

Zenith Model Framework Papers -
Version 3.0.1

Paper D - Travel Market Segmentation Model

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Zenith Model Framework Papers - Version 3.0.1

Paper 5 - Travel Market Segmentation Report

Draft Report

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Executive Summary

The aim of the Travel Market Segmentation Model is to take a number of trips made for a given purpose (i.e. Home Based Work) and to estimating the proportion of these trips that were made by households of a given car ownership level.

Research has shown that car ownership is a strong indicator of travel behaviour. The segmentation of travel by car ownership significantly improves the accuracy of the Trip Distribution and Mode Choice Models. It does this by acknowledging that households with limited private motor vehicle access are also likely to display atypical destination and mode choice decision-making behaviour.



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1 Introduction

This Technical Note is one of a series of framework papers that collectively describe the Zenith Transport Model. Zenith is a four step transport model, implemented in the OmniTRANS software package for a range of Australian cities and regions.

This paper details the Travel Market Segmentation Model, which is an important sub-model within the overall Zenith Model framework.

This document focuses on the methodology of the Travel Market Segmentation Model, and does not include parameter estimates or model validation for specific regions. Information about parameter estimates and model validation can be found in the region specific technical notes relating to Travel Market Segmentation (located at <http://zenith.veitchlister.com.au>).

For further information, please contact our research and development team at zenith@veitchlister.com.au.



2 The Travel Market Segmentation Model

2.1 Overview

The Travel Market Segmentation Model is the third step in the Zenith Model Run process, and follows the Trip Generation Model, as illustrated in Figure 2.1 below.

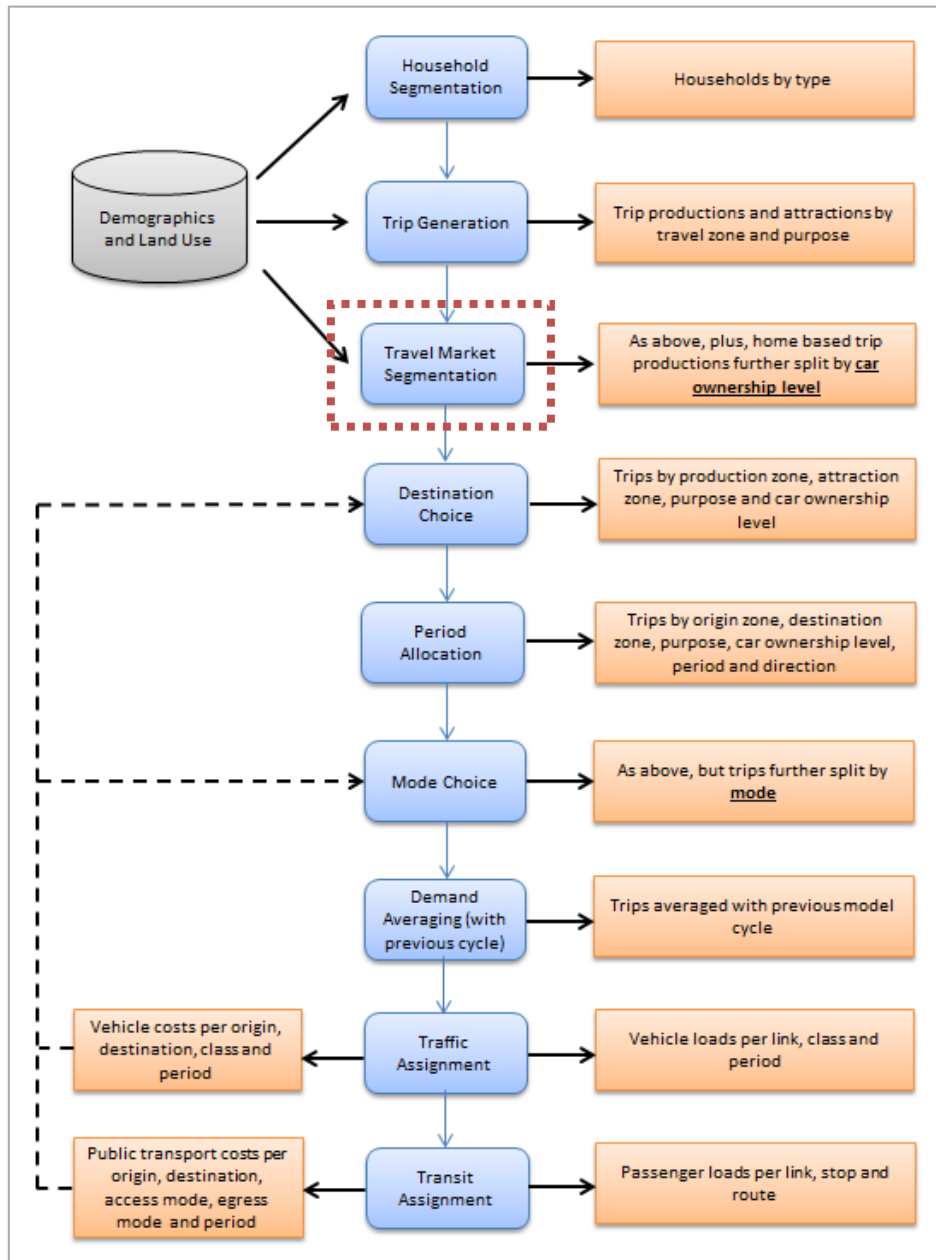


Figure 2.1: Zenith Model Run Process

The aim of the Travel Market Segmentation Model is to segment home based trips by the number of cars owned by the household responsible for each trip (i.e. segment trips by 0 car, 1 car, 2 car and 3+ car households).

It has been found during the development of all Zenith Models that segmenting travel by car ownership level, prior to destination and mode choice, significantly increases the accuracy of the resulting models, by acknowledging that households with limited private motor vehicle



access are also likely to display atypical destination and mode choice decision-making behaviour.

An example of the Travel Market Segmentation process is provided in the inset below.

Travel Market Segmentation Example – Home Based Work (White Collar)

Question:

Given that the households residing in a travel zone have an average household car ownership level of 1.2, what proportion of Home Based Work (white collar) trips produced in this zone are likely to be made by households owning 0, 1, 2, or 3+ cars?

Answer:

There is no single correct answer to this question. Nonetheless, models can be developed which estimate realistic proportions given an average car ownership level.

In the case of the Victorian model, the estimated proportions of trips are as follows:

- 0 car households => 12.2% of trips
- 1 car households => 40.8% of trips
- 2 car households => 35.2% of trips
- 3+ car households => 11.8% of trips

Figure 2.2: Travel Market Segmentation Example



2.2 Methodology

2.2.1 Trip Purposes

Travel market segmentation by car ownership level is separately performed for each of the eight **home based** trip purposes:

- Home based work (white collar)
- Home based work (blue collar)
- Home based education (primary)
- Home based education (secondary)
- Home based education (tertiary)
- Home based shopping
- Home based recreation
- Home based other

Segmentation of home based trips by car ownership level is based on the average car ownership level of the travel zone within which the home is based.

For non-home based trips, segmentation by car ownership level is not possible. This is because trip based models make no connection between non-home based trips and the households which make them.

2.2.2 Functional Form

The functional form of the Travel Market Segmentation Model is presented below. Note that this functional form is identical to that of the Household Segmentation Model.

$$T_n(x) = \frac{200 - A_n}{1 + e^{1/B_n(x - C_n)}}$$

where: $T_n(x)$ is the percentage of trips which are made by households owning $\leq n$ cars

x is the average car ownership of the travel zone

A_n , B_n and C_n are the model parameters for level n

The primary input to this model is the average car ownership level for households residing in the travel zone (x). Separate sets of parameters (A, B, C) are estimated for each trip purpose.

2.2.3 Parameter Estimation

The Travel Segmentation Model is developed using data extracted from Household Travel Surveys (HTS).

A dataset is typically constructed by repeatedly drawing sub-samples of households from the HTS, and for each sub-sample, calculating the average car ownership, as well as the proportion of trips made by 0, 1, 2 and 3+ car households for each trip purpose. Sub-samples of 200 households are typically drawn with replacement.

An example dataset, and the estimated curves which are fitted to the data, are plotted in Figure below.



For each data point (which represents a sub-sample of 200 households from the HTS), the average household car ownership level is calculated, placing it on the x-axis.

Then, for the given trip purpose the fraction of trips made by households owning 0, 1 or less, and 2 or less cars is calculated resulting in three dots (blue, red and green). The vertical spacing between the dots represents the number of trips made by households owning precisely 0, 1, 2 and 3+ cars.

The segmentation curves themselves are plotted as grey lines which pass through the survey data, and divide the market into our four segments; the grey, blue, red and green regions representing trips made households owning 0, 1, 2, and 3+ cars respectively.

An example is marked on Figure 2-3 showing the segmentation of trips by car ownership level for a zone with average car household ownership of 1.2. This is the same example as was presented as a worked example in Figure 2.2 above. The model (for this data set) estimates that on average, 12.2% of trips would be made by 0 car households, 40.8% by 1 car households, 35.2% by 2 car households and 11.8% by 3+ car households.

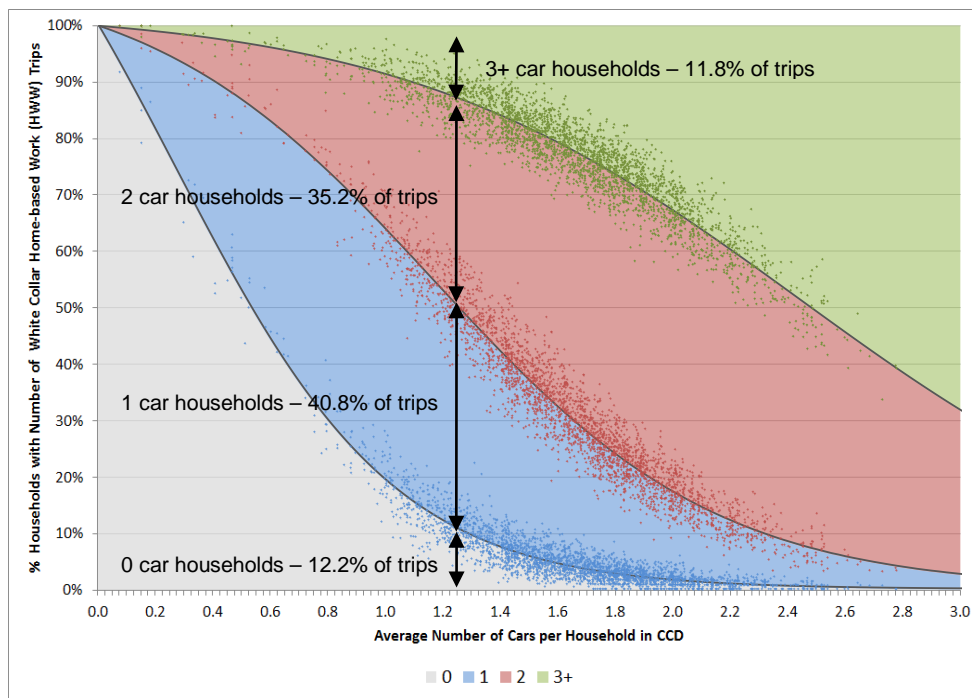


Figure 2-3 - Segmentation of Home Based Work (white collar) trips by car ownership level