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Exploring systemic bias in Australasian urban road/rail investment

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Abstract

Since 2007 more than half the world's population has lived in cities, with urban populations forecast by the UN to double by 2030. Australia and New Zealand are both among the most urbanised countries in the world. All Australian and New Zealand cities face issues with growing population and traffic congestion. There is strong evidence that solutions to urban congestion lie in space efficient modes such as heavy rail, light rail and busway (hereafter rail), and that increasing road capacity may be self - defeating. Despite this, the majority of funds for urban transport capital investment in Australia and New Zealand have historically been spent on road projects. This continues to be the case, despite a shift away from this approach in most OECD countries.

This paper explores the balance between road and rail projects in Australia and New Zealand and places this in an OECD context where data permits. Evidence for the effectiveness of road and rail investment to alleviate congestion is investigated. Assessment methodologies for road and rail projects in Australia and New Zealand are compared to international practice. It is concluded that there is no systemic bias in assessment methodology, but there is in capital funding allocation. There has been a long history of urban road programs with priority over rail investment. For the period from the 1950s to the 1990s this was based on demand pressures. Those pressures have changed significantly in recent years, but the balance of investment has not changed as quickly. The current investment balance is contrary to international practice, and the road capital investment is unlikely to achieve its stated objectives in the long term.

1. Introduction

This paper examines investment in urban transport infrastructure in Australia and New Zealand in recent decades, in order to investigate whether there is a perceived or actual bias between capital investments in road versus rail. Having a difference in level of investment does not necessarily prove bias. Bias is defined as road or rail investment trends that cannot be justified by evidence in demand trends or cost effectiveness.

The paper does not consider whether there are any significant differences in efficiency between categories of mass transit, namely heavy rail, light rail or busways. For convenience, the term "rail" is used to refer to all urban mass transit modes, since busways are often not separately reported. In practice we do not consider that this distinction alters any conclusions. "Road" refers to freeways and arterial roads with a primarily traffic capcity function. Costs are quoted in Australian dollars unless stated otherwise. New Zealand project costs have been converted to Australian dollars for purposes of comparison.

Comparisons are made with OECD nations where data is published in a consistent format. Comparisons with non-OECD nations are not considered relevant, due to differing levels of income, car ownership and urban population density. The efficiency of transport investment in freight and rural areas encompasses a different set of issues and is outside the scope of this paper. Political factors in government decision making are also outside its scope.

The paper is structured as follows. It starts by considering trends in urban growth, transport demand and congestion. Comparisons are made among Australia, New Zealand and OECD nations with available data. The question of whether congestion can be eliminated in urban areas is discussed. The cost effectiveness of urban transport investment is discussed, together with trends in Australasian urban transport investment. Transport project assessment guidelines from national transport agencies are then compared between Australia and New Zealand and reported OECD assessment policies. Finally conclusions are reached on whether the project funding trend is consistent with data on demand trends and project cost effectiveness, and what if any systematic causes there are for any differences.

2. Transport – the Urban growth imperative

The world is undergoing the largest trend towards urbanisation in history. The United Department of Economic and Social Affairs (UN) estimated that as of 2007 more than half of the world's population now lived in urban areas, and projected that by 2050 city populations will be 66% of total population. This trend includes developing nations in Africa and Asia that were formerly mostly rural, and are now concentrated in the largest cities. There are now 37 megacities with populations greater than ten million. Of these 22 are in developing nations (UN 2014).

In Australia and New Zealand the same trend can be seen. All large urban areas are growing in population, and their share of national population is increasing. Australia, with 90% urbanisation and 70% of the population living in major cities, is the fourth most urbanised among developed nations (OECD, 2015). New Zealand, with 86% urbanisation and 45% of the population living in three major cities is close to the OECD average (48% in major cities).

The share of economic activity in major cities is also growing, and is greater than their share of population. In Australia in 2014, 80% of all GDP was produced in major cities (Kelly and Donegan 2014). In New Zealand in 2015 some 64% of GDP was produced in its three largest cities – Auckland, Christchurch and Wellington. More than 95% of New Zealand's economic growth occurred in those three cities (Stats NZ, 2016). Hence the efficient functioning of major cities is critical to the economy and quality of life of both nations.

Larger cities mean larger commuting traffic volumes and larger commuting distances and, unless transport is able to be made more rapid, longer commuting times. Transport in cities is one of the primary factors in achieving economic and environmental sustainability while maintaining quality of life for residents in all countries worldwide. Funding adequate urban transport infrastructure in growing cities is listed by the UN as one of the largest challenges facing all governments (UN 2014).

3. Effectiveness of urban transport infrastructure

3.1. Measures of congestion

When travel demand (traffic volume) exceeds the supply of road space (traffic capacity) congestion may be said to occur. Perceptions of congestion vary but for analysis purposes we are interested in congestion that represents delay from travel demands exceeding the capacity of urban transport infrastructure. Note that if congestion were defined as the difference in travel time (and cost) between free flow speed on roads and actual speed, the perceived cost of congestion would be significantly higher than discussed here.

All large cities in Australia and New Zealand experience congestion. The avoidable cost of traffic congestion in Australian capital cities was estimated at $16.5 billion *per annum* in 2015 (BITRE, 2015). In New Zealand the avoidable cost of traffic congestion for Auckland alone was estimated at $638 million per annum in 2010 (Wallis and Lupton, 2013). Reported congestion costs for cities in Australia and New Zealand are shown in Table 3.1.

Table 3.1: 2015 Annual Cost of Traffic Congestion in Australasian cities ($M/year)

Sydney	Melbourne	Brisbane	Perth	Adelaide	Auckland
$6100M	$4600M	$2300M	$2000M	$1100M	$755M

Data: BITRE paper 74 and NZTA report 389. Auckland data updated from 2010 to 2015.

3.3. Is congestion able to be eliminated?

Economists have long argued that it was not possible for a city to "build its way out of congestion" for urban roads (Downs, 1962). In economic terms road space is a scarce commodity during congested peak periods. The existing degree of congestion represents the accepted "user cost" balancing the demand to travel against the cost of infrastructure provision and use. As the supply of road space grows, higher demand for roads (i.e. more traffic) will be induced to take up the spare capacity, so that there is no net reduction in congestion. Hence other approaches to managing congestion such as road pricing (tolls) or congestion pricing (tolls variable by time of day) should be employed in addition to building more capacity to "eliminate" congestion. Infrastructure investment should occur after transport usage has been optimally priced to incorporate externalities, and then the investment level should be subject to benefit cost analysis to confirm its utility (OECD, 2008).

In recent years empirical analysis has tended to confirm this economic theory. Duranton and Turner (2009) investigated the relationship between the lane miles of urban interstate highways in US cities (i.e. freeway lanes) and the freeway miles travelled (VKT). This relationship was compared for all 228 Metropolitan Statistical areas in the United States, for the years from 1983 to 2003. They found that the relationship held in proportion (i.e. traffic grew as freeway lanes grew) even after controlling for population growth, geography, size and city population density. The long run demand elasticity for vehicle kilometres travelled is close to one. That is, as urban road capacity expands, urban road traffic expands. Likewise as the cost of travel fell, demand rose and congestion and travel time rose. This adjustment occurred in less than ten years in every case. Duranton and Turner identified three primary sources for the extra VKT: an increase in driving per capita by current residents, an increase in transportation intensive productive activity and (to a lesser extent) an inflow of new residents. Diversion of traffic from other networks is not significant. There was also little evidence that an improved rail could reduce road traffic.

These findings undermine the case for urban road construction to eliminate congestion, except to relieve localised bottlenecks. Congestion reduction benefits from increased road capacity are likely to be short term and quickly absorbed by induced traffic. Duranton and Turner found that the welfare gain for drivers from building new highways did not justify the cost of building them. Investment in rail capacity will also not reduce road congestion.

Duranton and Turner stated that this did not necessarily mean rail investment could not be justified, depending on the benefits and costs of individual projects. Their database only considered US cities that had predominantly low public transport mode shares, hence they did not consider the impact of a comprehensive rail system that allowed persons to move without being affected by road congestion. This explains why Canadian or European cities with comprehensive public transport networks may have high road congestion, but still have high overall urban mobility, since they have effective alternatives to road use. Thus the two most effective ways to “solve” traffic congestion are to increase the price of road travel, or build alternative modes, not to build more road capacity.

3.4. Does congestion matter?

In Australia and New Zealand increasing economic growth and reducing traffic congestion are the primary stated reasons for urban transport infrastructure investment by national transport agencies, especially for road projects. Public transport projects are more often justified by social inclusion and access to jobs. The question arises: is there evidence that urban road projects do increase economic growth and does reducing congestion benefit the economy? We will deal with the first question in this section.

Historically there is no question that periods of high economic growth in the past coincided with the building of the first systems of highways and freeways. During the period from the 1950s through to the 1970s freeway construction was the dominant trend in infrastructure in all western countries. This was notably led by the US Interstate Highways program starting in 1956, most of which was completed by the 1970s. The majority of the funding was actually spent on freeways within cities, which proved far more expensive than rural highways. This was nevertheless a period of rapid economic growth in most western countries, including the United States. Cities grew in size and declined in density. The mode share for rail transport fell. This trend occurred somewhat later in Australia and New Zealand but all their major cities developed plans for freeway systems in the 1950s or 1960s, and continued implementing them at least up till the 1980s (Lay, 2013).

Today the need for investment in urban and rural road systems is still critical to economic growth in developing countries. But the evidence for further urban road construction generating economic growth in developed countries is less clear. Urban arterial roads use up large amounts of land, create severance effects and tend to disperse employment, which is likely to create a dis-benefit according to agglomeration (concentration) theories of economic geography. Gibbons et al (2016) found that increases in accessibility of 10% from UK road projects might increase plant and employment in the benefitted area by 3 to 4%. New roads encouraged transport intensive industries to establish, but led to job shedding in established industries, resulting in a small net gain. By contrast improved rail access to CBDs increases productivity (via agglomeration) leading to rises in the number of employees and wage levels. This has been demonstrated for cities with high population density (e.g. London) and low to medium density (e.g. Melbourne) (Gwee et al 2011).

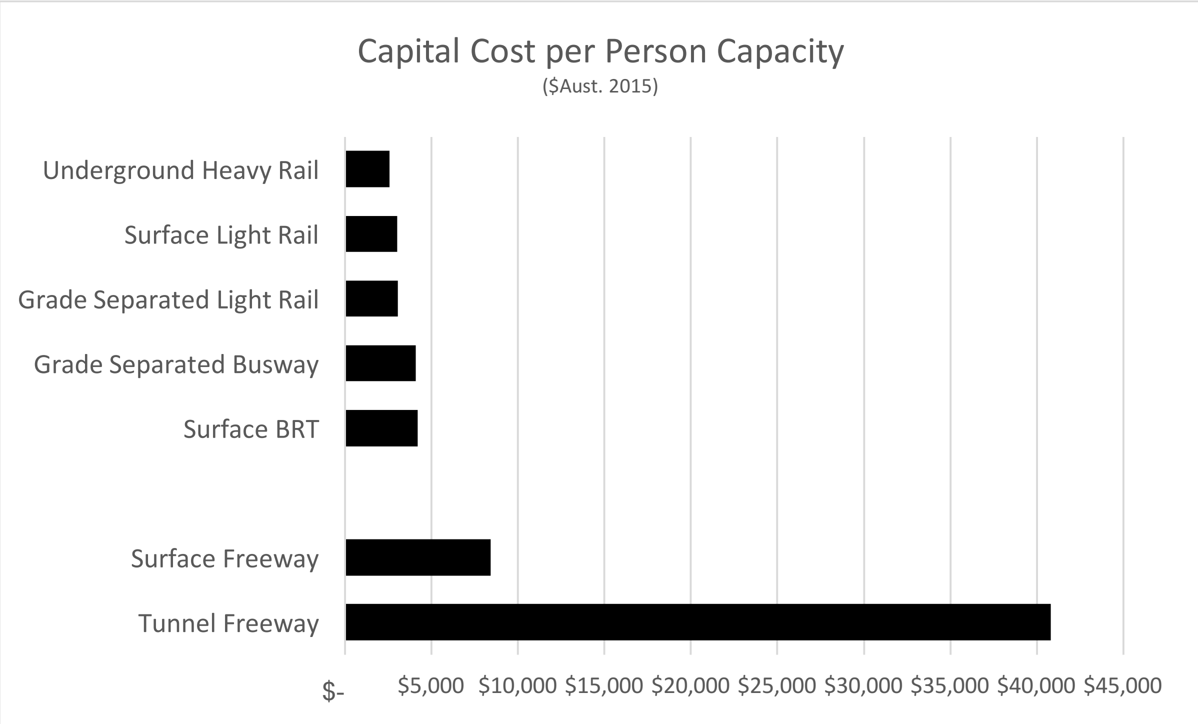
In many European countries the emphasis in transport planning has shifted away from planning for growth in road traffic. Instead the focus is on implementing “Sustainable Urban Mobility Plans (SUMPs) to achieve accessibility objectives for an urban area through a variety of different measures. Measures may include new infrastructure (generally rail with high capacity), services, soft (demand management) measures, and land use policies to achieve better transport performance. This will utilise all modes including walking and cycling. Sufficient road access and capacity will be retained to maintain business access and freight functions, but not necessarily more. SUMPs have been implemented in dozens of cities ranging in size from over ten million to under one million (EC, 2009).

This leads to the next question – what transport solutions are worth funding in congested cities?

3.5. Efficiency of urban transport modes

Urban mass transit investment is widely recognised as being more space efficient and having potentially higher capacity than urban road investment. When the cost of land and service relocations is taken into account, all forms of mass transit are also cheaper to construct than freeways in urban environments. Internationally recognised capacity limits (Vuchic 2011) and Australasian data for average construction cost for urban transport modes (Elaurant and Louise 2015) are shown in Figure 3.1.

Figure 3.1 Cost effectiveness of Urban Transport Modes in Australasia



Data: Capacity: Vuchic (2011); Cost: Elaurant and Louise (2015)

As can be seen from Figure 3.1, regardless of the mode chosen, in built up urban areas all forms of mass transit (whether busway, light rail or heavy rail) are cheaper to construct for a given capacity level than freeways, especially so if the freeway is in a tunnel. Note that this does not mean mass transit will always be preferable. Capacity needs to be seen in the context of utilisation. If transit does not attract a sufficient mode share its higher capacity will not be of benefit. Likewise in fringe suburbs where demand does not match the capacity of mass transit a lower capacity road may be cheaper.

One possible reason for the preference for urban road projects is the operating cost of public transport. Public transport subsidies represent a financial cost to State Government budgets while freeways, notably Toll Roads have less budget impact. This ignores private (operator) costs for roads and also external costs for both modes. There is a lack of consistently reported data on this question, particularly in the time period since 2000 when road user costs have risen and mode shares changed. From the available data, when the total of public and private capital, operating and external costs are considered, all modes are subsidised in recent years (as road related revenues have been in decline). Rail is found to be the cheapest urban travel mode in most available reported data in OECD cities. A comparison of published data for OECD urban areas is shown in Table 3.2.

Table 3.1: Total Cost of Urban Travel Modes Comparison Data

Datasource	New Zealand (2005)	Switzerland (2002)	Sydney (2009)
Metric	% Cost Recovery	% Cost Recovery	Cost/passenger km
Car	10% (peak) 17% - 36% (off-peak)	41%	86 cents/pass-km
Bus	38% - 47% (peak) >100% (off-peak)	47%	57 cents/pass-km
Train	58% - 89% (peak) >100% (off-peak)	43%	47 cents/pass-km

Data: NZ DOT 2005 (for Auckland and Wellington), Unite 2002, Glazebrook 2009).

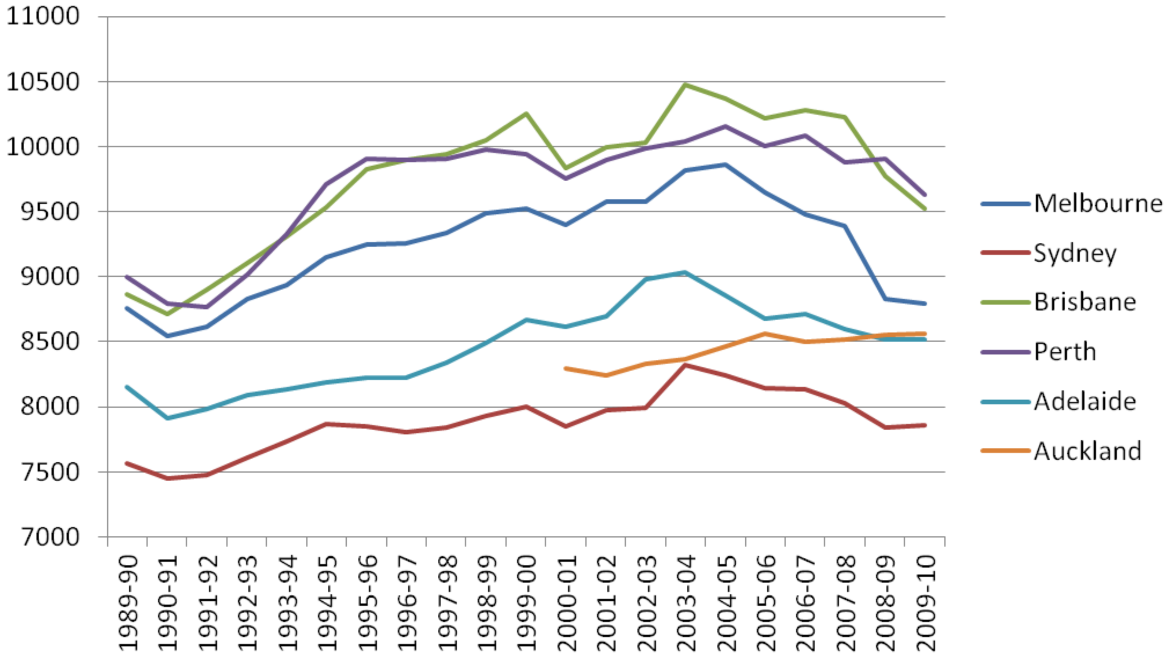
This overall cost pattern is consistent with the capital cost data from Figure 3.1. The capital cost differentials are so large that even on a whole of life basis urban road projects are more expensive than rail of equal or greater capacity. For example applying the running cost of Sydney rail - $260,000/track km – (CIE, 2015) an underground heavy rail line could be operated for 390 years before its combination of capital and operating cost matched the average capital cost of a four lane tunnel freeway. Overall there is a cost effectiveness case for rail over road investment accounting for their relative capacity and usage.

Before we see whether Australasian urban transport investment is rational in this context, we need to check travel demand trends. Are urban commuters willing to use road or rail more?

3.6. Demand trends for urban road and rail

All major Australasian cities from the late 19th century to the 1950s had comparatively high public transport mode shares, based primarily on tram systems. However as car ownership rapidly grew from the 1950s onward, most urban tram systems were dismantled, only partly replaced by buses, and the mode share of urban car travel grew rapidly. Per capita car usage in Australasia increased from the 1950s to the 1990s. After 2000 per capita car usage plateaued and began to decline, probably due to urban road systems becoming "saturated" with traffic, and congestion levels increasing. This trend in per capita car uage in Australasian cities is shown in Figure 3.2. Note the consistency across all cities after 2004.

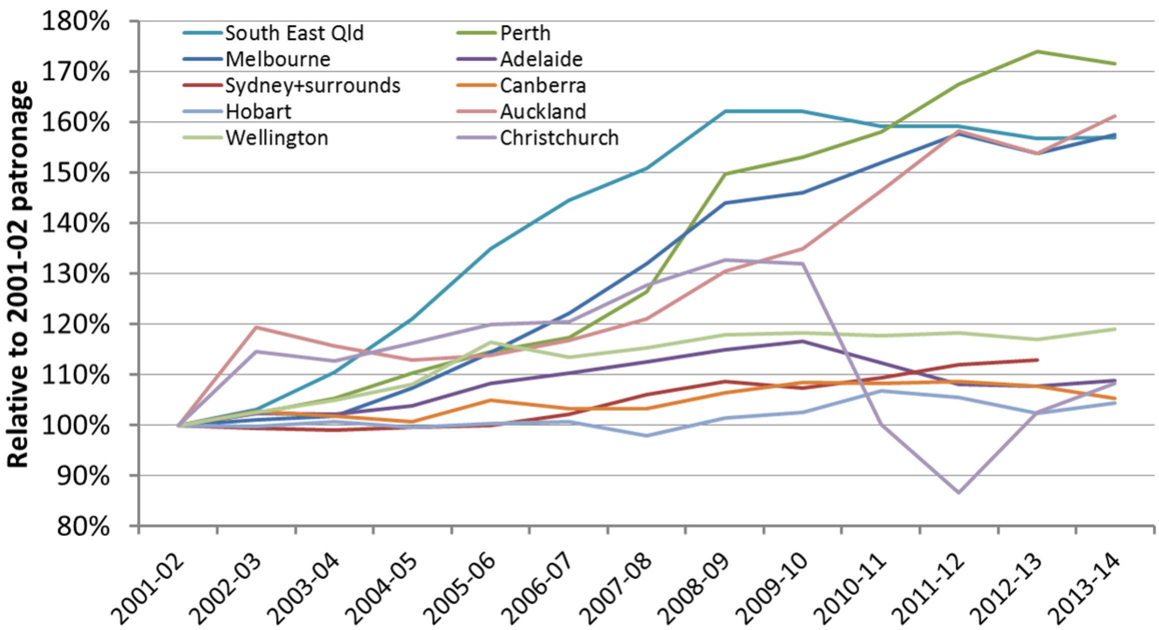
Figure 3.2 Total vehicle kilometres per capita in Australasian cities (Loader 2011)



Data: Chris Loader (2011)

Urban public transport usage correspondingly declined from the removal of trams in the 1950s until the 1990s. From approximatley 2000 onwards per capita usage of public transport in Australasian cities has been increasing, consistent with international trends (Richardson and Elaurant, 2013, Loader, 2015). The exceptions were Christchurch (due to the 2011 earthquake) and Sydney, where rail investment was limited. See Figure 3.3.

Figure 3.3 Trend in urban public transport usage in Australasian cities (Loader, 2015)



Data: Chris Loader (2015)

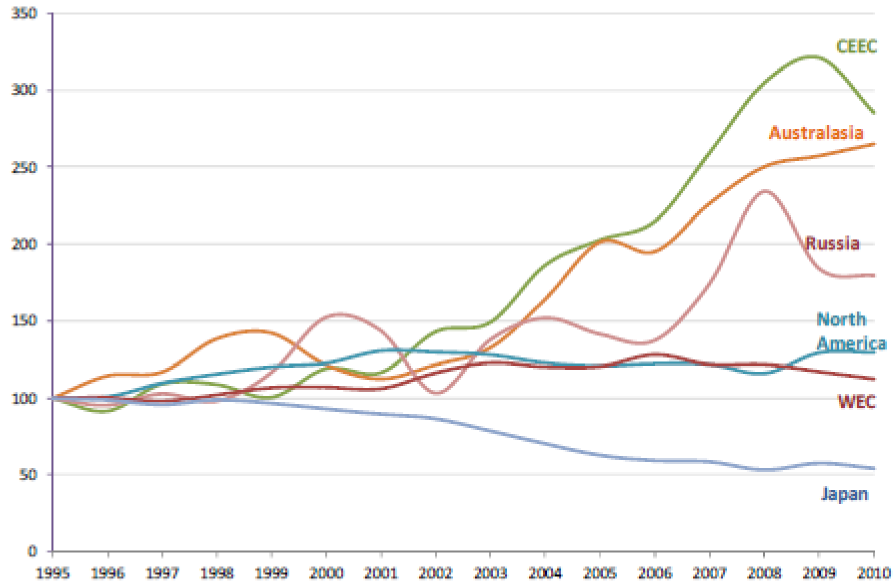
On the basis of these demand trends, and cost efficiency, we would then expect a change in investment from urban road construction towards rail during this period. We will next examine the extent to which that has occurred.

4. Trends in urban transport funding

4.1. International

Overall land transport investment in OECD countries has been in long term decline as a percentage of GDP, falling from an average of 1.3 % of GDP in 1995 to 0.8% by 2013. In most OECD countries infrastructure investment fell particularly after the global financial crisis (2008). Australasia was one of the areas of largest growth in transport infrastructure spending, exceeded only by former communist countries in Eastern Europe (CEEC). See Figure 4.1.

Figure 4.1 Investment Index for Land Transport Infrastructure (1995-2010)



CEEC = Eastern Europe; WEC = Western Europe (**Data: ITF 2012)**

In North America and Western Europe there was a shift of investment away from road construction and towards rail construction. Rail investment in Western Europe increased from 30% of total funding in 1995 to 40% by 2010 and to 45% by 2013 (ITF, 2015).

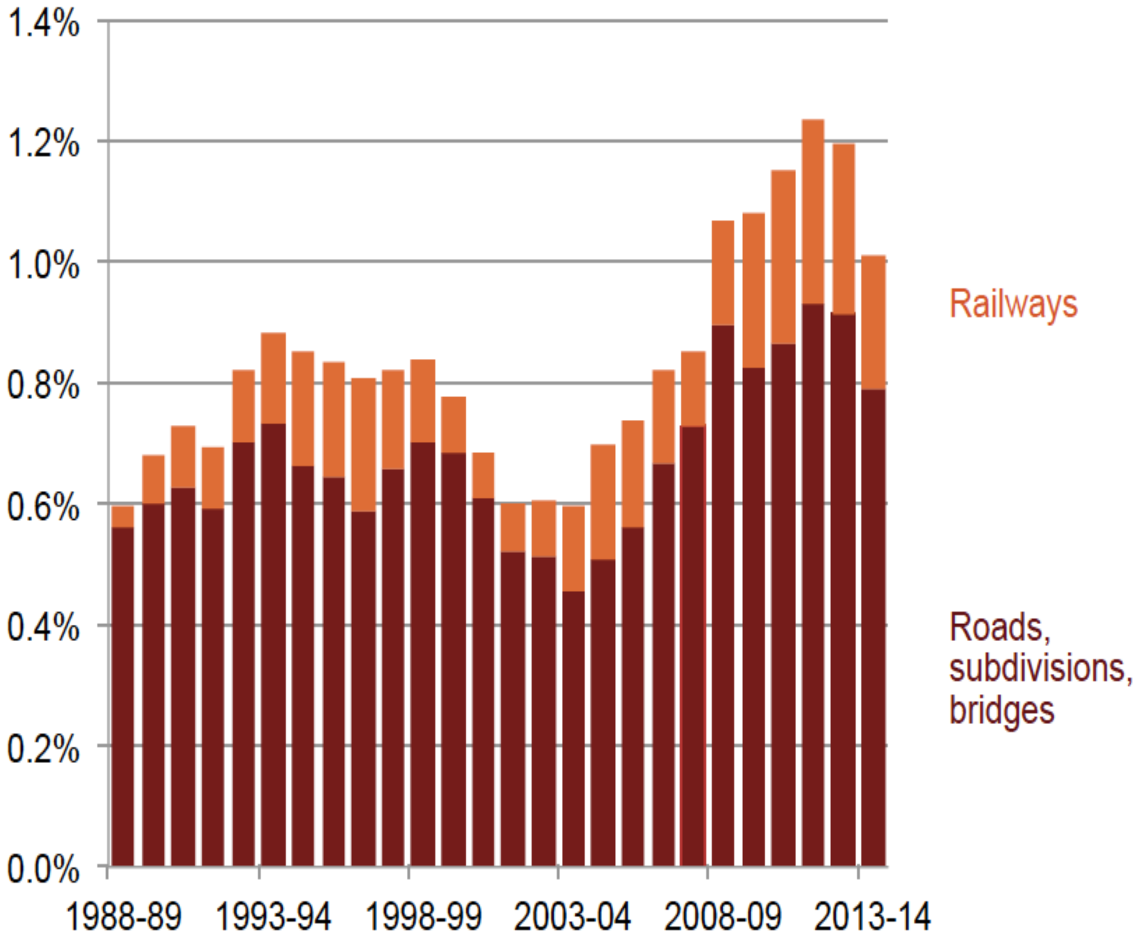
US rail investment increased in the past decade though off a small base (less than 10% of total). US urban freeway spending has been falling since the 1970s, when the original financing mechanisms for the US Interstate program began to lose strength. US rail investment will increase after 2018, with more than $200 billion in urban rail funding measures passed in 2016 US election ballot measures, despite cuts to Federal rail funding.

In Canada investment in rail and public transport has proportionately been higher than in Australasia and the United States and this trend is continuing and increasing. In the 2017 Canadian budget rail funding announced was $20 billion out of a total infrastructure investment of $35 billion, or 57%.

4.2. Australia and New Zealand

In Australasia spending on urban transport infrastructure in recent decades has been variable. Australian transport investment increased from 0.6% of GDP in 1989 to 1.2% in 2011-12, the highest in the OECD. It then dipped between 2013 and 2015, before rising again in the 2017 budget. Rail funding started at less than 0.1% of GDP in 1989 (7% of total transport spending) and rose to 0.3% of GDP (32% of transport spending) by 2012. See Figure 4.2 (Terrill, 2016). Note that this is for total transport spending (urban plus rural).

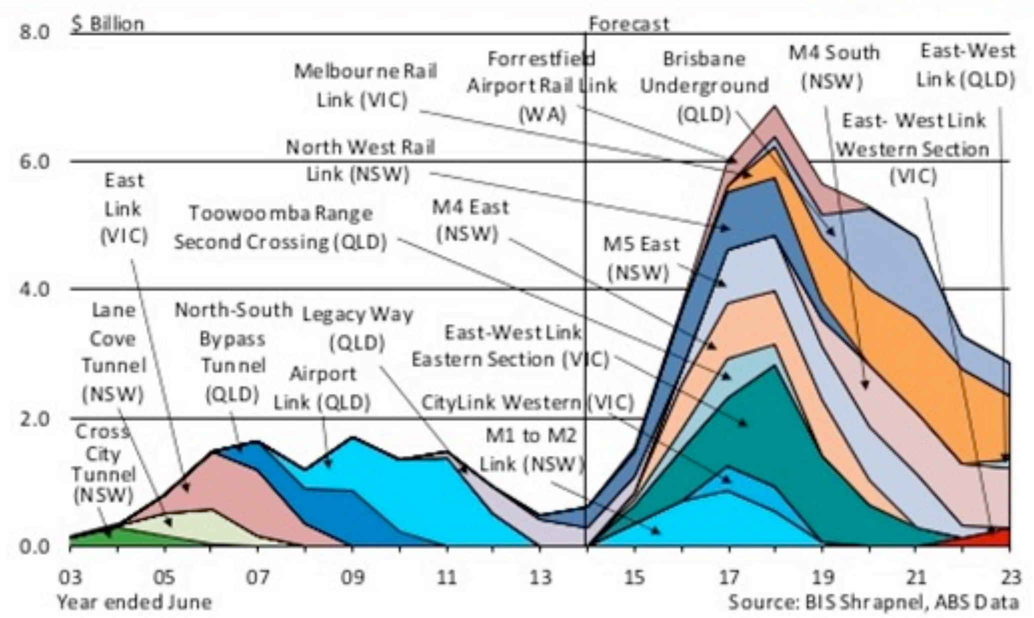
Figure 4.2 Australian road and mass transit funding (1989-2014) (Terrill 2016)



Spending on rail projects increased during the global financial crisis (2008 to 2011), but then declined to virtually zero under the following government (2013-2015) which had a policy to only fund road projects. Under the most recent 2017 budget, rail spending planned for the ten years from 2017 to 2026 was $18.4 billion out of a total of $75 billion (24%). This was a significant improvement over 2013 to 2016, although only $1.35 billion was committed to current projects (Budget 2017-18).

Throughout this period the majority of funds were spent on roads, particularly freeway tunnels. As was identified in Section 3.5 road tunnel projects are the most costly way to provide urban transport capacity, and so this trend is questioned. Of the six such projects delivered in the ten years to 2014 more than half (4 of 6) went bankrupt within three years of opening. There has since been a change to the delivery mechanism for urban road tunnels in Australia, but not to the scoping of the projects themselves. The cost of past and planned urban road and rail tunnels in Australia as at 2014 is shown in Figure 4.3.

Figure 4.3 Urban Tunnel Projects in Australian Cities (2003-2023) (BIS Schrapnel)



In New Zealand spending on urban transport infrastructure has been proportionally lower than in Australia, increasing in real terms, more consistent over time, and also primarily focused on road projects. The Central government is responsible for funding state highways including all urban freeways. The Central government contributes 25% of the operating cost of urban rail (50% of subsidy) but no fixed percentage of urban rail. It contributes to the capital cost of individual projects on an ad hoc basis. During the ten year period 2007-2016, 94% of capital funds were spent on roads, and 6% on public transport (NZTA, 2016).

Under the current National Land Transport Fund for the ten years from 2015 to 2025, a total of $36 billion NZ will be invested in urban and rural road and rail infrastructure. Of this total, $28 billion NZ (80%) will be spent on State highways and local roads, and $4 billion NZ (11%) will be spent on public transport subsidies. Capital spending on urban rail will be an additional $2.3 billion NZ, compared with $9.2 billion for road projects, a ratio of 20% public transport to 80% roads (NZ Budget 2017). For 2015-2018 total transport funding, including policing, 53% is spent on highways, comprising capital (37%) and maintenance (16%) and 9% is spent on public transport.

In summary transport funding in Australia has increased to a high level over the past decade, with rail funding highly variable. In New Zealand transport funding has also increased but been more consistent. Rail or public transport funding has increased in both cases, but is still a minority (<25%) of urban funding, in contrast to other OECD nations. There has been no consistent funding commitment towards a rail program, with all funds being in the form of one-off ad-hoc decisions. This is in contrast to road programs, is similar to the situation in the United States, and contrary to practice in most other OECD nations.

5. Transport Project evaluation methods

5.1. Methodologies

Australia (ATAP 2016) and New Zealand (EEM 2015) both have comprehensive guidelines for economic assessment of urban transport projects. Gwee et al (2011) undertook a detailed analysis and comparison of Australasian and other OECD nations' methodologies for evaluating rail projects. They found that Australian and New Zealand assessment guidelines were comprehensive and structurally similar to other nations. At the time

Australian guidelines did not incorporate agglomeration impacts. New Zealand guidelines did not consider pedestrian and cyclist costs or benefits.

Since then Australian and New Zealand guidelines have been updated. The New Zealand guidelines have added pedestrian and cycling costs. Australian guidelines have kept the monetarisation of greenhouse gas emissions (negative but not significant) and included agglomeration impacts (positive for rail, road and significant). Consequently we consider that Australian and New Zealand guidelines are now neutral between road and rail projects.

5.2. Demand modelling

One of the major limitations in practice for Australasian project assessment is in the modelling of transport demand. In Australasia the following limitations are observed:

- Strategic demand models are four step and not activity based. This limits their ability to model behavioural change that may occur with large rail or light rail projects.
- Fixed future land use scenarios are used for testing of impacts, limiting the ability to model induced demand, which would otherwise reduce the benefits of road projects.
- Lack of Land Use Transport Interaction (LUTI) models mean that future year modelling does not consider feedback between infrastructure construction and land use form. Duranton and Turner highlight this as a cause of induced demand.

These limitations are all likely to overstate the benefits of road projects (due to lack of allowance for induced demand), and underestimate the benefits of rail projects (due to lack of consideration of long term benefits). Rail projects are susceptible to induced demand, however their capacity and nature is such that travel time (and hence benefit) does not change greatly with demand level.

5.3. Discount Rates

The interest rate or discount rate that is used to convert future benefits and costs to net present values is critical to the outcome of analysis. In this regard it should be noted that Australasian transport project benefit cost analysis uses discount rates that are unusually high by international standards, and this favours projects with short term benefit streams.

In theory Australia uses a discount rate equivalent to the private sector borrowing rate. In practice Australia has used discount rates of 7%, with sensitivity tests for 4% and 10% since before the Global Financial Crisis. New Zealand uses discount rates of 6% with sensitivity tests of 4% and 8% (NZTA EEM, 2016). This compares with much lower discount rates in other countries. France, Germany, Japan, Singapore, and UK, all use rates of 4% or less (Gwee et al., 2011). In USA rates vary from 3% to 7%. The impact of these different discount rates on net present value (NPV) can be seen in Table 5.1.

Table 5.1 Impact of Discount rates on Net Present Value of Future Benefits/Costs

Time period	Discount Rate						
	2%	3%	4%	6%	7%	8%	10%
Present Day	100	100	100	100	100	100	100
10 Years	82	74	68	56	51	46	39
20 Years	67	55	46	31	26	22	15
30 Years	55	41	31	17	13	10	6
50 Years	37	23	14	5	3	2	1

Economists argue what the basis for discount rates should be. It is difficult to reconcile current rates with actual government or private borrowing costs. The Australian government bond rate (for government borrowing) at the time of writing in June 2017 was 2.6%, close to a record low. It has not been above 7% in the nine years since before the global financial crisis commenced in September 2008. The Reserve Bank of Australia cash rate for inter-bank lending was 1.5% in June 2017, which is a record low (RBA 2017).

The discount rates are also difficult to reconcile with the design lives of the assets being analysed. Concrete structures such as road and rail bridges, concrete sleepers and track slabs for heavy rail and light rail, and concrete road pavements will have a long design life, typically 50 or 100 years. Asphalt pavement common in urban roads has a shorter life, typically 20 or 30 years, and requires mid-life rehabilitation after 10 to 15 years.

Operationally, as Duranton and Turner (2009) demonstrated, the congestion relief benefits from urban road projects are shown to be short term. Induced demand was found to eliminate them within ten years. This disadvantage will have limited impact on the benefit calculation of a road project using high (6%+) discount rates. In the authors' view the discount rates currently used in Australia and New Zealand are too high to reflect prevailing economic conditions, and represent an effective bias favouring road projects over rail, and over longer life assets generally.

5.4. Exemptions from assessment

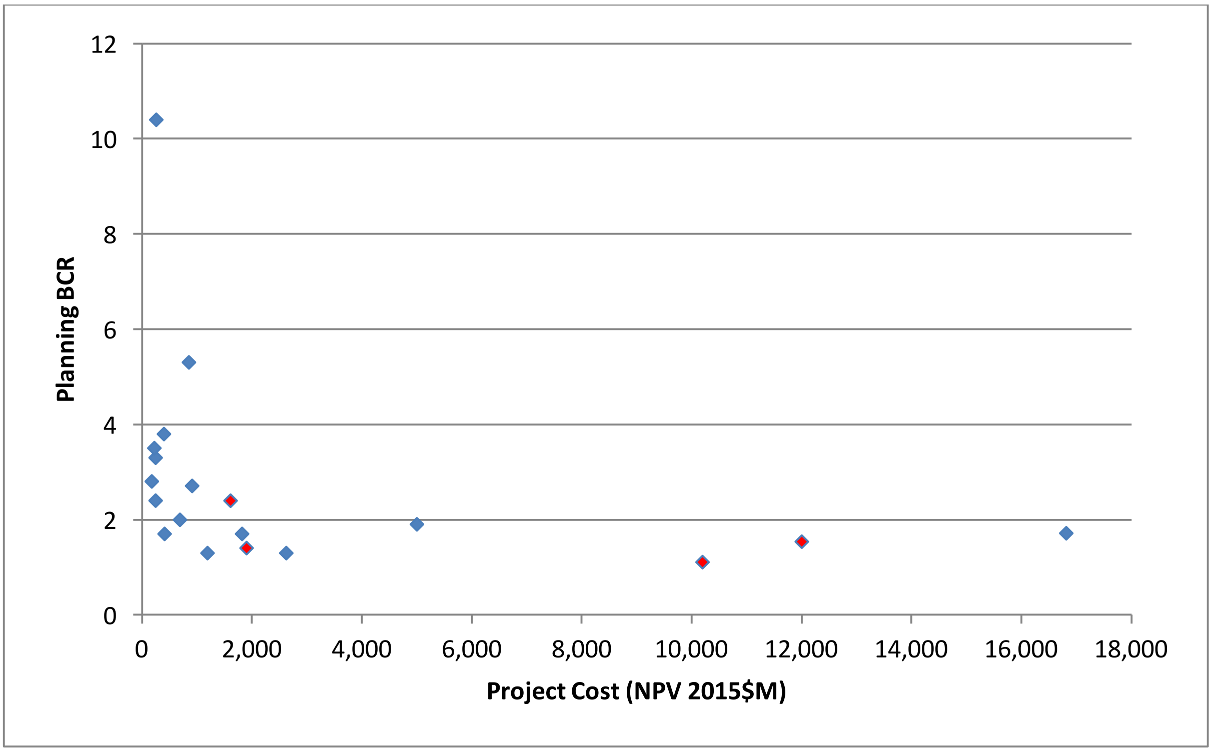
The largest bias in urban project assessment in Australia and New Zealand is in the categories of project that are exempted, or which are funded by different mechanisms regardless of the results of assessment. In Australia in theory projects are assessed and then submitted to Infrastructure Australia for prioritisation. However since 2012 over half of Federal infrastructure spending went to projects that had no published assessment. Benefit Cost Ratios (BCRs) have not been reported for these projects (Terrill, 2016). In the 2017 Australian Federal budget the two largest transport projects - the Sydney Westconnex project, with a stated cost of $16.8 billion (SMC, 2015) and the $8.4 billion Inland Rail project – were both funded without reported BCRs, or complete cost estimates.

For New Zealand, the project assessment process is now relatively complete and, aside from limitations in modelling induced demand, unbiased in a structural sense. All mass transit projects go through the same assessment process, and would generally seek to demonstrate a benefit cost ratio (BCR) greater than one to be funded. However not all urban road projects do so. The Roads of National Significance (RONS) program is developed separate to this process. This is highly significant, as the majority of large urban freeway projects in New Zealand are funded under this category.

5.5. Project assessment in practice

Based on the above we would expect project BCRs for funded urban road projects in Australia to be higher than BCRs for funded mass transit projects. A list of 19 funded urban road and mass transit (coloured red) projects with reported BCRs was compiled for Australia from 2003 to 2015. The reported BCRs are shown in Figure 3.1 compared with their cost (NPV in 2015 $AUS).

Figure 5.1 Australian urban road (blue) and rail (red) project BCRs versus NPV



It is difficult to be definitive with a small dataset. Firstly the projects with the highest BCRs (>3) are all under $1 billion. Likewise no road tunnel project had a BCR > 2. The average BCR is 3.1 for the road projects and 1.6 for the rail projects. Whilst it is difficult to draw conclusions from the small number of rail projects in the sample, this difference may be related to the omission of agglomeration benefits. The one rail project for which agglomeration benefits had been assessed gained a 30% increase in benefits.

In New Zealand a review was undertaken in 2015 by NZTA of the economic efficiency of capital spending on roads (Nunns, 2015). The review noted that benefit cost ratios for urban road projects were falling. Prior to 2008 urban road projects had typically been assessed to average 3.5. After 2008 urban road project BCRs were observed to average 2. The reasons for this were not made public, but it is consistent with the earlier findings in Section 3 of this paper that spending on capacity upgrades in already congested urban road networks yields declining economic outcomes.

6. Conclusions

We will consider the question of bias from the point of view of assessment methodology, investment versus demand trends, and funding allocation process.

We do not find evidence for a systemic bias in the assessment methodology for Australasian urban road or mass transit projects. The methodology used for assessment in Australia and New Zealand is sound and consistent with international practice, with the exception of omitting agglomeration benefits in Australia, which tends to reduce benefits for mass transit projects. Results of assessment where available are consistent with this conclusion.

In practice non-systemic issues have the effect of indirectly influencing the assessment of road and mass transit projects in Australia and New Zealand. The use of high discount rates and models with fixed land use scenarios both tend to favour projects with short term benefit streams and understate the impact of induced traffic. This is likely to favour urban road projects over mass transit. Nevertheless we suggest that this is not the primary problem.

The greatest weakness in urban transport funding in Australia and New Zealand, is in the fund allocation process. In both countries a large number of funding decisions are made without published assessments of the economic merits of the project. These include many of the largest urban freeway projects. Further, there is no systematic program of urban mass transit project funding, unlike the situation for roads. This is a major bias and is contrary to practice in most other OECD nations.

This has resulted in a mismatch between urban transport funds allocated, and urban transport demand trends. Demand for mass transit has been growing faster than demand for roads for over a decade, yet the majority of funds (75%+) are still allocated to urban roads. This cannot be supported on economic or functional grounds. Available evidence suggests that in congested cities road capacity increases are more expensive to build than mass transit, do not have lasting benefits, and are likely to be negated by induced traffic.

In summary there is a serious problem with urban transport fund allocation in Australia and New Zealand. However the problem does not appear to be bias in project assessment. Rather, there is bias in the funding allocation. We hypothesise that there has been a lag in the transition of national funding agencies that historically delivered roads to becoming supporters of mass transit systems, in a time when the nature of urban travel demand is changing. There is an absence of programs to plan and fund mass transit in an efficient and predictable manner. This situation appears likely to result in economic losses in both countries, from expenditure on urban roads that are unlikely to deliver claimed benefits, and from excess travel costs for commuters in cities with high congestion and inadequate mass transit alternatives.

7. References

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