CHAPTER V: REVIEW

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TN 16, 3 and 29 provide examples of three distinct approaches to the measurement of the supply of spatially distributed facilities. The first paper describes an ad hoc measurement technique that is, for the most part, based on unstated assumptions about user behaviour. The latter two papers explicitly or implicitly assume that evidence about behaviour is necessary to estimate a supply measure. Recognizing that the attractiveness and distance exponent parameters of TN 3 can be empirically estimated, the major distinction between it and the last paper (TN 29) is that in the latter estimates of a place's supply are made without the analytical problems and the expensive, detailed behavioural data associated with estimating a distance exponent and separate attraction values for each activity-site combination. It may be argued that this saving is made with a possible sacrifice of validity. How can such supply factors be changed to reflect changes made in the supply of an area? In a similar vein, TN 16, which requires the least specialized (and therefore least costly) data and produces the most stable results in terms of test-retest reliability, probably makes the greater sacrifice of validity. Thus, the three papers in the order 16, 29, 3 reflect a progression in the trade-off between ease of data collection and supply estimation on the one hand and the ultimate validity on the other.

One thread which emerges from these papers is that total participation increases as total supply increases, although greater supply leads to greater competition for customers being faced by any single recreation site (in competition with the others which go to make up the total supply). Inevitably there is a level of total supply above which diminishing returns set in for individual sites. But at lower levels of supply it is quite conceivable that the competitive effect of additional supply is more than offset for the individual site by the increase in overall participation generated by the supply increase. In the private sector it is conceivable that the supply level above which diminishing returns set in for individual sites might be the optimal supply level from the entrepreneurs' point of view. (For other approaches to this problem, see Reference 00????.) However, in the public provision of recreation sites, a higher level of supply might be deemed proper since it would produce a lower density of use at individual sites and perhaps, therefore, a higher quality of recreation experience.

TN 16 illustrates a conventional "accounting" method of measuring supply. In order to make a variety of decisions, the "accountant" requires operational definitions of variables (such as the amount of camping facilities at a site) and other factors used to compute total supply (such as the average length of stay and the number of usable days at a site per year). The basic question about the validity of this approach relates to whether users of these facilities perceive supply in terms of the same variables and factors as does the planner-"accountant". This is a valid consideration if it is argued that site use ultimately depends on the (perceived) quantity and quality of supply.

In general, a supply measure is highly dependent on a host of behavioural assumptions, often untested, about such things as the acceptable density of sunbathers on a beach, the average length of stay at a site for a particular activity, and the average friction of distance for an activity. Without precise behavioural information to replace these assumptions the available measures of recreation supply are at best tentative, if not misleading. Only if there happened to be a high correlation between the perceptual measures and the "accountant's" measures would the difference in the users; and planners; accounting procedures be of minor importance. In that case, planning a proper regional distribution of recreation facilities could be properly based on the "accountant's supply measures". The main advantage of the method is the relative ease of supply measurement and the test-retest reliability of such measures.

The fact that no measure of distance between users and sites is incorporated in the supply calculation, in the manner (say) of a market potential model, might be thought of as a serious weakness of TN 16, which simply defines sites as equally accessible provided they can be reached "by car and/or after a short walk". The degree of accessibility of recreation sites, which range from a few miles to hundreds of miles from population concentrations in some cases, is clearly a critical determinant of the effective supply of recreation sites. However, the attendant problems of adding a distance component to a supply measure are well illustrated in TN 3, which shows that the measure of an origin's supply of recreation facilities varies considerably with changes in the size of the distance term's exponent. This variation would be of little concern to the recreation planner if the supply measures of all places changed by the same proportion, as the value of the exponent was changed.

It can be indirectly inferred from Table 1 in TN 3 that the foregoing is not the case. For example, the larger the exponent, the less important are more distant recreation facilities in contributing to an origin's overall recreation supply. Consider two origins, one with major recreation sites nearby, the other with its major sites at a greater distance. If a large distance exponent is assumed, the first origin has much greater effective supply than the other, but if a very small exponent is assumed, the differences between the two origins; supplies is slight. Inevitably, planning decisions as to whether an origin is relatively undersupplied or not, particularly in situations more complex than the above example, depend very much on the distance exponent assumed. Though TN 3 does not discuss empirical estimation of the exponent, it does clearly illustrate the effect that variations in the distance exponent have on location-dependent supply measures, and the importance of reliable empirical estimates of the distance exponent for recreation supply measurement.

In the same paper it should be noted that in defining the alternative factor as a measure of overall competition for the users from one origin, the implication is that t(i,j), the number of trips from i to site j, is partly a function of the level of competition from other sites. This in turn implies a choice model of trip making, in contrast to the widely-used unconstrained gravity model which assumes t(i,j) to be a function of only the characteristics of i and j and their distance apart, but not related to the nature of alternatives. Surprisingly, no direct empirical comparisons have been made of the predictive power of these two types of model of interaction behaviour. Since the gravity model can be seen as a special and simplified case of the choice model incorporating an alternative factor, an obvious question is whether the more complicated, general model enhances prediction of trip distributions sufficiently to merit the extra calibrating effort that its use involves.

One form of indirect answer to this question is to acknowledge that high R^2 values have often been achieved in calibrating gravity models against trip distribution data. However, in their concluding statement, Beaman and Smith caution us that high R^2 values are no guarantee of the appropriateness of a model. An illustration of this point, in the form of a high R^2 value obtained using a misspecified gravity model calibrated against data that were in fact consistent with the more general choice model, is provided in Reference 00??. Recognizing the problems associated with empirically estimating distance exponents as well as site attractiveness scores, TN 29 seeks to avoid these parameter estimation problems entirely by adopting a different, though still behavioural, approach to the measurement of supply. It attempts to measure the local supply of facilities for a recreation activity by using as a surrogate of supply the participation rate in that activity suitably discounted in terms of local socio-economic population characteristics. However, certain interpretation problems do arise. The reasons why over or under participation in any region is inferred to indicate an over-or under-supply of facilities in that region, rather than to reflect some other possible causes, is discussed in the paper itself.

Two associated issues deserve comment. Firstly, the inclusion of city-size levels as predictors of participation along with socio-economic variables implies that some of the regional variation in participation is related to the size of the city participants live in. However, unlike the effects on participation of education or income, over which the recreation planner has no control, the effect of city size level may reflect locational constraints on participation similar in effect to inaccessible supply. Specifically, the larger the city, the less readily accessible are surrounding recreation facilities on account of the time involved in travel within larger cities. Thus, a lower participation by large-city dwellers may reflect a less accessible supply of recreation facilities, rather than some innately lower propensity to participate. it could be argued, therefore, that in Equation 3 in TN 29, it is improper to include a city size effect as that will decrease the value of the expected level of participation of individual i, in region g, In activity a. Without that term in Equation 3, the resultant larger values of in some areas would decrease the supply factor estimate, and if the above assumption is accepted, more accurately reflect the extent of (accessible) supply in areas with large cities. Clearly the recreation planner cannot influence personal attributes such as education or income. Yet he can modify the effect large cities have on their inhabitants, for whom rural recreation facilities' are made more distant by the intervening speed—restricting urban space. If supply factors were low for these areas, he could locate recreation facilities close to the edges of, or within the boundaries of, the larger urban areas. Certainly the question of whether to exclude that factor from Equation 3 deserves further consideration.

A second issue relates to the assumption implicit in the paper that there is a relationship between participation levels and supply levels. From a positive view, it is possible to consider supply as measured in TN 3 by Beaman and Smith and as measured in this paper as complementary. In other words supply factors can be viewed as intrinsically a perceptual measure of supply as reflected by people's participation, whilst the gravity model measure:

$$\Sigma[A(j)/F(D(g,j))]$$

can be considered as a more direct measure of supply "on the ground". This being so, a useful exercise would be to consider supply factors as the dependent variable and alternative factors as the independent variable in a possibly non-linear regression model. Clearly, if the latter were a good predictor of the former, knowledge of the regressed relationship would simplify the estimation of future participation increases in any area resulting from increases in the supply of particular recreation facilities. And, of course, the shape of the function relating the two variables would provide valuable evidence about the varying marginal utility of extra supply for any given existing level of supply as measured by the independent variable.