Extended Abstract

Transportation networks are integral to modern society and transport policy decisions can have far-reaching consequences. Economically, the impacts of transport policy can provide additional revenue to government, reallocate the costs of operating the network to different community sectors, improve the utility of the network and affect individuals’ decisions about where to live and for companies, where to operate. Many of these economic impacts also have a social dimension, in terms of equity and social inclusiveness, both of which can be adversely affected by poor accessibility to appropriate transportation. A further topical consideration is the environmental impact of transportation, which is heavily influenced by mode choice decisions.

Transport models permit objective assessment of the impact of transport policy decisions. Over the past two decades there has been significant research and development devoted to the construction of land use and transport models for major metropolitan areas with relatively high population densities (Wegener, 2004). In contrast, the development of analogous models for rural and regional areas has not previously attracted the same level of interest, with the most notable exceptions being the Netherlands National Model (LMS); the Italian Decision Support System (SISD); and the national model for Thailand (NAM) (Daly, 2008). These systems evidence the usefulness of models capable of evaluating policy instruments outside of metropolitan areas.

The lack of any such regional modeling capability for Australia has motivated the development of R-TRESIS, a regional transport and environment strategy impact simulator, implemented for New South Wales, Australia.

Frequently, the development of transport models has relied upon the collection of primary data relating to passenger (and freight) activity in order to permit the development of inter-connected travel choice models using multinomial and nested logit model forms. As such primary data is not currently available for Australia, its collection would require a substantial financial investment beyond the scope of available funding.

This constraint necessitated the consideration of alternative methods to capture and model transportation activity. Recent research has modeled the demand for air travel within Australia as a set of simultaneous equations where there is endogeneity with respect to a number of influencing factors on air travel (such as air fares, number of competitors etc.) (Collins et al.,
Secondary data collected from pre-existing published sources provided the complete data set used to estimate a three stage least squares (3SLS) system of equations.

The success of this approach provided the impetus for developing an analogous but integrated model system for each transport mode (i.e. car, coach, train, air) available in the regional network. Structuring the model system in this way allows the introduction of feedback, through endogeneity, within and between both the demand and supply models, and within and between each particular mode of transport. The main practical benefit of this approach is the significant reduction in data acquisition costs that would be incurred by the use of a more traditional logit model form.

This paper makes a number of contributions. Firstly, the model system for the multi-modal regional context is described, detailing data needs and the relevant exogenous and endogenous variables required to develop scenario based applications relevant to key agendas such as accessibility, social exclusion and greenhouse gas emissions. Secondly, as 3SLS has previously been used in transportation studies only rarely (Ozbay et al., 2006), an in-depth analysis of the use of this technique in the context of a transportation model is presented. Finally, although this current work focuses exclusively on passenger activity, the methodology presented here is sufficiently general that it could easily be extended to incorporate the freight sector, subject to the availability of relevant data.

References


