The Conflict Between Fuel Prices, Environmental Concerns and Vehicle Secondary Safety: Insights From The Used Car Safety Ratings

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Abstract

Sharply increasing fuel prices and significantly heightened concerns about environmental impacts of vehicles have dramatically changed the profile of new vehicle sales in Australia over the past few years. Specifically, sales of light and small vehicles have grown rapidly whilst the medium and particularly the large vehicle segments have contracted sharply. In the face of this, sales of four wheel drive vehicles have remained strong, further polarising the vehicle fleet in terms of mass and size of vehicle. This study examined the potential road trauma impacts of these changes through reference to vehicle secondary safety performance by make and model, market group and year of manufacture measured as part of Monash University Accident Research Centre’s Used Car Safety Ratings (UCSR) program. Effects were examined in terms of occupant protection outcomes, collision partner outcomes and outcomes for all road users combined through consideration of the range of secondary safety measures estimated in the UCSRs. The study identified likely increases in overall road trauma as an outcome of the fleet changes and particular increases in trauma amongst the occupants of small and light vehicles. Potential for improving road trauma outcomes amongst those choosing small and light vehicles is discussed and examples of best practice performance amongst vehicles in these classes identified.

Keywords

Vehicle Safety, Vehicle Fleet Mix, Environment, Fuel Prices

Introduction

In the past decade, the profile of new vehicle sales with respect to the types of vehicles being purchased has changed dramatically. Figure 1 shows how the relative distribution of new vehicle sales by market group has changed over the period from 2000 to 2009 based on new vehicle sales published by the Federal Chamber of Automotive Industries.

Figure 1: Proportion of Total Light Passenger Vehicle Sales by Market Group
A key notable feature of Figure 1 is the sharp decline in the market share of large cars with large cars going from being the most popular market segment in 2000 to being only the fourth most popular market segment in 2009. In contrast there has been a steady increase in the proportion of small and light vehicles as well as steady increases in the market share of commercial utilities and compact and medium 4-wheel drive (SUV) vehicles. The proportion of large four wheel drive vehicles and people movers has also declined steadily over this period. Viewed in its totality it is apparent that the Australian vehicle market has moved into a phase of downsizing over the past decade for both regular passenger cars as well as 4-wheel drives. A further undercurrent to this trend is evidence of a continued polarization of the vehicle fleet into light and small cars and 4-wheel drives and utilities. From Figure 1 and other information available, it is unclear whether there have been any significant shifts in the average mass of vehicles within each market segment. However, mass changes within a market group will be for less significant in the context of the safety outcomes being examined in this paper compared to the more major shifts in representation of each market group noted in Figure 1.

There is a paucity of research investigating the specific reasons why the Australian vehicle fleet is downsizing. Anecdotally there are two key factors driving this change. The first is the rapid rise in fuel prices over the past decade. Figure 2 gives the price index for automotive fuels from 1990 to 2009 collated by the Australian Bureau of Statistics [1]. It shows that in real terms the cost of automotive fuels has doubled in the past decade, the upward trend in the series mirroring the sharp downward trend in large car market share. Research in the United States shows vehicle choice is strongly linked to fuel prices particularly for private consumers with limited financial resources [2]. This is likely to be the case in Australia also and is supported by the fact that small vehicles are the predominant choice amongst private consumers.

A further factor most likely influencing the downsizing of the Australian vehicle fleet is a heightened push towards environmental sustainability. This has manifested as a push for reduction in greenhouse gas emissions through improved fuel efficiency. Whilst new vehicle technologies emerging in the last few years have improved fuel efficiency, downsizing remains one of the most effective and immediate ways of dramatically improving fuel consumption. This can be seen by examining the Federal Government’s green vehicle guide website [3] which shows that the vast majority of the lowest emissions vehicles are from the light or small classes.

This aim of this paper was to explore some of the implications of the changing profile of new vehicle sales, and particularly the effects of downsizing, on secondary safety outcomes in crashes through interpretation of a range of studies carried out under the Used Car Safety Ratings research program in the recent past.

**Figure 2**: Price Index for Automotive Fuels – Australian Average

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Methods

A range of research measuring various secondary safety characteristics of the Australian and New Zealand light vehicle fleets has been undertaken under the banner of the Used Car Safety Ratings project. This paper has drawn together results from a number of the published studies to infer the likely secondary safety implications of the changes in mix of the Australian vehicle fleet.

The Used Car Safety Ratings program has measured vehicle secondary safety performance in a number of dimensions. The first of these, termed crashworthiness, measures the vehicle’s ability to protect its own occupants from death or serious injury in the event of a crash. The second, called aggressivity, measures the ability of the vehicle to protect unprotected road users with which it collides from death or serious injury. It should be noted that other studies or references may use different definitions or connotations of crashworthiness and aggressivity to those defined here. Furthermore, the measures of crashworthiness and aggressivity defined here are based on the risk of death or serious injury combined rather than just on the risk of death. Even in a database as large as that used to derive the results presented in this study, there is still insufficient number of deaths to measure relative death risk between specific makes and models of vehicles or market sectors with sufficient accuracy to make meaningful comment. A final measure, called total secondary safety, measures the combined crashworthiness and aggressivity performance of the vehicle. Each of these ratings is adjusted for the effect of non-vehicle related factors on injury outcome using sophisticated statistical analysis procedures [4]. Each of these measures has been considered in assessing the effect of downsizing the vehicle fleet on secondary safety outcomes. The ratings are estimated from police reported crash data from Australia and New Zealand over the period 1987 to 2006 and covers over 3.2 million drivers and 700,000 injured road users in crashes with light vehicles manufactured from 1982 to 2006 in the latest update [4]. Vehicles in the ratings are classified by make and model as well as into one of 10 market group categories equivalent to those shown in Figure 1:

**Passenger Cars**
- Light: Passenger car, hatch, sedan, coupe or convertible 3 or 4 cylinder engine, up to 1,500cc.
- Small: Passenger car, hatch, sedan, wagon, coupe or convertible 4 cylinder engine, 1,501cc-1,900cc.
- Medium: Passenger car, hatch, sedan, wagon, coupe or convertible 4 cylinder engine, 1,901 cc upward.
- Large: Passenger car, hatch, sedan, wagon, coupe or convertible 6 or 8 cylinder engine.
- People Movers: Passenger usage seating capacity > 5 people.

**Four Wheel Drive Vehicles** (high ground clearance, off road wagon)
- 4WD Compact: typically less than 1700kg tare mass
- 4WD Medium: typically between 1700kg and 2000kg tare mass
- 4WD Large: typically greater than 2000kg tare mass

**Light Commercial Vehicles**
- Van: Blind & window vans.
- Utility: Two and four wheel drive, normal control (bonnet), utility, cab chassis and crew-cabs.

Results

**The Broad Effects of Fleet Downsizing on Vehicle Crashworthiness, Aggressivity and Total Secondary Safety**

Figure 3 shows the average crashworthiness, an estimate of the risk of death or serious injury to the vehicle driver given crash involvement, for vehicles within each market group taken from the latest update of the Used Car Safety Ratings [4].

Amongst regular passenger cars Figure 3 shows a defined trend towards improving crashworthiness with increasing vehicle size. It also shows the estimated crashworthiness for compact 4-wheel drive vehicles to be poorer than that for medium or large 4-wheel drive vehicles. Together, these results show that downsizing the vehicle fleet is likely to lead to higher average risk of death or serious injury to drivers involved in crash whether they are driving regular passenger vehicles or 4-wheel drives. Although the crashworthiness ratings only assess injury outcomes for drivers, the effects of downsizing on injury risk for other vehicle occupants is likely to be similar.
Whilst Figure 3 shows that on average downsizing leads to poorer vehicle crashworthiness, it is not necessarily the case that downsizing from one specific vehicle to another will lead to poor crashworthiness. Figure 4 plots crashworthiness against tare mass for specific vehicle models. It confirms the general trend to improving crashworthiness with increasing mass but also shows significant dispersion around that trend. Importantly it shows they are a number of lighter vehicles, specifically those within the range from 1100 to 1400 kilograms that have very good crashworthiness. However it also confirms that the probability of a specific vehicle having good crashworthiness reduces as vehicle mass reduces. Overall these results show that it is more difficult to make a light vehicle very crashworthy.

![Figure 3: Crashworthiness by Vehicle Market Group](image1)

![Figure 4: Crashworthiness by Vehicle Mass](image2)

Figure 5 shows average aggressivity, the risk of death or serious injury to other road users with which the vehicle collides, by vehicle market group again taken from the most recent update of the Used Car Safety Ratings [4]. In contrast to crashworthiness it shows that decreasing vehicle size leads to lower average aggressivity. This is the case for both regular passenger vehicles as well as for 4-wheel drives. Consequently whilst vehicle downsizing leads to poorer crashworthiness it leads to lower levels of aggressivity. Figure 6 which plots aggressivity against vehicle tare mass for specific models of vehicle corroborates the general trend seen in Figure 5. Like the analogous Figure for crashworthiness it shows a
high degree of dispersion around the trend line illustrating that downsizing from one specific vehicle to another will not necessarily result in reduced Aggressivity.

![Figure 5: Aggressivity by Vehicle Market Group](image)

![Figure 6: Aggressivity by Vehicle Mass](image)

The previous Figures have demonstrated the contrary effects of vehicle downsizing on crashworthiness and aggressivity. The net effect across these two dimensions of vehicles secondary safety can be assessed by examining the Total Secondary Safety Rating published as part of the Used Car Safety Ratings. The total secondary safety rating reflects the combined crashworthiness and Aggressivity performance of a vehicle giving appropriate weighting to each dimension based on their relevance to injury outcome in real world crash circumstances. Based on the profile of Australian crashes, crashworthiness is relevant in 90% of real world crashes, being all crash types except those involving unprotected road users. In contrast vehicle aggressivity is only relevant in 55% of crashes reflecting the high incidence of single vehicle crashes in Australia. In effect the total secondary safety rating reflects the average risk of death or serious injury to all key road users involved in a crash, both inside and outside the rated vehicle.

Figure 7 shows average Total Secondary Safety by vehicle market group from the most recent Used Car Safety Ratings update. For regular passenger vehicles it shows a general trend to worsening total secondary safety with reducing vehicle size. This general trend is similar to the trend seen in the crashworthiness ratings, albeit much weaker, reflecting the higher weighting crashworthiness has compared to aggressivity in the total secondary the rating. For regular passenger cars this result shows
that downsizing will lead to poorer injury outcomes on average across all road users. The results for 4-wheel drives are more complex. Whilst downsizing from a medium to compact 4-wheel drive will decrease total secondary safety on average, downsizing from a large 4-wheel drive to either a medium or compact 4-wheel drive will improve total secondary safety reflecting the very high aggressivity of large 4-wheel drives. A further notable feature of Figure 7 is the relatively poor total secondary safety of commercial utilities given the large increases in new vehicle sales of these vehicles noted in Figure 1.

![Figure 7: Total Secondary Safety by Vehicle Mass](image)

The relationship between vehicle tare mass and total secondary safety for specific vehicle models is shown in Figure 8. It confirms the general trend to improving total secondary safety with increasing vehicle mass again reflecting the high weighting of crashworthiness in the total secondary safety index. As for crashworthiness, significant dispersion of the data around the trend line shows that downsizing from one specific vehicle to another will not necessarily compromise total secondary safety although finding a vehicle with best possible total secondary safety becomes more difficult as vehicle mass decreases.

![Figure 8: Total Secondary Safety by Vehicle Mass](image)

In summary the above analyses show that vehicle downsizing will on average lead to worse vehicle crashworthiness and better aggressivity combining to produce slightly higher levels of total death and serious injury across all crash involved road users. However downsizing from one specific vehicle to another will not necessarily produce these outcomes. The following sections investigate the effect of vehicle downsizing in specific crash types that make up the majority of all crashes involving light passenger vehicles, namely crashes with unprotected road users, crashes between 2 light vehicles, crashes between a light vehicle and a heavy vehicle and single light vehicle crashes. It is the outcomes in each of
these crash types that combine to produce the overall results shown in Figures 3 to 8. The results of this more detailed analysis assist in articulating the particular crash types where downsizing the vehicle fleet is likely to lead to poorer overall injury outcomes and hence where there is a need to focus particularly on mitigating these outcomes.

**Effects in Specific Crash Types**

The above results have illustrated the overall effects of vehicle downsizing on crashworthiness, aggressivity and total secondary safety. A vehicle’s assessment in these three dimensions is derived from its performance across the number of specific crash types. Work completed under the Used Car Safety Ratings program has identified differential relative performance between vehicle market groups in terms of crashworthiness and aggressivity for different crash types [5]. Examination of the results from this study gives insight into the particular crash types in which downsizing creates poorer secondary safety outcomes. The specific crash types examined are single vehicle crashes, crashes between light vehicles and heavy vehicles, crashes with unprotected road users including motorcyclists, bicyclists and pedestrians and crashes between two light vehicles. In this work 4-wheel drive vehicles have only been considered as a single aggregated group and small and light cars have been combined into a single group. However, the results are still useful for examining the effects of downsizing.

Figure 9 gives average crashworthiness by market group for vehicles involved in single vehicle crashes. It shows evidence of a trend to poorer crashworthiness with reducing vehicle size. An exception to this trend is 4-wheel drive vehicles which have the poorest crashworthiness of any market group in single vehicle crashes. Although 4-wheel drive vehicles are known to have a high propensity for rollover in single vehicle crashes which typically produces high injury risk, further analysis has showed that crashworthiness is also relatively poor in single vehicle crashes not involving rollover [5]. The trend to poorer crashworthiness with reducing vehicle size has also been noted in research from the United States [6] and is thought to be a result of reduced survival space in crashes involving intrusion along with generally lower levels of standard safety features included in small cars due to cost constraints.

![Figure 9: Crashworthiness by Market Group in Single Vehicle Crashes (with 95% Confidence Limits)](image)

Patterns of relative crashworthiness of light vehicles in crashes with heavy vehicles somewhat mirror those observed for single vehicle crashes in the sense that smaller vehicles again show poorer average crashworthiness than larger ones. This is illustrated in Figure 10 which shows estimates broken down by heavy vehicle collision partner type. Some market groups are not covered due to insufficient data. Furthermore, the trends presented in Figure 10 should be treated with some caution due to the relatively wide confidence limits on the estimates.

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**Figure 9: Crashworthiness by Market Group in Single Vehicle Crashes (with 95% Confidence Limits)**

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Figure 10: Crashworthiness by market group and class of heavy vehicle collision partner (with 95% confidence limits)

Aggressivity towards unprotected road users by vehicle market group is given in Figure 11. Perhaps surprisingly the trends in Figure 11 are similar to those observed in the previous two figures for crashworthiness. They also showed a trend to increased aggressivity with decreasing vehicle size for regular passenger vehicles. Both 4-wheel drives and commercial vehicles exhibit the highest aggressivity towards unprotected road users. Consequently downsizing from a 4-wheel drive to a regular passenger vehicle will improve aggressivity however downsizing within regular passenger vehicles will not.

Figure 11: Aggressivity towards unprotected road users by impact vehicle market group (with 95% confidence limits)

Assessing the influence of downsizing on injury outcomes in crashes between two light vehicles is more complex as it depends on the crashworthiness and Aggressivity of each vehicle in the crash. Figure 12 shows average crashworthiness by market group has a function of the market group of colliding vehicle in two vehicle crashes. Aggressivity effects can be seen in the vertical dispersion of the plotted lines which highlight clearly the trend to increasing aggressivity as vehicle size increases indicating that downsizing vehicles will improve aggressivity. The vertical positioning of points on the same line quantify the crashworthiness effects and again show a trend to poorer crashworthiness with reducing vehicle size, a negative of downsizing. The identified trends in crashworthiness and Aggressivity for collisions between two passenger vehicles are consistent across market groups and collision partners.
Figure 12: Crashworthiness by Driver Vehicle Market Group and Impact Partner Market Group in Collisions between Two Passenger Vehicles.

A further aspect that can be learned from Figure 12 is the likely effects of fleet polarization that have been observed in Figure 1. The crashworthiness estimates by market group and collision partner presented in Figure 12 have been converted into relative risks of death or serious injury to the drivers of each vehicle in the two vehicle crash as a function of the combination of market groups involved. These are shown in Table 1 and are expressed as the risk to the driver in the horizontal category relative to the driver in the vertical category. For example, in a collision between a small car and a 4-wheel drive the risk of serious injury to the small car driver is 4.43 times greater than the risk to the 4-wheel drive driver.

<table>
<thead>
<tr>
<th>Collision Partner Market Group (Denominator)</th>
<th>Driver Car Market Group (Numerator)</th>
<th>4WD</th>
<th>Commercial</th>
<th>Large</th>
<th>Luxury</th>
<th>Medium</th>
<th>Passenger Van</th>
<th>Small</th>
<th>Sports</th>
</tr>
</thead>
<tbody>
<tr>
<td>4WD</td>
<td>1.00</td>
<td>2.20</td>
<td>2.12</td>
<td>1.46</td>
<td>2.83</td>
<td>1.50</td>
<td>4.43</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Commercial</td>
<td>0.45</td>
<td>1.00</td>
<td>1.18</td>
<td>0.70</td>
<td>1.80</td>
<td>1.13</td>
<td>2.50</td>
<td>1.38</td>
<td></td>
</tr>
<tr>
<td>Large</td>
<td>0.47</td>
<td>0.85</td>
<td>1.00</td>
<td>1.03</td>
<td>1.51</td>
<td>1.46</td>
<td>1.99</td>
<td>1.47</td>
<td></td>
</tr>
<tr>
<td>Luxury</td>
<td>0.68</td>
<td>1.44</td>
<td>0.97</td>
<td>1.00</td>
<td>1.59</td>
<td>2.76</td>
<td>3.02</td>
<td>1.64</td>
<td></td>
</tr>
<tr>
<td>Medium</td>
<td>0.35</td>
<td>0.55</td>
<td>0.66</td>
<td>0.63</td>
<td>1.00</td>
<td>0.78</td>
<td>1.51</td>
<td>0.93</td>
<td></td>
</tr>
<tr>
<td>Passenger Van</td>
<td>0.66</td>
<td>0.89</td>
<td>0.69</td>
<td>0.36</td>
<td>1.28</td>
<td>1.00</td>
<td>2.56</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Small</td>
<td>0.23</td>
<td>0.40</td>
<td>0.50</td>
<td>0.33</td>
<td>0.66</td>
<td>0.39</td>
<td>1.00</td>
<td>0.62</td>
<td></td>
</tr>
<tr>
<td>Sports</td>
<td>N/A</td>
<td>0.73</td>
<td>0.68</td>
<td>0.61</td>
<td>1.08</td>
<td>N/A</td>
<td>1.61</td>
<td>1.00</td>
<td></td>
</tr>
</tbody>
</table>

Table 1: Relative Risks of Serious Driver Injury by Market Group in Collisions between Two Passenger Vehicles

Interpretation of the figures in Table 1 suggests that fleet polarisation will lead to a change in the distribution of the injury outcomes between different market segments of vehicle. In two vehicle crashes drivers of the lighter vehicles will shoulder a much greater proportion of the total injury burden. This result highlights a particular problem with a non-uniform downsizing of the vehicle fleet. It is likely that injury outcomes would be improved if the fleet could be downsized uniformly.

Results presented in this section have identified specific outcomes resulting from vehicle fleet downsizing related to specific crash types. Downsizing is likely to lead to poorer injury outcomes in single vehicle crashes and crashes with heavy vehicles for drivers of regular passenger cars but might lead to improved injury outcomes if downsizing from a 4-wheel drive to a regular passenger car. The same observations are also likely for injury outcomes in unprotected road users. In terms of crashes between two light vehicles,
the polarization to small vehicles and 4-wheel drives that is being seen in the Australian fleet is likely to lead to a particular injury burden for those choosing to downsize.

**The Potential for Downsizing to Safe, Economical Vehicles**

Results presented in this paper have suggested that the observed downsizing of the Australian vehicle fleet will lead to poorer overall injury outcomes primarily through poorer crashworthiness performance. Figures of 4 and 8 however suggest it is possible to move to a smaller vehicle without compromising crashworthiness or total secondary safety through judicious choice of a safety vehicle. Interrogation of the used car safety ratings for specific makes and models of vehicles identifies three small vehicles that are rated in the best possible category for crashworthiness and total secondary safety that also achieve low fuel consumption and a good greenhouse emissions rating. These vehicles are listed in Table 2 along with their quoted fuel consumption from the Australian Standards test and their greenhouse emissions rating as reported on the green vehicle website [3].

<table>
<thead>
<tr>
<th>Vehicle Make, Model and Year of Manufacture</th>
<th>AS Fuel Consumption</th>
<th>Greenhouse Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mazda 3 2003 – 2009</td>
<td>6 – 8.4 l/100km</td>
<td>6.5 – 7.5</td>
</tr>
<tr>
<td>Volkswagen Golf / Jetta 2004 – 2009</td>
<td>5.5 – 8.2 l/100km</td>
<td>6.5 – 7.5</td>
</tr>
<tr>
<td>Peugeot 307 2001 – 2009</td>
<td>4.9 – 8.4 l/100km</td>
<td>6.5 – 8</td>
</tr>
</tbody>
</table>

*Table 2: Australian Standard Fuel Consumption and Greenhouse Rating for Small Vehicles with Good Crashworthiness and Total Secondary Safety*

Whilst the vehicles listed in Table 2 achieve excellent secondary safety performance without compromising fuel consumption, these vehicles are the exception rather than the norm. Furthermore, none of the vehicles in the light vehicle class which are also becoming very popular and achieve even lower fuel consumption and emissions were rated as having good crashworthiness and total secondary safety. It highlights the need to focus particularly on improving the secondary safety performance of light vehicles by manufacturers and ensuring consumers downsize to only the safest small vehicles. A particular emphasis on small vehicle safety through consumer information programs such as ANCAP might help in achieving this goal.

**Conclusions**

This paper has examined the potential implications on vehicle secondary safety performance of the trend to downsizing and consequent size polarization of the Australian vehicle fleet over the past decade in response to rising fuel prices and heightened environmental concerns. Research results summarized show that downsizing of the fleet will lead to higher levels of deaths and serious injury from crashes primarily through poorer crashworthiness performance in all crash types. Whilst reduced injury risk for unprotected road users will be achieved by downsizing from 4-wheel drives to regular passenger vehicles, downsizing within regular passenger vehicles will lead to poorer secondary safety outcomes for this group. Furthermore, the polarization of the vehicle fleet will translate an increased proportion of the injury burden to drivers who choose to downsize their vehicles. Interrogation of the secondary safety performance of specific makes and models of vehicle show it is possible to downsize into a vehicle that has excellent secondary safety performance as well as low fuel consumption and emissions. However the number of such vehicle models achieving this duality is small and significant effort needs to be made to improve the general secondary safety performance of small fuel efficient vehicles in order to produce the desired environmental outcomes without sacrificing safety.

This paper has only examined broadly the injury outcome implications expected from downsizing the vehicle fleet to achieve lower fuel consumption and emissions. Specific quantification of the likely additional injury burden and assessment of strategies to minimize this burden would require a much more detailed and systematic analysis which is recommended.

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References