March 2017

URBAN PUBLIC TRANSPORT INVESTMENT MODEL

Abstract submitted to:
hEART 2017: 6th Symposium of the European Association for Research in Transportation. Technion, Haifa.

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Key words:
City transport economic model

Transit network investment

Transport corridor optimal investment

Word count: 820

ABSTRACT

Mobility is essential and a major concern in cities all over the world. Increase in population, urban density and congestion make urban mobility more complex to plan and budget while finding an optimal solution or even a good balance between different transport investments and policies is complex both in theory and in practice.

Transport economic theory deals with urban transport policy and investments in various approaches. The macro-economic approach investigates the impact of a transport investment on the economy, usually the gross domestic product (GDP), the labor market or the real estate market. On a project level, micro economic theory tools such as cost benefit analysis were developed to evaluate the project economic contribution. The question of how much should be invested in the city public transport network got less attention in the literature.

Some theoretical models have been developed in recent year, introducing a combined two mode model, where travelers can choose between car or transit based on the generalized cost they perceive (Basso & Jara Diaz, 2012), (Beaudoin, Farzin, & Lin, 2014), (Anas, 2012).

Large cities reveal a fundamental difference between car and public transport in terms of the generalized costs. In dense areas, high car usage causes congestion and increase in private car generalized costs. On the other hand, higher public transport demand justifies increase in frequencies and improves service (such as faster modes, add capacity or right of way) and hence reduces waiting time, operating costs and the overall generalized costs.
Moreover, travelers choose travel mode based on the relative monetary costs and trip time but also based on their preferences and other attributes related to the mode, the journey and the city characteristics (such as density). Therefore, optimal policy and transport investments should be considered in a combined mode model and depending on the way mode choice occurs. Yet, in the literature these issues are rarely studied together.

This paper intends to advance the theoretical and practical understanding of the economics of urban transport planning and budgeting. The theoretical model indicates the optimal urban transport network investment in on a multi corridor city network. The model integrates many decision parameters that the city planners need to consider such as transit network investment, transit modes, price policy and subsidy.
More specifically, the research presents:

- A combined theoretical economic and planning model aims to optimal public transport investment in the city main corridors and the total recommended city level public transport investment. The model identifies optimal investment and recommends the public transport appropriate mode for each corridor.
- The integrated modal split model implies the consideration of the traveler's choice, taking into account also the characteristics of the passenger and the city. This feature takes the non-optimal part of life and the decision making process into consideration in the model. If the preferred modal split in a corridor is significantly different then the optimal, the model can than recommend the planners additional policies (such as toll or parking prices) to shift towards a better equilibrium in the corridor.

- Development of an empirical model and assign to two different cities: Tel Aviv and Toronto. The empirical model assigns specific investment and mode for each corridor on a spider web network for the 2040 transport demand forecast. The model results can be compared to the official plans for the Tel Aviv and Toronto mass transit system in terms of the level of investment and the appropriate public transport mode in the corridors and the whole network. Conclusion and recommendation to planners and policy makers can then be derived regarding the level of investment, recommended network structure and policy decisions.

The practice of transit network planning usually produces concept alternatives to the network followed by transport model simulation and an economic appraisal. This procedure can be iterative until the planner is satisfied with the results of the proposed network. The model in this research combines all three disciplines and provides the planner with recommendation of the optimal network and policy and the appropriate transit mode for all the main corridor in the city. This feature will allow planners to integrate economics within the planning process and thus introduce a more efficient and consistent planning process.

The model is flexible to include more features such as optimal road investment and capacity, introducing land prices and their effects on transport investment, agglomeration effects, or the parameters that will allow new technology to penetrate as a third transport mode (shared autonomous cars for example). Equity considerations can also be included in the model by introducing heterogeneous population. These features require more research in the future.

RERERENCES

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