5 Traders Versus Nontraders

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The terms traders and nontraders in the context of the analysis of modal split date back to one of the first studies in this field (1). Beesley distinguished between travelers who faced a choice between a faster but more expensive mode and a slower but cheaper mode (the traders) and between travelers who faced a mode that was both faster and cheaper (the nontraders). In his sample of about 1,100 travelers, less than 30 percent belonged to the first group. The percentage of traders in other samples was even lower (2, pp. 49-53). Furthermore, it was found that estimates of the value of time based on the sample as a whole differ significantly from those attained in a sample consisting exclusively of traders.

Given the large fraction of nontraders in the population and given their effect on the estimates of the value of time, which is the right method of estimation? If it is necessary to exclude nontraders, an additional question must be answered: Can one use the estimates of the value of time (estimates based solely on traders) for the valuation of the benefits of projects that also involve nontraders? The answers to these 2 questions are the focus of this paper.

To an economist the distinction between traders and nontraders or, more specifically, the existence of nontraders may verge on sacrilege because economists believe that all people are born to be traders. We trade services (labor and capital) for money and money for goods and services. Thus, their specific situations and not their characteristics make persons nontraders. It is therefore worthwhile to generalize Beesley's definition and examine some of its ramifications.

Given a situation where a person has to choose between n alternatives on the basis of k characteristics, we have to distinguish between those cases where there is 1 alternative (among the n) that is perceived to be dominant (i.e., is superior in all k respects) and the case where there is not. In the first case the person is a nontrader; in the second case the person is a trader. Let me start with some of the most trivial implications of this definition.

When n = 1 (i.e., there is no choice) the person is a nontrader.

The definition hinges on the existence of a dominant alternative and is independent of the actual choice made. Thus, if a person seems to behave illogically, i.e., if a person is in a situation where a dominant alternative exists but still chooses an inferior one, he or she is still defined as a nontrader (in this case an illogical nontrader).

Trading or nontrading is not a property of the person but relates rather to the situation. A person may face a dominant mode of travel (say, car) and hence be a nontrader where the choice of modes is concerned, but be a trader where the decision about which route to take is concerned. Furthermore, the situation that makes a person a nontrader may be the outcome of a trading decision. Thus, the location of the household, which

is a major factor in the determination of the feasible alternatives, is in the long run not exogenously given, but is often decided on the basis of a comparison of (among other factors) the cost of traveling (including the opportunity costs of time) versus the cost of housing.

The classification of the population into traders and nontraders depends on the number of characteristics k. Travelers who may be considered to be nontraders if the decision process is confined to $k = k_o$ characteristics may be regarded as traders if the decision set is expanded to $k > k_o$ characteristics. An increase in k may, therefore, convert some nontraders into traders (the opposite cannot happen).

Finally, though the distinction between traders and nontraders may seem to be an objective one, it is not necessarily so. Our definition depends on the "perceived" characteristics that may differ from the objective ones [this is particularly true in the case of the cost of cars (see the paper by Beesley in this Special Report) and where the measurement of time is concerned (6)]. Thus, we talk about perceived dominance rather than objective dominance.

The existence of nontraders does not create any difficulties in the prediction of the modal split. On the contrary, the greater the percentage of nontraders in the population is, the easier the tasks facing the forecaster are. In the extreme case where the population consists solely of nontraders and where the forecaster predicts the modal split on the basis of traveling time and costs, the odds for a correct prediction exceed 9:1 (the illogical nontraders being, in general, less than 10 percent of the nontraders).

The distinction between traders and nontraders becomes important when one tries to analyze the general decision procedure determining travel choice. Specifically, this distinction is important when one tries to estimate the value of time. Assume that a person makes a modal choice on the basis of a generalized cost function, Π, and prefers mode 1 to mode 2 if

$$\Pi_1 < \Pi_2 \tag{1}$$

This cost function consists of 2 parts, the money cost, P, and the opportunity cost of time, KT (where T is traveling time and K is the value of time).

$$\Pi = P + KT \tag{2}$$

The decision criterion governing the choice of mode calls for the choice of the faster mode (mode 1) if

$$K > (P_1 - P_2)/(T_2 - T_1) = K^* \tag{3}$$

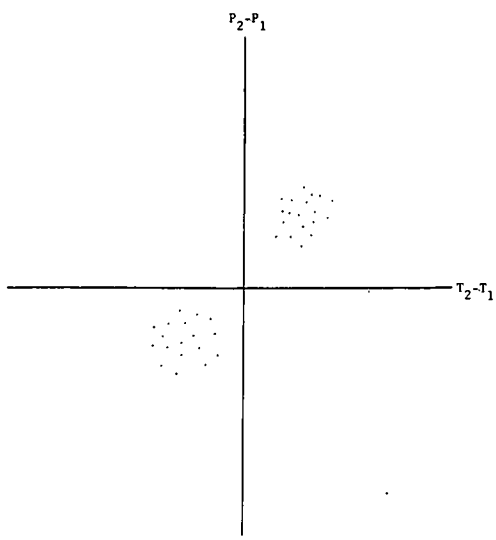
i.e., the faster mode is preferred if the value of time exceeds K^*, the ratio of the money costs differential to the time differential. The faster mode is always preferred when K^* is negative, i.e., when the faster mode is also the cheaper ($P_1 < P_2$). Thus, the choice of nontraders is consistent with any value of K as long as the value of time is positive. Put differently, the behavior of nontraders does not have any informational content as far as the value of time is concerned. This is particularly true in the case of illogical nontraders (i.e., those who face a negative K^* but choose the slower mode) because they clearly act according to different rules.

How does the existence of the nontraders affect the estimation procedure of the value of time K? As we emphasize above, nontrading is a property of the situation, not of the person. Thus, though a traveler may be a nontrader when it comes to modal choice, he or she may be a trader in a different context. The value of time may be irrelevant to the decision on what mode to travel by, but it may still affect the number of trips the nontrader takes. Assuming that the generalized cost function, Π, affects the demand for trips by a given mode, one may infer the value of time from the estimated demand function (3, 5), regardless of the percentage of nontraders in the sample.

The more common method of estimating the value of time, however, is based on data reflecting binary choice. How should nontraders be treated in this estimation procedure? It is obvious that the illogical nontraders have to be removed from the sample because

their behavior clearly contradicts the model, their choice being made on more than 2 characteristics. But what about the logical nontraders? Admittedly their behavior cannot teach us anything about their price of time, but does it impair our procedures?

If nothing else, simplicity and the saving in computation cost call for the exclusion of irrelevant data (particularly if a nonlinear iterative estimation procedure such as probit is employed). But it seems that there are far more serious reasons for removing the nontraders from the sample. Thus, let us assume a population consisting exclusively of logical nontraders, some of them choosing mode 1 and some choosing mode 2. Diagrammatically the first group is concentrated in the first quadrant of the sketch below, while the second group is located in the third quadrant. Using discriminant analysis to discriminate between these 2 populations should provide a perfect match.



Moreover, though there are an infinite number of lines separating the 2 populations, the discriminant analysis picks 1 line—the one that yields the greatest variance between samples relative to the variance within samples. Thus, if, for example, one regresses a binary variable (0, 1) on K^* to obtain an estimate of the value of time, there will be nothing in the results to warn the analyst that all the values of K^* are negative. The outcome (i.e., the slope of the discriminant line) will be interpreted as the value of time, though it clearly is merely a technical result. Mixing data of traders and nontraders, therefore, yields biased estimates of the value of time.

To prevent this kind of bias, one must exclude the nontraders from the sample. But the distinction between these 2 groups is based on perceived characteristics. This makes it all the more important to collect data on the perceived costs and time of travel. Only these kinds of data will allow the analyst to escape the pitfalls of nontraders.

Finally, can one use estimates of the value of time derived from a sample of traders for the evaluation of the benefits of, say, a road improvement that is also used by nontraders? The answer at this point seems clear. The value of time depends on the socioeconomic characteristics of the traveler—income, age, education, family composition [the determinants of the value of time are discussed in a somewhat different context in another report (4)] as well as the time scarcity facing the traveler at a given moment (e.g., an emergency). This value is intrinsic to the person and independent of the transportation choice faced. On a first approximation, travelers with the same socioeconomic characteristics whose trip purposes are the same have the same value of time. The exclusion of nontraders from the estimation procedure does not impair the applicability of the results so long as the estimates of the value of time are adjusted for possible differences in the socioeconomic characteristics of traders, nontraders, and new entrants.

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