

Community Consequences of Highway Improvement*

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ABRIDGMENT

This paper, as presented at the 44th Annual Meeting of the HRB, was the summary of findings of one year's research project sponsored by the National Cooperative Highway Research Program (Project 64-2-2). Since the summary volume of this project is expected to be published elsewhere in the Highway Research Board literature, only an abridgment is given here to facilitate interpretation of the commentary by Pashek and reply by Horwood.

The project's objective was to correlate and evaluate existing studies of highway economic impact and other community consequences, to develop guidelines for the determination of such consequences, and to specify the aspects of indirect effects of highways in most need of further research.

Studies of bypasses and urban radial and circumferential freeways were found to be numerous and were subjected to correlative analysis. Lack of uniformity as to methodology and selection of variables made statistical correlations difficult. Therefore, it was necessary to resort to crude averages and ranges to derive numerical values with guideline utility. It was found that bypasses have differential effects on communities, with least benefit generally derived by towns of less than 5,000 population and by highway-oriented businesses. Greater benefit accrued to the larger centers and to the nonhighway-oriented business sector, presumably due to decreased congestion, greater pedestrian amenity in shopping areas, and an enlarged trade area. Small towns without central place importance may suffer substantially from a highway bypass.

The circumferential freeway studies revealed the propensity of industrial and commercial land uses to develop along beltway routes. Land values usually rise concomitantly in proximity to the circumferentials. Urban radial freeways generally have the effect of temporarily increasing the values of land, especially undeveloped land, very near the route, though the benefit derived falls off rapidly with distance from the facility.

Evaluation of the studies analyzed revealed a number of methodological shortcomings which tended to decrease their utility for comparison and prediction as well as for understanding of the long-term consequences of highway developments. Utility of the studies, as determined by interviewing cognizant highway officials and researchers in a sampling of the states most active in nonuser impact research, reveals that they were made mainly to alleviate public relations problems by countering adverse public opinion with factual information.

Gaps in knowledge requiring research, as expressed by interviewees, were of three types: (a) specialized impacts of highways, especially as they affect currently protesting special interest groups; (b) refined methodological approaches to impact research; and (c) miscellaneous areas of analysis representing operational problems of highway agencies (e.g., interchange congestion, frontage road needs, and air rights evaluation).

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Synthesizing these findings, three areas of future community consequences research were proposed: (a) spatially localized studies, i. e., tactical studies intended to enhance public relations or to solve particular agency problems of an operational nature; (b) spatially integrated studies, or areally comprehensive strategic planning studies which add to basic knowledge and provide feedback on interrelated user and nonuser effects useful in making decisions on future use of highway systems and route locations; and (c) theoretically oriented models, mathematical representations of economic or settlement impacts of highways useful in testing alternative regional land-use and transportation patterns, thereby aiding policy and plan decision making.

The general conclusions drawn from the research are:

1. There will be a continued need for the operational types of studies made in the past, although future ones should be made with more sophistication in the selection of variables, indices of change, control areas, identification of exogenous influences, etc.
2. There is an emerging need for a research program of spatially integrated studies which examine community consequences in the larger context of the metropolis or region, identify a spectrum of economic and social effects, integrate user and nonuser aspects (benefit transference, land use, traffic, etc.), and are justified by their utility in expanding basic knowledge, suggesting useful theoretical constructs and aiding in the determination of highway plans and policies. The particular objective must be to gain a better understanding of the systems effect of urban highway development, including the iterative impacts of freeway and land-use developments on each other.

Discussion

ROBERT D. PASHEK, The Pennsylvania State University—Mr. Horwood has provided a valuable report on a research project concerned in part with the correlation and evaluation of the existing body of literature on the economic impact of highway improvements. Other stated general objectives of the project are the development of "guidelines for highway agencies to follow in considering the community consequences of highway improvements and to specify those aspects of the problem requiring further study."

The following comments will be confined largely to the analysis of bypass studies and to some proposals presented by Mr. Horwood as a policy guide for future research efforts.

The analysis of bypass studies must have been a very frustrating experience with different classification of variables, different universes, and nonuniformity in research design. Mr. Horwood should be highly commended for his clear presentation of the few strengths and many weaknesses of the various reports. Acknowledgment must be given to the finding that "a bypass has distinctly different effects on towns of 5,000 persons and on cities over 5,000 population" with the implication that the former were adversely affected and the latter remained unchanged or were favorably affected. This reviewer raises the question, however, as to whether or not the emphasis on a population classification may obscure the basic reasons behind the findings. For example, I would suggest that, regardless of population, the extent to which the community serves as a market or shopping center for the surrounding area and its geographical relationships with competing market and shopping centers would be two of the basic factors. The introduction of a bypass for the community could result in the community becoming a more attractive market and shopping center through the reduction in congestion and an increase in "pedestrian amenities." Population differences among communities need not provide an indication of these factors.

This reviewer would also like to raise the question as to whether or not a substantial bias may be present by the very nature of the universe studied, i. e., the available bypass studies. What type of a sample do these studies represent of all bypassed com-

munities? Were the communities studied chosen because they did provide some unique situations?

The statement is made by Mr. Horwood that "It is highly probable that many small communities are adversely affected by highway bypasses when travel times are changed to permit a greater accumulation of goods and services in a larger neighboring community." The reviewer recognizes the importance of travel time but suggests that the travel time from a studied community to neighboring communities is not changed by the introduction of a bypass. A change in travel time is only likely to occur when the bypass is at an intermediate point between the origin and destination points, not when the bypass is at the origin point itself. What may have happened in many situations is that the bypass was constructed along with a general improvement of the highway to neighboring communities. The travel time was thus affected by the improved highway link and not by the bypass.

In general, the specific recommendations made by Mr. Horwood for future bypass studies are commendable and strongly supported by this reviewer with two modifications. There is agreement on the recommendation that "The same spans of time before and after opening the bypass should be used in all studies." However, there is not agreement that 2 years before and 2 years after is an appropriate standard for measuring the impact of the highway. In some instances the impact of the bypass may not become evident for 4, 6, or more years. An important variable in this situation would appear to be nearness to an important urban center. It is recommended that a limit of 2 years not be imposed but that the impact be measured uniformly at 2-year intervals.

A question may be raised with regard to the recommendation that such data as electricity usage, telephone installations, bank deposits, and employment be discarded in future studies since they are subject to many extraneous factors and are not reliable indicators of highway impact. There is no disagreement with this statement as it stands, but elsewhere Mr. Horwood makes an impressive plea for control areas. Would not this type of data be important in the measuring of changes in levels of economic activity between the community being studied and the control areas, especially when no better indicators were available?

The reviewer believes that the analysis of bypass studies is an important step in the continued development and refinement of highway impact research. It is also felt that the major contributions of such studies have been attained. It would seem that such additional isolated case studies of the type undertaken in the past regarding bypasses can contribute little new knowledge in the area of predictive techniques and provide little additional aid to the decision-making entities.

Mr. Horwood concludes his paper with a general appraisal of highway impact research efforts which is followed by some proposals that could serve as a policy guide for future research efforts. He states, "it appears that three types of studies must be conducted in the future." These are (a) spatially localized studies which are a public relations-oriented, limited objective type of field studies, (b) spatially integrated studies which examine phenomena comprehensively in terms of space, and (c) theoretically oriented models "which may lead to the development of models of economic activities or settlement from which policy decisions may ensue."

This reviewer fully supports Mr. Horwood's general appraisal of highway impact research and the specific proposals for future study. This reviewer does take issue, however, with the implication that this classification would provide an adequate policy guide for future research efforts. The proposed classification, as defined and developed by Mr. Horwood, is criticized on the basis that it presents a misleading picture and that it is unduly narrow in scope or range of vision.

For example, Mr. Horwood presents "the impact of land-use changes at interchanges" as a gap in knowledge under the spatially localized study classification. Remember, by definition, the spatially localized study proposals are public relations oriented. At the present time, we have a study nearing completion at Penn State dealing with land-use changes at 105 interchanges in Pennsylvania. The study is examining a host of variables such as age of interchange, traffic flows, topography, distance from other interchanges, distance from market centers, population, and other indicators

of economic activity. The objectives of the study include the development of tools and knowledge for the prediction of change so that plans may be designed for highway protection, better planning in the future, and controls of land use. I am certain that the econometrician in charge of the study would be horrified to find his efforts classified as public relations oriented.

Let us look at Mr. Horwood's second classification, "spatially integrated studies." His definition of this classification states that "space may be either the total urban region or space in some linear context such as a regional development along a river valley or freeway." The restriction of studies to urban regions and developments along a river valley or freeway actually states what has been done in the past and not necessarily what needs to be done in the future. This is an unduly restrictive and extremely narrow approach. I would suggest that studies should involve economic regions, regardless of whether they are urban or rural. I would also suggest that studies of systems or networks of highways rather than an individual freeway might provide findings of greater value to Mr. Horwood's studies for "strategic planning purposes." How would a study for a road program to aid distressed areas such as might be found in President Johnson's proposed Appalachia Program fit into Mr. Horwood's classification?

This reviewer must also raise a question with regard to the statement that "these also tend to be studies for strategic planning purposes rather than tactical studies needed to answer field-oriented problems." I would suggest that many of these studies could provide a base and important ingredients for tactical studies needed to answer field-oriented problems. "Spatially integrated studies" and field-oriented problems are not mutually exclusive.

Although the classifications proposed are not acceptable to this reviewer, this section of the paper has many valuable suggestions. It serves a function in pointing out specifically many gaps in knowledge that need additional study. Mr. Horwood is to be commended for this contribution.

As a conclusion to these remarks, it might be well to add some comments regarding what is absent in the report rather than further comments on material in the report. This is limited to two items—one a question and the other a suggestion.

Mr. Horwood has at different places in his paper mentioned the urban transit and urban regional studies. Would not the analysis and evaluation of the relevant portions of the CATS, PATS, and Penn-Jersey studies, among others, be an important addition to this report?

Mr. Horwood has alluded to research horizons in his concluding statement. I would suggest that this horizon would include the development of studies concerning both the direct and indirect impact of highway improvement on the income and employment of a community. Highway impact research efforts have been primarily directed towards the impact on what may be called fixed assets such as land values and land use. Little attention has been given to the next step in the research process; i. e., what impact does the change in fixed assets such as land use have on the income and employment of the community? Some important developments are occurring in this area. The Pennsylvania Regional Analysis Group at Penn State, using input-output analysis, developed a transaction matrix of economic activity for Clinton County. It so happens that a segment of the Interstate system (the Keystone Shortway) will cross this county with three interchanges. Information concerning probable changes in fixed assets such as land use at the three interchanges was fed into the transaction matrix, and it could clearly be seen what the impact of the highway improvement was likely to be on the income and employment of the area. A report on this procedure will be available in July. It is suggested that this type of flow analysis can be a most powerful guide for new highway construction and constitutes a portion of the new horizons.

Edgar M. Horwood, Closure—Mr. Pashek raises the question as to whether or not the emphasis on a population classification may obscure the basic reasons behind the

findings. This is always a risk, of course, in the stratification of any data. The population class increments of 5,000 people were used as a simple first-order scale, mainly because no other numerical classification seemed appropriate. This treatment should not be thought of as an emphasis, although the reader may easily carry away this impression because of the many observations that appear to be differentiated by the 5,000 population value level. Figures are also given for the cities in all population classes so that the reader may judge for himself as to the validity of the 5,000 population level as a criterion.

On this same point, Mr. Pashek's remarks are well taken in that the bypass may result in a community becoming a more attractive market through the reduction in congestion and increase in pedestrian amenities. In fact, amenity improvement may even justify either a drop in some economic indicators or the shift from one set of economic benefits to another. It seems unlikely, though, that highway departments could reasonably explain the justification for any reduction of economic indicators based on projected improvement in pedestrian amenity to a community.

Mr. Pashek raises a question as to whether or not a substantial bias may be represented by the fact that only the studies of bypassed cities were analyzed. It is a valid statistical observation that the studies themselves constitute a biased sample of the total universe of bypassed communities; however, they were the only evidence available short of a massive effort such as the financing of the study did not anticipate. It would also seem that because the bypassed cities were selected without bias, the sample itself is not too biased and probably represents a reasonable simulation of the universe.

This writer is confused over the statement that the "reviewer (Pashek) recognized the importance of travel time but suggests that the travel time from a study community to neighboring communities has not changed by the introduction of a bypass." This is undoubtedly true if no transportation improvement has been made between the bypassed community and its neighbors. Invariably, however, the bypassed community is connected to other communities by the new facility which bypassed it. In fact, because typical settlement patterns run along highways, it is most probable that the bypassed community is one of a series of "beads" along the transport link. The remark by Mr. Pashek suggests that controlled communities must include those along the improvement as well as those unconnected by the improvement. When considered in this context, his point is very well taken and represents an aspect of economic impact analysis that was not emphasized per se in the basic study. It must be observed, however, that only one of the existing studies probes this question, and even then not too comprehensively.

Concerning time sequences for analysis of economic impact, there is nothing magic about the 2-year before-and-after span. It is usually difficult to anticipate improvement and develop before studies much in advance of 2 years. Specific routes are not generally known and it takes some time to develop interest in the before portion of a before-and-after study. Naturally, the continuation of economic impact analyses at 2-year increments after the construction of a facility would be admirable, and hopefully some studies may be refunded or originally funded with a long-term analysis in mind. Most fiscal arrangements make it difficult to extend financing of the study beyond 2 years.

My suggestion that electricity usage, telephone installations, bank deposits and employment be discarded in future studies as they are subject to many extraneous factors may have been stated a little too strongly, in retrospect. The implication behind the presentation of this statement is that these measurements are associated with many other things than highway improvement itself and substantial problems are raised in relating them to highway improvement.

This writer accepts as a valid criticism the charge that spatially localized studies must be substantially more than public relations oriented. In fact, his criticism should have extended beyond bypass studies to all of the others mentioned under this classification. There is no doubt in my mind, however, that most of the spatially localized studies conducted through 1964 have been public relations oriented. A more appropriate wording for the report would have been that these spatially localized studies include those which are public relations oriented. It is felt at the same time, however, that

Mr. Pashek's remarks that the proposed classification in its entirety is "misleading" is not substantiated. Although Mr. Pashek has suggested the inclusion of a few important types of studies that could very well be added to the list presented, he does not substantially support a basic attack on the classification system itself. In fairness to him, however, his remarks have been designed to point out deficiencies and not to counter with new structures for analysis.

Mr. Pashek makes a claim that the "restriction of studies to urban regions and developments along a river valley or freeway actually states what has been done in the past and is not necessarily what needs to be done in the future. This is an unduly restrictive and extremely narrow approach." He states in addition the need for analysis of economic regions, urban or rural, and systems of networks of highways rather than an individual freeway. He further refers to the need to study programs in relation to aids to distressed areas, as typified by Appalachia.

Besides emphasizing the fact that the research report makes a substantial plea for analysis of urban freeway systems and their total economic impact rather than individual freeways, the author feels that the merits of these remarks cannot be disputed, although they beg the question as to priorities of analyses as well as the concerns of those who commission highway economic impact studies. This raises very broad questions as to the future nature of highway economic impact research, especially as may be funded by state and federal agencies.

Mr. Pashek undoubtedly has a sense of the broad-scale and social consequences of highway developments and the need for analysis along these lines which is shared by the author. Mr. Pashek would be shocked, however, to read the review committee report of NCHRP Project 2-2, which presents an extremely circumscribed point of view of highway economic impact analysis. Highway administrators, as this report indicates, are not substantially concerned with broad economic analysis. They are trying to solve rather specific problems, or what they believe are specific problems, in regard to state highway developments, mostly relating to freeways. Highway administrators are looking for relatively simple and quick answers, not a general education on economic impact.

Perhaps a failure of the concluding section of the research report is that it does not emphasize specifically the fact that the direction of highway economic analysis suggested for future analysis implies what the author believes to be of the highest priority and most significance. As a long-time student of highway economics, this writer has been close to some of the most comprehensive research done in the country, that in the State of Washington in the early 1950's which dealt with highway economic benefits in relationship to economic regions and highway networks. A basic risk of this kind of analysis is that it is hard to tie down in specific terms for those who commission it. It is inevitable that when highway development is analyzed in terms of local or economic regional viability, many of the benefits are of a negative nature. Highway administrators and legislators do not want to see any negative results. There is as great a chance that the current highway program in Appalachia will drain off what economic viability remains in that region (except for recreation) as that it will not. In fact, history implies there is a greater chance that transportation improvement will confer greater benefits to the areas of greater viability when it connects regions of greater and lesser economic strength. This is the history of the railroads in the western areas of this nation. Gateway cities such as Chicago and St. Louis precluded economic development of western cities as the railroads moved west.

Mr. Pashek poses a very significant challenge for the inclusion of relevant portions of the Urban Region Transportation Studies along with other traditional studies dealing with highway economic impact. This thought crossed the mind of the research group at one point and was dismissed as being highly relevant from the standpoint of the specific scope of work programs presented in the research prospectus. The realization that highway economic impact studies must examine the works coming out of regional transportation studies came about at a time when the funding would not permit the broadening of the study. For one thing, the urban region studies do not present the findings in traditional terms as related to highway economic impact analysis, and for another the interpretations of the economic aspects of these studies are as yet

extremely difficult to assess. Studies such as those developed as part of the Penn-Jersey program delve deeply into regional economics and open a very much broader door than highway administrators are traditionally thinking about. Mr. Pashek probably did not have available other volumes of the NCHRP 2-2 report which discussed the urban metropolitan region highway economic evaluation problem, such as arose from the key study of Los Angeles.

In conclusion, I believe that Mr. Pashek has identified some very important points that were not sufficiently underscored in the summary report of the series. It seems difficult, on the other hand, to reconcile these broadening questions of highway economic impact with the operational needs of highway programmers and current thinking in highway agencies. Highway economic impact analysis is a subject much like the proverbial elephant, which appeared as seven different artifacts to the seven blind men who examined it. These different orientations are discussed in the section of the report dealing with interpretation, appraisal and application.

The utility of highway economic impact studies logically covers the gambit from public relations to highly complex studies dealing with regional and interregional economic events. It is difficult to draw a line as to what is a highway economic impact study and what is a study of a highway planning nature that will deal intelligently with the cycle of user and nonuser impacts over time. In the opinion of one observer who comments in the final report on NCHRP Project 2-2, "The contractors have trespassed into the provinces of the traffic engineer and the urban planner in worrying about developing a method of estimating future traffic volumes." Such thinking would certainly take a constrained view of the breadth which Mr. Pashek suggests, although this writer is sympathetic to his point of view.

The field of highway economic impact analysis lies between the extreme poles of broad educational findings and specific points relating to specific route locations. What is practical may stem from either end of the spectrum, although the highway administrator may not be looking for education in the search for practical solutions to what he believes are practical problems. These polemics seem to suggest a differentiation in terms. Conceivably the term "community consequences" could be used for a more restrictive type of analysis than the term "highway economic impact analysis."