Highways have become in recent years one of the most important media of inland transportation. To a great extent the network of highways which now exists in the United States grew like Topsy. Many of the major routes pass through the hearts of our great cities as well as villages. This was logical in the earlier days when these roads were developed, but with the vast increase in the demand for high speed, long distance travel, and the extension of the practice of commuting, our highways have become inadequate to serve the needs of motorists.

For the past several years a significant amount of our material resources have gone into expansive highway building programs in all the states. The largest single undertaking is, of course, the national system of interstate and defense highways. In all these recent highway expansion and remodeling projects attention has been given to the over-all effect new roads will have, not only on the movement of traffic, but also on the economic development of the communities transversed and, indeed, on the economic development of the nation as well.

Obviously, some knowledge of the nature and extent of the economic impact of new highways is a prerequisite to intelligent planning and design of new roads. This paper attempts to outline the role of economic research into highway impact and to point out some areas in which future research seems essential to sound economic planning of highways.

I. Review of the Nature and Economic Importance of Highways in the United States

It is helpful to place highway economic research in perspective by briefly tracing the development of our inland transportation system—particularly as it is related to the settlement and economic development of the country.

A continental nation like the United States requires highly developed inland transportation if its interior lands are to be settled and used productively. Early settlement of the United States and Canada was limited to regions accessible by use of tidal waters and such major rivers as the Hudson, St. Lawrence, and Mississippi. In the period of colonization and of the formative years of the republic waterways were the most important form of transportation between the eastern and southern port cities and the continental hinterland.

Settlements in the interior were almost always located on a navigable stream. Such inland cities as Louisville, Detroit, Cincinnati, St. Louis, and Pittsburgh were either established as transhipment points or as military control points over commerce on navigable waterways.

After the Revolutionary War the rapid expansion of the nation was spurred by the development of canals by which goods and people could be moved at reasonable cost between the “western” land and eastern ports. The most important of these was the Erie Canal which was opened in 1825. This waterway con-
nected Buffalo on Lake Erie with Albany on the Hudson and thus finally with New York City. This and subsequent developments in Ohio, Indiana, and Illinois enabled the northwest territories to be opened for settlement.

Highway transportation was limited at this time to short stretches of roads serving most often to connect local service areas. Some post roads, military roads, and turnpikes were built; but the use of these was limited to the movement of goods and people which required rapid transportation. One of the few roads constructed at this time which provided a link with the expanding interior was the National Highway from Cumberland, Maryland to Vandalia, Illinois and to Harrodsburg, Kentucky. Westward extension of this turnpike was contemplated, but the coming of the transcontinental railroads halted further plans for construction.

The 1840's and 1850's saw the development of many railroad lines. The Baltimore and Ohio was extended; the Michigan Central was completed; and Erie was begun. By 1860 an extensive network of railroads was in operation, and in each decade until 1900 further expansion of the system took place. The railroads directly influenced the settlement of the plains and provided a link between the separate corners of the continent.

The nature of each inland system used and the sequence of forms played a major role in forming the geographical face of the nation. Patterns of settlement and the location of economic activity were dependent on transportation. Subsequent transportation improvements often were designed and located to serve the existing pattern of industrial centers and port complexes and thus solidified the economic positions of communities of major importance.

Although railroads laid the base for extraordinary growth, many small towns and hamlets were literally killed by them. Those towns which were on the new lines grew and received the business of their less fortunate neighbors since stock yards, grain elevators, and so on were located in the railroads towns and local market functions were transferred to them.

As these processes interacted and as the economy grew, industries rose and fell and the processes of economic life became more complex; our present economic structure began to emerge.

During this period road developments were geared to local needs and constructed for shorthaul purposes. Although the road system of the country expanded, it was characterized mainly by a collection hodgepodge of local roads which were in no sense integrated.

The development of the internal combustion engine, the rapid expansion of production and the acceptance by the public of the new transportation form created pressure for further development and integration of the nation's system of roads.

By 1916 the concept of a national system was recognized by many highway officials and by a number of congressmen. Legislation aimed at systematizing the national network was passed and laid the groundwork for the Federal Highway Act of 1921, which provided for the designation of important state routes as "Federal-Aid Primary Roads." This legislation was prompted by the increasing need for improved primary routes, and in general was applied to important existing routes.

In the 1920's and 1930's a concerted effort was expended to "get-the-farmer-out-of-the-mud." Although this program was useful and concentrated, it was administered locally since its aims were the improvement of farm-to-market or feeder roads. During this period the importance of trucks, buses, and family automobiles increased almost geometrically. The need for an integrated system of roads outstripped by far the achievements of the nation's highway programs. The situation was rendered more acute by wartime use of obsolete highways.

The rate at which motor vehicles increased in importance necessitated constant revision of goals and redefinitions of what constituted an adequate system. As these needs became distressingly apparent, the necessity for planning became...
The primary purpose of highway impact studies is to isolate the economic effects of new and improved highways and to explain how and why these effects occurred. Although these studies are not directly concerned with the effect on motor vehicle users, as such, it is important to note that most of the nonvehicular benefits arising from highway improvement are the indirect effect of benefits realized in the first instance by motor vehicle users. For example, virtually all the rise in the market value of nearby property—this is a usual occurrence—resulting from highway improvement can be attributed to the capitalization of operating economies, time savings, and other vehicular benefits.

More specifically, basically what do highway impact researchers attempt to do? First, they try to ascertain the magnitude and nature of benefits and losses resulting from improved roads. Secondly, they attempt to determine which nonvehicular groups were benefited and which sustained losses and the extent of the loss or gain. Then, they examine the evidence available and try to piece together the process by which gains and losses accrued to the various nonvehicular groups and why these effects occurred. Finally, if they are able to do so, the researchers formulate generalizations. If the generalizations are useful they can be employed in forecasting the effects of proposed highway improvement.

Recent studies of the economic effects of improved highway facilities shed some light on the nature and magnitude of nonvehicular benefits. The researcher in this area has very little sound theory and methodology on which to build. In many cases, therefore, he develops in part his own methodology and techniques of attack. While this is desirable from most points of view, it has resulted in a considerable degree of noncomparability of results from study to study. Very few

\[\text{\footnote{There appears to be very few strictly nonvehicular benefits. Sidewalk, storm sewers, and street lights installed as part of the highway improvement are in this category. So is street-provided right-of-way for public utility installation.}}\]

\[\text{\footnote{This, of course, does not obviate the difficulties attending the isolation of property value changes ascribable to highway improvement from changes in value due to other factors, and of accounting for property value changes due to the highway improvement in terms of transferred or capitalized vehicular benefits.}}\]

\[\text{\footnote{This procedural sequence is used primarily to explain the approach and is not, of course, rigid in all respects as applied to the actual study method. Actually, many researchers have not really accomplished the first step. This is not a condemnation of research in the area but an illustration of the complexity of the problems involved.}}\]
useful generalizations have been formulated. However, some tentative conclusions have emerged from the various investigations.4

The studies have concentrated on the impact of new highways on (1) land use and value, (2) local business, and (3) industrial development. New highways, particularly expressways, seem to exert a rather substantial positive effect on the value of nearby property. Spectacular increases in market value have occurred where the new facility has been responsible for a conversion of unimproved land to a more intensive use. The market value effect on properties which were already being utilized residentially, commercially, or industrially is much smaller. In fact, for residential property adjoining or in close proximity to heavily traveled routes, a small negative effect on values has often been found.

Studies of the economic effect of bypasses or circumferential routes have indicated that in most cases the new highway did not result in a serious detrimental effect on local business. Businesses catering primarily to community needs have benefited in most cases by the bypasses. Highway-oriented businesses, especially those on the bypassed route, usually suffer rather severe, immediate volume declines but thereafter recover some of the lost business.

New highways, especially those of superior quality, by creating good industrial and commercial sites, offer opportunities for capital investment and growth. Thus, a multitude of firms have located or relocated along new highway facilities. The transportation economies effected thereby results in lowered cost-of-production. The public benefits, in so far as the transportation savings are passed on, from the more efficient movement of goods and services.

Highway impact studies can be useful in many different respects. The Secretary of Commerce, with the Bureau of Public Roads acting as his deputy, is obligated by section 210 of the Highway Revenue Act of 1956 to investigate nonvehicular benefits and losses resulting from federal-aid highways. Congress deemed such investigation necessary in order that it may have information on the basis of which it can formulate an equitable taxation scheme to finance the federal share of the highway improvement program. The origin of most of the highway impact studies undertaken since 1956 can be traced to this congressional requirement.

There are, however, other actual and potential uses of such studies. A requirement of the Federal-Aid Highway Act of 1956 is that hearings must be held to consider the economic effects of any proposed federal-aid highway project that bypasses or penetrates any city, town, or village. The results of objective research in this area would, of course, be valuable at hearings.5 Another use is in right-of-way acquisition. If it can be shown that abutting property owners almost always benefit from new highways, the right-of-way may be purchased at a more reasonable price then would otherwise be the case. If, on the other hand, fragmentation of a large farm results in severe diseconomies for the farmer, this finding should be considered in establishing the price of right-of-way. The point is that if enough reliable generalizations were available, right-of-way could be purchased at a price which is equitable both to the property owner and the public.

An estimate of nonvehicular benefits and losses is helpful in highway planning. For example, a priority list of highway construction projects to be undertaken or the maximal location of a particular facility cannot be properly determined without a reasonable estimate of the nonuser effects. If the economic impact of highways on patterns of land use, on urban and rural areas, and on community development were known, the results could be considered in highway design and location and in community planning. The pattern of development in urban

4 In a Bureau of Public Roads memorandum, Economic Impact Studies Completed, by E. H. Holmes and dated September 4, 1959, all highway impact studies reported on by June 1959 were listed. The memorandum included information on the nature of the studies completed.
5 Economic impact studies are of limited value unless they are helpful in predicting the effects of proposed highway improvements.
and rural communities could be influenced significantly. Finally, these investigations should add to the store of knowledge on the importance of highways, or of transportation generally, in determining the location of industrial and commercial plants.\(^6\)

Previous statements have alluded to the lack of accomplishments in this area. This is perhaps not unexpected in view of the immense difficulty of isolating and explaining the economic effects of highways. The paucity of useful results can be further explained by several factors. There is still a lack of adequate theoretical models and sound methodology from which badly-needed generalizations can be derived. In most studies, for example, it is assumed that only the highway improvement factor must be investigated in order to draw conclusions concerning the effect of new highways on land use and value. What is needed is a sound theory of value or use of real property that includes the highway improvement factor as merely a contributing variable. However, researchers have usually been under pressure to obtain results speedily. The 1956 Highway Revenue Act required that the final report on the highway cost allocation study be submitted on or before March 1, 1959. This requirement did not allow enough time for thorough study.\(^7\)

Finally, due to the lack of time and difficulty of the analysis, researchers have not seriously attacked the question of "how" and "why." They have, for example, been able to estimate, usually with an unknown degree of accuracy, that a new highway is responsible for, say, a 100 per cent increase in value on nearby farm land. This is a useful bit of information, assuming it is reasonably accurate. However, until we have some definite notions of how and why the 100 per cent increase occurred, the result is of limited value. In a broader setting it might be said that researchers in the highway impact area have tried to trace the effects of improved highways on some special aspect of the economy in the short run, but have largely ignored the consequences to the over-all economy in the long run.

It is perhaps appropriate to observe that the problem of isolating the economic effects of new improved highways is enmeshed in changing conditions and literally innumerable variables. It appears that progress in this area of research will come slowly.

### III. Possible Directions for Future Research

As suggested before, it appears that researchers should direct more attention toward questions which would advance our knowledge of the consequences of highway improvements to the over-all economy in the long run. Major contributions can be made in developing more adequate theoretical and methodological tools as well as directing attention to the "why" and "how" of the effects observed. The outcome will be the suggestion of new directions for research activity into areas not yet recognized.

Extended effort in highway impact research should in the final analysis be a broad search for the impacts of highway improvements on the nation's economic structure as it continues to evolve. Spatial changes are not the only structural modifications that we can expect. Redistribution of economic activities, of the values of landed assets, incomes, and of people means that different firms, organizations, operations, and people will be variously affected by highway improvements. Continuing research must be characterized by explicit recognition of these changed relationships and be pointed toward analysis of their implications.

The studies of highway economic impact on the local level would be much more valuable in yielding useful generalizations if their perspective is broadened and they are placed in the context of the whole of the highway system of which

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\(^6\) This list of actual and potential uses of highway impact studies is not intended to be all-inclusive. It merely serves to illustrate the potential value of the studies.

\(^7\) In order that the AASHO Road Test results be available for inclusion in the final report, the date of final reporting has been advanced by 22 months to January 1961. This extension provided some relief to researchers; present and future studies should be of considerably higher quality than those in the past.
the local roads studied are a part. This means also that studies should be developed
which are concerned with systems and adjustments within and between systems.
Particular attention should be given to changes in market structures which result
from road additions and improvements.

Serious methodological problems will be met in attempts to broaden the
scope of impact studies and research programs should include provisions for
special studies designed to solve these problems.

With such considerations in mind what types of studies appear to be fruitful
for future research? Several types can be suggested; one cannot review all of
them, of course, but the following are examples of topics to which more attention
should be directed.

(1) Industrial development studies which measure more than employment
statistics. Such investigations could be concerned with distribution of
income, the relation of a new industry's wages to previously existing wage
levels in the area and for similar employment elsewhere, the degree of
seasonality of employment, sensitivity of the activity to cyclical fluctua-
tions, sex of employees, and relation of a new industry's employment
to the local labor pool.

As an example of the pertinence of such studies the following situation can
be postulated. If in an area of surplus labor and depressed economic conditions
a new manufacturing plant is located, employing a small number of people; does
analysis end with a statement of its payroll and a recounting of the jobs involved?
Possibly such a development could retard the outmigration of people from the
area by offering to them the hope of greater future development which may not
materialize. If outmigration is basic to the solution to the area's economic
problems, can isolated industrial development be considered a benefit? Such a
hypothetical example is extreme, but it is designed to indicate a more fundamental
problematic approach than that which is typical of some impact research.

(2) Business activity studies need to be focused on more than the measure-
ment of changes in gross receipts. Changes in gross receipts answer a
very few questions and leave many more fundamental questions un-
answered, and as a result overlooked. Researchers should also be con-
cerned with ascertaining and describing what types of activity are in-
volved, changes in type of ownership, changes in real income, if any,
through marketing efficiency, market area adjustments, and effects on
local capital and employment. Such investigations would be more
difficult than studies of gross receipts, but they also would be much
more meaningful.

(3) Some studies could also be made of the effects of redistributing economic
activities and people among governmental units of varying size since the
impacts on tax bases and costs of governmental services are important.
From such studies one could evaluate the changing need ad hoc units of
government drawn on economic regional bases or on the predicted need
for shifting costs and revenues to varying levels of government.