3 Policy Issues

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This workshop was concerned with the applicability of disaggregate behavioral travel models in demand estimation and value of time studies. We were concerned especially with their usefulness in aiding policy decision-making and planning in special situations.

Discussions were stimulated by papers by Lisco and by Hartgen and Wachs, both in this Special Report. Lisco addressed problems involved in the concept of travel time valuation and the determination and application of travel time values. Hartgen and Wachs considered the practical requirements of demand modeling in special context planning and the appropriateness of disaggregate travel demand models in such situations.

FUNDAMENTAL POINTS

No one model or package of models is universally applicable to all transport planning problems. Depending on the problem being addressed, models will differ with regard to the basis for and complexity of their formulation, the level of data disaggregation involved in their calibration, the level of data disaggregation involved in their application, and so on. This is as true of what we have termed behavioral disaggregate models as of any other class of model. Moreover, different models may be appropriate depending on whether the primary concern is prediction, evaluation, or design.

We need to build models that are explicitly directed toward particular policy or planning issues. This means that variables under the control of or sensitive to the policy in question must be included in the model and that the scale of modeling effort involved with regard to model construction, data collection, calibration, and application must be commensurate with the nature of the decision being considered. Moreover, the speed of response of the models must be appropriate to the time frame within which the decisions have to be made.

Transportation system attributes, especially those other than simple time and cost variables, need to be included in travel demand estimation models on the basis of what attributes are important to travelers in their travel decisions if satisfactory explanations of behavior are to be achieved. At the same time system attributes must be included in models on the basis of what attributes are important to the policy-maker if they are to be useful in aiding policy decisions. Environmental and other external costs, for example, may be of major concern to the policy-maker but of little importance to the individual in making travel decisions.

Behavioral disaggregate travel demand models are generically no different from other demand estimation models. Compared to other travel demand models, they are behavioral only in degree. The models developed in the past, whether growth factor models, gravity models, shortest route models, or whatever, are all attempts to model travel behavior. In current models, we are attempting merely to provide a more complete specification of behavior. Similarly, their level of disaggregation is a matter of degree. All statistical estimation models employ data that are disaggregated at some level. Using data that are collected at the level of the individual traveler to calibrate a demand model has significant advantages of economy in data utilization. However, the calibration is no different in kind from that using data aggregated at, say, the household or traffic zone level. In transportation planning we are rarely interested in the travel behavior of individuals as individuals, and even if models are calibrated from data at one level of disaggregation they will often be applied at some other level of disaggregation.

Inasmuch as behavioral disaggregate models are basically no different in kind from any other travel demand models, they are not incompatible with the models used in existing travel demand estimation procedures. In particular, there is no conceptual reason why behavioral demand models cannot be integrated into the generation-distribution-modal split-assignment logic of the urban transportation planning (UTP) models for certain kinds of analyses. The view that behavioral disaggregate models and the UTP models are necessarily incompatible is a mistaken one.

Because behavioral disaggregate models are generically like other models, we have to be concerned with all the problems, difficulties, and requirements of models in general. For example, models are always imperfect representations of the real world and will always be dependent to some extent on the peculiar supply and demand characteristics underlying the data from which they are calibrated. They can never, therefore, be completely general in their applicability, although behavioral disaggregate approaches hold a greater promise of our being able to develop models that are transferable to different situations. Models should be soundly based both logically and empirically. The assumptions and logic of policy-oriented models should be made as clear as possible and be understandable by the policy-maker. The confidence level that can be associated with models and their outputs should always be made clear. Models should be as simple as possible and consistent with the nature and complexity of the issues being addressed.

CONCEPTUAL ISSUES

Travel time savings only have value with respect to their activity contents. Strictly speaking, time cannot be saved; it can only be transferred from one activity to another, and the value associated with the transfer of time from one activity to another depends entirely on the relative utility or disutility of the activities involved. Thus, a minute of travel time saved on the journey from work to home may be valued more or less highly than a minute of travel time saved on the journey from home to work depending on how pleasurable the activities are that are or could be indulged in at either place. A minute saved on a journey by bus will be valued by a traveler more highly than a minute saved on a journey by automobile if riding in a bus is considered less pleasurable than riding in an automobile. A minute saved on an automobile journey in congested traffic may be valued more highly than a minute saved on an automobile journey in free-flowing traffic, and so on.

The recognition that only savings in time spent doing something can practically be considered to have value has many implications for value of travel time models. Basically it means that only times of similar activity contents can be aggregated, compared, or valued together. A frequently voiced criticism of past value of time studies has been that they have shown wide variation in results. Although many of the criticisms of methodology are undoubtedly valid, the criticisms of the results may be less so. To the extent that the different studies considered savings in time spent in different ways, they should be expected to produce different values. Many models have recognized the significance of activity content in time valuation by considering walking, waiting, and in-vehicle time separately. Future models both to predict travel demand and to evaluate system improvements perhaps need to be structured in terms of an even finer stratification into different kinds of time—for example, time spent traveling in comfortable conditions and time spent traveling in uncomfortable conditions. Empirical constraints of data collection may, however, pose major difficulties.

The problem of how to measure and include in models attributes of travel other than time and cost—especially qualitative measures of comfort and convenience—is of current concern to many researchers. The fact that most attributes of travel are experienced over time may provide a solution to this problem of measurement: In some instances it may be appropriate to model an attribute such as comfort not in terms of the relative level of the attribute itself but in terms of the relative time spent experiencing a given level of the attribute.

A continuing point of contention among some researchers is the issue of whether a monetary value of time or of time savings is a meaningful concept at all. It can be argued that time cannot be transferred between individuals, nor bought nor sold in a marketplace, nor saved for use in a future period. Each person has neither more nor less time than 24 hours a day, and this passes at a constant rate. How then can economic theories of marketing be appropriate to the peculiar and nonmarketable good of travel time? Such conceptual issues can only be settled by a consideration of the activity content of peoples' time. The distinction, if any, between the value of time and the price of time is an issue that has yet to be finally resolved. So, too, are questions of the value of small amounts of time and the relation between average and marginal values.

Should perceived or objectively measured values of time, cost, and other attributes be included in models? Perception is the basis of traveler behavior, and so perceived values should be used to best explain and predict choice. But if the purpose of the model is economic evaluation of the costs, benefits, and resource allocations associated with transport alternatives, objective attribute values should be used. Pragmatically speaking, moreover, the difficulties of predicting peoples' perceptions will generally require objective values to be used. The development of models expressing the relations between perceived and objective variable measurements may become an important aspect of future travel demand models.

An advantage of behavioral modeling approaches is held to be that they allow models to be developed that are transferable to situations other than the ones for which they were calibrated. Implicit in this objective is the feeling that there are universal or generalizable patterns of traveler behavior. This feeling has been questioned and is perhaps likely to continue to be a point of some contention.

CURRENT POLICY ISSUES

We have concluded that demand estimation models must be developed to assist in specific policy or planning questions and that no one model or class of models can be expected to answer all questions of policy. Consequently, to give any meaningful answer to the general question of what the implications are for behavioral disaggregate demand modeling of current policy questions without considering specific policy questions is impossible. Nor is it possible to assess the appropriateness of behavioral disaggregate demand models in general for answering policy questions in general. We will not, therefore, attempt to give answers to these questions here, either in general terms or with regard to specific policy questions. We do, however, feel it is worthwhile to restate some of the current policy issues that models will be required to address and that should consequently determine the direction of future modeling efforts.

As transportation planners we are likely to be increasingly concerned with situations in which severe constraints are applied to the environment in which travelers must make their travel decisions and in which the transportation system must operate. The most obvious of these constraints are more stringent environmental standards for air pollution and noise levels, more expensive and less easily available fuel, and political and social pressures associated with these and other environmental issues. Given these constraints, the most important policy issues will be those dealing with how and to what degree travel demand should be controlled to achieve environmental objectives such as air quality or fuel conservation. Some of the policy options that have been and will be considered as means of controlling travel demand are as follows:

1. The availability and price of fuel may be controlled;
2. The use of the private car may be restrained in other ways such as by increasing parking charges, by charging for the use of road space through congestion tolls, licenses, or other road-pricing schemes, or by prohibiting private cars on certain streets at some or all times of day;
3. Public transport ridership may be encouraged by reducing or eliminating fares, by improving frequency, comfort, reliability, and other characteristics, by marketing such improvements, and by providing public transit with operating advantages over private transport by the provision of exclusive lanes and other priority schemes;
4. New transportation systems such as people movers, personal rapid transit, demand-responsive transportation, and jitney systems will be considered as will low-capital options such as incentives to encourage car pooling; and
5. The "do-nothing" option by which road congestion is itself allowed to control demand will inevitably, by default, arise as a policy option.

In evaluating alternative policies to control travel demand, policy-makers will have major concerns about the effects on travel generation in absolute terms; that is, how much travel will be suppressed or generated as the result of implementing a particular control policy, and what will be the effects on origin-destination distribution patterns? Assessment of the likely effects on land use redistribution will be important, especially the movement of employment and other activities into or out of the city center. Of major concern, also, will be the implications for the movement of essential goods and services in the city.

DIRECTIONS FOR FURTHER RESEARCH

A number of issues of modeling concepts, methodologies, and policy requirements have been mentioned in previous paragraphs, each of which implies the need for further research and development effort in specific areas. Underlying most of these is a basic need for an improved and deeper understanding of the motivations and rationales underlying traveler behavior. Especially important is the need to improve our understanding of the way in which travelers perceive the characteristics of both travel alternatives and the activities for which trips are made and the relative importance that they attach to those characteristics in making their travel decisions. Although the dominant feeling of the workshop was that future model development efforts should emphasize the need for simplicity and policy orientation in model application, we would agree that there is certainly a place and a need for continued "pure" research of travel behavior. An emphasis on consideration of the activities that do or could take place over time may be an important and fruitful avenue of such further research.

Further research is required into several aspects of the question of what attributes of travel alternatives should be included in travel demand estimation models, and how. The question of whether the model is to be used primarily in predicting or in evaluating the economic benefit associated with changes in travel mode characteristics will be important. The question of what travel attributes should be included in models should be considered from the viewpoint of the traveler or the viewpoint of the policy-maker depending on the problem being addressed. The question of whether perceived, objective, or other "attitudinal" attribute measures are appropriate will also depend on the problem being addressed. Policy variables may be included directly and explicitly in the model, or they may be included indirectly as attributes to which travel behavior responds. Two-stage modeling approaches may be implied in which the effects of policy decisions on travel attributes and the effects of travel attributes on travel behavior and demand are modeled sequentially. The appropriate model form in any situation must be developed with regard to specific planning decision issues.

The increased emphasis on policies to control travel demand in urban areas has a number of implications for the requirements of future demand estimation models. Behavioral modeling approaches need to be applied to the trip generation, attraction, and distribution phases of demand estimation as well as to modal choice. The problem of how to estimate the absolute increase or decrease in travel resulting from changes to the transport system will become even more pressing when traffic restraint policies must be assessed. The changes in the distribution of land use and land use activity resulting from changes in the transport system are a closely related and equally important area where further model development work is urgently required. For example, the effects of traffic restraint on the movement of business activity out of the central business districts of cities are likely to be a major concern of policy-makers in the future. Behavioral modeling approaches based on the home and work location decision-making behavior of individuals or firms may be appropriate in addressing these model development needs.

SOME PRACTICAL SUGGESTIONS

In the last 10 years, a great deal of research has been done on issues associated with behavioral travel demand models and value of time estimation. Research findings have been fairly effectively disseminated through transportation research journals, research reports, and conferences. We have reached the point where this body of literature is too great for any one researcher to review comprehensively. As future research and development work is completed and reported and as the results of the application of models to practical planning issues become known, there will be a pressing need for the comprehensive review and dissemination of research findings in the field.

The function of information dissemination should be undertaken by a single central agency. This agency should (a) prepare and publish independent critical reviews of all work done internationally in the behavioral demand modeling field; (b) summarize and compare in a consistent way the assumptions, methodology, and results of different model development efforts; and (c) publish relevant research findings in the form of comprehensive guidelines and manuals for data collection and model application and update these guidelines as further research results indicate.

The function of information dissemination and coordination might most effectively be accomplished by an agency of the federal government, such as the U.S. Department of Transportation. The dissemination and coordination of research information in the field would be an important complement to the function of the federal government as a supporter of travel demand model research and development.

In making this suggestion, we recognize there are likely to be reservations among both researchers and practitioners concerning the role of a federal agency as the arbiter of research activity. These reservations, which were held by some members of the workshop, apply particularly to the extent to which a government point of view can be expected to be a truly independent one. Furthermore, the practical constraints of the availability of suitably qualified personnel within existing agencies may preclude their adding such a task to their other responsibilities and commitments. Nevertheless, we feel there is a need for a positive and authoritative dissemination of research information on the subject of behavioral demand modeling and that a federal government department may best direct and support such an activity.

The UTP package of computer models, which is currently maintained by many state and local planning agencies, is cumbersome and inappropriate for most of the planning and policy issues that we currently face. Even so, maintaining those models frequently consumes large resources of trained and qualified personnel. Because so many of their people are occupied in maintaining the UTP model, many planning agencies are prevented from developing more appropriate planning tools. Short of abandoning the current UTP models altogether, there is no easy way out of this circle. However, it seems clear that the present state of affairs often represents a poor use of manpower resources. During the conference, we heard pleas for increased government support of behavioral modeling efforts. While supporting these pleas, we feel that the manpower resources and funds already available for planning model development could and should be put to much better use by redeploying some resources away from the maintenance of large-network UTP models to the development and application of more responsive, policy issue-oriented behavioral models of travel demand.