

Fuel consumption by new passenger vehicles in Australia

The BTRE has examined trends in the fuel consumption of new passenger vehicles. The overall trend in fuel consumption was down during the 1980s. However during the 1990s, a more gradual reduction in the fuel consumption of cars, coupled with increasing sales of 4-wheel-drive vehicles, has seen fuel consumption for new passenger vehicles as a whole stabilise.

BTRE new vehicle database

The average fuel consumption rate of new passenger vehicles sold each year is a significant factor in determining Australia's transport fuel use and emissions well into the future. This is because passenger vehicles, the largest element of the vehicle fleet, are very long-lived. In fact, about half of new passenger vehicles sold in any one year are still on the road 20 years later.

The BTRE has recently compiled one of the most comprehensive databases on new vehicle sales in Australia, with information on all light vehicle sales, by make and model, back to 1978. Though focussing on average fuel consumption, the database also records time-series for many other vehicle characteristics – including vehicle body style and drive type, fuel type, engine displacement, gear number, axle ratios, number of cylinders, maximum engine power (kilowatts – kW), gross vehicle mass (GVM), and vehicle price. With the exception of motorcycles, the database covers all types of light vehicles sold in Australia – that is, passenger cars, four-wheel drive (4WD) passenger vehicles (often categorised as All Terrain Wagons – ATWs) and light commercial vehicles (LCVs). These three categories add up to total new passenger vehicle sales in the analysis that follows.

The database has essentially been collated using three primary sources:

- data on sales by model, reported by the VFACTS unit of the Federal Chamber of Automotive Industries;
- vehicle characteristics data by model from Glass's Guide; and
- fuel consumption data by model from the Australian Greenhouse Office (previously reported by the then Commonwealth Department of Primary Industries and Energy).

Figure 1 shows the trend in sales of the various light vehicle types over the last 20 years.

Average fuel consumption

The BTRE database records **cycle test fuel consumption** for urban driving (simulated by a 'city' cycle test on a dynamometer), non-urban driving (simulated by a 'highway' cycle test) and a weighted average of the two – using 55% city and 45% highway values. When sales-weighted averages of the city-highway combined values for each model are calculated across a fleet, it is often called the National Average Fuel Consumption (**NAFC**) for that vehicle fleet.

Actual on-road fuel consumption is generally about 20 per cent higher than respective NAFC values – with city cycle results typically underestimating fuel consumption on city roads by around 15 per cent, and highway cycle tests underestimating that for highway driving by as much as 34 per cent. However, trends in the NAFC are similar to trends in actual on-road fuel consumption.

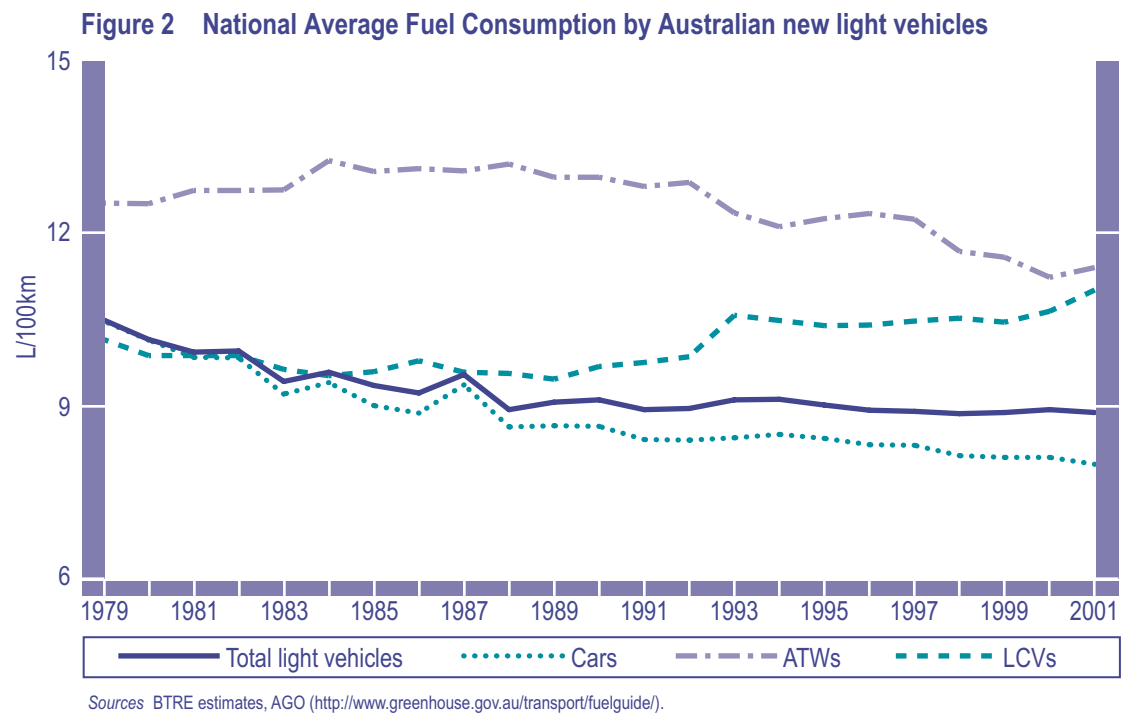
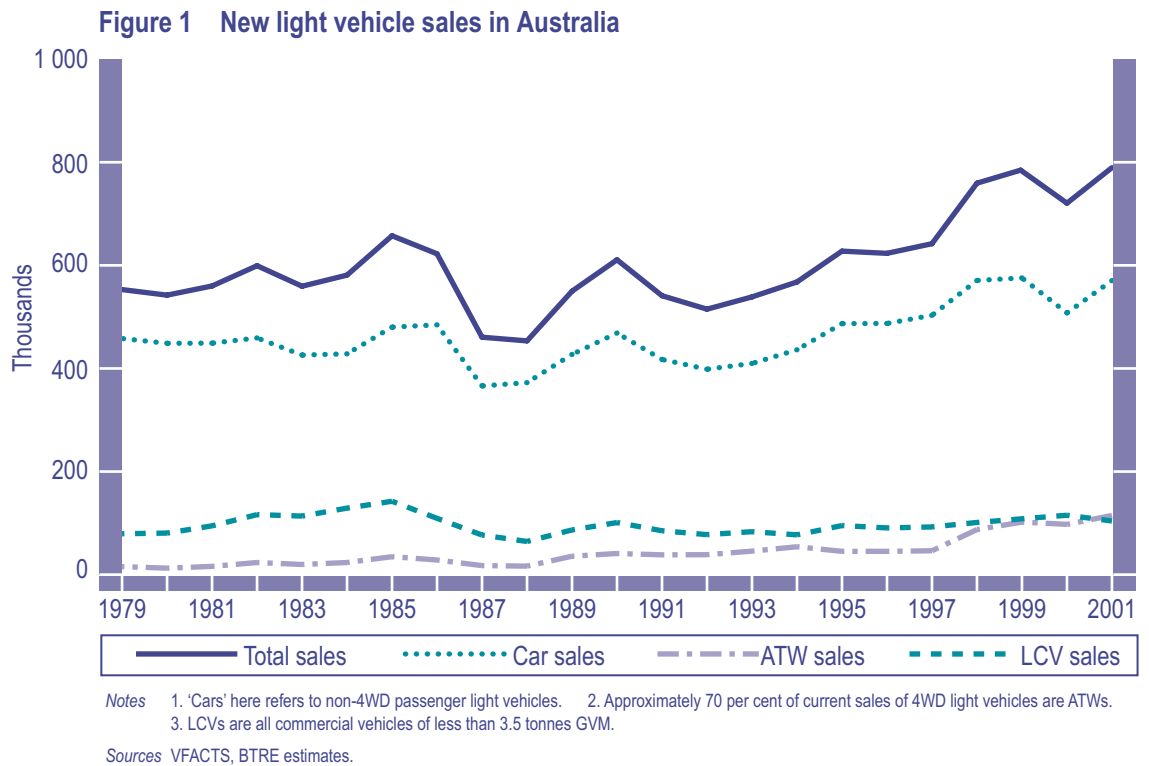
Figure 2 plots the historical trend in NAFC for the light vehicle fleets.

From figure 2, it is apparent that the average fuel consumption of total sales fell significantly during the 1980s. However, average fuel consumption for total sales then remained fairly constant over the 1990s, exhibiting virtually no further improvement. If cars alone are considered, the story is somewhat better, with a limited fall in fuel consumption (of about 6 per cent) occurring over the 1990s.

The trend in average fuel consumption for new vehicles is effectively the result of several factors:

- the efficiency of engine technology at any point in time;
- the power of the engines; and
- the average weight of the new vehicles (including the mix of small, medium, and large vehicles).

The contribution of each of these factors is examined in the following section.

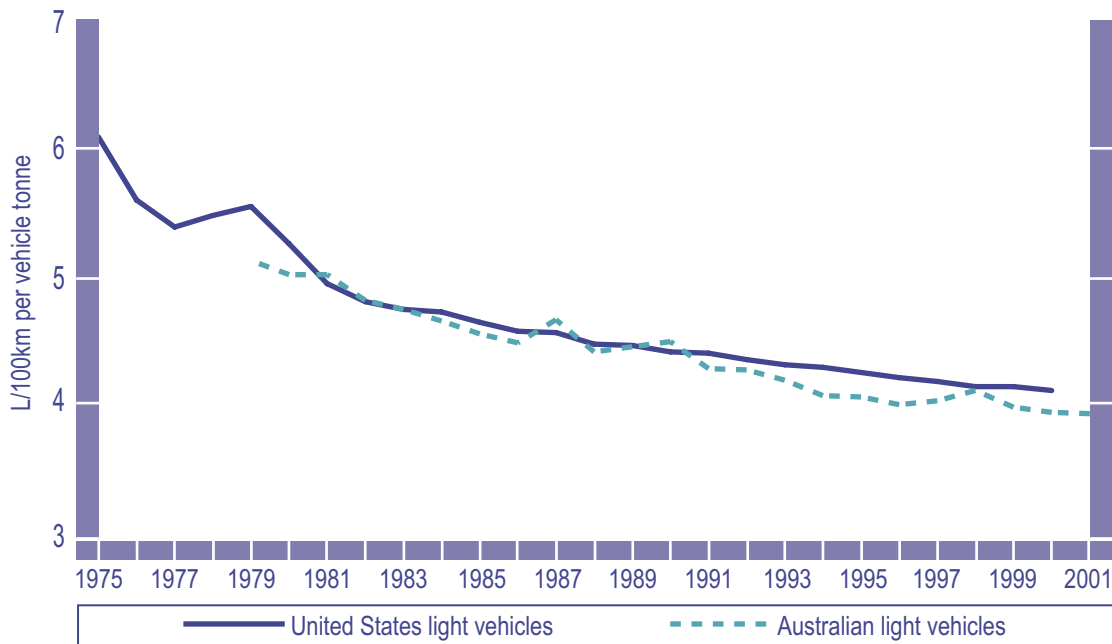


Vehicle performance trends

The basic story behind fuel consumption trends over the last 20 years is that engine technologies have improved substantially. But the potential fuel savings have been largely offset by increases in vehicle power and weight, by strong growth in the All Terrain Wagon category of new sales (which have higher fuel consumption), and by increases in the average fuel consumption of light commercial vehicles.

Engine technology has advanced substantially since the 1970s. Figure 3 illustrates an element of this trend for the United States and Australia, by plotting the average fuel consumption for light vehicle sales (L/100km) per unit of vehicle weight (GVM in tonnes). It would appear that both countries have had a significant increase in the intrinsic energy performance of vehicle engines, with the amount of fuel required to move a vehicle of a given size declining reasonably steadily at 1.3 per cent per year.

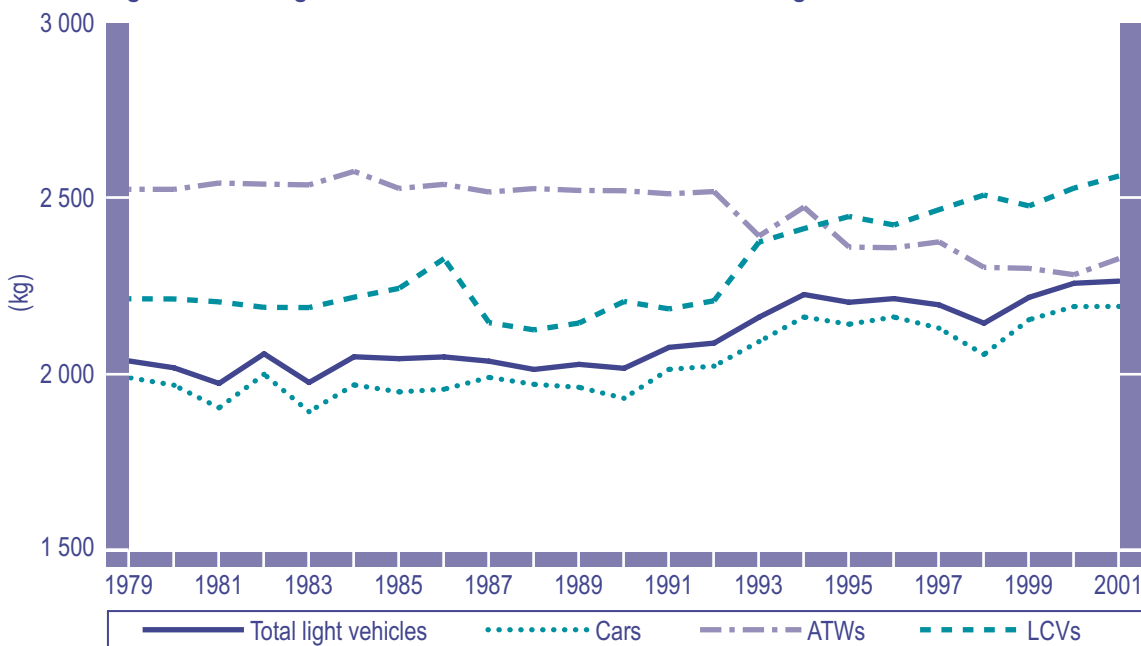
Figure 3 Engine performance trends for new light vehicles



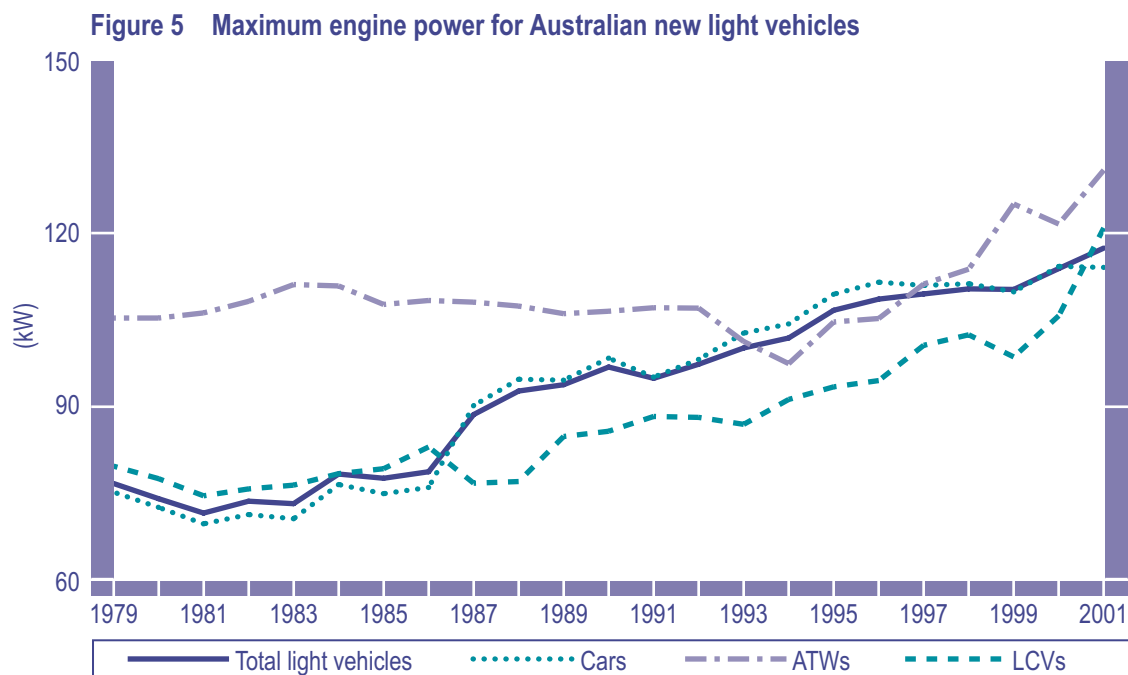
Sources: BTRE estimates, U.S. Environmental Protection Agency (<http://www.epa.gov/otaq/fetrends.htm>).

However at the same time, the average **weight** of new light vehicles has increased substantially (see figure 4). The **power** of new vehicles has also trended upwards (see figure 5). As a result, even though the average fuel consumption per unit of maximum power output by the engine has decreased by around 45 per cent over the last 20 years, the fuel consumption of the new vehicle fleet has only declined by slightly more than 10 per cent. Buyers have wanted larger, more powerful cars and the industry has responded.

Figure 4 Average Gross Vehicle Mass for Australian new light vehicles



Sources: BTRE estimates, Glass's Guide.



In particular, many new car buyers in recent years have been switching to the **All Terrain Wagon category** (see figure 1). As a proportion of new light vehicle sales, ATWs have gone from below 3 per cent in 1979 to nearly 15 per cent by 2001, and the proportion is still rising. As ATWs have higher fuel consumption than cars, this has tended to raise the fuel consumption figure for total sales. Even if the ATW share of new *sales* stabilises immediately at 15 per cent, the current share of ATWs in the *fleet* will continue to rise from the present 8 per cent, with consequent upward pressure on fleet fuel consumption.

The share of **Light Commercial Vehicles** in total sales has been fairly constant. But the mix has shifted toward the light trucks as opposed to utilities and panel vans, with a consequent increase in average fuel consumption for the category.

Conclusion

The desire of an increasingly affluent population for vehicle characteristics that increase fuel consumption (power, weight, accessories, 4WD), has meant that potential reductions in fuel consumption made possible by technological advances have not been fully realised.

This is a world-wide trend in the automobile sector, and it cautions against undue optimism about realising reductions in fuel use and emissions stemming from technological change.

References

- Australian Greenhouse Office, www.greenhouse.gov.au/transport/fuelguide/
- Glass's Guide (to Passenger Vehicles), www.glassguide.com.au
- US Environmental Protection Agency, www.epa.gov/otaq/fetrends.htm
- VFACTS (a service of the Federal Chamber of Automotive Industries), jim.rutherford@fcai.com.au

Prepared by MARK CREGAN, DAVID GARGETT and DAVID COSGROVE (david.cosgrove@dotars.gov.au)
 Bureau of Transport and Regional Economics, GPO Box 501, Canberra ACT 2601
www.btre.gov.au

