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Modelling Transport and the Economy in London

Framework and Literature Review

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1 Executive Summary

Motivation

There has been growing interest in the role that transport has in stimulating, growing and supporting the economy, as explored in the Eddington Review. This report builds on earlier work on the TANDEM (transport and economy model) developed for GLA Economics.

Land Use and Transport Interaction models, and modelling more widely, are a useful tool for planners. The aim of this report is to understand how, and if, they address the key questions facing the role of the transport system in the London economy.

London Focus

The evidence base for the interaction between the economy and transport has been growing in London. Work has explored the link between earnings and employment density, between accessibility and employment density, and between crowding on tube lines and the levels of growth experienced. Meanwhile, we have observed the broad changes in the distribution of employment in London as different sectors have experienced growth and decline, and as the availability of transport has shifted.

For a modelling framework to fit well in London, it needs to be able to incorporate these key issues, which may be more strongly present in the capital than elsewhere.

A Broader View of Modelling

A large amount of intellectual effort has gone into developing and building models of urban systems, land use and transport over the past century. The 1960s in particular saw the introduction of large scale comprehensive models drawing on analogies from the sciences. In recent years much academic interest has been directed towards cellular and agent based modelling, drawing on the growing body of complexity sciences.

A number of substantial challenges face modellers. Validation, the process of checking that a model produces results which match the real world, is particularly difficult given both data and time constraints, and faced with the immense complexity observed in real urban systems. It is however completely necessary if the models are to be used and believed in a policy context. Getting the question right, and making sure that the model contains enough detail to address this whilst the model itself is simple enough to be understood, become essential payoffs for the modelling endeavour to succeed.

Finally, urban, land use and transport models are not primarily economic models. Generally, these models handle the economy in a limited way. Increased effort will therefore be needed to find the correct framework for introducing economic impacts.

The Models

We examined three models in detail, and assigned each a tagline and short summary. A more precise discussion is available in the text and from the cited reports.

- **LASER v3**, *WSP Group* – Solving for Household Location
The model uses fixed ‘base’ employment scenarios, and solves to find where all population and locally serving jobs will go.
- **DELTA**, *David Simmonds Consultancy* – Modelling Choice
The model typically uses fixed forecasts for employment and population at a regional level. Each period new and relocating employment and population choose where they would like to move and bid to see where they do go.
- **UDM**, *Steer Davies Gleave* – Evolving locations
Total employment is not fixed. Each period growth rates for zones are adjusted in response to the local conditions. In particular they are stimulated to grow until constraints are reached, while making sure that the balance of jobs, workers and sites are maintained.

While the models contain useful analysis of the implications of economic scenarios, and generate outputs which can be used in the estimation of Wider Economic Benefits, none of them currently embraces the feedbacks implied by the economic theory behind them. In particular output and productivity are not typically variables within the models, and therefore do not respond to the location of growth.

This is also true of the three additional models we examined: the Tyndall Model (*Mike Batty UCL*), TIGRIS (*RAND Europe and TRC Netherlands*) and California Land Futures (*John Landis, Berkeley*). For each the focus has been on the distribution of employment, rather than levels of growth. The three additional models are interesting case studies, due to their approaches to GIS presentation and calibration.

Conclusions

Given the limited treatment of economic issues in current Land Use and Transport models, and the difficulty of validating the models once additional processes are added, there is a very strong need for a deepening of the evidence base for the interactions. In particular, understanding the balance between simple redistribution of growth following transport change, and the extent to which actual growth or decay happens. Also, further exploration of the role of productivity, wages and commuting on development patterns, is needed.

In order to move forward, new data sets will need to be explored, and existing data sets brought together and used in a new way. This should be done transparently so that evidence can be used to calibrate existing models, as well as to develop new ones. It may be necessary to construct smaller models that collate and test the relationships in the data.

We propose that research is needed to examine local links between businesses, those linking further a field, the way in which incomes are passed through the spatial economy and the broader way in which economic development has occurred alongside accessibility.