-45			1950-57		
	No.[1]	Med.[2]	Mean	No.	Med.	Mean	No.	Med.	Mean	No.	Med.	Mean
0-5[4]	47	.125	.191	9	.167	.185	23	.132	.212	17	.275	.305
5-10	26	.100	.132	23	.100	.196	42	.100	.141	23	.190	.220
10-20	25	.077	.093	9	.048	.074	28	.042	.063	23	.079	.136
20-30	10	.049	.067	7	.056	.057	14	.045	.056	11	.086	.107
30-50	10	.042	.089	5	.012	.055[6]	18	.022	.030	8	.046	.142[5]
50-75	5	.105	.092	1	.009	.009	10	.029	.033	4	.022	.029
75-100	1	.006	.006	3	.006	.008	14	.012	.020	3	.033	.046
100-300	6	.018	.046	7	.011	.012	9	.009	.014	15	.049	.075
300-500	2	.004	.004	1	.002	.002	4	.020	.020	4	.023	.025
500-1,000	0	----	----	2	.002	.002	4	.003	.002	1	.070	.070
over 1,000	7	.004	.007	2	.001	.001	6	.004	.005	7	.006	.013

1 Number transactions
2 Median
3 In thousands
4 Subtract one in this column so they are exclusive catagories
5 On the basis of six transactions this value is .032.
6 On the basis of four transactions this value is .013.

TABLE E-2

RATIO AND REGRESSION ESTIMATES OF
REAL LAND VALUES UNDER 30,000 SQUARE FEET

ZONE

	1			2			3		
Year	R[1]	aX[2]	aX+b[3]	R	aX	aX+b	R	aX	aX+b
1	.19	.17	.37	.17	.14	.30	.10	.08	.24
2	.16	.13	.43	.43	.33	.70	.11	.08	.85
3	.33	.21	.70	.13	.08	.34	.22	.21	.27
4	.20	.13	.47	.16	.12	.34	.11	.10	.29
5	.36	.33	.48	.15	.13	.26	.09	.07	.23

1 Ratio estimate
2 Regression estimate for curve Y=aX discussed in evaluation 1.
3 Regression estimate for curve y=aX+b discussed in evaluation 2.

TABLE E-3

RATIO AND REGRESSION ESTIMATES OF
REAL LAND VALUES OF ALL VACANT LAND

ZONE

	1			2			3		
Year	R[1]	aX[2]	aX+b[3]	R	aX	aX+b	R	aX	aX+b
1	.16	.013	.13	.21	.001	.20	.07	.004	.13
2	.07	.005	.15	.18	.120	.48	.14	.139	.58
3	.12	.005	.39	.07	.001	.17	.04	.011	.21
4	.34	.011	.21	.24	.010	.18	.16	.004	.12
5	.52	.016	1.18	.36	.026	.91	.16	.008	.59

1 Ratio estimate
2 Regression estimate for curve Y=aX discussed in evaluation 1.
3 Regression estimate for curve Y=aX+b discussed in evaluation 2.

TABLE E-4

CONFIDENCE INTERVAL FOR SELECTED REGRESSION ESTIMATES (Y=aX) OF REAL LAND VALUES FOR PARCELS OF LAND UNDER 30,000 SQUARE FEET

Year	Zone	Interval	Confidence Coefficient	Confidence Coefficient To Reject Hypothesis	
				F	α
5	1,2	.015 to .093	F (.20)	-	-
5	2,3	.006 to .058	F (.20)	-	-
1,3	3	-.046 to .294	F (.20)	.69	-
2,5	2	-.026 to .434	F (.20)	1.02	-
4,5	1	-.008 to .400	F (.20)	1.20	.25
3,4	1	-.141 to .297	F (.20)	.60	.99
1,5	1	-.245 to .559	F (.20)	.20	.99

TABLE E-5

STUDENTS "T" TESTS OF SIGNIFICANT
DIFFERENCES BETWEEN SELECTED REGRESSION
ESTIMATES (Y=aX) FOR LAND PARCELS
UNDER 30,000 SQUARE FEET

Year	Zone	F	α
1,3	3	5.17	.005
2,5	2	7.66	.0005
4,5	1	9.01	.0005
3,4	1	1.24	.25
1,5	1	1.49	.25

APPENDIX F

INDEXES OF LAND VALUE

Various indexes of land value have been used to measure the influence of a highway on land or property values. There is some evidence that the impact would vary with the index used to measure it. One objective of this study was to collect data for several indexes and to test their comparability and collection problems. Means, medians, and ratio estimates; percentile groups; improved and unimproved property; assessed values; and front foot values provide the indexes which are examined.*

The basic index used in this study to portray changing land values was a ratio estimate. Values for each geographical area were determined by dividing the total price for all transactions obtained in the area, for a particular time period, by the total number of square feet involved in these transactions. The resultant value is in dollars per square foot. The figure is thus weighted by the area and price of each parcel. The larger the parcel, the more nearly it reflected the market value of all land in the strata or zone at that time.

Means, Medians, Ratio Estimates

Analysis of selected means and medians showed a high correlation in the direction and magnitude of land value fluctuations. This similarity disappeared when these indexes were compared with the ratio estimates. The contrast between the indexes, as illustrated in Figure F-1, raises at least two important issues:

1) The same type of index should be used for interstudy comparisons.
2) Selection of the index can determine the results of the study.

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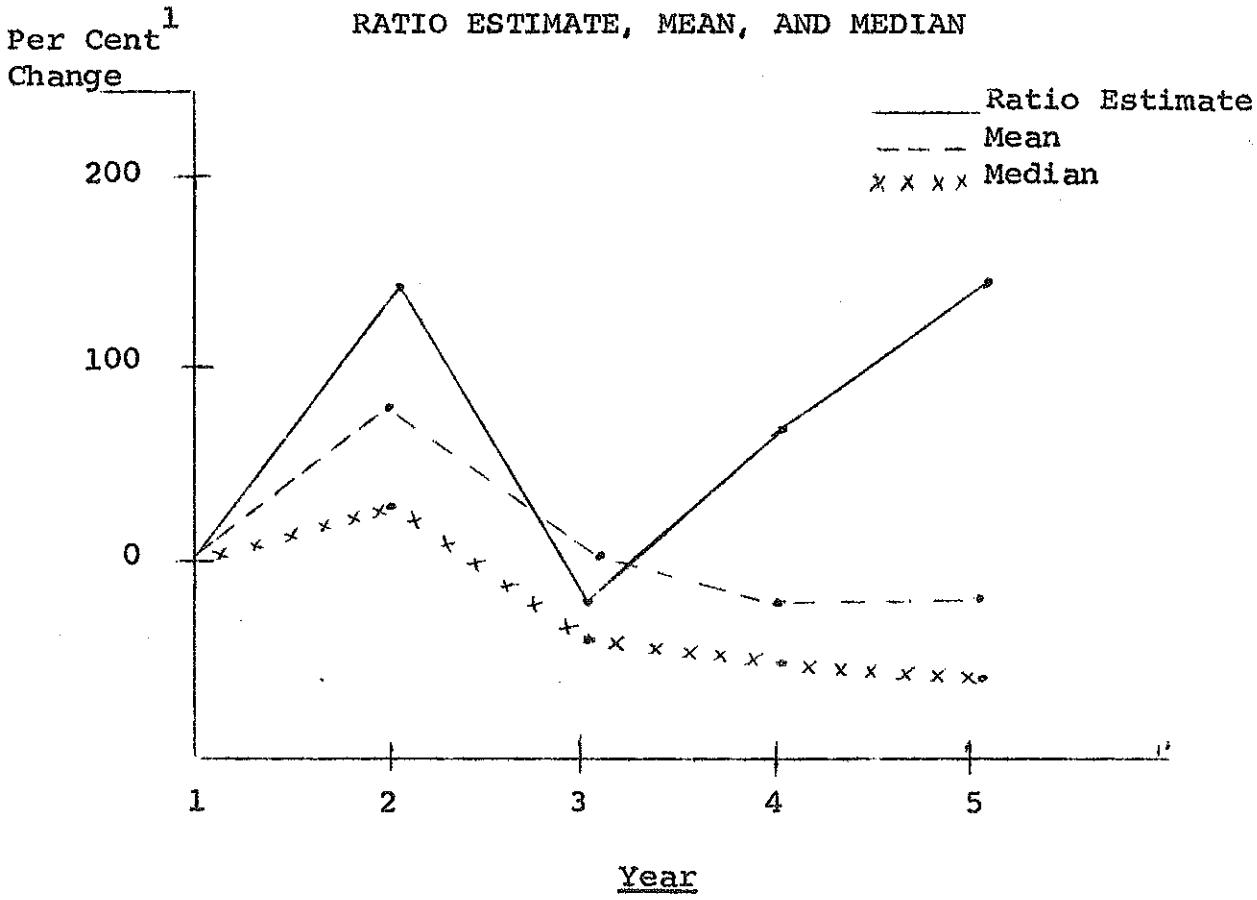
*For purposes of index comparison, Zones 2a and 3a are used. Zone 2a refers to property abutting the major streets crossing the Dort Highway. Zone 3a refers to all property not included in Zones 1 and 2. Preliminary classification of data was made on this basis and to avoid recomputing all of these tests they are presented in the original form. The results are the same in either case.

Figure F-1

PER CENT CHANGE[1] IN REAL VALUE FOR ALL UNIMPROVED PROPERTY AS MEASURED BY RATIO ESTIMATE, MEAN, AND MEDIAN



[1]Per cent changes are presented as a per cent of year one.

Table F-1

PER CENT CHANGE IN REAL VALUE FOR ALL UNIMPROVED PROPERTY AS MEASURED BY RATIO ESTIMATE, MEAN, AND MEDIAN

	Per Cent Change[4]		
	R[1]	M[2]	Med[3]
1	0	0	0
2	129	68	23
3	-7	4	-29
4	71	-18	-46
5	136	-13	-49

[1]Ratio estimate
[2]Arithmetic mean
[3]Median
[4]Per cent changes are presented as a per cent of year one.

Conclusion: Be cautious when comparing different studies and be sure to understand the tools used in the analysis.*

Percentile Groups

Preliminary data analysis revealed that large properties skewed the value in an area in the direction of the large property, because each sale was weighted by the area. To offset these fluctuations due to size alone, an effort was made to throw out the extremely large properties and show changes in the value of the land only. Data was tentatively grouped in various percentiles--lower 90, central 90, middle 50, and under 30,000 and 10,000 square feet.

The size factor was subsequently treated by grouping the data below 30,000 square feet with multiple regression analysis which is discussed elsewhere in this report. The value trends indicated by the percentile groups is presented here to show the relationship that existed between them.

The most significant result of this comparison was the high degree of similarity in these measures and their collective difference from the value changes of all the unimproved property--see Figure F-2. The relatively greater increases and fluctuations in the all unimproved group results from the exclusion of the larger properties. While stratification serves to reduce the distortions between specific zones and time periods it also distorts the actual changes taking place in land values. As these larger properties are subdivided and put to more intensive use, their values appear to rise markedly. By eliminating these properties from consideration the changes in land values would appear to be understated. For this reason, both the all vacant and the under 30,000 group provide important information about land value changes. Used independently, a false or distorted picture would be presented.**

Land Value Index Based on Assessed Values

Two assessed value indexes were collected. One index uses the total assessed value of the parcel. The other index is based on the assessed value of the land only for improved property. Due to varying assessment practices in the area studied the latter data were available only in one area--primarily in Stratum B.

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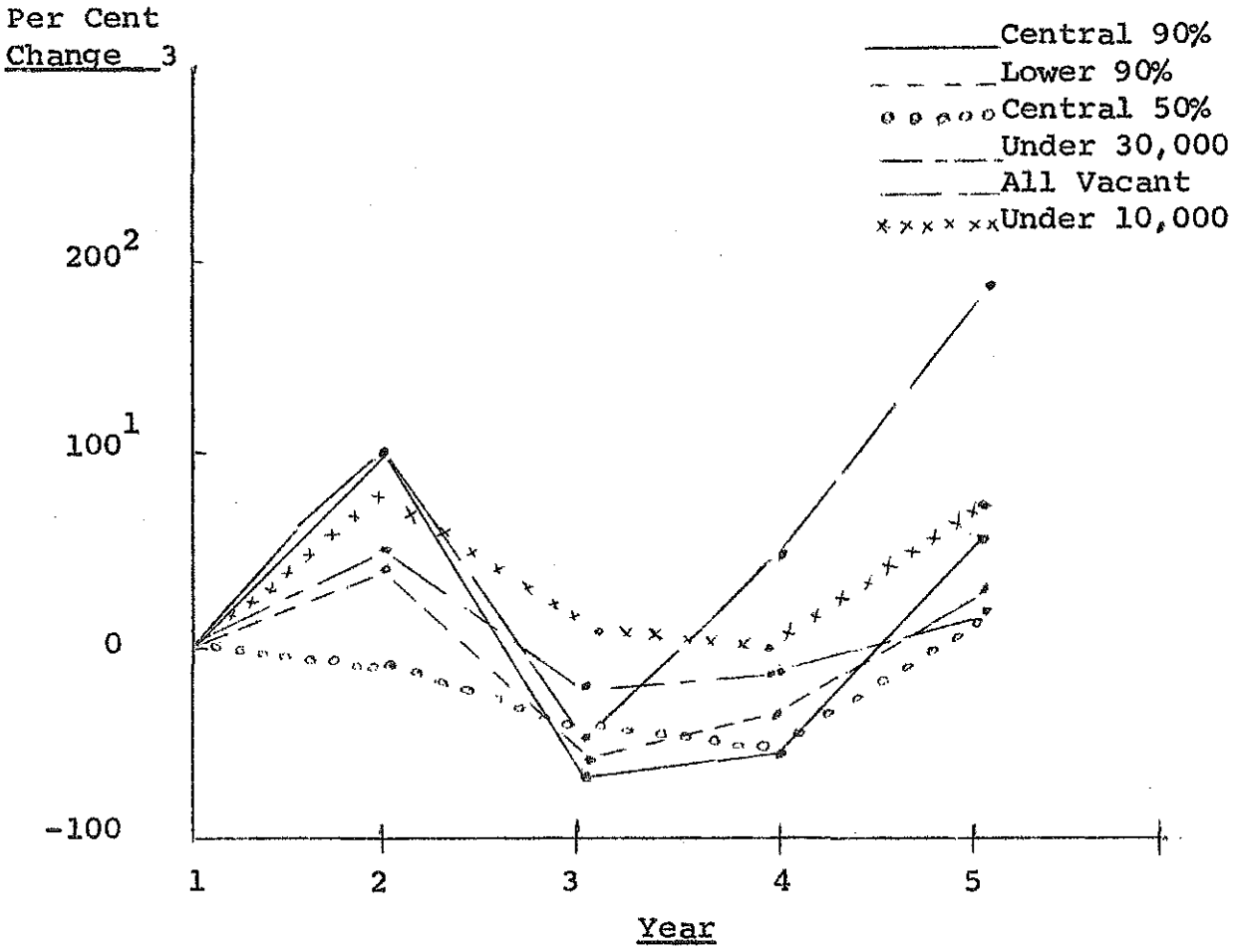
*Additional supporting data are found in Table F-7.

**Additional supporting data are found in Tables F-8, 9, 10, and 11.

Figure F-2

PER CENT CHANGE[1] IN ACTUAL LAND VALUE OF SELECTED PROPERTIES



[1]Per cent change is presented as a per cent of year one.

Table F-2

PER CENT CHANGE IN ACTUAL LAND VALUES OF SELECTED PROPERTY

Year	All Vacant	Central 90%	Lower 90%	Central 50%	Under 30,000 ft.	Under 10,000 ft.
1	0	0	0	0	0	0
2	100	≠98	≠46	-17	≠49	≠85
3	-40	-69	-51	-31	-21	≠10
4	≠40	-53	-36	-35	-13	≠4
5	≠210	≠51	≠57	≠41	≠35	≠83

Total Assessed Value

When the assessed value index was compared with the stamp price index, little agreement in terms of magnitude and direction of land value changes was noted. Figure F-3 shows virtually no change in value per square foot when assessed value is used. This contrasts with a 357 per cent increase indicated by stamp prices for unimproved land. Comparison of individual zones showed the same lack of similarity. These results suggest that indexes based on assessed values should be viewed with suspicion unless the assessed values correlate with prices in the particular study area.

Assessed Land Values of Improved Property

This index was based on the practice of assessing both land and improvements of a parcel of property. Using the value assigned to the land, an index of land value was obtained which was easily accessible to investigators. This type of data was available primarily in Stratum B and only for a limited number of years.

According to this index land values rose 260 per cent in actual prices from the 1930s to the 1950s. As indicated in Figure F-4, this rise in values differs substantially from the trends indicated when stamp prices were analyzed. This lack of agreement suggests that the more accessible assessed value data are not a substitute for stamp prices. However, further investigation is desirable because assessed values are so much more easily obtained than revenue stamp values and assessing practices tend to vary with the community.*

Land Value Estimates--based on assessed and stamp values

Another index of land value was computed with assessed and stamp values. Assessed values of improved property are frequently divided between land and improvements. The ratio of land value to total property value (as determined by the assessment) was applied to the stamp price resulting in a value estimate for the land portion of each parcel of improved property. For example, if an improved property was assessed at $2500--$1000 for land and $1500 for the improvement--the land value was determined by multiplying this ratio ($\frac{1000}{2500}$), 40 per cent, by the stamp price--say $5000. The resulting land value estimate would be $2000. Assessment practices of this nature were largely limited to Stratum B in this study and only for the years subsequent to 1930.

*Additional supporting data are found in Tables F-12, 13, 14 and 15.

Figure F-3

PER CENT CHANGE[3] IN ACTUAL LAND VALUES OF ALL UNIMPROVED PROPERTY BASED ON STAMP AND ASSESSED VALUES

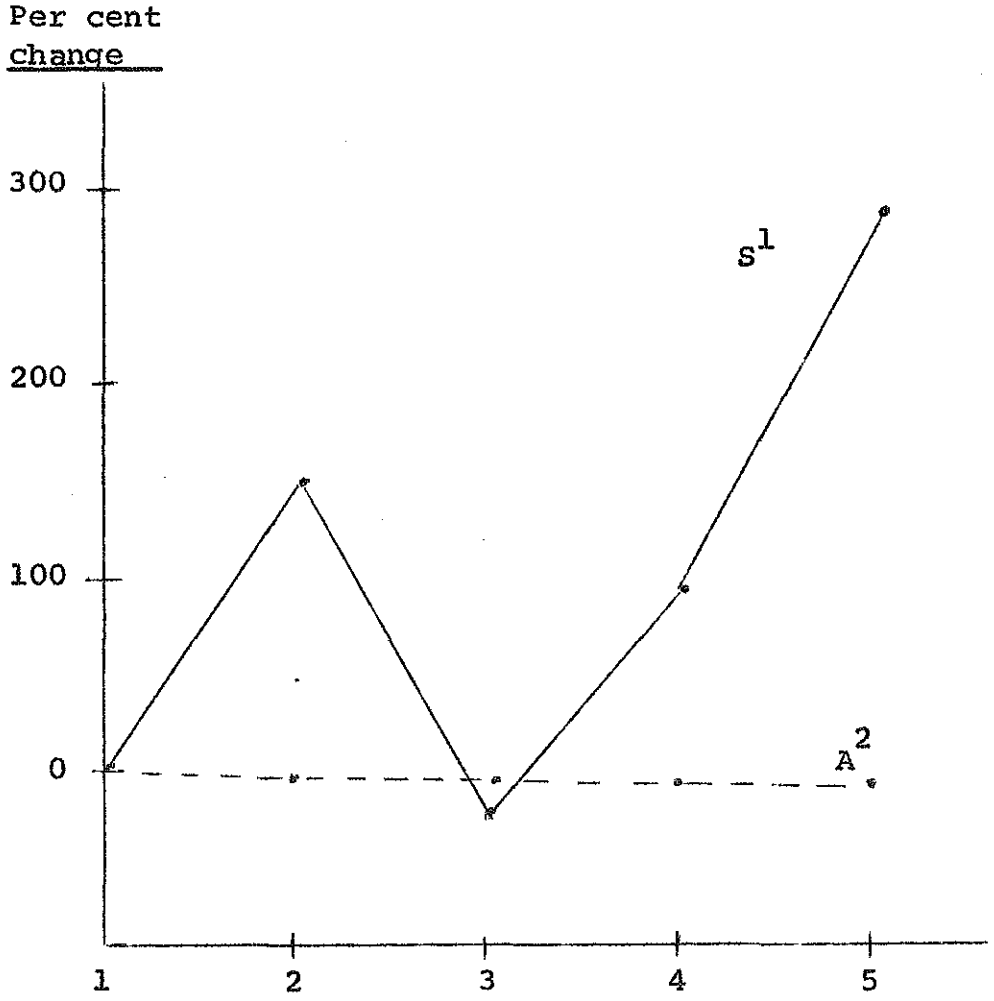


Table F-3

Year	S[1,4]	A[2]
1	0	0
2	186	0
3	-14	-11
4	100	-11
5	357	-22

Year

[1]Index based on revenue stamp prices.

[2]Index based on assessed values.

[3]Per cent changes are presented as a per cent of year one.

[4]See footnote 3 in Table F-15.

Figure F-4

PER CENT CHANGE IN ACTUAL LAND VALUES OF ALL UNIMPROVED AND IMPROVED PROPERTY BASED ON ASSESSED VALUES
-- Stratum B --

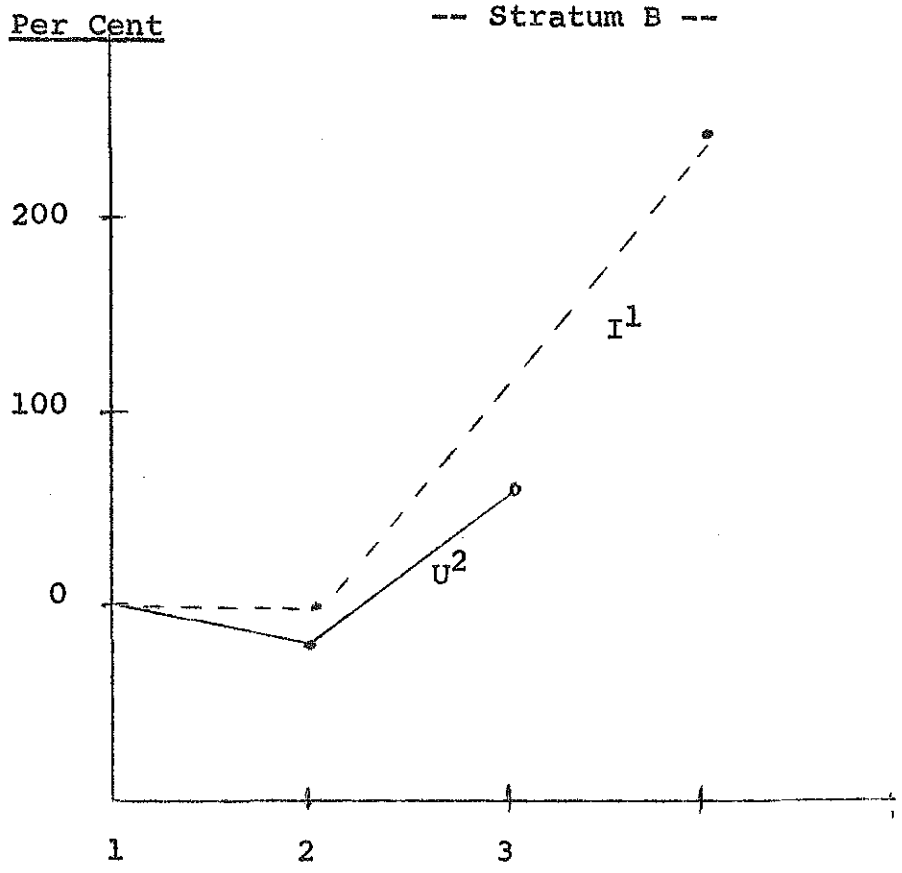


Table F-4

Year	I^1	U^2
3	0	0
4	6	-15
5	261	80

Year

[1]Index based on assessed values of land only for improved property.

[2]Index based on revenue stamp prices of unimproved property.

[3]Per cent changes are presented as a per cent of year one.

As indicated in Figure F-5, there was only partial agreement between this index and the comparable ratio estimate. However, the amount and age of the data, plus local assessment problems, indicate that further tests of this index need to be made. This is especially true since each index (assessed and stamp) was from different samples of the universe.

When this index is compared with the one based on assessed values, only a high degree of similarity between the two is observable.*

Unimproved and Improved Property

As anticipated, there was no agreement between these two indexes--see Table F-15. Improved property increased in value substantially more than vacant or unimproved land.

For improved property to accurately show changes in property values, the ratio of land to improvements must be the same in each time period and location. Since this condition is seldom present, improved property should not be used to show land value changes unless additional adjustments to the data are made.

Front Foot and Square Foot Values

Appraisers frequently compare land values in terms of dollars per front foot. Comparison with dollars per square foot--the basic index in this study--shows a close relationship between the two indexes. As illustrated in Figure F-6, the proportionate changes in land values were similar with the square foot index showing a slightly greater increase in value. On the basis of this study--it should be checked further--the indexes would seem to be interchangeable and possibly reliable in interstudy comparisons.**

*Additional supporting data are found in Table F-16, 17.
**Additional supporting data are found in Table F-18.

Figure F-5

INDEXES OF ACTUAL LAND VALUES FOR STRATUM B
EXPRESSED AS A PER CENT OF YEAR FIVE

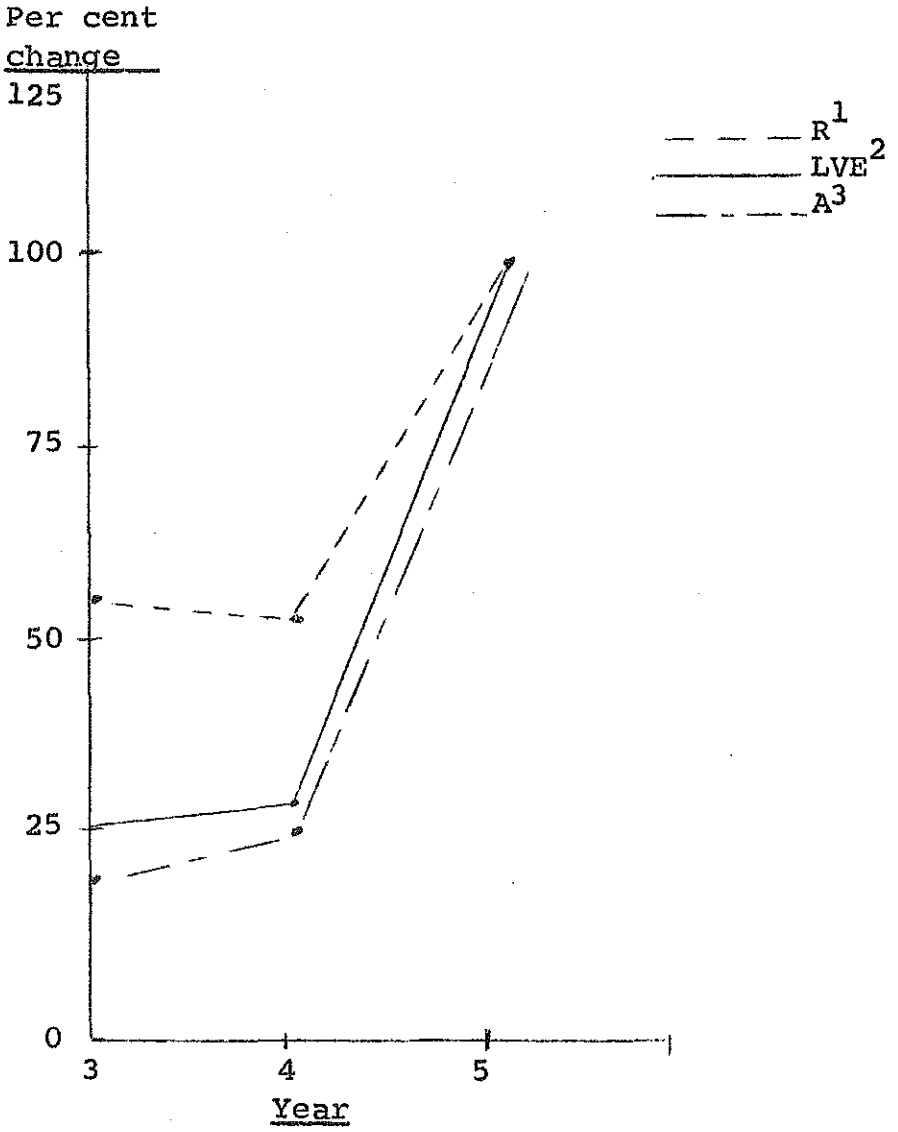


Table F-5

INDEXES OF ACTUAL LAND VALUES FOR STRATUM B
EXPRESSED AS A PER CENT OF YEAR FIVE

All Zones

Year	R[1]	LVE[2]	A[3]
3	56	22	28
4	47	28	29
5	100	100	100

[1]Ratio estimate

[2]Value based on assessed and stamp prices discussed above.

[3]Values based on assessments of land only for improved property--See previous section.

Table F-7

RATIO ESTIMATES, MEANS, AND MEDIAN VALUES
(REAL) FOR ALL UNIMPROVED PROPERTY

	Zone											
	1			2			3			All		
Year	R[1]	M[2]	Med[3]	R	M	Med	R	M	Med	R	M	Med
1	.016	.164	.144	.006	.211	.148	.014	.163	.162	.014	.182	.164
2	.007	.094	.025	.122	.378	.354	.220	.351	.213	.032	.305	.201
3	.013	.341	.246	.005	.113	.100	.043	.177	.114	.013	.190	.117
4	.034	.173	.060	.017	.142	.084	.028	.133	.091	.024	.149	.088
5	.056	.239	.172	.018	.135	.065	.041	.134	.086	.033	.158	.083

[1] Ratio estimate

[2] Arithmetic mean

[3] Median

Table F-8

ACTUAL VALUE PER SQUARE FOOT OF THE LOWER
90 PER CENT (BY SIZE) OF ALL VACANT PROPERTY

	Zone Value			
Year	1	2a	3a	All
1	.026	.066	.077	.067
2	.047	.067	.137	.098
3	.040	.022	.038	.033
4	.037	.049	.046	.043
5	.138	.135	.073	.105

Table F-9

ACTUAL VALUE PER SQUARE FOOT OF THE CENTRAL
90 PER CENT (BY SIZE) OF ALL VACANT PROPERTY

	Zone Value			
Year	1	2a	3a	All
1	.030	.063	.040	.045
2	.047	.072	.108	.089
3	.037	.008	.019	.014
4	.019	.020	.028	.021
5	.078	.057	.071	.068

Table F-10

ACTUAL VALUE PER SQUARE FOOT OF THE
CENTRAL 50 PER CENT (BY SIZE) OF ALL VACANT PROPERTY

	Zone							
	1		2a		3a		All	
Year	No.	Value	No.	Value	No.	Value	No.	Value
1	1	.052	22	.091	33	.098	56	.095
2	2	.031	6	.065	5	.109	13	.079
3	2	.086	6	.040	21	.070	29	.066
4	22	.062	35	.066	38	.058	95	.062
5	7	.230	21	.138	32	.108	60	.134

Table F-11

ACTUAL VALUE PER SQUARE FOOT OF ALL VACANT
PROPERTY LESS THAN 10,000 SQUARE FEET IN AREA

	Zone							
	1		2a		3a		All	
Year	No.	Value	No.	Value	No.	Value	No.	Value
1	10	.129	21	.187	38	.139	69	.153
2	1	.208	10	.313	4	.199	15	.283
3	5	.351	7	.096	14	.118	26	.137
4	20	.211	24	.144	26	.138	70	.159
5	11	.363	11	.459	22	.185	44	.280
Total	47		73		104		224	

Table F-12

ACTUAL ASSESSED VALUES PER SQUARE FOOT OF ALL VACANT PROPERTY
-- By Strata --

	Stratum A		Stratum B		Stratum C		All	
Year	No.	Value	No.	Value	No.	Value	No.	Value
1	20	.015	58	.050	21	.003	99	.009
2	4	.015	21	.013	5	.004	30	.009
3	11	.006	24	.018	16	.006	51	.008
4	34	.004	66	.009	55	.009	155	.008
5	23	.003	51	.014	31	.005	105	.007
Total	92		220		128		440	

Table F-13

ACTUAL ASSESSED VALUES PER SQUARE FOOT OF ALL PROPERTY
-- By Strata --

	Stratum A		Stratum B		Stratum C		All	
Year	No.	Value	No.	Value	No.	Value	No.	Value
1	26	.009	76	.074	24	.003	126	.009
2	5	.006	32	.032	8	.007	45	.016
3	26	.007	56	.094	26	.011	108	.024
4	57	.013	129	.032	75	.041	261	.026
5	53	.009	122	.045	87	.019	262	.026
Total	167		415		220		802	

Table F-14

ACTUAL ASSESSED VALUE PER SQUARE FOOT FOR THE
LAND PORTION OF IMPROVED PROPERTY

-- Stratum B --

	1		2a		3a		All	
Year	No.	Value	No.	Value	No.	Value	No.	Value
3	3	.162	14	.026	19	.031	36	.031
4	6	.143	29	.022	31	.039	66	.033
5	10	.256	28	.088	35	.054	73	.112
Total	19		71		85		175	

Table F-15

ACTUAL VALUE PER SQUARE FOOT OF UNIMPROVED AND IMPROVED PROPERTY[3]

	Stratum Value							
	A		B		C		All	
Year	I[1]	U[2]	I	U	I	U	I	U
1	.007	.039	.116	.014	.001	.002	.005	.007
2	.001	.128	.051	.027	.013	.004	.018	.020
3	.004	.009	.139	.020	.052	.003	.035	.006
4	.051	.011	.100	.017	.198	.014	.093	.014
5	.077	.030	.211	.036	.091	.028	.135	.032

[1] I = Improved property

[2] U = Unimproved property

[3] These values were computed on the first IBM run and vary slightly from the final one. Variations are due to reclassification of individual properties.

Table F-16

LAND VALUE ESTIMATES (ACTUAL) BASED ON ASSESSED AND STAMP PRICES OF IMPROVED PROPERTY[1]

	Zone 1		Zone 2a		Zone 3a		All Zones	
Year	No.	Value[2]	No.	Value	No.	Value	No.	Value
3	15	.022	36	.027	46	.022	97	.023
4	8	.015	31	.026	43	.030	82	.025
5	5	.104	16	.114	26	.024	47	.058
Total	28		83		115		226	

Table F-17

LAND VALUE ESTIMATES (ACTUAL) BASED ON ASSESSED AND STAMP PRICES OF IMPROVED PROPERTY[1]

Stratum B

	Zone 1		Zone 2a		Zone 3a		All Zones	
Year	No.	Value[2]	No.	Value	No.	Value	No.	Value
3	9	.134	28	.035	31	.023	68	.029
4	6	.053	29	.031	30	.046	65	.036
5	3	.182	11	.117	17	.117	31	.130
Total	18		68		78		164	

[1]Computed by applying the ratio of land to total assessed value to the stamp price of the property.

[2]Actual value per square foot.

Table F-18

ACTUAL VALUE PER FRONT FOOT AND SQUARE FOOT OF ALL UNIMPROVED PROPERTY

Year	Number Transactions	Value	
		Front Foot	Square Foot
1	12	$10	.016
2	5	5	.007
3	8	4	.012
4	45	12	.034
5	25	39	.052