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Reform of Australian urban transport: A CGE-microsimulation analysis of the effects on income distribution

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ABSTRACT

Australian urban transport industries experienced substantial reform during the 1990s leading to significant structural change. Urban transport is typically an important expenditure item for households and structural change in these services may affect households differently depending on their position in the distribution of income and expenditure. We estimate the effects on household income groups of this structural change by applying a computable general equilibrium model incorporating microsimulation behaviour with top-down and bottom-up links. We compare estimates based on a pure microsimulation approach, a top-down approach and a hybrid top-down/bottom-up approach. We estimate small reductions in real income and small reductions in inequality; this pattern is largely replicated across regions. Our results are insensitive to the inclusion of bottom-up links; in contrast, applying a pure microsimulation approach gives accurate results at the aggregate level but underestimates the variation in effects across deciles and regions.

1. Introduction

Urban travel is an important component of daily life for households in most high-income countries, but particularly so for Australia where 85% of the population lives in urban areas. Of the three main modes of urban transport in Australia (road, rail and water) road and rail are the most important. Before the 1990s, most urban transport services in Australia were heavily subsidised by governments, and governments commonly either provided public transport directly or regulated the fares of private service providers (IC, 1994; PC, 2002). Around this time, Australian governments began an extensive process of microeconomic reform of Australian infrastructure industries; this included utilities (e.g., gas, water and electricity supply) as well as urban transport. The reforms were part of the process motivated by the Hilmer Report (Commonwealth of Australia, 1993). The main objective of these reforms was to increase competition and performance in these industries.

Infrastructure industries are generally major service providers, so the reform of these industries can potentially have significant impacts on households, businesses and on other industries. For households, changes in infrastructure prices will directly affect household incomes via cost-of-living changes. But changes in infrastructure prices can also indirectly affect the cost structure and competitiveness of downstream industries. In turn, this will affect factor incomes to some extent. Changes in factor incomes will affect household incomes; unless such changes affect all households evenly, the distribution of income will also change. Our focus is on quantifying the direct and indirect effects of structural change in urban transport and income distribution. As urban transport services are directly purchased by households and are usually a significant share of household expenditure, a priori, the link between the urban transport industries and income distribution seems direct and strong. In contrast, the indirect links between urban transport industries and other industries seem weak because urban transport is not an important production input for most industries. An alternative indirect link is through the effects on factor market prices via movement of labour and capital across industries, but it is not clear how strong the factor market links are or whether they are positive or negative for households; some scholars contend that the factor market links are unequivocally negative for households, e.g., Quiggin (1997).

To quantify the direct and indirect links between structural change in urban transport and income distribution, we apply an economywide framework with a high degree of sectoral detail and intersectoral linkages: i.e., computable general equilibrium (CGE). CGE analysis of reforming infrastructure industries is not common: examples include Argentina's utilities sectors (Benitez et al., 2003); Bolivia's gas sector (Andersen and Faris, 2002); Morocco's rural areas (Löfgren et al., 1997); and Australia's road and rail freight industries (PC, 2006). Analysing the distributional effects of such reforms within a CGE framework is even less common[1]: Boccanfuso et al. examine the impact of electricity industry reform on income distribution in two low-income

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[1] Table 1 lists studies analysing the distributional effects of such structural reforms within a CGE framework.

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countries, Senegal (2009a) and Mali (2009b); PC (1996) analyse the effects of electricity and telecommunications reforms on income distribution in Australia; and Verikios and Zhang (2008) analyse the effects of a range of infrastructure reforms on income distribution in Australia.

Our analysis proceeds by incorporating household expenditure and income data within a multi-region CGE model of Australia. Within this framework, we simulate the changes in labour productivity and relative prices of urban transport services during the 1990s to generate region-specific changes in commodity prices, factor returns and usage. The region-specific changes are linked in a top-down manner to expenditure prices, employment and factor returns at the household level. In contrast, labour supply and commodity demand is determined at the household level and is linked to the CGE model in a bottom-up manner. In the microsimulation literature, this approach is typically referred to as macro–micro (Hertel and Reimer, 2005). Within this class of analysis, it is most accurately sub-classed as a variant of the CGE microsimulation sequential approach (e.g., Chen and Ravallion, 2004), also known as CGE micro-accounting (Boccanfuso et al., 2009a). In CGE micro-accounting, the representation of households is purely an accounting framework with no behavioural responses. Our approach follows that developed by Bourguignon and Savard (2008) by going beyond a pure accounting framework and incorporating micro-feedback effects from labour supply and commodity demand determined at the household level. Incorporating a micro-feedback effect from labour supply and commodity demand determined at the household level addresses one of the main criticisms directed at the macro–micro approach (Bourguignon and Spadaro, 2006; Hertel and Reimer, 2005); it also represents an advance on the few studies that analyse the distributional effects of reforming infrastructure industries within a CGE framework (e.g., Boccanfuso et al., 2009a,b; PC, 1996; Verikios and Zhang, 2008).

2. Changes in urban transport during the 1990s[2]

At the beginning of the 1990s, Australian governments began an extensive process of microeconomic reform of Australian infrastructure industries. The objective of the reforms was to increase competition and performance in infrastructure industries. Prior to the commencement of the reform process, almost all infrastructure industries were dominated by government trading enterprises (GTE) providing services with monopoly rights; this was a feature of industry policy in Australia for most of the 20th century. Thus the reform process has been largely concerned with improving the performance of GTE.

2.1. Urban transport and microeconomic reform

Urban transport in Australia comprises passenger travel by railroad (trains), road (tramways, buses and taxi) and water (ferries) in urban areas. In 1997 in the major Australian metropolitan cities, urban passenger services accounted for between 3% and 30% of employment in the road and water transport industries, and urban rail services accounted for between 10% and 40% of employment in rail transport (SCRGSP, 1998). Before the 1990s, most urban transport services were heavily subsidised by governments, and governments commonly either provided public transport directly or regulated the fares of private service providers. Beginning in 1990, urban transport industries were subjected to many reforms. Principally, these comprised changes to:

- governance arrangements, including commercialisation, corporatisation and, in some cases, privatisation of government-owned service providers;
- market structure, by introducing contestability through competitive tendering for some urban transport services and the partial deregulation of the taxi industry; and
- pricing structures, including reductions in (or the elimination of) government subsidies by aligning prices more closely with the costs of delivering services to different customer groups.

[2] Sections 2.1–2.2 draw on PC (2002) and Williams et al. (2005).

2.2. Structural change in urban transport

As a reflection of the effects of the reform process, the economic structure of the urban transport industries at the end of the 1990s was different from that at the beginning of the reform process in the early 1990s. The structural changes are reflected in information available on employment, output and prices for these industries. Using these variables, first we calculate the change in employment per unit of output over the 1990s, i.e., gross employment (in persons) divided by the quantity of output. This measures the labour intensity of the industry; its inverse is also a measure of labour productivity. Output is defined as annual boardings. Our second measure of structural change is the relative output price: the output price divided by the consumer price index (CPI), indicating movements in relative price of urban transport services.

Table 2 reports the changes in employment per unit of output and relative prices in urban transport over the 1990s. We see that unit-output employment decreased for road transport in most regions: the maximum decrease being 3.9% in Victoria (VIC). Unit-output employment increased slightly in Tasmania (TAS) by 0.3% and by 3.7% in the Australian Capital Territory (ACT). Much larger changes in unit-output employment occurred in rail transport: −20% in VIC, −16% in New South Wales (NSW), and around −9% in South Australia (NSW) and Western Australia (WA). The large improvements in labour productivity for rail transport indicated in Table 2 over this period have also been noted by Williams et al. (2005). Unit-output employment for water transport only changed marginally over this period.

Relative prices increased for all forms of urban transport and significantly so in some regions: road and rail transport in Queensland (QLD) increased by around 80%; all forms of urban transport in WA increased by around 47%. The smallest price increase was observed for rail transport in VIC (11%). The general pattern of relative price increases reflect price reforms whereby government subsidies for urban transport were reduced or eliminated and prices were set to more closely reflect the costs of delivering services to different customer groups.

We apply the changes shown in Table 2 to the CGE model described in the next section. Unit-output employment is typically an endogenous variable in a CGE model. We accommodate applying exogenous changes in unit-output employment by setting labour-augmenting technical change as endogenous. The relative price of any commodity is also typically an endogenous variable in a CGE model. To apply a relative

Table 1
Summary of studies analysing the distributional effects of structural reforms within a CGE framework.

Study	Summary of method and application
Boccanfuso et al. (2009a)	Method: CGE micro-accounting (i.e., top-down). Application: the impact of electricity industry reform on income distribution in Senegal.
Boccanfuso et al. (2009b)	Method: CGE micro-accounting (i.e., top-down). Application: the impact of electricity industry reform on income distribution in Mali.
Productivity Commission (1996)	Method: CGE micro-accounting (i.e., top-down). Application: the effects of electricity and telecommunications reforms on income distribution in Australia.
Verikios and Zhang (2008)	Method: CGE micro-accounting (i.e., top-down). Application: the effects of a range of infrastructure reforms on income distribution in Australia.
Bourguignon and Savard (2008)	Method: macro–micro approach (i.e., top-down/bottom-up). Application: the effects of trade liberalisation in the Philippines on income distribution.
Savard (2010)	Method: macro–micro approach (i.e., top-down/bottom-up). Application: the distributional impact of increasing infrastructure investment in the Philippines.