

BENEFIT-COST ANALYSIS AND THE LOCATION OF URBAN HIGHWAYS

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The location of urban highways has become a major source of unrest in American cities and a bone of contention between highway planners and urban populations. The argument developed in this paper is that some of the problems associated with route-location decisions are inherent in benefit-cost analysis as it is commonly practiced, but that a more fundamental weakness lies in the governmental framework in which benefit-cost analysis is conducted and the consequent burdens that are placed on it as a decision-making tool.

•THE POSTPONEMENT (or, in some cases, cancellation) of construction of highways originally planned as part of the freeway system in a number of major urban areas caused by lawsuits or political actions may be attributable, at least in part, to flaws in the process by which highway decisions (route location, facility design, and whether to build the facility at all) are made. Examples of cities where major segments of freeway construction were at one time held up for a substantial period or currently are being contested, or where the route location or facility design was altered because of citizen opposition include Atlanta, Morningside area; Baltimore, Interstate routes 70, 95, and 83; Cleveland, proposed expressway through Shaker Lakes Park; Nashville, Interstate 40; Philadelphia, Delaware River Expressway; San Francisco, Embarcadero Freeway; New Orleans, Vieux Carre Expressway through the French Quarter; New York, Lower Manhattan Expressway and the Richmond Parkway; Brooklyn, Cross Brooklyn Expressway and the proposed "Linear City"; and Washington, D.C., North-Central Freeway.

In addition to lawsuits and various forms of political protests against particular highways, a certain malaise or frustration about the procedure by which highway decisions are made can be found in news articles, even when no political or legal action against a facility is involved. For example, an article in *The New Yorker* (1) recently reported the following:

A Portland newspaper recently recorded the angered dismay of the people of Kennebunk, Maine, who rose the other morning to find that the town's centennial plot—a remnant of the original village green—had been "removed by state-highway crews to make way for new traffic islands". Outrage provoked an inquiry, which established that the removal was pursuant to a state-highway project that had been approved not very long before by the town's citizens themselves. The centennial plot had been Kennebunk's more important and visible link with its past, having been enjoyed and admired by more than five generations. . . . The centennial plot was gone before anyone even noticed. However, the paper reported, a decision by the town selectmen to request "grassed-over islands rather than the hard-topped type" was expected to "ease the situation—if the grass tops are approved by the State Highway Commission". . . .

Who destroyed the centennial plot? Not the highway crew. . . . Not the voters of Kennebunk. They merely approved a recommendation for new lights to control the obviously congested traffic on its way to other parts of Maine. The engineering plans were on file in the engineer's office at

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the Capitol in Augusta, about eighty miles away, but they did not appear on any ballot. Nor could many voters have understood them if they had appeared. In any event, the subsequent protest clearly proves that the citizens would have rejected the design if they had been aware of its details. Not the State Highway Commission. It was, after all, the Commission's assigned task to draw up plans for improving the highway system in a manner that, according to studies, would benefit the entire area. Having submitted recommendations, it thereafter acted as the faithful agent of the expressed popular will. . . . It seems unduly harsh to blame a bureaucracy that perhaps had never even heard of Kennebunk, and whose program, moreover, was a self-evidently necessary response to the enormous boom in automotive transportation.

While it may be tempting to attribute the lawsuits and protests to the social and political climate in America in recent years, this line of thought begs the question. Matters related to distribution and incidence of benefits and costs are at the heart of the frustration that culminates in legal and political actions. For example, construction of the proposed Cambridge alignment of the Inner Belt Road in the Boston metropolitan area has been deterred by political and legal activities that culminated in the passage of a law by the Massachusetts State Legislature that gave ten communities veto authority over proposed highways with route alignments going through their respective townships or municipalities.* Opposition to the highway came, as it often does, from residents of the neighborhood through which the facility was to be built. Many residents felt that they had much to lose—pleasant low-to-middle income housing at reasonable rents, long-established neighborhood ties, a convenient location—and little to gain from the construction of the highway (2).

Another example of opposition to freeway construction based on matters of distribution is the current controversy in the Washington, D.C., metropolitan area over the proposed North-Central Freeway and the Three Sisters Bridge. While the issue is complicated by the fact that Congress has tied the funding of the proposed subway to the completion of the freeway system and that the transportation controversy has, therefore, become involved with the D.C. home rule issue, the basic objection to the North-Central Freeway is the familiar "running a white man's road through a black man's bedroom" argument.

The importance of incidence and distribution of benefits and costs within the domain of concern of highway decision-making is not confined to some dozen or more highways in densely populated sections of major urban areas that have received national attention in the news media. It is not simply a matter of an occasional facility in a given metropolitan area that angers or frustrates a group of people who feel that they are being asked to pay a disproportionate share of the costs. No decision-making process is perfect, and almost any decision to build a highway in an urban area will make some people unhappy. Rather, route-location problems, which essentially are questions of incidence and distribution, are relevant with respect to the entire highway network of any metropolitan area.

Data (3) located for the Columbus, Ohio, standard metropolitan statistical area (SMSA), for example, suggest, that for almost the entire Interstate system built in that metropolitan area during the last decade or more, the social costs of relocation caused by freeway construction were borne to a disproportionate extent by citizens who were nonwhite, whose income was considerably below the median for the metropolitan area, and who were much less likely than other citizens to own their homes (and therefore be entitled to some government-provided compensation for their property) or to own an automobile (and thereby have the possibility of benefiting from the new facility as users).

Table 1 gives a comparison of certain socioeconomic characteristics of relocated households with socioeconomic data pertaining to the population of the city of Columbus

*Section 4, Chapter 590 of the Acts of the General Court of 1961 and Section 12, Chapter 782 of the Acts of the General Court of 1962 (Commonwealth of Massachusetts). This statute was repealed in 1955 by the legislature. However, Governor Sargent called a moratorium on all construction (except for one leg) of the Inner Belt Road, so that, as of this writing, the Cambridge segment is still not being built.

TABLE 1

COMPARISON OF PERTINENT SOCIOECONOMIC CHARACTERISTICS OF IMPACTED CENSUS TRACTS WITH THE COLUMBUS, OHIO, SMSA AND THE CITY OF COLUMBUS

Item	Aggregate for Census Tracts With Over 90 Percent of All Displacements ^a	Total Columbus SMSA (Franklin County)	Total City of Columbus
Households with no automobile available	$\frac{8,967}{20,772} = 43.2$ percent	$\frac{35,253}{200,763} = 17.6$ percent	$\frac{32,594}{142,378} = 22.9$ percent
Households with automobile available	56.8 percent	82.4 percent	77.1 percent
Housing units, owner-occupied	$\frac{4,994}{19,904} = 25.1$ percent	$\frac{108,204}{189,694} = 57.0$ percent	$\frac{67,411}{136,229} = 49.5$ percent
Housing units, renter-occupied	$\frac{14,910}{19,904} = 74.9$ percent	$\frac{81,490}{189,694} = 43.0$ percent	$\frac{68,818}{136,229} = 50.5$ percent
Black population	$\frac{24,929}{65,939} = 37.8$ percent	$\frac{80,235}{682,962} = 11.8$ percent	$\frac{77,140}{471,316} = 16.4$ percent
Median income for families	\$4,473	\$6,425	\$5,982
Families with income under \$4,000	$\frac{6,361}{14,959} = 42.5$ percent	$\frac{35,971}{169,196} = 21.3$ percent	$\frac{28,769}{115,501} = 24.9$ percent

Source: The U.S. Census of Population and Housing, 1960.

^aThe wide dispersion of the other 10 percent makes the identification of characteristics difficult in the absence of actual relocation records.

and to the SMSA population (3). Although data for the relocated households were located, these data were not used in the Urban Institute study because extensive assembly, reduction, and analysis would have been necessary. As a surrogate, census data were compiled for tracts in which relocation occurred, and a composite picture was derived by weighting the data by the number of relocated households in each census tract. Any differences between the actual relocation data and the census tract data (Table 1) probably are not significant, because more than 90 percent of the displacements for the Columbus Interstate highway program were concentrated fairly evenly in the census tracts from which the data were compiled.

Problems associated with quantifying certain social costs are not, as some might suggest, the principal or only reason why benefit-cost analysis typically does not take into account social costs (or only a few of them). Benefit-cost analysis generally focuses on aggregate costs and aggregate benefits; thus, a project will be judged a social good (i.e., the road will be built) even though many people are significantly harmed. Questions related to incidence and distribution are usually ignored. In connection with benefit-cost studies for water resources projects, Eckstein notes that "one of the criteria on which a project must be judged, and which benefit-cost analysis disregards altogether, is the redistribution of income which a project brings about" (4).

In a thoughtful and concise attempt to explain the emphasis by practitioners in the benefit-cost analysis field on economic efficiency considerations as opposed to "equity" or distribution factors, Weisbrod (5, p. 182) points out that "economists, as scientists, are unwilling to make any explicit assumptions regarding the relative importance of a marginal dollar of benefits (or of costs) to different people. This reticence, which I regard as the primary explanation of the disregard for distributional effects, means that the implicit marginal importances are all equal—that is, a dollar's worth of marginal income or cost has been given an equal weight (equal to one) regardless of the people who received that benefit or who bore the cost. This implicit assumption cannot bear scrutiny, however, and economists have simply made it for convenience."

The most obvious manifestation of this assumption can be observed in the very process of totaling the benefits and the costs of a proposed project. Various attempts to take into account the distributional effects of a project by using weights (5, 6, 7) do not stand up, because the weights are derived from the judgment of the analyst (or the analyst's employer) and not from some objective welfare function. Weisbrod's

effort (5) to develop a model that would integrate distributional and allocative-efficiency considerations is based on several assumptions that would appear to cast doubt on its potential operational value. Weisbrod seeks to avoid introducing his own value judgments by attempting to determine the government's value judgments (i.e., weights), based on past government expenditures and their distributional effects. As Haveman points out in his critique (8), it is doubtful that the government agency involved was conscious of the distributional effects or that they were of prime importance in the decision-making process. Furthermore, Haveman notes (8, p. 210), "these weights are not independent of the number of expenditure programs or individual expenditures included in the model. Analysis of a part of the water resource program, for example, will yield a set of weights different from that secured by analyzing the entire program, which program in turn will yield a quite different set of weights than the highway, urban renewal, or aid to education programs. The point is that the Weisbrod model must... be applied to the totality of federal expenditures if the set of implicit weights applied by the federal decision-maker is to be inferred." Finally, the validity of forecasting future weights or value judgments of public agencies, based on past decisions, appears questionable.

The reluctance of modern economists, as noted by Weisbrod (5), to make comparisons between the utility functions of individuals has its roots in the so-called "new welfare economics" set forth by Bergson in 1938. In an essay (9) in which he traced the history of welfare economics, synthesized its arguments, expressed its theorems and axioms in the form of differential equations, and pointed out its philosophical underpinnings, Bergson showed that the old-fashioned welfare economics was based on the initial premise that interpersonal utility comparisons were acceptable and that a social welfare function would be derived by summing the cardinal utilities of individuals. After Bergson's essay appeared, welfare economists avoided the old initial premise and devoted their energies to developing a social welfare function that was not based on the assumption of equivalence of individual utilities. No post-Bergson attempt to develop such a social welfare function has held up under scrutiny. Samuelson (10) presents in cogent form the reasons why the old assumptions are no longer regarded as tenable but notes that "vestiges (of this line of argument) can be found today."

In their authoritative overview of the benefit-cost field, Prest and Turvey (11, pp. 700-702) point out that, among the various constraints under which benefit-cost analysis functions are distributional constraints, "...income distribution requirements may affect cost-benefit analysis. . .when the authorities have not laid down any specific financial rules but do clearly care about income distribution. In this case it is up to the analyst to invent and present as alternatives a number of variants of a project which differ both as regards the particular people who pay (or who are paid) and the prices charged and, in consequence, as regards outputs and inputs. For each alternative, the analyst will have to set out not only total costs and benefits but also the costs and benefits for those particular groups whose economic welfare is of interest to the decision-maker."

In their conclusions on the state of the art of cost-benefit analysis, Prest and Turvey note that it is fairly straightforward to enumerate the benefits, identify the beneficiaries, and avoid double-counting. They warn (11, p. 729), however, that "on the evaluation of benefits, there are several layers of difficulty. First, there is the point that we are trying to measure surpluses, and this immediately takes us into the vast jungle. . . of the measurability of utility, . . . the comparability of utilities between persons, and so on."

Thus, it appears that benefit-cost analysis fails to deal adequately with equity considerations such as highway location; yet, with the prospect of increasingly densely populated urban areas and increasing national wealth, the questions of who pays the costs, how much, and in what ways with respect to transportation facilities and who benefits are likely to become increasingly important in the decades to come. Highway planners are increasingly sensitive to distribution questions, but they have not developed a workable procedure for dealing with them (12).

The prescription outlined by Prest and Turvey, wherein the technician or analyst undertakes a series of analyses for projects with a number of alternative assumptions, with varying distribution effects, and with the final project decision made by policy-

makers who insert the weights, would probably win the approval of many economists, engineers, and systems analysts in the field. Eckstein (13) appears to recommend a similar role for the technician with respect to policy formulation. In conceding that welfare economics has not (a) proved the superiority of laissez-faire, (b) provided criteria for judging economic changes or optima, and (c) provided methodology for isolating the economics aspects of policy from ethical principles, Eckstein recommends that economists emphasize measurement. The economist may interpret or formulate objective functions, based on policy directions of politicians. Eckstein feels that "the economist can also feel free to perform experiments in policy evaluation using specific objective functions, treating the results as absolutely free of normative significance."

There are, however, several shortcomings with this solution. First, it ignores the fact that benefit-cost analysis, as it is now computed, implicitly assumes the comparability of individual utilities. A second question that can be raised in connection with this approach is this: Which policy-makers are envisioned as the decision-makers who will insert the weights (distributional factors) after the benefit-cost studies have been conducted and select the project or projects? In the case of highways it is apparent that benefit-cost experts generally have in mind highway department officials as decision-makers and not exclusively for technical or engineering decisions but for social choices as well.

The primary thrust of this paper has been to argue that present analytic techniques are inadequate with respect to evaluation of the distribution and incidence aspects of public transport projects and that too great a burden is placed on benefit-cost analysis because it is used, or rather misused, in decisions about urban highway location despite this inadequacy. The root of the problem is that benefit-cost methodology assumes that a dollar's worth of any kind of benefit (or cost) has the same value for all of the individuals on whom the highway has a direct impact. In addition, the discussion has noted the central dilemma of welfare economics, which has not found a solution to the problem of moving from individual utilities to social utility.

Systems analysis, PPBS, cost-effective models, and other modern analytic techniques do not really resolve these thorny issues better than benefit-cost techniques because they provide no way of choosing the objective function. The question of who decides goals is still unanswered. In practice, the objective function is selected by nonelected executive branch personnel, who have no warrant to decide goals and no mandate to use attitudinal surveys as a surrogate for citizens' approval.

A means of getting away from the custom of more or less ignoring the distributional aspects of route location or of leaving the equity judgments to technicians is suggested in a utility model developed by Haefele (14). By the use of a model that combines ordinal preferences and voting stances, Haefele demonstrates that representative government (with the two-party system and single-member districts, as exists in the United States and the United Kingdom) provides a means of moving from individual utilities to social preferences. The essence of this model is to allow vote-trading on independent issues (e.g., highway location, low-cost housing, school construction, and expanded police service). Thus, intensities of preference about these issues can be expressed (i.e., a person can give in on an issue of lesser importance in exchange for support on an issue he values more). Clearly, this kind of vote-trading can occur only when more than one independent issue is being decided by more than one elected official (i.e., in a legislative body).

When state highway department officials, most of whom are civil servants in the executive branch of state governments (wittingly or unwittingly) make equity judgments, they are beyond the realm of their administrative, technical-analytical, and implemental duties. Even if the commissioner or commissioners are appointed by the governor, their responsibility to the voters is too remote for them necessarily to be equipped or motivated to evaluate the distributional effects of route locations in urban areas throughout the state. If, as Haefele's model demonstrates, elected representatives sitting in a legislative body function in a manner that bridges the gap between individual utility and social preference, then it would appear that the appropriate officials

for making route-location decisions are elected legislators in municipal or metropolitan councils, who can resolve location decisions in the context of other local concerns of voters.

The public hearings held by state highway departments in connection with proposed highways are not a valid mechanism for expression of the "popular will" in these matters. The officials are almost invariably civil servants who cannot be turned out of office by unhappy constituents. Under these circumstances the highway officials can claim that the "silent majority" who did not attend the hearings supports the proposed facility and carry on with their plans. Even if the officials presiding at the hearings were elected, the attempt to reach a decision on a single, isolated problem may be futile or long in coming. Moreover, this procedure ignores the advantage of utilizing in the decision-making process relative degrees of concern about different issues. For example, note the statement in The New Yorker article (1) quoted previously, "Having submitted recommendations, it (the State Highway Commission) thereafter acted as the faithful agent of the expressed popular will." Yet, in Kennebunk, Maine, as in other cities and towns in the United States, the state highway department was clearly not equipped to serve as the faithful agent of the public will, even though a vote had been taken on the proposed highway. The social choice issue of the centennial plot was not brought to the public's attention prior to the balloting.

If the suggestion set forth here—that route location (and other distributional aspects of highway and other public works projects) should be made by elected local officials—sends shudders down the spines of highway officials, engineers, and benefit-cost analysts, the fears are understandable. The bulk of the decision-making power was by and large removed from local city and town councils and placed in the hands of highway departments, because local governments were making decisions on highway and other public works projects that worked to the personal profit of local politicians and ignored the economic and technical implications of their decisions. The concept of benefit-cost analysis was borrowed from the U.S. Army Corps of Engineers and the water resources field, and the techniques were refined and expanded to provide some scientific analysis on which to base project decisions. To argue that decision-making powers on issues with distributional considerations be vested in elected local legislative bodies, rather than in the executive branch of government, would appear to be advocating a return to the old ways and to be casting aside the strides that have been made through the refinement and use of analytical techniques.

However, to point out that benefit-cost analysis, and other analytical techniques, cannot deal with distribution matters is not intended to imply that the analytic process should not be used by the legislative branch. Haefele (15) suggests an alternative procedure to that of totaling benefits, totaling costs, and computing ratios. He proposes that the analyst should list (but not sum) all of the benefits and all of the costs (in monetary terms whenever possible; otherwise in physical terms) and the respective incidences and timing of these benefits and costs. This information would then be channeled to the appropriate elected officials who would then make the social choices and select (or turn down) the project or projects. This procedure would bypass the present implicit assumption that utility functions are equivalent and would allow benefits and costs that cannot be expressed meaningfully in monetary terms to be included.

On a related point, Eckstein's comments (13) do not appear entirely appropriate: "Of course, the economist can stop short of this judgment, leaving the evaluation of distributive effects to the politician. But even under this view the economist will find it very difficult to sidestep the distribution issue altogether. After all, he cannot conduct his analyses in terms of the names of the millions of people in his country, and grouping of population into categories—by income class or geography or anything else—already prejudices the distributive issue." It is not clear, for example, that pointing out the incidence effects on low-income or nonwhite citizens or both of a particular route location in a metropolitan area prejudices the distributive issue. While one city council may want to avoid constructing a highway through a ghetto, another city council (or faction within the council) may advocate locating the highway through such a neighborhood.

Highway officials are well aware of the political heat generated by urban highway route location. This heat could be directed toward local legislative bodies, which would have the dual advantage of reducing pressure on state highway departments and at the same time keep the decisions and actions of legislators in the forefront of the public consciousness. This glare of publicity as well as the growth of special organized groups on all sides of the urban highway question would work against a return of highway decision-making to the personal profit of local politicians.

SUMMARY

This study argues that route-location decisions in metropolitan areas are in considerable measure matters of incidence and distribution of costs and benefits. Benefit-cost analysis, with its emphasis on economic efficiency and on aggregate benefits and costs, does not and cannot take into account distributional considerations. Those aspects of highway planning involving issues of distribution are questions of social choice. Economics as a discipline has not succeeded in developing a social welfare function that moves from individual utilities to social preferences. Decisions made by elected representatives of society may well bridge the gap between the utilities of individuals and social utility. Therefore, it is appropriate that urban route-location decisions be made by elected legislative bodies in metropolitan areas.

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