

Developing an econometric model to assess State public transport expenditure needs

Kathryn J. Conroy¹, Marc Boisseau¹, Alison Harper¹

¹Commonwealth Grants Commission, 86/88 Northbourne Ave, Braddon ACT, Australia

Email for correspondence: Kathryn.Conroy@cgc.gov.au

Abstract

Developing an econometric model to assess State expenditure requirements on bus, ferry, light and heavy rail systems for public transport is challenging. Transport is a derived demand with drivers that can be jurisdictionally dependent. In preparation for its 2020 Methodology Review, the Commonwealth Grants Commission undertook a consultancy to understand the explanatory drivers of this expenditure on a national level. The purpose of this extract is to present the process by which the Commission is integrating the outcomes of this consultancy into its recommendations to the Commonwealth Government on the distribution of GST revenue to States. This is presented in two parts. Firstly, the consultant's econometric model is considered. Secondly, the ongoing work of the Commission to develop the model for its purposes is discussed. The dependent variable of both models, that designed by the consultants and that used by the Commission, is the consolidated expenditure of both the general government sector and public non-financial corporations. The consultants recognised the following as the primary drivers of public transport expenditure: population density, the number of public transport passengers and commuter distance to work. Jurisdictionally specific characteristics such as topography and the presence or absence of a ferry service are also included in the model. The consultants also determined whether an urban centre could be considered a satellite of its respective capital city according to its level of labour market integration. The final section of this extract presents the considerations the Commission makes while weighing up the merits of any new model. Particularly, that it should strike a balance between capturing jurisdictional expenditure needs and using the most policy neutral, contemporaneous and nationally comprehensive data available. While it is likely that the model ultimately adopted will resemble the analytical framework presented by the consultants, its development for Commission purposes remains ongoing.

1 Introduction

The Commonwealth Grants Commission ("the Commission") was established by a 1933 Act of Parliament to provide advice to the Commonwealth regarding grants of financial assistance to the States and territories ("the States"). Fundamentally, the role of the Commission is the inquiry of and reporting on revenue sharing arrangements between the Commonwealth and States to achieve horizontal fiscal equalisation

(HFE)¹. HFE is the transfer of fiscal resources between jurisdictions with the aim of offsetting differences in revenue raising capacity and the cost of delivering services. Its principle goal is to allow sub-national governments to provide similar standards of public services to their communities at a similar tax burden.

More specifically, the Commission's inquiries inform Commonwealth decisions on the allocation of the goods and services tax (GST) pool to the States according to the principle of HFE. Put simply, a State's GST requirement is the difference between its assessed expenditure on public services (such as hospitals, schools or public transport) and the sum of its assessed revenue (such as taxes, mining royalties and Australian Government specific purpose payments). The GST requirement of a State covers the gap between assessed revenue and assessed expenditure. Improving the model that assesses public transport expenditure would result in an improvement to the accuracy of each State's assessed GST requirement.

However, assessing expenditure for public services can be a challenging proposition because jurisdictional needs and service levels can vary widely between States. This is particularly the case for public transport services (such as bus, ferry, light and heavy rail systems) because demand is derived from influences that may be affected by a jurisdiction's policies. In addition, data used for assessment purposes should also largely satisfy the Commission's data constraints of being policy neutral, contemporaneous, reliable and nationally comprehensive.

The Commonwealth Grants Commission undertook a consultancy to understand the explanatory drivers of this expenditure on a national level. The purpose of this extract is to present the process by which the Commission is integrating the outcomes of this consultancy into its recommendations to the Commonwealth Government on the distribution of GST revenue to States. This process is presented in two parts. Firstly, the consultant's econometric model is considered. Secondly, the ongoing work of the Commission to develop the model for its purposes is discussed.

2 An econometric model for public transport expenditure

A priority of the Commission for the 2020 Review was to improve upon the model used to assess public transport expenditure. The statement of requirements described an outcome that recognised the maximum number of drivers of public transport expenditure while the supporting data satisfied the Commission's data constraints presented above.

The consultants were provided with State-reported data that described net per capita expenditure broken down by significant urban areas (SUAs)². This confidential dataset is the dependent variable of the model. It considers the consolidated expenditure of the general government sector (GGS) and public non-financial corporations (PNFCs). The consultants' final report³ presented an econometric model that recognises the following as the primary calculable drivers of public transport expenditure: population density to depict demand, the number of public transport passengers to represent

¹ Information on the history of the Commission, the Australian framework for federal financial relations, and other reference materials are available for download from the Commission's website

² 1270.0.55.004 - Australian Statistical Geography Standard (ASGS): Volume 4 - Significant Urban Areas, Urban Centres and Localities, Section of State, July 2016.

³ The consultant's full reports are available for download on the Commission's website

mode availability (level of service) and congestion, distance to work to represent network complexity and the characteristics of individual urban centres, topography to account for urban topography and the presence or absence of a ferry service.

The underlying data used to represent the above drivers are reliable, nationally comprehensive and largely outside the influence of State governments. They are also contemporaneous, where the bulk of the data are either sourced annually from the Australian Bureau of Statistics (ABS) or collected quinquennially in the Australian Census.

The consultants also investigated the most appropriate functional form to describe public transport expenditure in the Australian context. Evidence from the literature suggested that the model should exhibit some economies of scale. However, given that most of the literature did not relate to Australian public transport systems, the consultants considered that, to some extent, the functional form was an open question.

Ultimately, the consultants determined that a linear-log functional form would most appropriately represent the trends observed in the State-reported expenditure data. This form suggests that per capita expenses increase as the network becomes more complex but the rate at which this occurs decreases as passenger volumes grow. This is represented in the model by considering the logarithm of public transport passenger numbers

2.1 Satellite cities: quantifying labour market integration

Another consideration is the influence of satellite cities on jurisdictional public transport expenditure, an issue that becomes relevant during model application. They considered that the best way to proceed was to apply criteria quantifying the level of labour market integration between capital cities and neighboring urban centres.

By cross-referencing commuter place of usual residence with place of work⁴, the consultants determined that, if both the proportion of people working outside a city and the proportion of that city's residents working within the capital city is sufficiently high, it could be considered a satellite of that capital city.

This analysis identifies four jurisdictions that are most likely considered to be satellites of their respective capital cities in terms of labour market integration:

- Gisborne-Macedon, Melton and Bacchus Marsh could be considered satellites to Melbourne
- Yanchep could be considered a satellite to Perth

The effect of treating these jurisdictions as part of their respective capital cities is that when allocating per capita expenses, these residents are assigned the per capita expense value calculated for the larger capital city.

3 Developing the model for Commission purposes

The exact econometric model for public transport expenditure to feature in the 2020 Methodology Review is yet to be determined. The Commission follows a process when considering the adoption of any new assessment method. Following the completion of any consultancy, the Commission consults its stakeholders regarding

⁴ ABS Census of Population and Housing, Journey to Work, 2016

its outcomes (e.g. State treasuries). Ideally, the final model will strike a balance between capturing jurisdictional needs to the greatest extent and using data that most closely aligns with the Commission's data constraints. The consultation process seeks commentary on the degree to which this balance is achieved. Where a State constructively disagrees with or can make a case against a fundamental aspect of a proposal, the Commission welcomes an alternative conceptual case. If the proposed alternative represents an improvement to the assessment in regards to precision or policy neutrality, the original proposal may be adapted to incorporate the alternative suggestion. The Commission is currently engaged in this process⁵.

For example, several States have argued during the consultation process that passenger numbers are not a policy neutral measure of mode availability and congestion. Queensland provided evidence showing State policies in regard to the level of subsidies (fare price) and concessions, as well as policies to improve the reliability, frequency and safety of the network, can affect the number of passengers. The Commission agrees with this argument. As an alternative, Commission staff are examining instead the use of modelled passenger numbers rather than actual Census data. This way, passenger numbers can be estimated to reflect the average level of services provided by States using other policy neutral measures, such as urban population or remoteness area (e.g. major city, inner or outer regional).

Another State concern regarded population density as being, to some extent, the result of State policies. Overall, the Commission considers that the majority of the differences in population density are due to circumstances outside current State government control. There is not strong evidence to suggest that urban densification policies are significantly different between the capital cities. This suggests that recent State government policies are influencing current levels of density only to a small degree.

The examples presented above represent some of the ongoing work on the development of an econometric model for urban transport expenditure. Ideally, the result will be robust and accurately assess per capita expenses for most jurisdictions while maintaining the highest possible level of policy neutrality.

4 Conclusion

The purpose of this extract was to briefly present the Commission's current progress in the development of an econometric model for estimating State public transport expenditure. It is important that the model accurately represents what States currently do in the provision of urban transport services while remaining as policy neutral as possible.

It is likely that the model ultimately adopted will resemble the analytical framework presented by the consultants, but its development for Commission purposes remains ongoing.

⁵ State concerns raised during the consultation process are available in full on the Commission website