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The PRISM Model

Evidence on Model Hierarchy and Parameter Values

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Prepared for the UK Department for Transport

The research described in this report was prepared for the UK Department for Transport.

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Published 2007 by the RAND Corporation
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Summary

The UK Department for Transport (DfT) provides detailed guidance on the appraisal of transport projects and wider advice on scoping and carrying out transport studies through its WebTAG website (www.webtag.org.uk). Part of this advice concerns development of transport models which contain the full range of important demand responses, i.e. trip frequency, mode choice, destination choice, time period choice and route choice, called 'Variable Demand Models', for the evaluation of large highway and public transport infrastructure schemes. For development of this advice, the DfT sought evidence about choice hierarchies and parameter values from existing transport demand models, specifically those that had been subject to rigorous calibration and validation procedures. The Policy Responsive Integrated Strategy Model of the West Midlands (PRISM) developed by RAND Europe and Mott MacDonald met these requirements and therefore RAND Europe was commissioned to undertake this small study to report the model choice hierarchies and model parameter values from the PRISM model.

The PRISM model system is a variable demand multi-modal transport model developed for the West Midlands region by RAND Europe and Mott MacDonald. It consists of detailed network models covering the highway and public transport (PT) systems, which are linked to a disaggregate model of travel demand. The demand model reflects a number of traveller responses in a number of interacting modules, including car ownership, PT travel pass ownership, tour frequency, destination choice, mode choice and time of day choice. All of these models, except for the car ownership model and the trip frequency model for business and non-home-based travel, were estimated from local data. Because the mode and destination models have been estimated from local data, the outputs provide evidence on appropriate model structure, particularly the relative sensitivity of mode and destination choice, which is of particular interest to DfT at this time.

The following table summarises the optimal nesting structures for mode and destination choice identified in the estimation of the PRISM models. The tables also report the resulting model sensitivity parameters, defined as 'Lambda' (λ), which identify the relative sensitivity of mode and destination choice responses.

Purpose	Tree Structure	θ	Mode Choice λ	Destination Choice λ
Commuting	Multinomial	1	0.020 to 0.050	0.020 to 0.050
Primary Education	Destination choice below mode choice	0.19	0.008 to 0.027	0.040 to 0.14
Secondary Education	Destination choice below mode choice	0.47	0.007 to 0.028	0.015 to 0.060
Tertiary Education	Destination choice below mode choice	0.35	0.010 to 0.035	0.035 to 0.090
Shopping	Destination choice below mode choice	0.38	0.020 to 0.040	0.050 to 0.100
Other	Destination choice below mode choice	0.27	0.008 to 0.015	0.030 to 0.050