Australian Government
Department of Infrastructure and Regional Development
Bureau of Infrastructure, Transport and Regional Economics

Saturating Daily Travel

At a glance

This BITRE information sheet illustrates the concept of saturating daily travel (i.e. natural limits being approached in the amount of personal day-to-day travel), by looking at the historical growth of per person urban travel in the United States and Australia. It is shown by the analysis of the two countries that urban travel per person is tending to saturate (faster in Australia, slower in the United States). In both countries, a notable halt to per person traffic growth in the period after 2005 is shown to be associated with mostly temporary influences. As such, the period to 2020 is likely to be one of renewed aggregate traffic growth, due mainly to population growth.

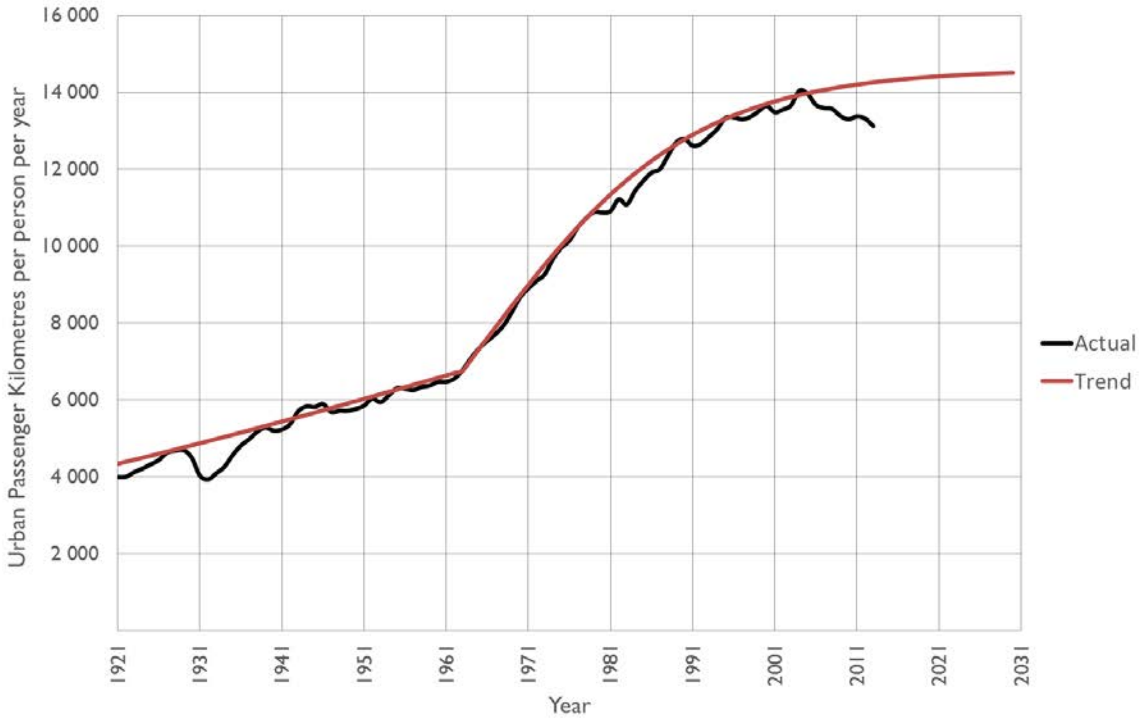
Saturating Daily Travel

'Saturating daily travel' refers to a saturating (or asymptotically limiting) trend in personal daily travel. As such, our concept:

1) is of a plateau,
2) refers to daily (short-distance) passenger travel per person,
3) includes all modes of daily passenger transport – i.e. cars, light commercial vehicles, motor cycles and mopeds, walking, cycling, urban public transport (UPT) and (in earlier days) horses and horse-drawn carriages,
4) is better measured in per capita passenger-kilometers (i.e. numbers of passenger trips times the average length of those trips) than just average number of trips, since passenger- kilometers (pkm) are a better indicator of the time and effort involved in passenger movement task.

Figure 1 shows Australian urban all-modes passenger-kilometers per person since 1921, and the two-phase saturating logistic trend fitted to it. Saturating daily travel as a concept is about the flattening part towards the right of the red curve.

Figure 1: Australian all-modes urban passenger-kilometres per person



Sources: BITRE (2012a, 2012b, 2014), Cosgrove (2011), BITRE estimates.

This information sheet presents estimates and models for urban daily travel in Australia and the United States using financial year data from 1920-21 through to 2011-12 for Australia, and calendar year data from 1921 to 2010 for the United States. Urban travel is focused on, as it is relatively short distance and data on different modes are available. It will be shown in the analysis of the two countries that urban travel per person is indeed saturating, and that the perturbations of the actual daily travel per person from the fitted (red line in Figure 1) saturating trends are a function of mainly three things:

1) petrol prices,
2) unemployment, and
3) major economic impacts, in particular the Global Financial Crisis (and the persistent changes in behavior associated with it).

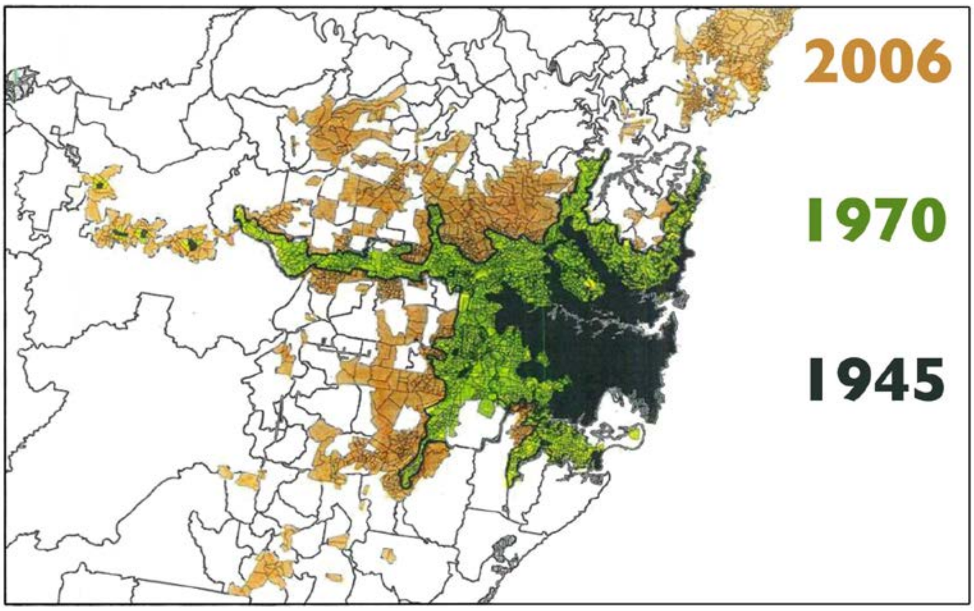
All three of these factors have been exerting downwards pressure on travel levels in recent years, contributing to the considerable gap (shown by the right-hand data of Figure 1) between current per capita values and the saturation levels implied by the pre-GFC historical trend.

Although the modeling of these perturbations is interesting in itself, it should be borne in mind that it is the saturating trend in per-person daily travel that is at the heart of the slowing daily travel phenomenon.

Factors underlying saturation

The concept of saturating daily travel is well suited to explaining the development of urban travel in Australia and the Unites States over the last century. Over the 1900s, and particularly since the end of the Second World War, Australian and American cities have gradually been transformed from quite tightly knit layouts (typically well suited to passenger movement by mass transit systems), to more sprawling suburban (generally low-density) configurations. Figure 2 shows the growth of Sydney from after the War to 2006. Post-war Sydney was compact, with arms stretching out along the rail lines. By 1970, two more post-war Sydneys had been added, and by 2006 there were the equivalent of five post-war Sydneys.

Figure 2: The Growth of Sydney



This transformation of urban form – as the major cities have tended to grow ever outwards, often leading to longer and longer average trip lengths – has been accompanied, and assisted, by considerable improvement and spread of road systems and an even faster expansion in car ownership. This phenomenon continues to the present, although modified in the past decade by an increasing trend to densification in the inner suburbs and central business districts (see BITRE 2013).

Basically, as income levels (and motor vehicle affordability) have tended to increase over time (especially post-war), average travel per person has increased. However, there are constraints on how far this growth can continue. Eventually, people are spending as much time on daily travel as they are willing to commit, and are loath to spend any more of their limited time budgets on yet more travel, even if incomes do happen to rise further. Therefore, future increases in urban passenger-kilometres travelled come to depend more directly on the rate of population increase, and less on increases in general prosperity levels.

Detailed analyses are now considered of this phenomenon for the two countries.

Vehicle Use

An earlier publication (BITRE 2012b) showed that even with the more restricted 'vehicle kilometres per person' there was a clear pattern of saturation in a selection of countries around the world. Table 1 shows the saturation date and level estimated (as either already experienced or projected) for each country.

Table 1: Dates and levels of saturation in vehicle kilometres per person

Country	Date of saturation	Level of saturation (vkt/person)
Australia	2006	10800
Austria	2037	11500
Belgium	2015	10500
Britain	2019	9500
Canada	2006	11200
Denmark	2011	10300
Finland	2039	13000
France	2018	10100
Germany	2032	11800
Greece	2052	16000
Ireland	2028	12300
Israel	2027	8000
Italy	2015	10900
Japan	2016	6800
Korea	2028	8500
Netherlands	2060	10200
New Zealand	2012	9700
Norway	2014	9000
Spain	2060	11000
Sweden	2043	11400
Switzerland	2015	9000
United States	2065	18500

Sources: BITRE (2012b)

The long-term trends in urban vehicle kilometres per person for Australia and the United States are shown in Figures 3a and 3b. Note that Australian distances are given in kilometres, while American distances are given in miles.

Starting from very low bases in 1921, both nations' vehicle use grew during the 1920s, dipped during the Depression and Second World War and then expanded rapidly, especially in the 1960s as the 'baby boom' generation reached driving age.

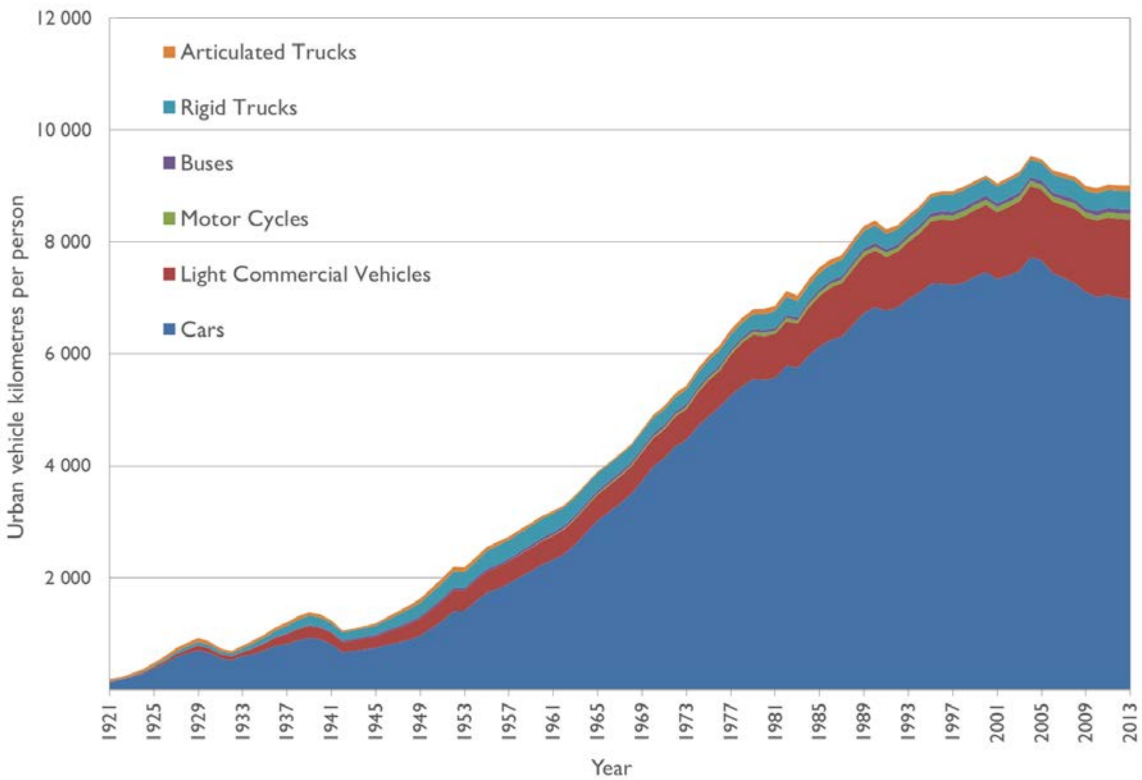
From the mid 2000s, however, there has been a distinct slow-down in growth.

Over the last century, most of the growth in vehicle use has been in cars and light commercial vehicles (LCVs). The US data have been standardised on current vehicle class defintions, and split into urban and rural using data from the Federal Highway Administration (2010).

The growth in vehicle kilometres per person has been large.

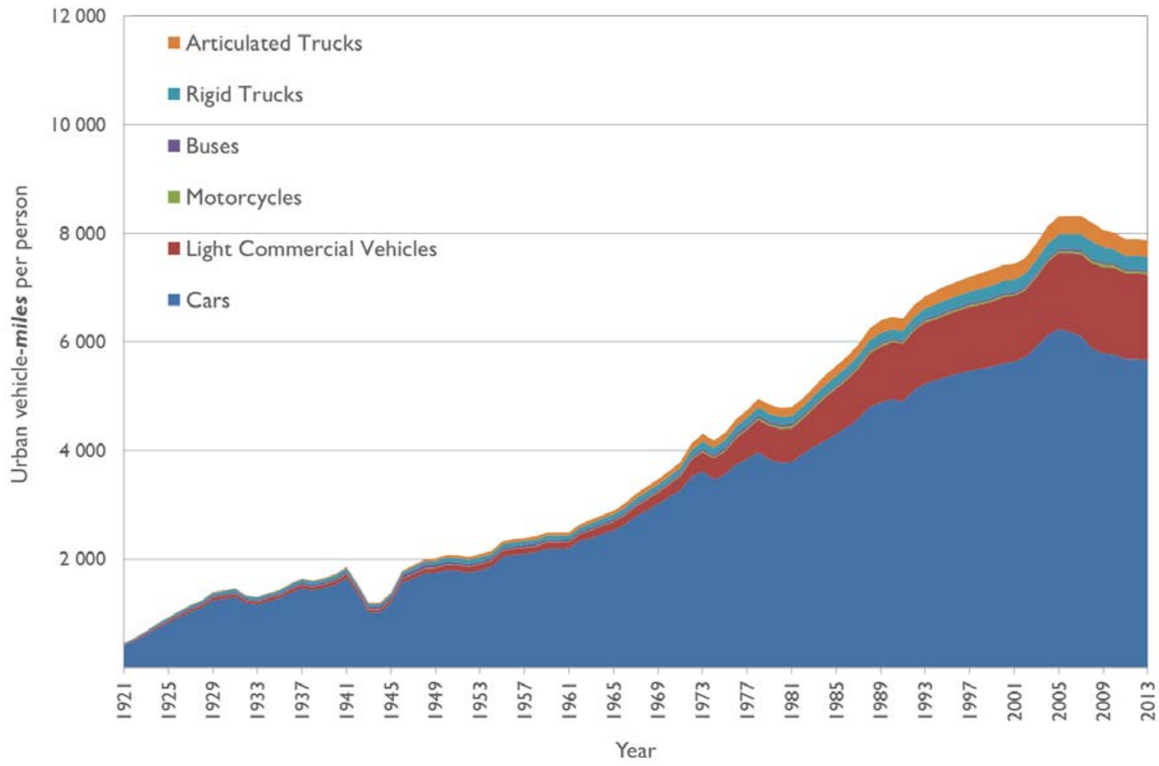
American vehicle use per person by 2010 was about 3.5 times its post-war level. In Australia the increase was more of the order of 7 times over the same time period.

Figure 3a: Australian Urban Vehicle Kilometres per Person



Sources: BITRE (2012a, 2012b), Cosgrove (2011).

Figure 3b: American Urban Vehicle-Miles per Person



Sources: BITRE (2012b), BITRE estimates.

Passenger Travel

To derive total urban passenger travel per person in Australia and the United States, one must weight the vehicle kilometres by occupancy levels and then add in urban public transport, walking and cycling, and (in earlier days) horses and horse-drawn travel.

In Australia, it was assumed that occupancy trends were near linear. The assumptions were: for cars 1921 occupancy was 1.75 and 2010 occupancy was 1.47, for light commercial vehicles effectively 1.0 and 0.8 (after allowing for the proportion of business use for these vehicles), and for motorcycles a constant 1.0. These simplifying assumptions were based on the limited information available for trends covering such a long time frame.

In the United States, the assumptions were: cars 1.75 in 1921 and 1.40 in 2010, light commercial vehicles 1.0 and 0.75, and motorcycles constant at 1.0; again based on whatever information was available.

Estimates of urban public transport were derived from available data. For Australia these are set out in Cosgrove (2011).

For the US, estimates of passenger miles are available from the American Public Transport Association (2012) from about 1977 on. Previous to this, the same source has passenger trips, which were multiplied by assumed constant distances per trip to give a series of passenger-miles by urban public transport going back to 1921.

Estimates of urban walk and cycle in the US are available (Pucher et. al. 2011) for periods since about 1960 to 1980. It has been assumed, very roughly, that walk/cycle was 65 per cent of urban public transport in 1921, and rose to equal urban public transport in 1967 and thereafter (based on Pucher et. al. 2011).

To generate urban travel per person, one just divides by the urban population. For the US there is a complication, in that the definition of 'urban' has changed twice. But there are overlaps and an 'urban fraction' standardised on the present definition has been derived, smoothed with a 13-year centred average and multiplied by the US population series (United States Department of Commerce 1976) to derive a US urban population series.

The results of such derivations, for urban passenger travel per person estimates, are shown in Figures 4a and 4b. Two things are apparent.

First the major growth has been in car travel, followed by light commercial vehicle travel.

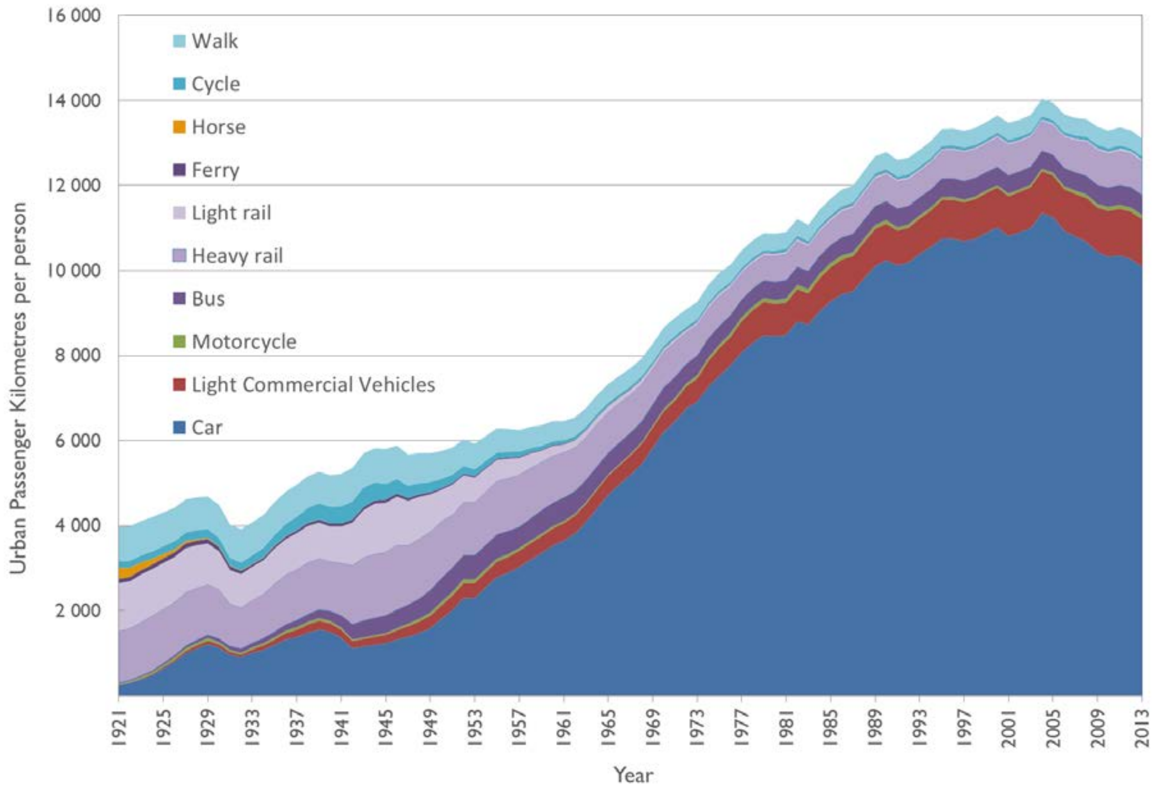
Car was a small part of city travel in 1921. During the 1920s, car use grew quickly, but then the Depression, Second World War and post-War circumstances held back growth. In the 1960s, car travel expanded rapidly, but per person use in both countries has been slowing in recent times, and has actually declined in the late 2000s.

Secondly, the absolute levels of walk/cycle and urban public transport declined, especially post-War, before gradually returning only to near their previous absolute levels. This means their share of total travel has declined markedly, given the growth in vehicle travel.

Figures 5a and 5b show estimated Urban public transport/Walk/Cycle as a percentage of total daily urban travel in the two countries. After dropping from 1921 to 1930, Urban Public Transport/Walk/Cycle shares in both countries tended to flatten out during the Depression years. During the Second World War, shares actually rose as petrol rationing caused a switch back to these modes.

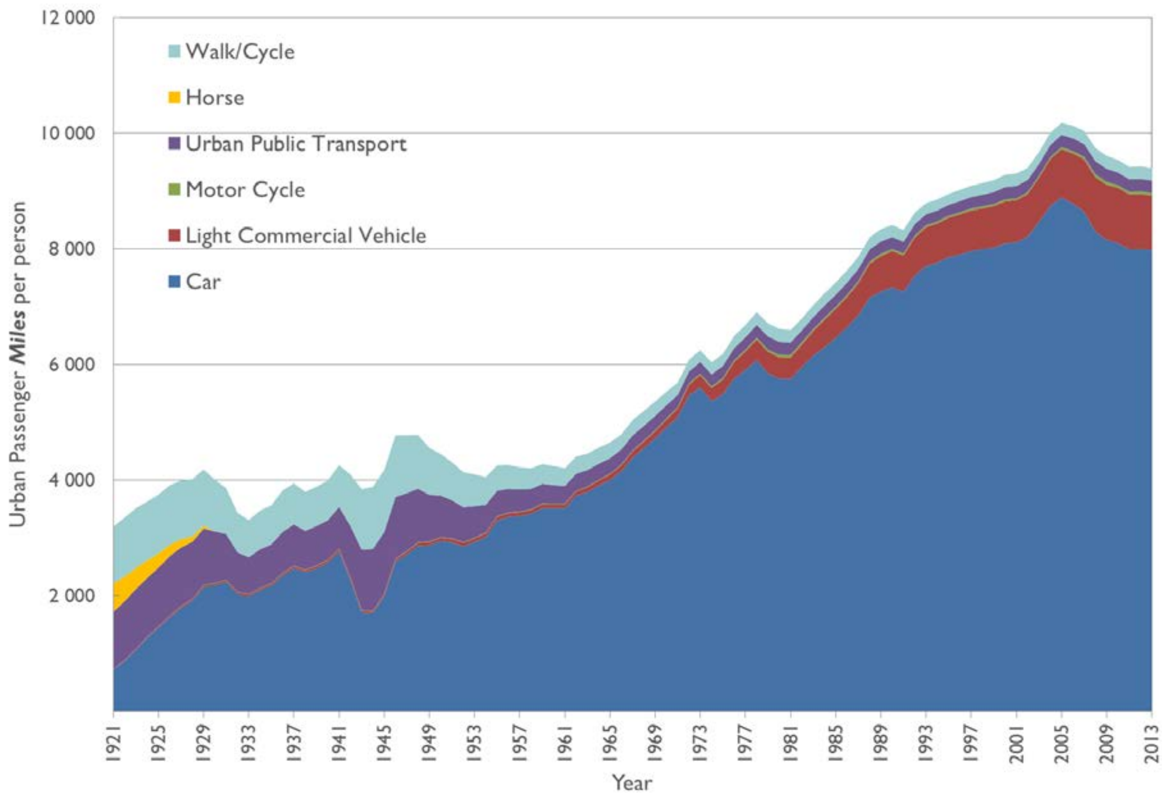
After the war, Urban public transport/Walk/Cycle shares declined strongly, before leveling out in the 1970s. In Australia in recent years, the share of Urban public transport/Walk/Cycle has increased somewhat. This is due to pressure on household budgets that lead people to 1) cut back on expenditure (including driving) and increase savings, and 2) switch to cheaper alternatives such as Urban public transport/Walk/Cycle (see Hossain and Gargett 2012).

Figure 4a: Australian Urban Passenger Travel per Person



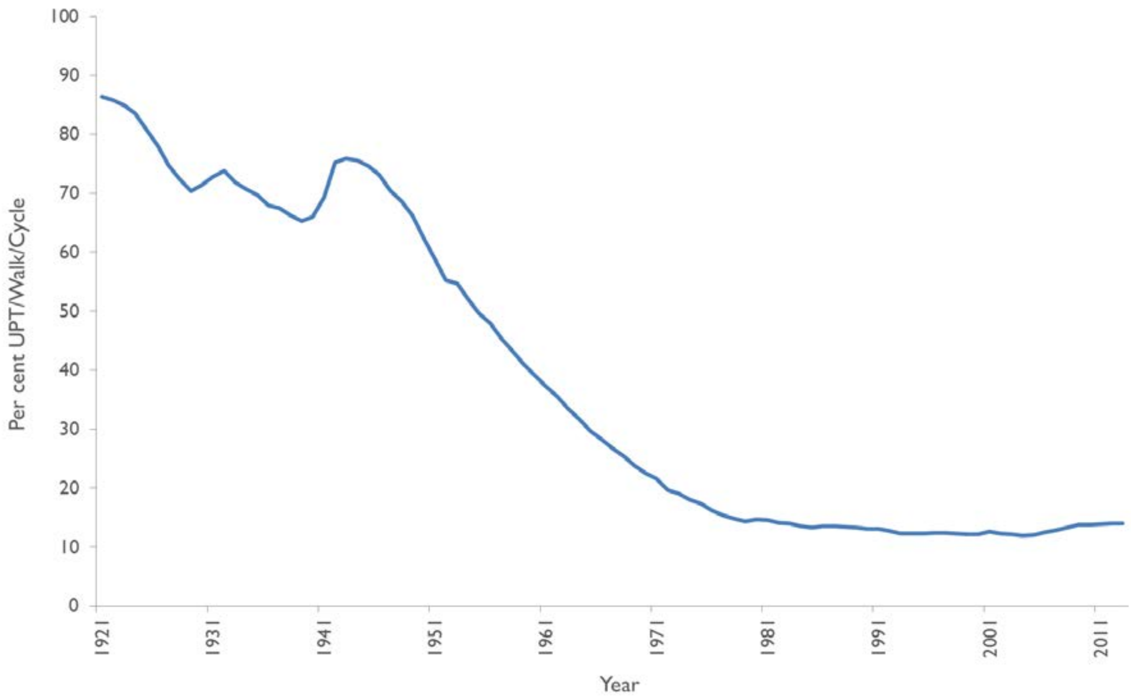
Sources: BITRE (2012a, 2012b), Cosgrove (2011), BITRE estimates.

Figure 4b: American Urban Passenger Travel per Person



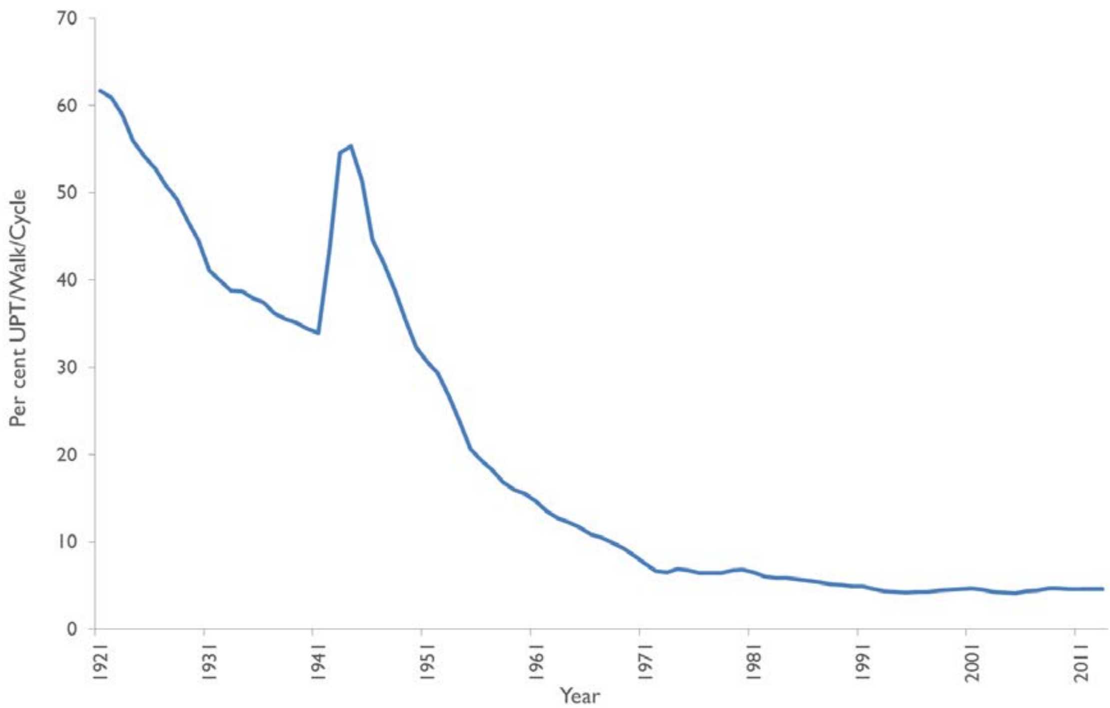
Sources: BITRE (2012b), BITRE estimates, American Public Transport Association (2012).

Figure 5a: Australian Urban public transport/Walk/Cycle as Percentage of Total Urban Passenger Travel



Sources: BITRE estimates.

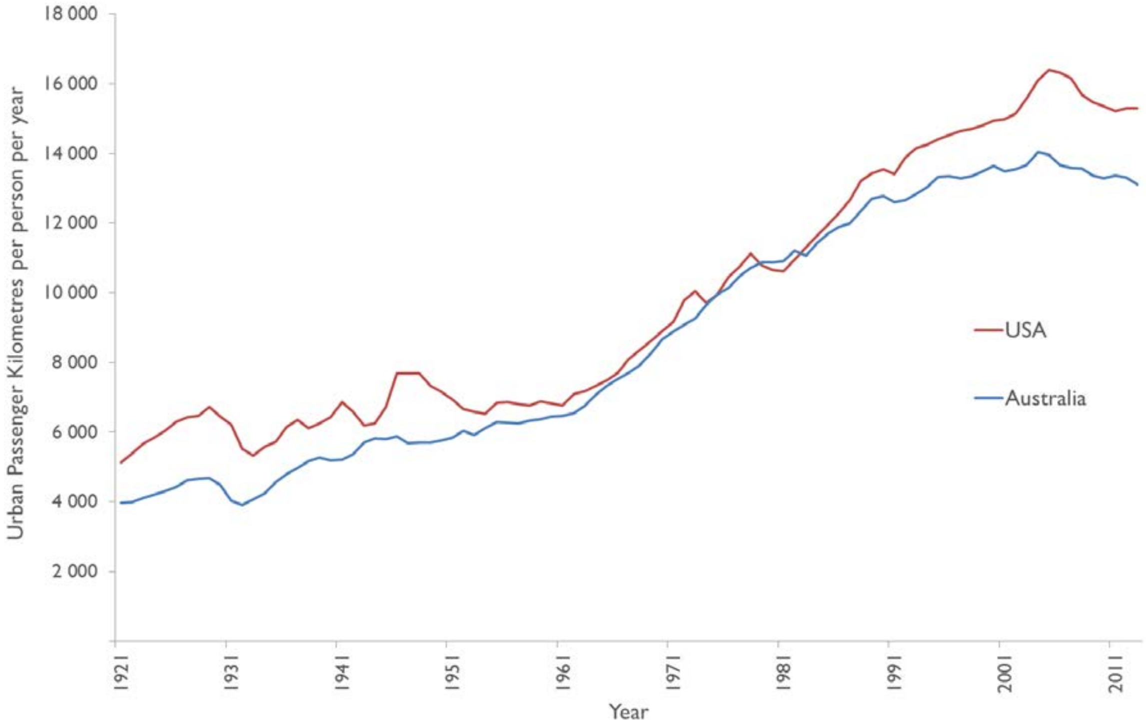
Figure 5b: American Urban public transport/Walk/Cycle as Percentage of Total Urban Passenger Travel



Sources: American Public Transport Association (2012), BITRE estimates.

Considering the aggregate of all the modes (and translating the US miles statistics into kilometres), Figure 6 shows very similar patterns in Australian and US cities, however with American levels of urban travel per person substantially above Australian levels from about 1990 on.

Figure 6: Urban Passenger-Kilometres per person in Australia and the US



Sources: BITRE estimates and American Public Transport Association (2012).

Modelling Urban Passenger Travel Per Person

Modelling of all-modes urban passenger travel in the two countries follows on from modelling of per person traffic growth in 25 countries recently published by the Bureau of Infrastructure, Transport and Region Economics in Canberra (BITRE 2012b). There are two general steps in the modelling. First, long-term models are fit (1921 to most recent) which yield the saturating trends. Then these trends themselves are used in short-term models with the other dependent variables. Data for the US are in calendar years, from 1921 to 2010. Data for Australia are in financial years from 1920-21 to 2011-12.

There were two phases to long-term growth in urban passenger travel in both countries – with the effective dividing line between the phases being the 1960s, when post-war travel growth entered a new phase. Thus, the long-term models are two-phase logistic models where trend urban passenger travel per person is modelled using two time variables in a linear regression on a logarithmic transformation of passenger-kilometres per person. The current perturbations of the actual daily travel per person below the saturating trend are modelled as a function of mainly three things:

1) petrol (gasoline) price (in real dollars),
2) unemployment (in per cent), and
3) the persisting effects of the Global Financial Crisis (GFC, represented here as a dummy variable)

The petrol price variable for Australia and the unemployment variable for the US are split into two components – before and after the relevant phase change. Tables 2 and 3 show the results of the regressions. All the explanatory variables have been left in these equations, even if not significant, in order to illustrate all effects. The signs on all the non-time variables are negative as expected. 'Wardum' is a dummy for the period of the Second World War.

Table 2: Australian Two-Phase Saturating Model

Dependent variable=ln(PKMpp/(14.6-PKMpp)); PKMpp='000 passenger kilometres per person

Table 2a: Regression Statistics

Multiple R	0.997612035
R square	0.995229772
Adjusted R square	0.99483693
Standard Error	0.092441769
Observations	93

Table 2b: Analysis of Variance

	df	*SS*	*MS*	*F*	*Significance F*
Regression	7	151.5443097	21.64918711	2533.407745	8.43194E-96
Residual	85	0.726365863	0.008545481		
Total	92	152.2706756			

Table 2c: Parameter Estimates

	Coefficient	*Standard Error*	*tStat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	-0.69911818	0.238213107	-2.934843465	0.004290523	-1.172749656	-0.225486705
pre67time	-0.060573991	0.00248696	-24.35664264	4.27231E-40	-0.065518734	-0.055629249
time	0.077570574	0.001472589	52.67631803	1.11796E-66	0.074642672	0.080498476
petrol66-	-0.001605168	0.001875545	-0.855840796	0.394492008	-0.005334253	0.002123918
petrol67+	-0.008872372	0.002145457	-4.135423275	8.2852E-05	-0.013138115	-0.004606629
unempl	-0.008225335	0.003420367	-2.404810925	0.018351898	-0.015025941	-0.00142473
GFC	-1.096120115	0.063285196	-17.32032437	1.28012E-29	-1.221948038	-0.970292192
wardum	0.215149534	0.170070798	1.265058652	0.209307506	-0.122996775	0.553295844

Sources: BITRE estimate.

Table 3: American Two-Phase Saturating Model

Dependent Variable=ln(PMTpp/(11000-PMTpp)); PMTpp=passenger miles travelled per person

Table 3a: Regression Statistics

Multiple R	0.995710907
R square	0.99144021
Adjusted R square	0.99051204
Standard Error	0.096742281
Observations	93

Table 3b: Analysis of Variance

	df	*SS*	*MS*	*F*	*Significance F*
Regression	9	89.97340584	9.997045093	1068.166631	7.27557E-82
Residual	83	0.776802718	0.009359069		
Total	92	90.75020856			

Table 3c: Parameter Estimates

	Coefficient	*Standard Error*	*tStat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	-0.624186279	0.127174837	-4.908095769	4.53088E-06	-0.877131914	-0.371240643
timepre60	0.004415632	0.001451837	3.041409698	0.003151063	0.001527986	0.007303278
time60on	0.065035581	0.001449942	44.853919	5.79893E-60	0.062151704	0.067919457
gas60-	0.000184733	0.001635415	0.112957748	0.910336815	-0.003068043	0.003437508
gas61+	-0.00155464	0.001251454	-1.242267127	0.217636568	-0.00404373	0.000934451
unempl60-	-0.007950609	0.002739412	-2.90230472	0.004742693	-0.01339919	-0.002502028
unempl61+	-0.014434468	0.011809215	-1.222305487	0.225051903	-0.037922522	0.009053585
GFC	-0.958308548	0.100965236	-9.491470351	6.79149E-15	-1.159124342	-0.757492753
war	0.014707862	0.032160435	0.457327822	0.648630261	-0.049257951	0.078673675
dum7903	-0.244494834	0.038676265	-6.321573077	1.234E-08	-0.321420369	-0.167569299

Sources: BITRE estimate and American Public Transport Association (2012).

Using these equations, a trend variable can be constructed for each country. Figures 7a and 7b show the all-modes urban passenger travel per person in each country, together with the two-phase saturating logistic trends fitted to the curves.

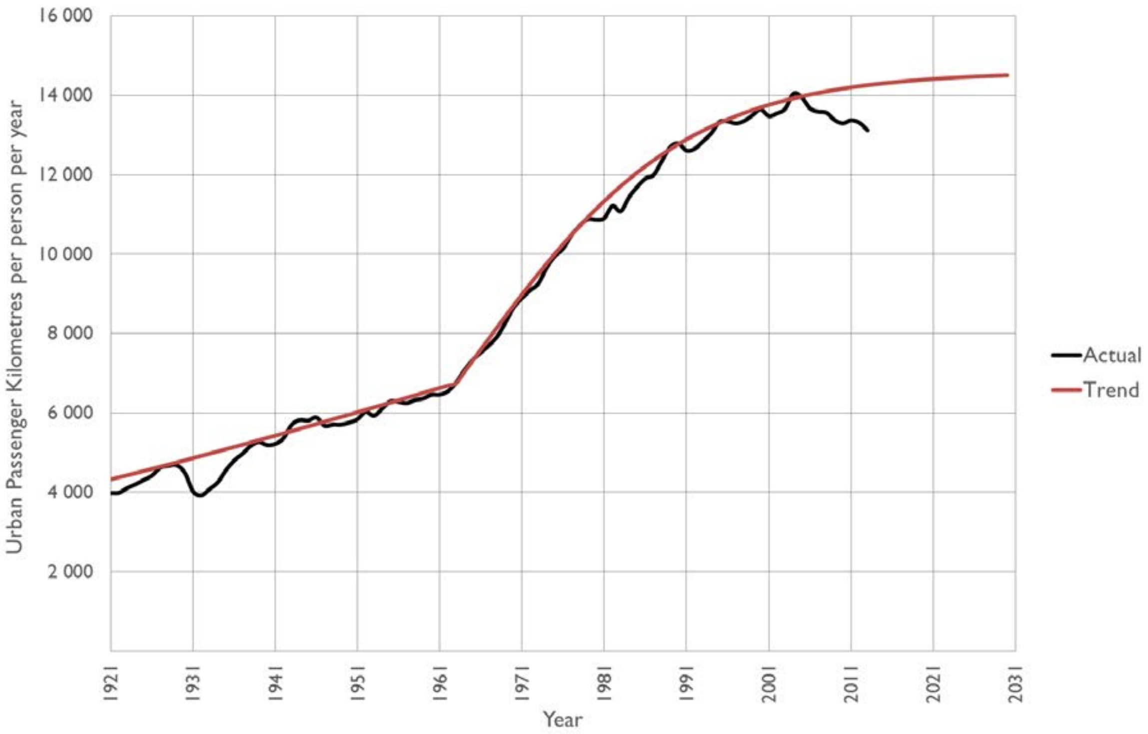
It can be seen that the trend patterns of growth in both countries are similar. The first trend phase is a gradual rise from 1921 to the 1960s. The second trend phase is a saturating (initially concave, before flattening) curve.

In Australia's case, the fitted trend curve nears an effective saturation at 14,600 kilometres per person by the end of the forecast period. The trend in the US exhibits slightly rising levels even by the end of the forecast period, with the eventual saturation point predicted to be at 11,000 passenger miles per person (equivalent to 17,700 passenger kilometres per person).

Then we look at the short-term models.

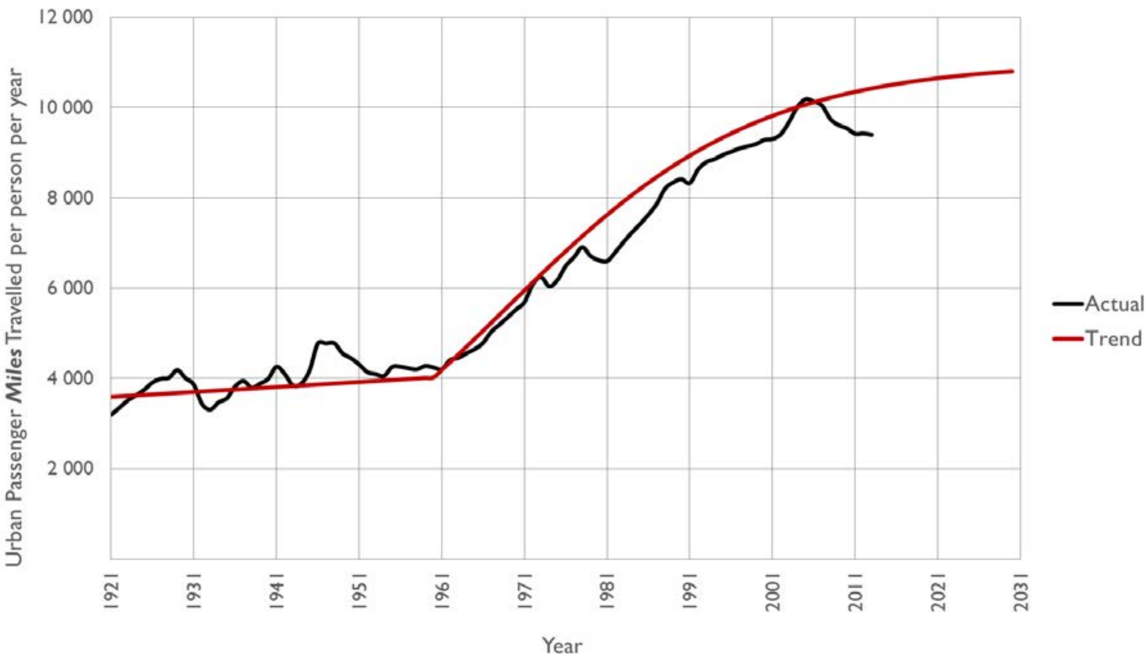
The long-term trends for each country were themselves used as one of the variables in the short-term (from 1967) models, together with petrol price, unemployment and the Global Financial Crisis. These equations should put more weight on the second growth phase of urban passenger travel, giving the best possibility for forecasting. The equations fitted are shown in Tables 4 and 5. The coefficients on the trend variables shift the saturation levels in the short-term models to 14,900 kilometres per person per year for Australia and 11,400 miles per person per year for the US (when minimum values for petrol price and unemployment are used). The coefficients on petrol price, unemployment and the Global Financial Crisis, although similar in effect to the ones in the long-term equations, show some differences, and result in better tracking in the period since 1967.

Figure 7a: Australian Two-Phase Saturating Trend in Passenger Travel per Person



Sources: BITRE estimate.

Figure 7b: American Two-Phase Saturating Trend in Passenger Travel per Person



Sources: BITRE estimate and American Public Transport Association (2012).

Table 4: Australian Urban Passenger Travel Model

Dependent variable = ‘000 Passenger-Kilometres per person

Table 4a: Regression Statistics

Multiple R	0.998038443
R Square	0.996080734
Adjusted R Square	0.995707471
Standard Error	0.120274624
Observations	47

Table 4b: Analysis of Variance

	df	*SS*	*MS*	*F*	*Significance F*
Regression	4	154.4141527	38.60353819	2668.57304	6.28195E-50
Residual	42	0.60757138	0.014465985		
Total	46	155.0217241			

Table 4c: Parameter Estimates

	Coefficient	*Standard Error*	*tStat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	0.071188196	0.14196929	0.501433764	0.618684179	-0.215317432	0.357693823
trend	1.066726313	0.01688153	63.18896004	2.85608E-43	1.032658006	1.100794619
petrol	-0.014149808	0.002795439	-5.06174815	8.70978E-06	-0.019791232	-0.008508384
unempl	-0.032578657	0.00986656	-3.301926584	0.001966554	-0.052490182	-0.012667133
GFC	-0.703545458	0.085389451	-8.239254963	2.59956E-10	-0.875868347	-0.531222569

Sources: BITRE estimate.

Table 5: American Urban Passenger Travel Model

Dependent variable = Passenger-Miles Travelled per person

Table 5a: Regression Statistics

Multiple R	0.998530824
R square	0.997063806
Adjusted R square	0.996705734
Standard Error	89.12983092
Observations	47

Table 5b: Analysis of Variance

	df	*SS*	*MS*	*F*	*Significance F*
Regression	5	110603343.2	22120668.63	2784.531176	9.33773E-51
Residual	41	325709.1971	7944.12676		
Total	46	110929052.4			

Table 5c: Parameter Estimates

	Coefficient	*Standard Error*	*tStat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	-30.7559567	116.5357238	-0.2639187	0.793164619	-266.1046255	204.5927121
trend	1.069995385	0.010801309	99.06163643	1.93458E-50	1.048181698	1.091809072
gas price	-7.484462741	1.159843104	-6.452995856	9.81356E-08	-9.826813408	-5.142112074
unempl	-42.06560803	10.34480733	-4.066350071	0.000211255	-62.95737027	-21.17384579
GFC	-724.7625472	85.08436646	-8.518163529	1.3021E-10	-896.5939113	-552.9311832
dum7903	-509.2971722	36.84715921	-13.82188432	5.02151E-17	-583.7115198	-434.8828245

Sources: BITRE estimate and American Public Transport Association (2012).

Figures 8a and 8b show the components of the predictive equations, both during the fitting period and in the period to 2030. Fuel prices, unemployment and the Global Financial Crisis cause the ‘perturbations’ of actual passenger travel below the saturating trends. Both fuel prices and unemployment were also responsible for dips below trend between the mid-1970s and the mid-2000s for both Australia and the US.

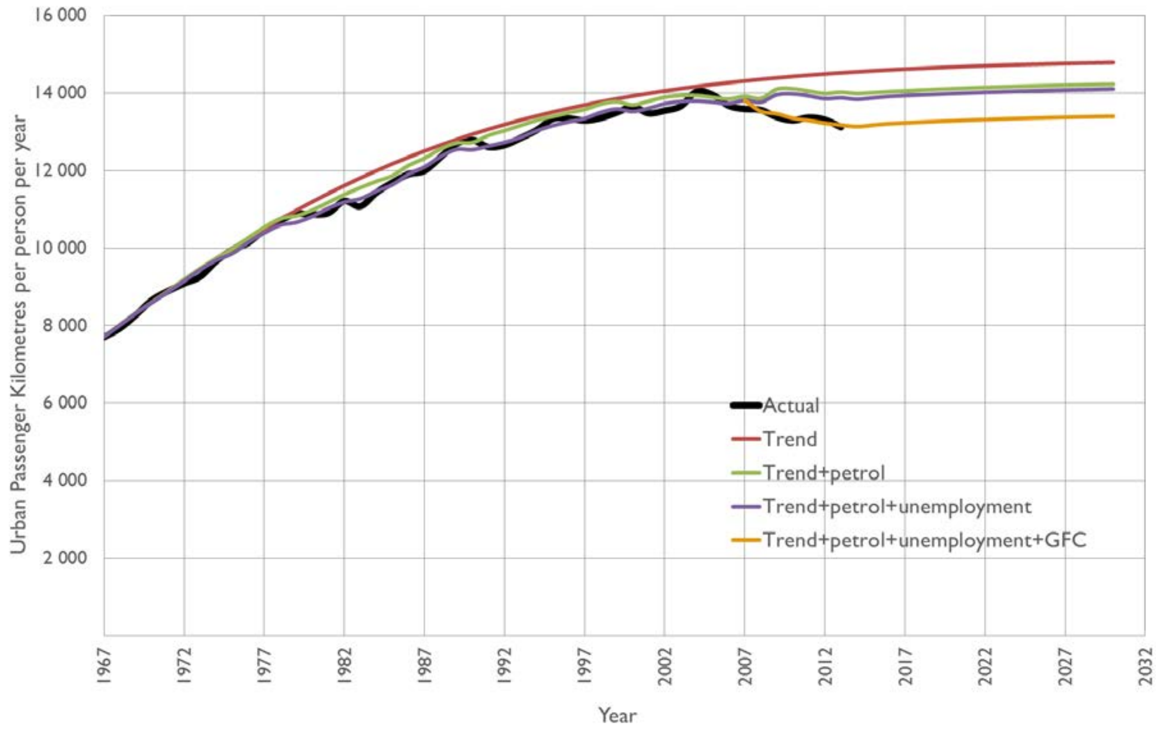
In Australia, the petrol price rise due to the OPEC supply restrictions was delayed until the late 1970s by price controls. But by 1979 Australian petrol prices were heading up toward world levels and personal travel per person reacted accordingly. Recessions in 1982-83 and in the early 1990s saw unemployment increase and travel per person dip further below the saturating trend. Finally in the 2000s, higher petrol prices and then the Global Financial Crisis saw travel per person dip markedly.

In the US, there were similar but earlier reactions of passenger travel to petrol price rises in the early 1970s and to rises in the 2000s. But unemployment was a more prominent factor in the dip below trend from the early 1970s onward. The biggest dips below trend in the US have occurred in the early 1980s when both petrol prices and unemployment were negative influences and in the late 2000s, when petrol prices, unemployment and the Global Financial Crisis combined to push passenger travel below a slowing upward trend.

From the mid-2000s onward, petrol prices and the effects of the Global Financial Crisis have been most important in Australia, while in the US gasoline prices, the Global Financial Crisis and unemployment have all been important.

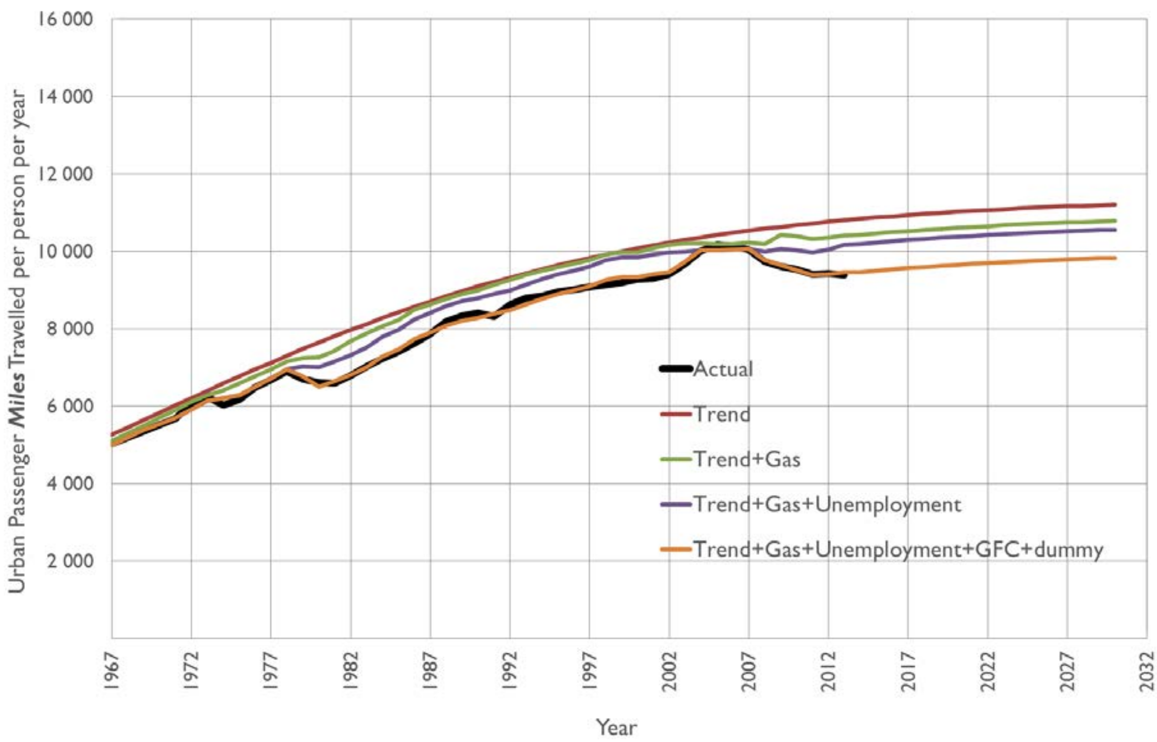
However, even though the modelling of these perturbations is informative – about the significance of their effects over the short to medium term – it should be borne in mind that it is the trend curves (the red lines, showing structural limiting behaviour) that are the essence of the *saturating daily travel* phenomenon.

Figure 8a: Components of Predictive Model for Australian Urban Passenger Travel per Person



Sources: BITRE estimate.

Figure 8b: Components of Predictive Model for American Urban Passenger Travel per Person



Sources: BITRE estimate.

Forecasts

The forecasts to 2030 in the previous figures are based on three assumptions to do with the independent variables:

1) fuel prices will remain constant at their 2011 values in each country
2) unemployment will retreat from its 2011 highs to more normal levels by 2015
3) the Global Financial Crisis effect will continue to persist.

There are two important implications of the analysis using these assumptions.The first concerns the approaching saturation of daily per person travel trends in both countries – i.e. the flattening per person trends of Figures 7a and 7b.

The second implication is that the recent past (2005 to 2010) is probably not going to be a good indicator of the likely future (2011 to 2030).

This is because the Global Financial Crisis, petrol price rises and unemployment rises in the recent past have exerted strongly negative effects. The result has been a downward perturbation in per person daily travel which, when multiplied by a generally upward trend in population in both countries, has produced aggregate levels of passenger travel that have tended towards going sideways in the period 2005 to 2010. Expressed graphically:

pkm/person	*	population	=	aggregate pkm
↘	✖	↗	=	→

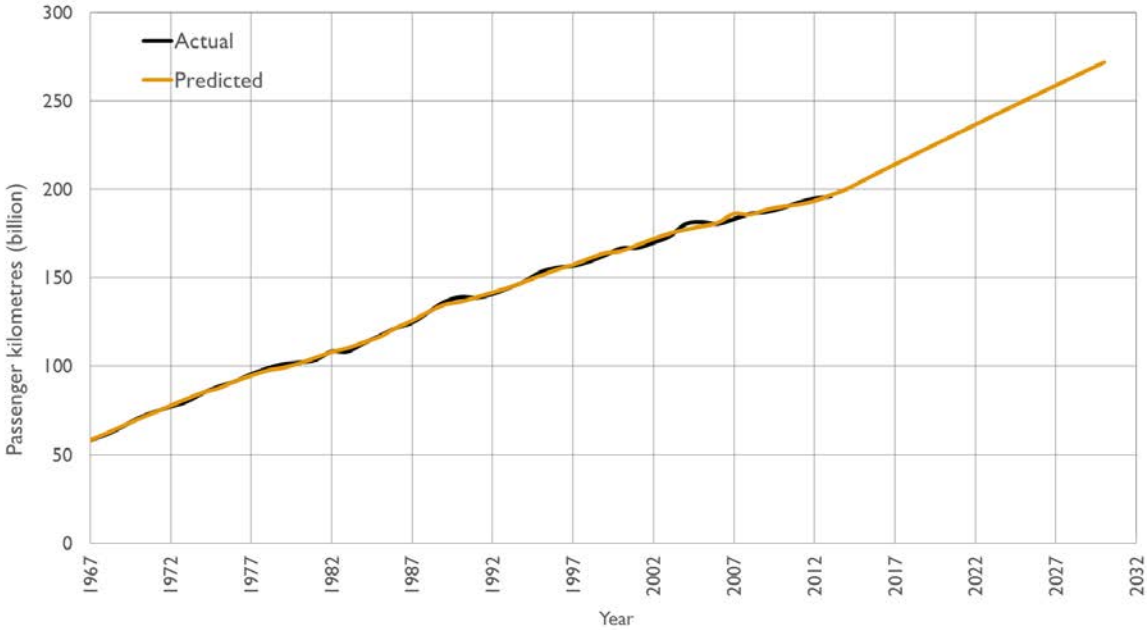
But in the future (2011 to 2030), if the Global Financial Crisis effect continues unabated (i.e. has encouraged long lasting changes in travel behaviour) and if unemployment falls and petrol prices stabilise, the result will be a fairly flat trend for pkm per person which, when multiplied by a rising population, will produce a subsequent rise in aggregate passenger traffic:

pkm/person	*	population	=	aggregate pkm
→	✖	↗	=	↗

Figures 9a and 9b show the actual and predicted growth paths for aggregate urban passenger travel in each country (using population projections from each government), showing the flattening-off from 2005 to 2010 and then the rises expected in the period to 2030.

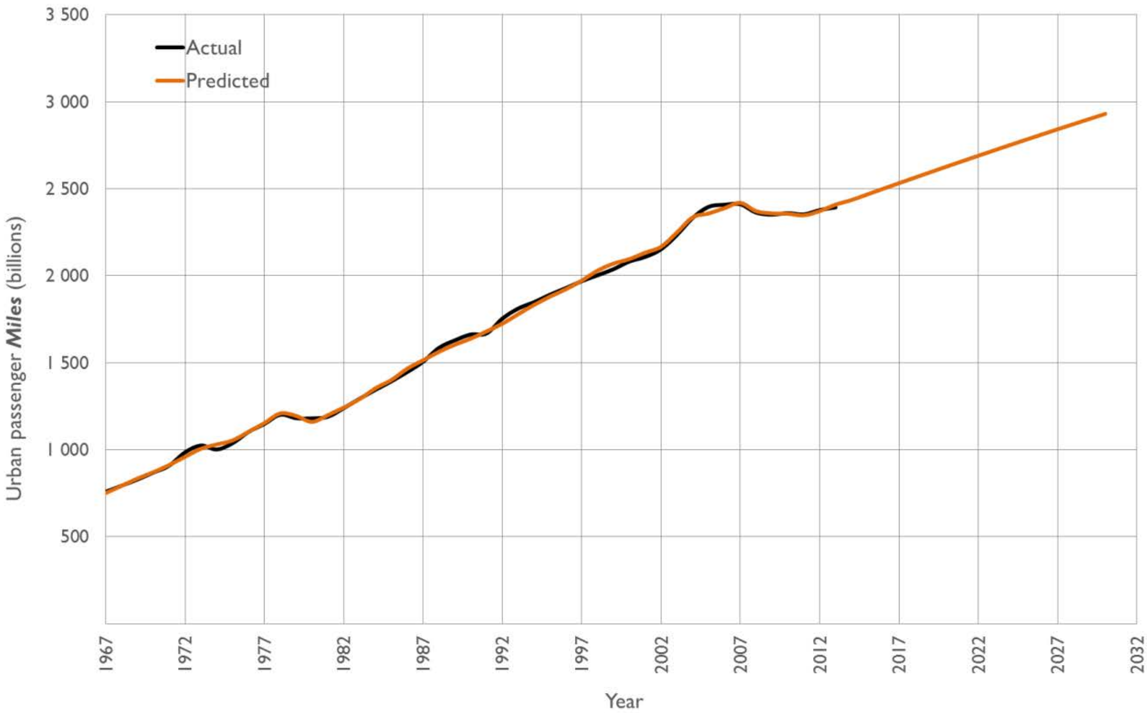
With approaching saturation in per person travel, it will be population growth that will be the major determinant of travel growth post 2020, making any projections of aggregate passenger travel highly dependent on the exact population projections provided to the forecasting process.

Figure 9a: Australian Aggregate Urban Travel



Sources: BITRE estimates (based on ABS 2014 Series B population projection results)

Figure 9b: American Aggregate Urban Travel



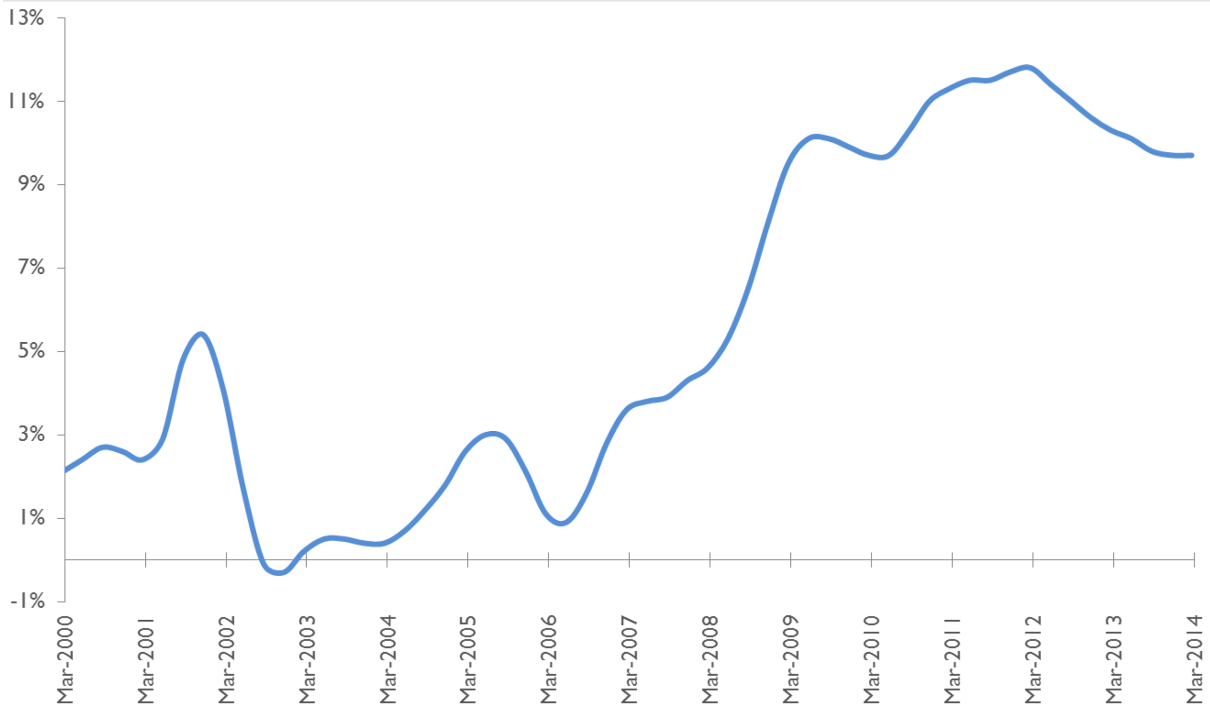
Sources: BITRE estimates (based on US Census Bureau population projection results)

Of course, this is only the generalized pattern expected if the assumptions (about petrol prices, unemployment and the Global Financial Crisis effect) hold. In other words, the forecasts would be different, given different scenarios for the perturbations – especially due to petrol prices, unemployment, and the Global Financial Crisis effect. In addition, future population growth may not match current government projections[1].

Continuing the dummy variable setting for the Global Financial Crisis is based on arguments that the changes in behavior that it influenced are likely to continue.

In Australia, the best proxy for this is the change in consumers' savings rate. As shown in Figure 10, before the Global Financial Crisis, the savings rate was sometimes negative, but ever since it has been averaging about 10 per cent of income.

Figure 10: Australian household savings rate



Sources: ABS Cat 5206.0 - Table 1: Key National Accounts Aggregates

As well, there are other documented changes in behavior that seem enduring, including increases in the average age when licenses are first obtained, and in the proportion of younger drivers not owning cars. Population growth rates are also higher in the inner suburbs and central business districts of cities, as densification proceeds.

Going forward, the main possibilities over the next few decades essentially comprise:

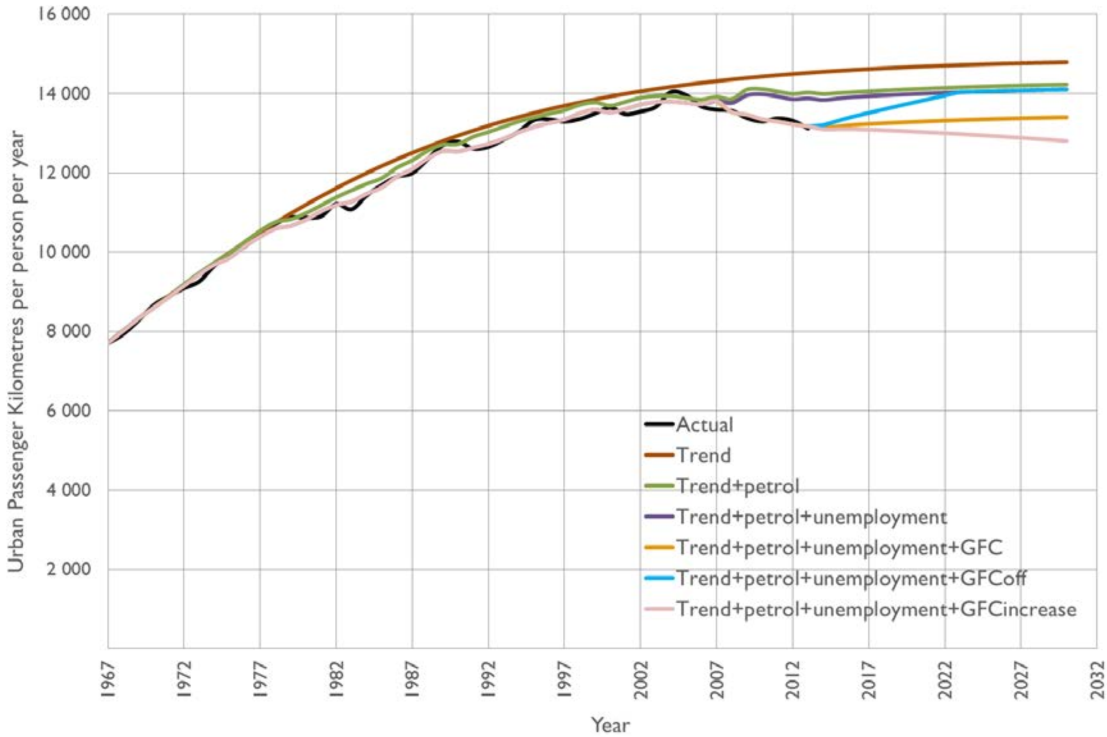
1) average urban travel per capita gradually returns to the pre-GFC trendline, perhaps by about 2020, as any residual socio-economic effects on travel behaviour fade over time (a "GFC off" scenario);
2) per capita travel continues over the medium to longer term at about current levels, with the post-GFC slowdown period having changed travel behaviour enough to effectively establish a new (lower) saturation level (the "GFC on" scenario adopted above); or

[1] For current Australian projections see ABS (2014) – where the Australian Bureau of Statistics 'Series B' projections of resident population have been used here – defined by the ABS as "Series B assumes medium levels of fertility, overseas migration, life expectancy, and interstate migration flows".

3) the downwards movement of recent years persists, and urban travel per capita (especially for car travel) continues falling for some time yet, before reaching a new (even lower) equilibrium level (a "GFC increase" scenario).

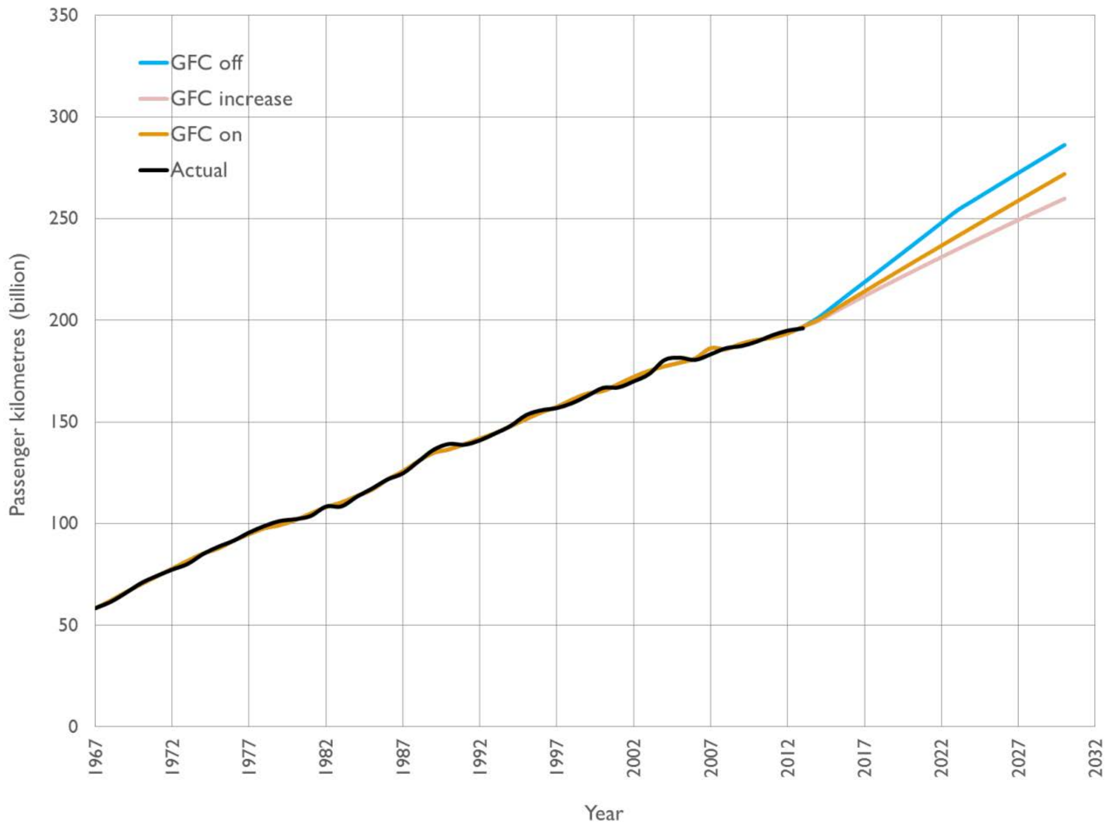
The effects of the three possibilities on per capita and aggregate urban passenger travel in the two countries are shown in Figures 11 to14.

Figure 11: Australian urban per capita passenger travel scenarios



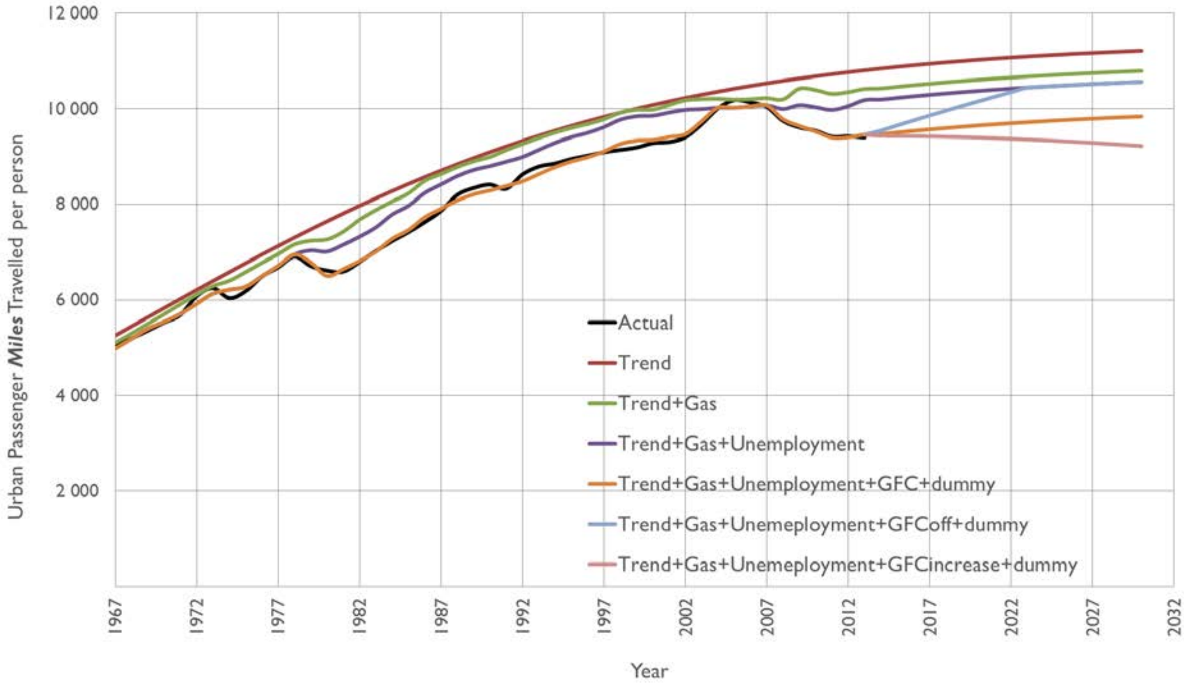
Sources: BITRE estimate.

Figure 12: Australian urban aggregate passenger travel scenarios



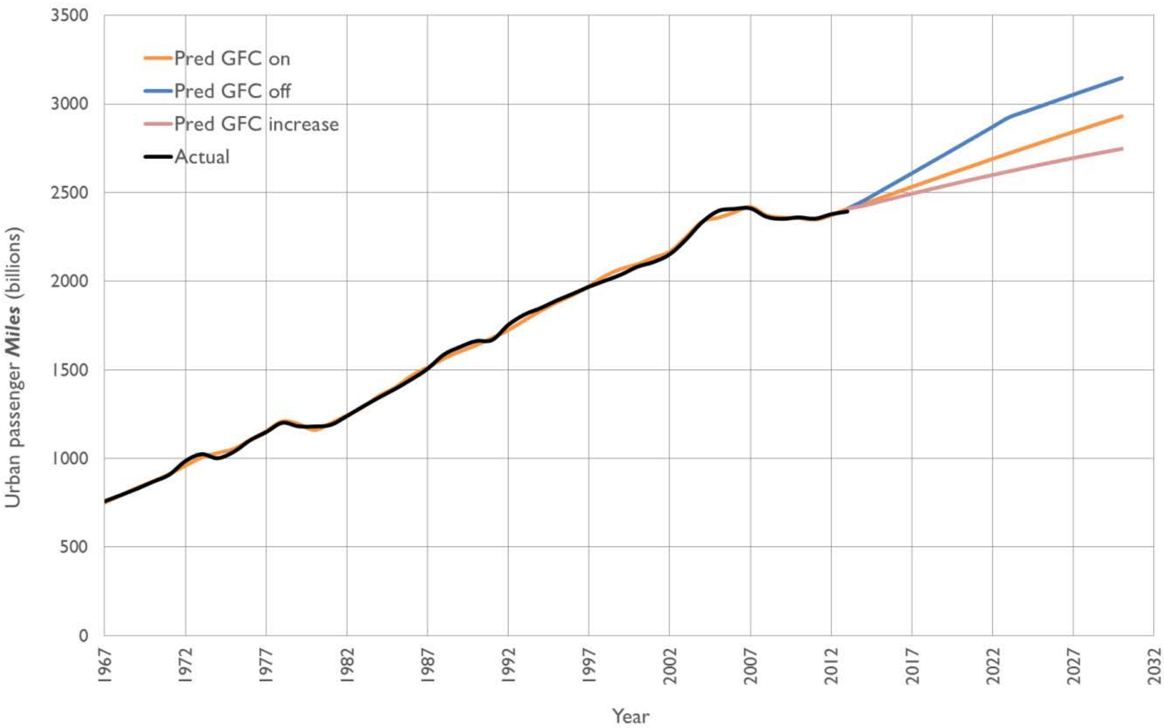
Sources: BITRE estimate.

Figure 13: American urban per capita passenger travel scenarios



Sources: BITRE estimate.

Figure 14: American urban aggregate passenger travel scenarios



Sources: BITRE estimate.

Conclusions

Saturating trends in vehicle kilometers per person are evident in all developed countries investigated and modelled in previous research (BITRE 2012b). Saturating trends in the broader passenger travel per person are apparent in the current study of urban travel in Australia and the US.

Perturbations of the actual urban passenger travel per person below the trend are a function of mainly three things:

1) petrol prices,
2) unemployment, and
3) the flow-on effects of the Global Financial Crisis

The modelling of these perturbations has allowed some clarification around the recent downwards trend in per capita travel (and the size of the current gap between actual levels and those originally expected from the pre-GFC trend). However, the underlying trend curves need to be remembered, since their basic limiting shape is the essence of the 'saturating daily travel' phenomenon; and their structural form is likely to remain an important explanatory variable for projecting over the longer term.

The experience of the recent past, of flattish aggregate travel, is unlikely to be a good guide to the future outlook for passenger vehicle traffic, especially if current population projections hold and fuel prices do not increase markedly. As the recent effects of higher petrol prices, unemployment and the Global Financial Crisis level off, trend travel growth related to population growth is expected[2].

[2] It is likely that future urban inhabitants will have similar expectations around access to mobility as presently, so trend growth in aggregate urban travel should closely correspond to projected urban population increase. If current behavioural changes related to reduced average travel, contributed to by the GFC effect, eventually abate then growth should be even higher than population growth rates; or alternately somewhat less if the tendency towards average travel reductions continues even further – see Figure 12 and 14.

References

Australian Bureau of Statistics (ABS) 2014, *Australian Demographic Statistics, December 2013*, Cat no. 3101.0, ABS, Canberra.
http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/3222.02012%20(base)%20to%202101?OpenDocument

Australian Bureau of Statistics (ABS) 2014, *Australian National Accounts: National Income, Expenditure and Product*, Cat no. 5206.0, Table 1, ABS, Canberra.
http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/5206.0Mar%202014?OpenDocument

American Public Transportation Association (2012) *Public Transportation Fact Book, Appendix A, Historical Tables*.

BITRE 2014, *Long-term trends in urban passenger transport*, Information Sheet 60, BITRE, Canberra.

BITRE (2012a) *Traffic Growth in Australia*, Report 127, Bureau of Infrastructure, Transport and Regional Economics, Canberra, Australia. http://www.bitre.gov.au/publications/2012/report_127.aspx

BITRE (2012b) *Traffic Growth: Modelling a Global Phenomenon*, Report 128, Bureau of Infrastructure, Transport and Regional Economics, Canberra, Australia. http://www.bitre.gov.au/publications/2012/report_128.aspx

BITRE (2013) *Population growth, jobs growth and commuting flows*, Report 142, Bureau of Infrastructure, Transport and Regional Economics, Canberra, Australia.
http://www.bitre.gov.au/publications/2013/report_142.aspx

Cosgrove, D. (2011) *Long-term Patterns of Australian Public Transport Use,* paper given to the Australian Transport Research Forum, Adelaide.
http://www.atrf.info/papers/2011/2011_Cosgrove.pdf

Federal Highway Administration (2012) *Highway Statistics 2010,* Washington.

Hossain, A, and Gargett, D. (2012) *Public Transport Use in Australia's Capital Cities: Modelling and Forecasting*, paper given at the Australian Transport Research Forum, Perth.
http://www.atrf.info/papers/2012/2012_Hossain_Gargett.pdf

Pucher, J., Buehler, R., Merom, D., and Bauman, A. (2011) *Walking and Cycling in the United States, 2001-2009: Evidence from the National Household Travel Surveys,* American Journal of Public Health, Volume 101, Supplement 1.

United States Census Bureau (2013) *2012 National Projections.*
https://www.census.gov/population/projections/index.html

ISSN 1440-9593
ISBN 978-1-925216-03-5
September 2014/ INFRA-2290

This publication should be attributed in the following way: Bureau of Infrastructure, Transport and Regional Economics (BITRE) 2014, *Information Sheet 61: Saturating Daily Travel*, BITRE, Canberra.

Prepared by David Gargett and David Cosgrove. For further information on this publication, please contact David Gargett (david.gargett@infrastructure.gov.au).

Acknowledgement

Assistance by Teddy Kurniawan in preparing this publication is acknowledged.

Contact us

Department of Infrastructure and Regional Development
Bureau of Infrastructure, Transport and Regional Economics (BITRE)
GPO Box 501, Canberra ACT 2601, Australia

Phone: (international) +61 2 6274 7210
Fax: (international) +61 2 6274 6855
Email: bitre@infrastructure.gov.au
Website: www.bitre.gov.au