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# THE PRIMARY DESTINATION TOUR APPROACH TO MODELLING TRIP CHAINS

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## Introduction

The demand for travel is primarily derived. That is, underlying travel demand is a more fundamental demand by individuals for the activities, goods and services that can be obtained by visiting different locations. The decisions made by travellers which are visible in their travel patterns are thus primarily decisions concerning their participation in activities, the length of time to be devoted to each activity and the location and scheduling of the activities, all determined within the time and cost budgets of the individual and his or her household.

Given this view of travel, the appropriate unit of travel for modelling is the amount required to participate in a particular activity. Most often, this will be a complete "tour", departing from home to the location of the activity and returning to home afterwards. An alternative is to incorporate a visit to the activity as a "detour" from a tour being made to one or more other locations. The use of tours and detours as units of travel contrasts with the more usual use of trips, one-way movements, one or two of which may be generated for each activity.

The primary advantage of representing travel as tours is thus that travel can then be linked more rigorously with the requirement to take part in activities, which is regarded as more fundamental. An important aspect of this link is that it addresses very directly the possibility that activities may be conducted at home (which may become more important with improved telecommunications). The tour approach also offers several further advantages.

First, it gives a theoretical framework for the treatment of non-home-based travel. In contrast to the somewhat shakily-based treatment of non-home-based trips, for which both attractions and generations present difficulties in modelling satisfactorily, the tour approach offers a systematic framework. This framework consists of a hierarchy of "importance", where one activity visited on the tour is represented as generating the tour, and travel to the other activities is represented as conditional on the primary activity. This framework is already partially implicit in most transportation surveys, when travellers are requested to omit details of "incidental" stops on their journeys. Naturally, the definition and justification of the "primary" ("secondary", etc.) destination requires considerable care: this is the subject of the first section of this paper.

Second, the fact that all the trips on a tour are considered as part of one unit allows a number of real-world constraints to be incorporated in the modelling that would otherwise be omitted. For example, a traveller who leaves home by car or bicycle will normally return by the same mode; this very natural linkage cannot easily be introduced into a trip model. Similarly, the outbound trip in a tour must take place earlier than the return trip, and the time difference between the trips is of course a function of the time spent on the activity.

Modelling can also be improved because certain travel characteristics are more accurately represented on a tour basis than on a trip basis. Mode and destination choice is improved because the whole journey can be considered, rather than the one-way trip. Frequency (generation) models can be improved, because the focus is on activity participation rates, which are fundamental, rather than on trip rates, which may be a function of rather arbitrary classifications. These modelling improvements and other practical considerations are discussed in the second section of the paper.

In general, tour models can be developed in much the same way, using the same concepts and structures as trip models. However, the modelling of detours raises some new issues. These are discussed and some models of secondary destination choice are presented in the third section of the paper.

Considerable research has been undertaken in the areas of activity participation and scheduling and trip chaining behaviour in general. Space precludes a review of this work in the current paper (see Damm, 1982; Kitamura, 1984). The research and modelling presented here is believed to be original in its practicality, and that it is incorporated in substantial forecasting systems.

## 1. DEFINITION OF THE PRIMARY DESTINATION

Two major studies in The Netherlands have considered the definition of the primary destination.

### 1.1 The Zuidvleugel Study

In the Zuidvleugel project the development of a complete travel demand forecasting system was undertaken (see Daly and Van Zwam, 1981; C.S.E., 1981). Travel was modelled using the tour approach instead of the trip approach (Weisbrod and Daly, 1979; C.S.E., 1979). Three alternative definitions of the primary destination were originally considered in the Zuidvleugel study: (1) the destination that is the furthest from the (home or work) base, (2) the destination whose purpose is highest on a ranking list of importance, and (3) the destination at which the longest amount of time was spent. The importance list approach is not desirable because it is arbitrary and there is little agreement on this topic, other than that going to work and school are usually more important to travellers than other destinations visited along the way. A preferable approach for identifying the primary destination is to infer the relative importance of destinations from each individual's behaviour. The use of time spent at an activity is one such measure of importance and the only convenient measure available in the Zuidvleugel data.

In the Zuidvleugel study, 26,884 trips reported in the travel survey were organised into 11,470 home-based tours. It shows that 17 percent of the tours include multiple destinations and, thus, according to the primary destination approach, require a primary destination to be identified. Implications of the activity time criterion for ranking destinations are shown in Table 1, which represents the average activity time and distance from home for each type of primary destination chosen. The average activity time spent and the average distance from home was far higher at work-related destinations than at any other type of destination, suggesting that the chosen strategy of workplace precedence would seldom yield a different primary destination than that identified by either activity time or distance criteria. Shopping destinations, which had the shortest average activity time, also had the shortest average tour length. Education tours, however, had one of the longest average activity times, but also one of the shortest average tour distances. On intuitive grounds, the activity time criterion appears to yield a ranking of destinations that is more reasonable than that of distance from the home.

The strategy finally adopted in the Zuidvleugel study was to choose as primary destination that destination which is highest in the following ranking:

(1) usual (fixed) workplace;
(2) other work-related destination;
(3) the non-work destination with the longest activity time.

Although this ranking was somewhat arbitrary, it was felt to be the best possible from the data available for the study.

## 1.2 The Overdraagbaarheid Study

The Zuidvleugel convention for the identification of the primary destination was later used in the modelling of tours during estimation of the Overdraagbaarheid (O.V.D.) travel forecasting system (see Gunn and Pol, 1985; Gunn, Ben-Akiva and Bradley, 1985). Importantly, for this study the survey instrument asked respondents to record which destination in the tour was the most important. The 'primary' destinations derived by the ZVL rule coincided with the self-reported "most important" destination in 94% of tours. However, approximately 75% of the O.V.D. tours are tours with less than two destinations, or with only one destination other than exchange points. Hence the "true" prediction success rate of the Zuidvleugel convention is (94-75)/(100-75) or 76%.

There thus appeared to be some scope for improvement. Investigation of the mis-predicted cases showed up some systematic effects which were not in accord with the simple Zuidvleugel convention. For example, medical appointments were frequently linked with less important, but longer duration, activities such as shopping or social.

Some simple amendments were made to the Zuidvleugel primary destination algorithm to incorporate such effects; this took the form of an extended hierarchy, in which the following destination purposes were ranked first in terms of importance, regardless of time spent, in the following order:

(1) fixed workplace
(2) medical treatment
(3) non-fixed workplace
(4) education
(5) private business
(6) durables shopping
(7) daily shopping

Social visits, recreation, church, serve passenger, deliver/pick up goods and "other" were then ranked in order of activity time. Lower in the ranking were mode interchange stops, followed by home or new-overnight address.

However, this sequence (and several similar ranking schemes) did not improve the success rate in matching the self-reported data; the number of mismatched observations matched under the new scheme was in each case offset by a corresponding number which became mismatched having previously been correctly allocated.

### 1.3 Modelling the Self-Reported Primary Destinations

This approach of testing various destination importance ranking lists having both time-consuming and unenlightening, a rather different analysis was conducted into the most effective ways to predict which of a set of destinations in a reported tour would be judged the "most important" by the traveller.

In this analysis, the tour data was processed to isolate those tours which had at least two "real" (i.e. non-interchange) destinations other than home or new overnight address, and in which there was a "self-assessed" primary destination amongst the first five of such destinations. The restriction to five was purely for convenience. 1345 tours remained.

Records were formed for each of five possible alternatives, being the choice of the 1st, 2nd, 3rd, 4th or 5th destination as the most important. Each alternative was also characterised as chosen, rejected, or unavailable. The model underlying the analysis was that the "importance" of each destination can be represented as a function of the activity time at the destination, the type of activity and the order in which the destination had been visited, together with an effect from all other influences and considerations. With the usual assumptions about the distributions of the total effect of all omitted variables, and the hypothesis that the self-reported "primary" destination is that which maximises importance, we can justify a logit analysis to establish the various contributions of order, time and purpose to the "representative importance."

Several such models have been run and are reported here. The variables involved are as follows: four dummy variables for order of visit, six dummies for purpose and activity time (ACTIM).

As usual, the dummy variables take the value zero unless a particular condition holds. The conditions in this case were as follows;

DUM2 : one if PD (primary destination) was second destination;
DUM3 : one if PD was third destination;
DUM4 : one if PD was fourth destination;
DUM5 : one if PD was fifth or subsequent destination;

thus all four equal to zero implies the PD occurred on first stop.

DUMWORK24 : one if PD activity was regular work;
DUMWORK25 : one if PD activity was business visit;

DUMEDUC : one if PD activity was education;
DUMMEDIC : one if PD activity was medical;
DUMSHOP : one if PD activity was shopping;
DUMPRBUSI : one if PD activity was personal business;

thus all five of these equal to zero implies that the PD activity was social or recreational.

The first four columns of Table 2 set out the first four models run. Column A presents estimated coefficients with t-ratios in parentheses, for a single, additive model fitted to the entire subsample of tours. With the exception of the dummy variable distinguishing personal business destinations from all tour purposes other than work, education, medical or shopping, all the coefficients are strongly statistically significant. The sizes and signs of the coefficients are also in accord with intuition. The importance of destinations declines as the order in which they are visited increases, other things being equal. regular work and education are the most important purposes; medical destinations follow and business destinations are also more important than the remainder. Shopping destinations are less important, other things being equal. Columns B, C and D set out the results of fitting the same model to subsets of 2, 3 and 4 or more destination tours, respectively. With a very few exceptions, there is a remarkable consistency between the four sets of coefficients. Only the coefficient of the activity time variable shows any sign of systematic variation.

In the last two columns, E and F, models are reported for two further subdivisions of the data, this time into male and female travellers. Once again, the overall resemblance of the coefficients is marked. The importance of the work purposes is less in the tours reported by females and in fact business appears less important than the reference group of activities. In statistical terms, however, neither of these effects is highly significant. There is strong evidence for a difference in the importance of activity time differences between the sexes.

As a system for assigning importance to destinations in a tour, the models seem reasonably well-defined and quite robust. The influences of the various effects seem broadly in accord with intuition. However, in terms of their success in correctly matching the self-assessed "primary" destination, none of the various models performs as well as the Zuidvleugel convention. Table 3 sets out the prediction success rates for the various specifications.

The reason for the difference is clear; the logit model coefficients are chosen to maximise the likelihood of the observed data, not the number of successful "maximum importance" predictions. As always with such models, they are highly sensitive to outliers, i.e. observations which appear highly illogical in terms of an "average" decision rule.

## 2. DEVELOPMENT OF TOUR-BASED TRAVEL DEMAND MODELS

### 2.1 Characteristics of Primary and Secondary Destinations

Some analysis was done in the Zuidvleugel study comparing the travel characteristics of primary and secondary destinations using the chosen algorithm for primary destination identification. Here we will briefly summarise the findings of comparing the purpose and mode characteristics for the primary and secondary destinations of all multiple-destination (home-based) tours.

The analysis determined that the distribution of purposes for secondary destinations was very different from that for primary destinations, and that a majority of the multiple-destination tours involved different purposes for the two destinations. The "usual workplace" is, by definition of the ranking algorithm, always a primary destination. Education locations are overwhelmingly primary destinations. Shopping destinations, on the other hand, are more likely to be secondary destinations than primary ones. These differences between purposes at the primary and secondary destinations are consistent with the behavioural theory underlying the definition of the primary destination.

Unlike destination purpose, where differences between primary and secondary destinations are substantial, it was found that there was relatively little difference in mode choice between primary and secondary destinations. Over 82 percent of the multiple-destination tours in the Zuidvleugel survey involved the same mode to both destinations. Three-quarters of the cases of mode switching were switches to or from the walk mode. Since mode choice was not a direct factor in the identification of primary destinations, it is not surprising to see that a few tours involved walking to the "primary" destination and automobile travel to the "secondary" destination. In general, however, mode choice to primary and secondary destinations was sufficiently stable that there is no appreciable bias from the use of primary destination mode as representative of overall mode choice for tours.

## 2.2 Operational Implications of the Tour Approach for Modelling

We now consider the travel demand modelling implications of using the primary tour approach instead of the trip approach in the framework of disaggregate demand models. We can expect better results from the tour approach because we expect the purpose of the tour to be more closely related to the traveller's true purpose than that of a trip.

For travel frequency models one operational implication, which relates mainly to work and school travel, is to improve the stability of tour rates by classifying lunchtime returns to home as work- or school-based tours. It is also reasonable to argue that the definition of primary destinations will increase the proportion of travel purposes whose frequency can be modelled more accurately (e.g. work) at the expense of those that give more problems (e.g. shopping). The overall tour rate will, therefore, be more accurately represented than the overall trip rate. Finally, since in the Zuidvleugel data each tour contains an average of two and one-third trips, the overall rates for tours are three-sevenths of those for trips. The whole issue of frequency, therefore, focusses strongly on the binary question of whether or not a tour was made, rather than whether 0, 1, 2, 3, or more trips were made. The possibility of a binary model opens more widely the prospect of escaping from the unsatisfactory continuous frequency models, which obviously do not represent properly the true decision process in the period surveyed. The extent to which this simplification is possible is shown in Table 4, which is based on

Zuidvleugel data. This table does, however, indicate a significant number of people making second tours for a particular purpose.

Time of day modelling with the tour approach offers a great advantage over the trip approach in that we can model simultaneously the trip from home and the return trip. In a tour model it means that we can take advantage of our information about time spent at the destination, that the time spent there is determined by the activity being undertaken. the magnitude of activity time at the primary destination (as shown in Table 1) determines the relationship between the times of day for travel to and from that destination, and usually the timing of the entire tour. A further advantage of the tour approach is that it is possible to investigate the order in which primary and secondary destinations are visited. Ultimately, it may be possible to consider the total of activity time and travel time compared with some time budget as an influence on whether or not the traveller has time to visit the secondary destination.

In principle, destination choice using a tour model should show a small but definite improvement over the use of a trip model, at least for primary tours. This is because a tour model is again able to consider both outward and return trips, therefore obtaining a better measure of separation. Otherwise, there is little difference in the mechanics. In the case of secondary destinations, however, the tour approach offers a greatly improved basis for modelling. The choice of secondary destination can be modelled conditional on both primary destination and home, with the extent of detours taken as an input variable. Models of frequency and destination of detours from work tours are discussed in the following section.

For mode choice, some potential problems arise in that tours using different modes to and from the primary destination are difficult to model. In fact, however, since 96.5 percent of the tours in the Zuidvleugel data set used the same mode in both directions, this problem is not severe. The modes used to secondary destinations are, as noted above, the same as those used to the primary destination in more than 82 percent of the cases. Naturally, for modes requiring a private vehicle (car driver, bicycle, moped), the rate is much higher at 92 percent, and two-thirds of the switches are to walking. Although there are some problems here, it seems that a fairly simple model will account for nearly all the variations. Note that tour models give a great improvement in mode choice representation relative to trip models, which are not able to reflect that cars or bicycles taken away from home must normally be returned there at the end of the tour.

As a further flexibility of the tour approach in modelling, subtours consisting of a chain of trips beginning and ending at a destination in a home-based tour can be modelled separately to the extent that they are based on locations which are reasonably fixed for the household or individual, and are regularly used as an origin for travel. This is necessary to assume confidence in the prediction of tour characteristics from such locations because, to be useful, such a model must assume the subtour to be contingent on the main tour. Home locations clearly meet those criteria, but workplace and education locations could also be included in this category. The tours that clearly fail the criteria are shopping, social and recreation destinations, the locations of which are generally far less fixed and less constantly used.

## 3. MODELLING DETOURS

A specific issue arising in the representation of travel as tours, that does not have an exact analogue in trip models is the modelling of detours. Before turning to the methods that might be applied to deal with this problem, it is first worth considering whether these models are themselves worthwhile. Because non-home-based travel is represented as detours, the actual amount of travel (i.e. passenger-kilometres) covered in this way is much less than the total length of non-home-based trips. A simplification of simply omitting all reference to detours might perhaps give a sufficient approximation to total travel for many purposes.

### 3.1 Single- and Two-Destination Representation of Tours

It is the basis of the primary destination tour approach that travel be modelled in terms of tours to a primary destination, but the option is left open of either ignoring some or all of the other destinations or modelling additional travel to them conditional on the primary destination. The exclusion of non-primary destinations has the advantage of eliminating stops that are incidental to the journey, but at the risk of also missing stops that represent significant influences on the journey. A possible measure of the importance of such stops is the relative contribution of the non-primary destinations to overall travel distances; this measure is obviously of particular importance in reflecting the forecasting accuracy of a model omitting secondary destinations.

The strategy of representing all travel in terms of simple tours to a primary destination, and ignoring all other tour destinations, is here referred to as the "single-destination representation." The alternative option of recognising a primary and a secondary destination for each complex tour, but ignoring any tertiary destinations, is here referred to as the "two-destination representation" of tours. It is natural to define the secondary destination, when more than two are visited, as the destination second highest in the ranking algorithm used.

Table 5 summarises destination and distance differences for the single-destination and the two-destination representations of tours. In addition to this "lost distance" measure of the extent to which the one- or two-destination representations capture the essential features of travel, we need also to consider the extent to which the omission of destinations might detract from the value of the model. Both strategies for representing tours omit some travel destinations, but this is not necessarily a bad feature. The destinations omitted are those at which the least amount of time were spent, and should tend to be the least important for determining travel characteristics. In fact, the omission of "incidental" stops could significantly improve the explanatory power of travel models.

### 3.2 Implementation of a Secondary Destination Model

In some cases, it will be necessary to implement a model for detours. Such a model was tested during the Zuidvleugel study, although it does not form part of the forecasting systems. Because detours were extremely uncommon (and very short) for travellers going to work by public transport, "slow" modes or as car passengers, car drivers only were modelled.

The model of detours was developed for work tours; i.e. the home and workplace and the tour between them (including the mode) were taken as fixed, and a model was developed to explain detour travel conditional on those fixed points. The work tour frequency model was expanded to model the choice between the following five tour type alternatives:

(1) No secondary destination - Person goes straight to work and home again and does not stop at any secondary destinations or make consecutive work tours.

(2) Secondary destination before work - Person goes to secondary destination, then to work, then home.

(3) Work-based tour, non-home destination - Person goes to work, then to any destination for any purpose other than home, then back to work, then home again.

(4) Work-based tour, home destination - Person goes to work, then home, then to work, then home again.

(5) Secondary destination after work - Person goes to work, then to secondary destination, then home.

These five alternatives are shown in Figure 1. It was recognised in the Zuidvleugel study that may cases where 2+ work tours were made consisted of consecutive work tours, and it was felt that this situation typically arose when a worker returned home temporarily for a meal. The structure of this model has the advantage that it includes the most common occurrence of 2+ work tours (when they are consecutive) within a choice context that more nearly approximates reality.

The triangular tour secondary destination model represents the choice of secondary destination conditional on primary destination and triangular tour choice (alternatives 2 and 5 in Figure 1). The only measure of level-of-service used in this model is the sum of the car network distances between the secondary destination and the home and between the secondary destination and the primary destination.

The work-based secondary destination choice model represents the choice of secondary destination conditional on primary destination and work-based, non-home destination tour type choice (alternative 3 in Figure 1). Car network distance is, again, the only measure of level-of-service used in this model, but the round-trip distance between the primary and secondary destination zones is used rather than the 2-leg distance mentioned previously. In most other respects, the secondary destination choice models used in the Zuidvleugel travel forecasting system resemble typical primary destination choice models which are calibrated for many different purposes.

The model of choice of secondary destination incorporated significant coefficients for level-of-service and for local effects. The model of tour type choice included connecting ("logsum") variables from the destination choice model, and variables describing the profession, education and daily schedule (i.e. working hours) of the traveller. The levels of explanation given by the models (goodness of fit) were comparable with those obtained from primary destination models. Space precludes a detailed presentation of these models.

## 4. Conclusions

The approach of classifying all travel into tours appears to be a natural step towards making trip-based travel demand models more realistic. Further, the specification of primary and secondary destinations seems the obvious first step towards a systematic analysis of tours, which has the potential for yielding greater insight into travellers' behaviour.

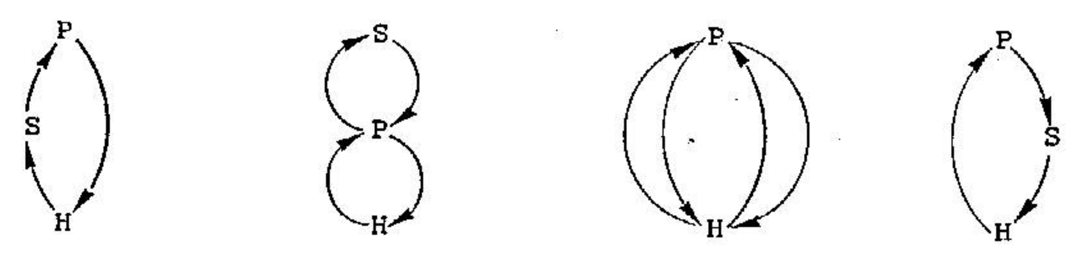
Various logit model specifications modelling the self-reported "most important" destination have been explored. Despite offering generalisations of the basic Zuidvleugel decision rule, the adopted criterion of maximising likelihood rather than prediction successes has resulted in models which do not match the observed self-assessments as well as that rule.

For forecasting, the omission of destinations subsequent to the primary or to the secondary might give adequate results. The "lost travel" consequent on these simplifications is quite small, and for many purposes can be ignored.

Considering the implications of a shift from trip- to tour-based analysis for the development of models, we found significant possibilities for simplifying and increasing the accuracy of modelling relative to trip-based approaches. Difficulties would arise in the models for secondary destination choice and the choice of modes to reach those destinations, but these difficulties are real ones, concealed by trip modelling and brought to the surface by the tour approach. We have therefore concluded that the tour approach offers excellent prospects for improved modelling.

Figure 1: Tour Type Choice Alternatives

(1) No Secondary Destination




(2) Secondary Destination Before Work

(3) Work-Based Tour, Non-Home Destination

(4) Work-Based Tour, Home Destination

(5) Secondary Destination After Work

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Table 1: Mean Activity Time and Round-Trip Distance by Primary Destination Type (Home-Based Tours)

| Primary Destination Type | Avg. Activity Time (hrs:min) | Avg. Round-Trip Distance (km) | % of Total Tours |
|---|---|---|---|
| Usual Workplace | 6:32 | 12.9 | 18.1 |
| Other Work Destination | 4:23 | 35.8 | 3.1 |
| Shopping | 0:40 | 3.4 | 17.9 |
| Education | 3:34 | 3.9 | 24.4 |
| Social Visiting | 2:15 | 8.6 | 11.0 |
| Recreation | 1:16 | 4.7 | 9.3 |
| Personal Business | 0:50 | 5.7 | 3.3 |
| Serve Passenger | 0:16 | 3.5 | 4.7 |
| Other | 1:13 | 6.9 | 8.2 |
| All Home-Based Tours | 2:50 | 7.2 | 100.0 |

Table 2: Models of "Primary" Destination Selection

| Model | numbers of destinations | | | | | |
|---|---|---|---|---|---|---|
| | A | B | C | D | E | F |
| | 2 & over 2 | 2 | 3 | over 4 | males | females |
| Variable | | | | | | |
| DUM2 | -0.36 | -0.30 | -0.51 | -0.41 | -0.41 | -0.33 |
| | (4.9) | (3.0) | (3.4) | (2.3) | (3.8) | (3.2) |
| DUM3 | -1.31 | | -1.60 | -1.11 | -1.42 | -1.24 |
| | (10.4) | | (8.7) | (5.7) | (7.6) | (7.2) |
| DUM4 | -1.43 | | | -1.39 | -1.86 | -0.98 |
| | (6.7) | | | (6.1) | (5.7) | (3.4) |
| DUM5 | -1.77 | | | -1.74 | -1.55 | -2.11 |
| | (5.3) | | | (5.0) | (3.7) | (3.7) |
| DUMWORK24 | 1.41 | 0.54 | 1.41 | 2.38 | 1.74 | 1.08 |
| | (5.2) | (1.4) | (2.4) | (4.4) | (5.0) | (2.1) |
| DUMWORK25 | 0.75 | 0.84 | -0.78 | 1.51 | 1.28 | -0.78 |
| | (2.5) | (1.5) | (1.0) | (2.8) | (3.5) | (1.2) |
| DUMEDUC | 2.24 | 1.99 | 2.81 | 2.21 | 2.49 | 2.10 |
| | (6.8) | (4.4) | (4.6) | (3.0) | (4.6) | (5.0) |
| DUMMEDIC | 1.16 | 1.62 | 1.68 | 0.31 | 1.10 | 1.41 |
| | (3.6) | (3.2) | (2.4) | (0.4) | (1.9) | (3.1) |
| DUMSHOP | -0.44 | -0.46 | -0.10 | -0.73 | -0.30 | -0.51 |
| | (2.9) | (2.2) | (0.3) | (2.2) | (1.1) | (2.8) |
| DUMPRBUSI | -0.24 | -0.16 | 0.14 | -0.77 | -0.02 | -0.40 |
| | (1.5) | (0.7) | (0.5) | (2.2) | (0.1) | (1.9) |
| ACTIM | 0.77 | 0.79 | 0.94 | 0.55 | 0.65 | 0.99 |
| (*.01) | (11.3) | (7.0) | (7.2) | (4.9) | (7.9) | (8.3) |
| $L_o$ | -1337 | -454 | -413 | -468 | -652 | -685 |
| $L_c$ | -1212 | -441 | -358 | -400 | -582 | -629 |
| L* | -1063 | -367 | -252 | -298 | -413 | -462 |
| Nobs | 1345 | 658 | 376 | 311 | 647 | 698 |
| $\rho^2$ | 0.27 | 0.30 | 0.30 | 0.26 | 0.29 | 0.27 |

Figures in brackets are 't' ratios for the estimated coefficients.

Table 3: Prediction Success Rate

| Model | Number of cases | Correct Predictions | Prediction Success Rate |
|---|---|---|---|
| ZVL | 1282 | 1013 | 79% |
| A | 1282 | 961 | 75% |
| B+C+D | 1282 | 975 | 76% |
| E+F | 1282 | 974 | 76% |

Table 4: Extent of Multiple Tours of the Same Purpose Type

| Tour Purpose (Primary Destination) | % of all persons making a tour of this type | Among persons making a tour, % making more than one tour | |
|---|---|---|---|
| | | (unadjusted) | (adjusted)* |
| Usual Workplace | 22% | 15% | 7% |
| Other Work Destination | 22 | 15 | 15 |
| Education | 24 | 40 | 19 |
| Social | 14 | 10 | 10 |
| Recreation | 11 | 13 | 13 |
| Personal Business | 2 | 5 | 5 |

* Omitting multiple tours caused by lunch trips between work or school and home.

Table 5: Summary of the Single-Destination and Two-Destination Representation of Tours

| | single-destination representation | two-destination representation |
|---|---|---|
| of total destinations omitted | 26% | 13% |
| of tours with some destinations omitted | 17% | 7% |
| mean % of tour length omitted | | |
| all tours | 5% | 2% |
| automobile tours | 7% | 2% |
| of total vehicle-kilometers lost | | |
| all tours | 7% | 1% |
| automobile tours | 10% | 4% |