WORKING PAPER

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The impact of fuel prices and supply availability on user behavioural change in Australian household travel amidst global turmoil

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ABSTRACT: The global conflict in the Middle East is having a significant impact on the availability of oil to many countries, with Australia feeling the impact more than most countries. Fuel prices escalated during the first three weeks of the war (up to the end of March 2026), typically being 30-50% higher than the retail prices at the pump under normal market conditions. Supply uncertainty has also created problems in distribution, especially for farmers, trucking companies and retail outlets. In response to the escalated fuel prices at the pump, the Federal government announced, on 31 March, a reduction in fuel excise for three months (from 52.6 to 26.3 cents per litre) with state and territory leaders agreeing to pass on the additional goods and services tax windfall to motorists (further reducing the total to 20.6c/litre as well as the removal of the heavy vehicle road user charge for the same period (the latter of 32.4 cents per litre is reduced to zero). This paper explores ways in which users of passenger cars have responded to these price hikes and supply uncertainty. A series of questions incorporated in a survey of 1,000 New South Wales (Australia) residents in the first two weeks of April 2026, up to a temporary ceasefire and US blockage of the Strait of Hormuz, sought evidence on behavioural change responses such as modal switching for work and non-work-related travel, changes in car kilometres, car sharing, working from home, purchase of an electric or hybrid vehicle, and switching car use between petrol/diesel and electric vehicles in the current household fleet. These responses are embedded in a number of scenarios that vary fuel prices and fuel scarcity (availability and rationing) to assess the likely behavioural response in the short run and in the longer run if a scenario becomes reality. Overall, the key policy takeaway is that fuel pricing is most effective as a short run signal and selective rationing tool, while long run resilience depends on structural adaptation, especially vehicle technology, income buffering, and access to substitutes.

KEY WORDS: ***Global turmoil, oil supply, fuel prices, supply uncertainty, car user responses, behavioural change, survey of car users, elasticities***

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1. Introduction

The Middle East conflict has produced significant uncertainty for fuel prices at the pump and supply availability[1]. While the Australian government reduced fuel excise for 3 months (from 52.6 to 26.3 cents per litre for April-June 2026), and the States and Territories removed the windfall gain in the goods and services tax (GST) from higher fuel prices (approximately 6c/litre), prices as of May 2026 are still well above the pre-war expected prices. While prices have become somewhat less volatile for the next three months at least (April-June 2026), the focus on supply continues to be a concern.

There are two aspects to supply – the amount available in the country, and its distribution to each retail outlet throughout the country. Federal government advice is far from clear (as of early April 2026), with a significant number of fuel outlets having no fuel, especially diesel (during March and April 2026). How this uncertainty is affecting users of vehicles that need fossil fuels is unclear.

This paper focusses on passenger cars that primarily use petrol, with diesel also in the mix. In Australia there is also a growing switch to electric vehicles, and although in 2026 the entire fleet is only 2% electric, the purchase of new electric vehicles represents 12% of the fleet, with a 34% increase between 2024 and 2025. Chinese EV cars are starting to flood the Australian market with considerably lower prices than other EVs[2].

A series of questions incorporated in a survey of 1,000 New South Wales (Australia) residents in April 2026 sought evidence on behavioural change responses such as modal switching for work and non-work-related travel, changes in car kilometres, car sharing, working from home, purchase of an electric or hybrid vehicle, and switching car use between petrol/diesel and electric vehicles in the current household fleet. These responses are embedded in a number of scenarios that vary fuel prices and fuel scarcity (availability and rationing) to assess the likely behavioural response in the short run (the next few weeks) and the longer run (by the end of 2026) if a scenario becomes reality.

The behavioural hypotheses tested in this paper posit that fuel price increases and supply disruptions lead to measurable changes in travel behaviour through price sensitivity, loss aversion, and uncertainty effects. Responses are expected to be asymmetric, heterogeneous, and context-dependent, with users adjusting travel intensity, mode choice, timing, and vehicle use rather than eliminating travel outright. The framework distinguishes short-run adaptive behaviour from longer-term structural change and explicitly accounts for interaction effects with existing transport policies, enabling evaluation of demand resilience under fuel-related global shocks in Australia.

A number of behavioural hypotheses will be tested, focussing on fuel price and supply shocks, behavioural response, and transport demand in Australia. The paper treats fuel price volatility and supply disruption as exogenous shocks that operate through three behavioural channels relevant to transport demand: (1) generalised travel cost adjustment (micro-economic response), (2) behavioural responses under uncertainty and loss aversion (behavioural economics), and (3) constraint-driven heterogeneity in adjustment capacity (equity and spatial structure).

We propose 13 empirically testable behavioural hypotheses, summarised in Table 1, testable using elasticities derived from the estimated mixed multinomial discrete choice model for both the short run and the longer run. The table supports a hierarchical behavioural adjustment framework, ranging from marginal adjustments (trip suppression) to non-marginal responses (cessation of driving). These behavioural hypotheses guide the econometric analysis of household travel responses to fuel price

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[1] See https://www.nsw.gov.au/driving-boating-and-transport/fuel-update-for-nsw and https://www.patreon.com/posts/2026-03-dataset-155592428?utm_medium=clipboard_copy&utm_source=copyLink&utm_campaign=postshare_creator&utm_content=join_link

[2] Typical retail prices in the $AUD30,000-$AUD40,000 range.

increases and supply constraints. The hypotheses link key explanatory variables—covering vehicle technology, fuel prices and availability, income, and activity substitution—to discrete behavioural adjustments observed under fuel stress conditions, including maintaining current driving patterns, reallocating vehicle use within the household, reducing travel, or ceasing to drive.

Hypotheses H1–H3 capture the role of vehicle technology ownership as a source of behavioural resilience. Hybrid and electric vehicle ownership is expected to increase the likelihood of maintaining baseline driving or reallocating vehicle use within the household, reflecting reduced exposure to petrol price shocks and short-run fuel scarcity. In particular, electric vehicle ownership is hypothesised to exert a dominant effect on vehicle reallocation relative to other behavioural alternatives, in the longer term.

Price and fuel-type sensitivities are addressed in H4–H6. These hypotheses distinguish between reductions in discretionary versus total driving in response to petrol price increases and allow for heterogeneous responses to diesel compared with petrol prices. The specification also permits non-marginal behavioural responses, such as complete cessation of driving, particularly under noticeable diesel price increases.

Socio-economic heterogeneity is incorporated through income-related hypotheses (H7–H8), which posit that higher-income households are more likely to absorb fuel shocks without altering travel behaviour, while lower-income households exhibit stronger adjustment across alternative response mechanisms. Hypotheses H9 and H10 capture activity and mode substitution effects, recognising the roles of working from home and public transport use (noting that the NSW government has decided against any reduction in fares) in facilitating reductions in private vehicle travel.

Finally, H11–H13 address temporal and supply-side dynamics, distinguishing short-run trip reduction from longer-run adjustment strategies such as vehicle reallocation, and examining how binding fuel availability constraints might amplify adaptive behaviour. For each hypothesis, the expected sign or dominance of the effect is stated alongside its formal behavioural representation in terms of marginal effects or elasticities (ε). Collectively, the hypotheses provide a coherent framework for empirical assessment within a discrete choice modelling context.

Table 1 Consolidated econometric hypotheses: household travel behaviour under fuel supply and price shocks

Hyp. ID	Hypothesis Theme	Explanatory Variable	Behavioural Alternative(s) i	Expected Sign / Relationship	Formal Behavioural Statement
H1	Vehicle technology resilience	Number of hybrid vehicles	DRVSAME	Positive	$\frac{\partial P_{\text{DRVSAME}}}{\partial \text{HYBRID}} > 0$
H2	Hybrid-enabled adaptation	Number of hybrid vehicles	REARCARS	Positive	$\frac{\partial P_{\text{REARCARS}}}{\partial \text{HYBRID}} > 0$
H3	EV-driven vehicle reallocation	Number of EVs	REARCARS	Positive and dominant	$\frac{\partial P_{\text{REARCARS}}}{\partial \text{EV}} > \frac{\partial P_i}{\partial \text{EV}}, \forall i \neq \text{REARCARS}$
H4	Selective trip reduction	Petrol price (U98)	RDRIVUT vs RDRVALLT	Larger for unnecessary trips	$\varepsilon_{\text{RDRIVUT},C} > \varepsilon_{\text{RDRVALLT},C}$
H5	Fuel heterogeneity	Diesel vs petrol price	RDRVALLT, NOTDRV	Diesel effect stronger	$\varepsilon_{i,\text{COSTDSL}} > \varepsilon_{i,\text{COSTU98}}$

H6	Non-marginal response	Diesel price	NOTDRV	Positive	$\frac{\partial P_{\text{NOTDRV}}}{\partial \text{COSTDSL}} > 0$
H7	Income-based resilience	Personal income	DRVSAME	Positive	$\frac{\partial P_{\text{DRVSAME}}}{\partial \text{INCOME}} > 0$
H8	Income-driven adjustment	Personal income	RDRIVUT, RDRVALLT, REARCARS, NOTDRV	Negative	$\frac{\partial P_i}{\partial \text{INCOME}} < 0, \forall i \neq \text{DRVSAME}$
H9	Remote work substitution	Working from home	RDRVALLT	Positive	$\frac{\partial P_{\text{RDRVALLT}}}{\partial \text{WFH}} > 0$
H10	Mode substitution	Public transport use	NOTDRV	Positive	$\frac{\partial P_{\text{NOTDRV}}}{\partial \text{PT}} > 0$
H11	Short-run escalation	Short-run trip reduction	RDRVALLT	Positive	$\frac{\partial P_{\text{RDRVALLT}}}{\partial \text{RTRIP\_SR}} > 0$
H12	Supply constraint adaptation	Fuel availability (40%)	REARCARS	Positive	$\frac{\partial P_{\text{REARCARS}}}{\partial \text{AV40}} > 0$
H13	Temporal asymmetry	EV purchase vs short-run reduction			

The paper is organised as follows. A brief literature review is followed by details of the survey undertaken in 2026, especially the design of a stated preference experiment. A descriptive profile of the data follows together with the hypotheses to be tested using a mixed multinomial logit framework. This is followed by the model results and elasticity implications. Policy evidence is summarised in the final discussion and conclusions section.

Literature Review

Even without considering the direct impact of the current ongoing conflicts and war in the Middle East, instability in both fuel supply and fuel price is the norm in the international oil market. This is because the global oil industry is going through many structural crises, such as the dominance of national and state-owned oil production, oil supply and reserves, and the sharp increase of oil demand from the non-OECD countries in Asia (Mitchell and Mitchell 2014). Research on the impact of high fuel prices and fuel supply shortage often peaked following a fuel crisis for various reasons from the 1970s. In a systematic review on the impact of the fuel crisis from 1972 to 2017, Leung et al. (2019) summarised the related research in a framework consisting of three key elements of energy (fuel prices and supply), transport and land use (urban). The reason for including land use is that the impact of the fuel crisis does not distribute equally under different urban contexts. A large majority of the reviewed research is in the cluster of inter-city comparison or intra-urban analysis, followed by more macro-level research on urban structure and fuel elasticities. It can be argued that research on fuel price and a supply crisis on travel behaviour and more broadly, on people's consumption and sustainable behaviour, is inadequate.

Studies on the demand and supply of fuel often use macro-level data, such as price and fuel consumption figures across areas and over a long period, to conduct macroeconomic analysis on demand and supply. For example, Bakhat et al. (2017) used data from 16 Spanish regions from 1999 to 2015 to estimate price elasticities of petrol and diesel in a short and long run. One advantage of this approach is that the impact of the period of a fuel crisis can be captured, showing different price elasticities of demand for transport fuel over time. However, the widely adopted demand and supply approach at the aggregated level has limitations. *First*, price uncertainty can change people's behaviour by depressing both the level and price responsiveness of demand (Scott 2015). These demand changes are often enhanced by other elements, such as policy changes to discourage fuel consumption. This has caused traditional demand models to generate systematic misprediction of consumer reaction and misleading key market interventions. *Second*, people's reaction in a fuel crisis makes commonly used elasticities inaccurate and what is often captured during normal times does not factor in the complex nature during a fuel crisis (Goodman 2017). According to the well-cited elasticity given by Graham and Glaister (2002) and Goodwin (1992), the short-term fuel price elasticities are often in the range of -0.25 to -0.3, and the long-term fuel price elasticities are often in the range of -0.7 to -0.8 on fuel consumption. In the time of a fuel crisis, these elasticities may not be accurate. Furthermore, a fuel crisis can be quite different in nature and duration. For example, the year 2000 fuel crisis in the UK and Europe (discussed below) lasted for one to two weeks and is very different to the current fuel crisis due to an ongoing war in the Middle East and blockade of global oil supply. *Third*, some of the commonly adopted economic assumptions may not be totally accurate when it comes to the demand and supply of fuel. Liddle (2012) examined the long-term relationship of fuel demand, fuel price, income and vehicle ownership in 14 OECD countries, and found that both the short-term and long-term income elasticities are smaller than typically assumed for fuel consumption. Adolfsen et al. (2025) focus on how supply shocks propagate to prices, shaping behavioural environments. They distinguish supply-driven vs demand-driven price shocks and show supply shocks create stronger and more persistent behavioural pressure. The findings are relevant for understanding why users change their behaviour more drastically during wars.

A number of papers establish how and why users change travel behaviour when fuel prices rise, forming the backbone of later crisis-oriented analyses. Key papers are Small and Van Dender (2007) on short- vs long-run fuel price elasticities, with evidence that behavioural change is gradual, with stronger long-term responses due to vehicle choice, activity rescheduling, and relocation. Yang and Timmermans (2012) use pseudo-panel data to capture *dynamic adaptation* rather than immediate response, and they find that habit persistence and lagged behavioural change are important during prolonged crises. A number of papers look into behavioural change during extreme price volatility and crises, explicitly dealing with sudden shocks, economic stress, and adaptation under uncertainty. Bandara et al. (2024) conducted research during a national fuel and economic crisis in Sri Lanka, showing rapid shifts to public transport, trip suppression, and mode substitution, highlighting behavioural thresholds rather than smooth elasticities.

People's behaviour during a fuel crisis, either reflected in fuel price increases, a shortage of supply, or both is complex. Despite differences such as country, economy, population density, and car dependency, fuel price increase and fuel vulnerability often generate similar sentiments among people; one of these sentiments is the louder public voice on cost of living and affordability due to changes beyond the impact on mobility (Leung et al. 2018). Some of the reactions and behaviour changes by the public during a fuel crisis, or indeed, any type of crisis, such as the COVID-19 pandemic, are expected and often occur. For example, the expectation of shortage (not limited to fuel) induces people to stockpile, which further worsens the shortage situation and encourages more stockpiling. There is an amplified effect, which implies that, even if the supply shortfall is small, a larger stockpiling activity may occur. One of the most well-known and recent cases is the stockpiling of toilet tissue during the early period of the COVID-19 pandemic (Klumpp & Su 2025).

Empirical studies in different countries during different periods show people's responses to fuel crisis may demonstrate similarities despite different economic, cultural and urban settings. High fuel costs reduced car travel and, at the same time, increased use of other modes such as public transport and active travel. This phenomenon aligns with common sense and has been shown in past fuel crises from the 1970s up to now. Crow and Savitt (1974) studied four modes of intercity travel across 22 city pairs in the "Northern Corridor" in the US under the influence of fuel price increase in the early 1970sand found car travel declined with the increase of fuel cost monotonically while rail travel increased monotonically. Lee-Gosselin (2010) studied the impact of the oil crisis over 30 years in North America since the 1973 OPEC embargo, covering the following fuel crises on oil production and supply interruptions, such as the change of the Iranian regime and wars in the Middle East. The study summarised many key observations through the review such as: 1) households preferred controlled changes on mobility and activities including elimination of trips/activities, trip chaining or switch to other modes; 2) people are not against government interventions to save fuel; 3) people were able to adapt lifestyle changes to save fuel; 4) people are willing to save fuel when the fuel emergency is real which eliminates the common dilemma that others may take advantages; and 5) reliance on commuting by car can be changed.

Using survey data, Noland et al. (2003) discussed behaviour changes in mobility in the 2000 fuel crisis in the UK and found that people with greater car dependence, especially for work trips, experienced more disruptions. Chatterjee and Lyons (2002) collected survey data in the UK during the same period and found that one-fifth of car drivers for commuting and other trips changed their mode and reduced trips and kilometres. Thorpe et al. (2002) made a similar discovery and pointed out that while reducing car travel was a notable change, improving bus services and enabling travel and activity planning are important to reduce car use. Arning and Venghaus (2024) applied factor analysis using a survey of 540 respondents in Germany to show that after the joint impact of both the COVID-19 pandemic and energy crisis due to the war in Ukraine, nearly 70% of the people had switched to energy saving behaviour, 50% had sustainable shopping behaviour, and 30% had sustainable car use behaviour. This demonstrates that sustainable mobility behaviour and sustainable consumption practices go hand in hand to illustrate people's reactive or adaptive behaviour change.

These behaviour changes in earlier fuel crises continue in recent times, involving increased use of active transport and e-micromobility. The tendency to switch to more sustainable modes during a fuel crisis can be observed in many different countries. Berezvai et al. (2024) studied people's responses to the elimination of the fuel cap in 2022 in Hungary when the fuel prices increased by one-third. Their study using survey data in Budapest shows that bike sharing usage increased by up to 6% following the fuel cap elimination, especially in the outer areas of the city. Ortar (2018) studied how households living in peri-urban or outskirt areas of French cities responded to the oil price peaks during 2012 to 2013. Many households living in these areas faced so-called "fuel poverty", limiting their mobility at day-to-day level. The study reveals that instead of giving up home locations, households living in these areas adjusted their lifestyle, including adopting sustainable travel behaviour like car-pooling when driving children to schools and leisure activities, and adjusted their home and work commute activities whenever possible. Through in-depth interviews, Nguyen and Pojani (2024) studied how people in Vietnam coped with the 2022 global energy crisis, which led to fuel price hikes locally. Instead of using motorcycles, which is the main motorised mode of transport in Vietnam, many people switched to traditional bicycles. They also pointed out that although the high fuel price (a "push" measure) switches people from using motorised modes for both commuting and leisure trips, only "pull" measures, such as upgrading infrastructure and policy and incentive changes, can retain this sustainable mobility change in the long term.

A consistent narrative emerges from the literature. The immediate response is trip suppression, mode switching, and reduced discretionary travel. The short-run adaptation is mainly public transport uptake, trip chaining and tele-activities (working from home). The long-run change involves vehicle choice, residential relocation, and structural demand reduction. Importantly, behaviour reacts more strongly to a *fear of scarcity* than to price alone. All of this evidence aligns well with turmoil-driven behaviour, where fuel becomes both an economic and psychological constraint. We now investigate these behavioural responses in some detail.

2. The Empirical Setting- Survey Details

An online survey designed by the authors and conducted by Pure Profile market research was implemented over the period April 12-20, 2026, with respondents using a smart device of their choosing. The survey involved a broad set of questions on customer opinions on how to improve transport in NSW; however, in the current paper we are interested in the subset of questions related to fuel prices and supply scarcity in additional to residential location and socioeconomic characteristics. Background questions were asked on current car ownership and use over a typical week, including details of the type of vehicle, namely size, (Small. Medium, etc.), fuel type (including octane if petrol), size of engine (litres), and purpose of use (e.g., business only) (see Appendix A).

We asked about any changes made by the household as a result of the current Gulf war, as well as whether an employer has provided additional assistance. A series of stated preference scenarios were offered on fuel prices, whether a supply cap is in place, and the percentage of local outlets with no fuel at the octane level or diesel used by a respondent. Respondents were asked to indicate what behavioural response they would make in terms of adjusting car use in the short term (i.e., over the next few weeks) and the longer term (by the end of the year). The questions related to fuel prices, supply and behavioural response are shown as screenshots in Appendix B (and Figure 1).

Fuel prices at the beginning of April were used as the base (100%)[3] The stated preference experiment used the range of fuel prices together with fuel limits (under rationing) and supply availability as given in Table 2.

Table 2. Fuel prices ($/litre) at the pump, fuel limits and availability included in the SP design

Fuel Price Level								
	1	2	3	4	5	6	7	8
	80%	**90%**	**100%**	**110%**	**120%**	**130%**	**140%**	**150%**
Unleaded E10	$1.80	$2.00	$2.20	$2.40	$2.60	$2.90	$3.10	$3.30
Unleaded 91	$1.80	$2.00	$2.26	$2.50	$2.70	$2.90	$3.20	$3.40
Unleaded 95	$1.90	$2.20	$2.40	$2.60	$2.90	$3.10	$3.40	$3.60
Unleaded 98	$2.00	$2.30	$2.50	$2.80	$3.00	$3.30	$3.50	$3.80
Diesel	$2.40	$2.70	$2.98	$3.30	$3.60	$3.90	$4.20	$4.50

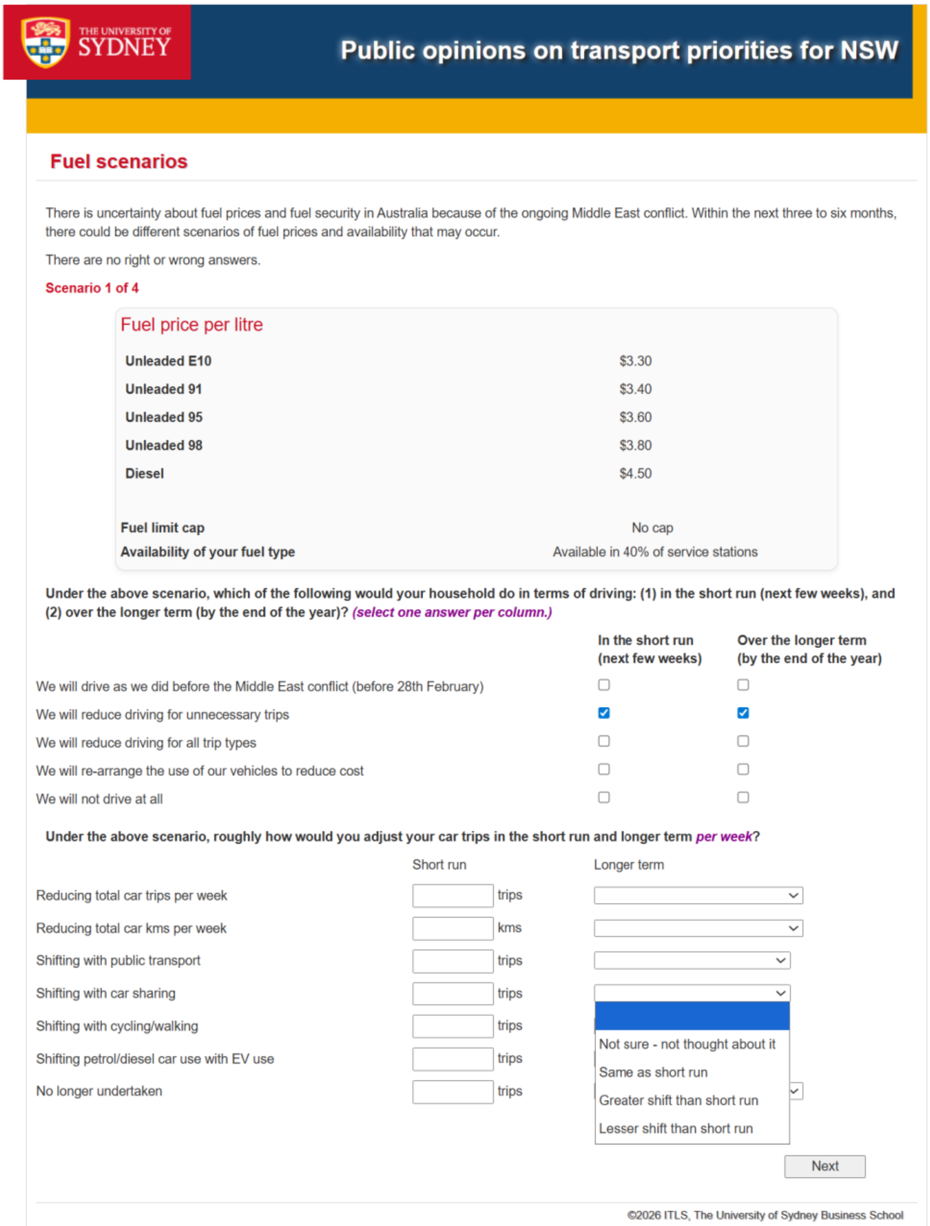
Fuel limit cap (cap)			
	Level	1	No cap
		2	50 litres cap
		3	40 litres cap
		4	30 litres cap
Fuel availability for the fuel type of my vehicle:			
	Level	1	Available in all service stations
		2	Available in 80% service stations
		3	Available in 60% service stations
		4	Available in 40% service stations

The three attributes have a total number of 8^1 4^2 number of combinations. For each choice task, we only need to show one combination with no alternatives involved. Instead of using design software to generate the design, we adopted an orthogonal array for this design[4]. We chose a design of 32 sets for 4^8 8^1 from the SAS library, which provided all combinations needed for the design. Respondents were randomly assigned to 8 blocks to complete four choice sets (scenarios). For 1,024 respondents, we have 4,096 scenarios completed in total.

[3] https://www.fuelcheck.nsw.gov.au/app

[4] There are two well-cited public orthogonal array libraries online to choose from, provided by Neil Sloane (https://neilsloane.com/oadir/) and the SAS OA library provided by Warren F. Kufeld (https://support.sas.com/techsup/technote/ts723b.pdf).

The stated preference fuel scenario question is shown in Figure 1, with the last part only asked if there is a change in travel behaviour. Given that some responses are likely to be immediate (i.e., short run over the next few weeks) and others over a longer period (i.e., by the end of the year), we sought both short run and longer run responses. Four choice scenarios were shown to each respondent, drawn from the design levels in Table 1, as given in Appendix B, and answered on behalf of the household.



THE UNIVERSITY OF SYDNEY

Public opinions on transport priorities for NSW

Fuel scenarios

There is uncertainty about fuel prices and fuel security in Australia because of the ongoing Middle East conflict. Within the next three to six months, there could be different scenarios of fuel prices and availability that may occur.

There are no right or wrong answers.

Scenario 1 of 4

Fuel price per litre

Unleaded E10	$3.30
Unleaded 91	$3.40
Unleaded 95	$3.60
Unleaded 98	$3.80
Diesel	$4.50
Fuel limit cap	No cap
Availability of your fuel type	Available in 40% of service stations

Under the above scenario, which of the following would your household do in terms of driving: (1) in the short run (next few weeks), and (2) over the longer term (by the end of the year)? *(select one answer per column.)*

	In the short run (next few weeks)	Over the longer term (by the end of the year)
We will drive as we did before the Middle East conflict (before 28th February)	☐	☐
We will reduce driving for unnecessary trips	☑	☑
We will reduce driving for all trip types	☐	☐
We will re-arrange the use of our vehicles to reduce cost	☐	☐
We will not drive at all	☐	☐

Under the above scenario, roughly how would you adjust your car trips in the short run and longer term *per week*?

	Short run	Longer term
Reducing total car trips per week	trips	
Reducing total car kms per week	kms	
Shifting with public transport	trips	
Shifting with car sharing	trips	
Shifting with cycling/walking	trips	
Shifting petrol/diesel car use with EV use	trips	
No longer undertaken	trips	

Not sure - not thought about it
Same as short run
Greater shift than short run
Lesser shift than short run

Next

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Figure 1. A stated preference scenario and response questions

3. Descriptive Profile

The latest evidence on action taken by NSW residents in the 2026 fuel crisis shows the extent to which households have changed their travel behaviour to date since the period of the Middle East conflict (and the latest date of survey was the precarious ceasefire). The findings in Figure 2 show that 45% of respondents reduced total petrol/diesel car trips, 25% reduced non-work-related travel, 24% reduced total petrol/diesel car kilometres, 7% increased car sharing while only 5% increased public transport trips. Over 1 in 3 (36%) made no changes at all. The decision to purchase an electric vehicle (4%) and the increased the use of a hybrid car (5%) are significant given the overall number of electric vehicles registered at present. Finally, the expected increased working from home was very small, at 4%. This suggests that the majority of NSW households have focussed on changes in car-related use and no change at all to travel behaviour. It is encouraging to see 16% of respondents increased walking, cycling or scooting using traditional bikes and scooters while a small 2% increased trips by e-bikes or e-scooter.

The small public transport (PT) percentage aligns well with the Greater Sydney estimated growth during this period of +2.5% to +3.5%, due to a noticeable uplift on weekday AM and PM peaks. Our survey is of car users only, whereas the publicly available public transport usage data is for all travellers, regardless of other mode and hence direct comparison is qualified. Our evidence is consistent with observed mode shift from car to PT during April's fuel-price spike and concerns about fuel availability, with the strongest signals on train, metro, and high-frequency bus corridors. This aligns with contemporaneous reporting that PT usage rose modestly as road traffic fell[5]. For the rest of NSW, the estimated growth is small, at +0.5% to +1.5%The relatively small percentage uptake of PT compared to active modes might be explained by existing PT being typically fixed in location, hours, fares (with no free or heavily discounted fares in response to the fuel crisis) and service quality, implying that people cannot easily switch (i.e., service not in the area), whilst active travel does not have this restriction, with switching to cycling and walking being far easier and flexible, and can be an immediate (short run) alternative. Thorpe et al. (2002) in investigating the 2000 UK fuel crisis (see literature review), pointed out the PT requires service levels to be improved as a real alternative to car in the time of crisis. In contrast, people/drivers very quickly switched to active travel during a fuel crisis, as shown in some recent studies (e.g., Berezvai et al. 2024; Nguyen and Pojani 2024).

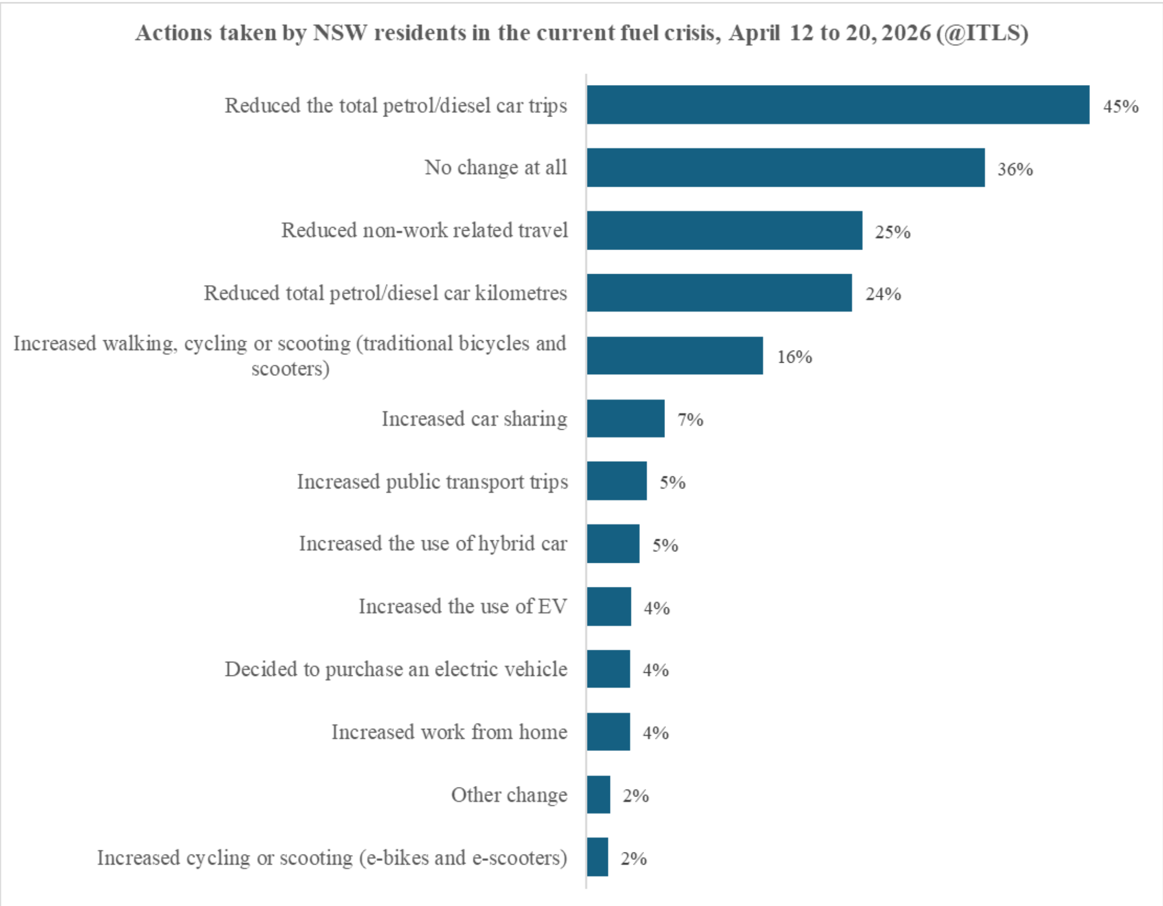

Figure 2. Revealed actual behaviour response actions

[5] abc.net.au

The descriptive profile of the overall sample is summarised in Table 3, with descriptive statistics associated with the final discrete choice models reported in the next section in Table 4. There is a good spread of residential location within and outside of the Greater Sydney Metropolitan Area, with an expected differential response given the availability of fuel in rural and regional areas. There is also a good representation of various socioeconomic characteristics of the respondent and their household, enabling assessment of their influence of behavioural response to the fuel prices and supply availability. Figure 3 shows the community support for various initiatives that should be undertaken by the Federal Government, some of which were subsequently supported to a degree through a number of actions.

Table 3. Descriptive statistics of the sample

Socio-demographics		
	Count	**%**
Living in the Greater Sydney Metropolitan Area (GSMA)	586	57.2%
Living in other New South Wales locations	438	42.8%
Female	545	53.2%
Male	477	46.6%
Have children in the household aged 5 to 18	395	38.6%
Have a paid job	685	66.9%
Looking for work	69	6.7%
Student (university / college / technical school)	37	3.6%
Home-maker	55	5.4%
Retired and not undertaking any work	187	18.3%
Retired and doing casual work	38	3.7%
I have an unpaid job / Volunteer	18	1.8%
Have government job	118	17.1%
Manager	172	24.9%
Professional	211	30.6%
Technicians and trades	37	5.4%
Community and personal services	44	6.4%
Clerical and administration	118	17.1%
Sales	45	6.5%
Machine operators/drivers	14	2.0%
Labourer	28	4.1%
Other occupation	21	3.0%
Actions and opinions for the current fuel crisis		
	Count	**%**
Fuel stations with a fuel cap in your area	158	15.4%
Employer support in this fuel crisis	60	8.8%
Government intervention is needed	848	82.8%
Lower the fuel price by removing fuel excise/tax completely for a period until the crisis is over (e.g., a further 26 cents lower per litre)	659	64.4%
Rationing fuel supply to ensure a fair distribution of the limited supply	336	32.8%
Ensure fuel supply, even if it means paying high prices overseas for sourcing fuel supply.	351	34.3%
Provide adequate funding to industries in coping with the soaring costs of materials (e.g., increasing costs of construction materials for builders and increasing costs of fertilisers for farmers due to the fuel crisis)	349	34.1%
Other descriptive statistics with means and standard deviations		
	Mean	**SD**
Number of vehicles	1.41	0.81
Age	47.94	16.06
No. of children aged 5 to 6	0.45	0.53
No. of children aged 7 to 12	0.72	0.85
No. of children aged 13 to 18	0.81	0.89
Annual personal income	$76,220	$51,908
Annual household income	$121,253	$88,638
Number of push bikes	1.82	1.11
Number of e-bikes	1.17	0.47
Number of e-scooters	1.65	1.87
Percentage of stations with your fuel available	78.13	32.18

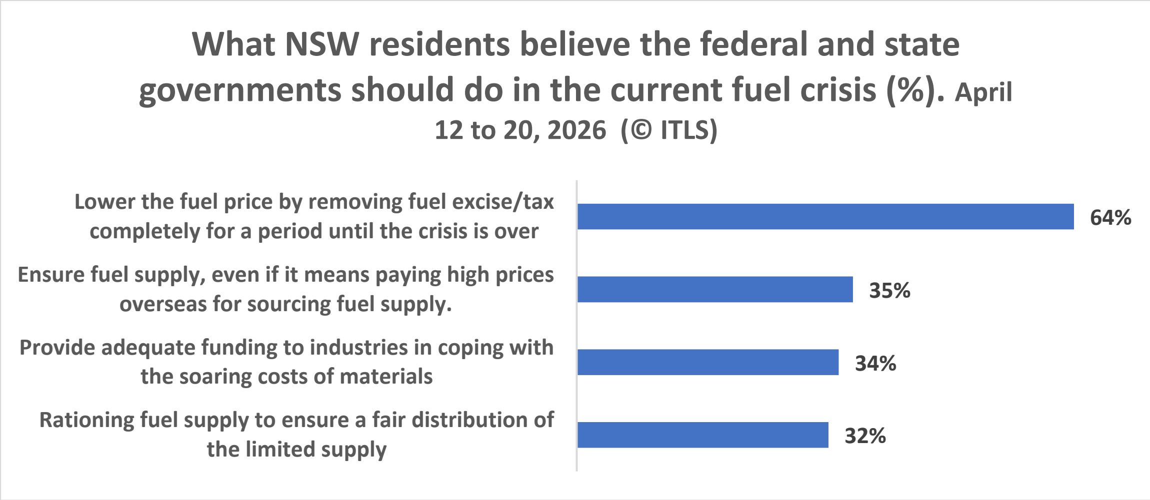

Figure 3. Initiatives requested for the Federal Government to implement

Figure 4 shows the profile of behavioural response for the five alternatives assessed in the stated preference experiment (shown in Figure 1). There are noticeable percentage differences between the short run response, and the anticipated longer run response, with a partial correlation overall of 0.679. As expected, there is a greater rearrangement of use of the household cars in the longer run (10.11% by the end of the year) compared to 5.76% in the short run over the next few weeks.

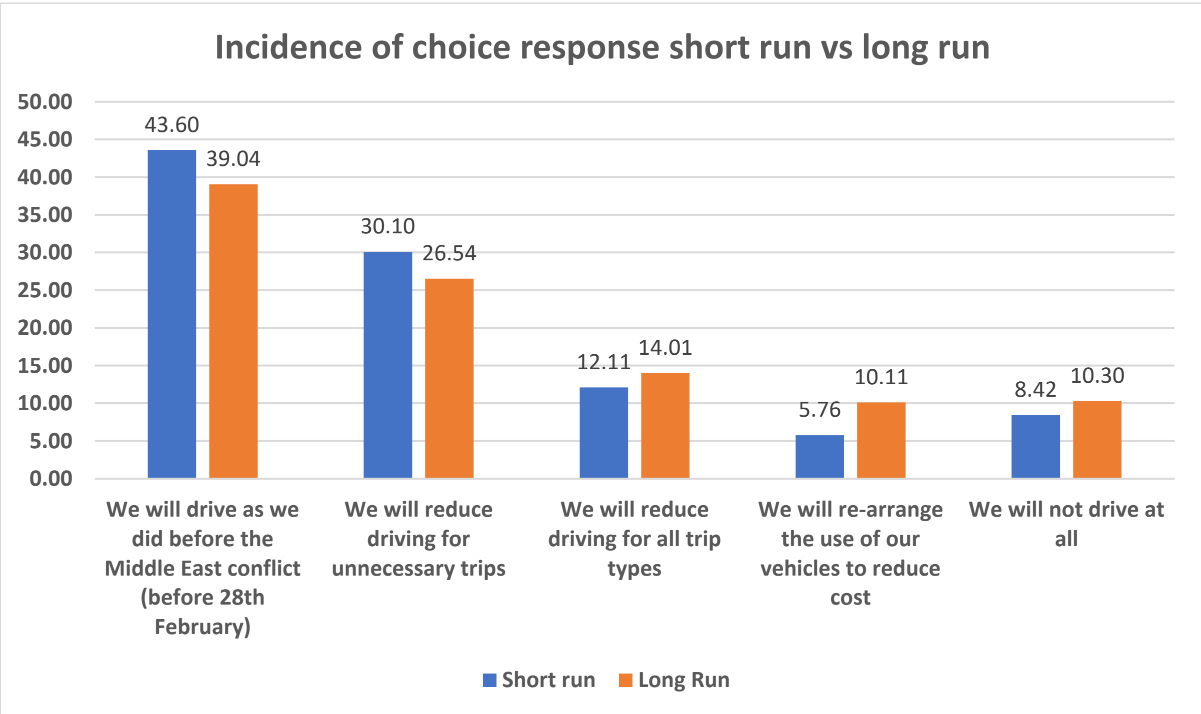

Figure 4. Profile of short run and long run choice response from stated preference questions

4. Model Specification

Household behavioural responses are modelled using a discrete choice framework in which individual n selects behavioural alternative $i \in \mathcal{J}$. The mixed multinomial logit (MMNL) model uses the stated preference data and the five choice responses (as the choice set – see Figure 1) in the short run and long run respectively. It assumes that some of the parameters are random, following a certain probability distribution. These random parameter distributions are assumed to be continuous over the sampled population. The choice probabilities of the mixed multinomial logit (MMNL) model, P_n^*, depends on the random parameters with distributions defined by the analyst. The MMNL model is summarised below in (1) (see Hensher et al. 2015).

$$\text{Prob}(choice_{ns} = j \mid \mathbf{x}_{nsj}, \mathbf{z}_n, \mathbf{v}_n) = \frac{\exp(V_{nsj})}{\sum_{j=1}^{J_{ns}} \exp(V_{nsj})} \tag{1}$$

where

V_{nsj} = $\boldsymbol{\beta}_n{}'\mathbf{z}_{nsj}$

$\boldsymbol{\beta}_n$ = $\boldsymbol{\beta} + \boldsymbol{\Gamma}\mathbf{v}_n$

$\mathbf{Z}_{nsj}$ = the K attributes of alternative j in choice situation s faced by individual n,

$\mathbf{v}_n$ = a vector of K random variables with zero means and known (usually unit) variances and zero covariances.

The deterministic component of utility is specified as follows with a number of candidate explanatory variables listed:

$$V_{ni} = \alpha_i + \beta_i^H \cdot HYBRID_n + \beta_i^{EV} \cdot EV_n + \beta_i^{PU98} \cdot COSTU98_n + \beta_i^{DSL} \cdot COSTDSL_n + \beta_i^Y \cdot INCOME_n + \beta_i^{WFH} \cdot WFH_n + \beta_i^{PT} \cdot PT_n + \beta_i^{SR} \cdot RTRIP_{SR,n} + \beta_i^{AV} \cdot AV40_n$$

with $\alpha_i$denoting alternative-specific constants and all explanatory variables defined in Table 1.

The choice model embodies both observed and unobserved heterogeneity in the preference parameters of individual n. The unobserved heterogeneity is embodied in $\boldsymbol{\Gamma}\mathbf{v}_n$. Structural parameters to be estimated are the constant vector, $\boldsymbol{\beta}$, and the nonzero elements of the lower triangular Cholesky matrix, $\boldsymbol{\Gamma}$. The expected probability over the random parameter distribution can be written as

$$E\left(P_n^*\right) = \int_{\boldsymbol{\beta}} P_n^*(\boldsymbol{\beta}) f(\boldsymbol{\beta}) \mid \Omega) d\boldsymbol{\beta}, \tag{2}$$

where $f(\boldsymbol{\beta} \mid \Omega)$ is the multivariate probability density function of $\boldsymbol{\beta}$, given the distributional parameters θ. By using a transformation of $\boldsymbol{\beta}$ such that the multivariate distribution becomes semi-parametric, we can write Equation (3) as

$$E\left(P_n^*\right) = \int_z P_n^*\left(\beta(z \mid \Omega)\right) \phi(z) dz, \tag{3}$$

where $\beta(z \mid \Omega)$ is a function of z with parameters Ω, and where $\phi(z)$ is the multivariate non-parametrical distribution of z. It is common to use several (independent) univariate distributions instead of using a single multivariate distribution, such that Equation (4) can be written as

$$E\left(P_n^*\right) = \int_{z_1} \cdots \int_{z_K} P_n^*\left(\beta_1(z_1 \mid \theta_1), \ldots, \beta_K(z_K \mid \theta_K)\right) \phi_1(z_1) \cdots \phi_K(z_K) dz_1 \cdots dz_K. \tag{4}$$

The MMNL models used herein is estimated using a panel data set (four choice sets per respondent) often called an 'instantaneous panel', which engenders (potential) correlation between observations common to a respondent. although the independence across respondent's assumption is maintained. Mathematically, this means that $E\left(P_1 P_2\right) \neq E(P_1)E(P_2)$, hence the log-likelihood function of the panel MMNL model may be represented as formula (5).

$$\log E(L_N) = \sum_{n=1}^{N} \log E\left(\prod_{s \in S_n} \prod_{j \in J_{ns}} \left(P_{nsj}\right)^{y_{nsj}} \right), \quad (5)$$

Hypotheses will be evaluated using estimated coefficients and elasticities derived from the choice probabilities. Together, the specification allows simultaneous testing of price effects, supply constraints, technological resilience, income heterogeneity, and behavioural substitution,

5. Mixed Multinomial logit Model Results

The short run and long model results are summarised in Table 6, with the mean and standard deviation of each explanatory variable that is statistically significant in each of the five-choice alternatives summarised in Table 5. The short run captures immediate coping responses (trip reduction, rearrangement, mode change), and the longer run captures structural adaptation (fleet composition, persistent non-driving, fuel-type effects).

The estimated short-run and long-run mixed multinomial logit models reveal a clear sequencing of household behavioural responses to fuel price and supply shocks, with strong evidence of heterogeneity across fuel type, income, and vehicle technology. Overall model fit is robust, particularly in the short run (McFadden pseudo-$R^2 = 0.28$), reflecting the salience of immediate coping responses (trip reduction, rearrangement, mode change), while the lower long-run fit ($R^2 = 0.18$) captures more diffuse structural adaptation decisions.(fleet composition, persistent non-driving, fuel-type effects).

Table 5. Descriptive statistics of key explanatory variables by short- and long-term choices

	Short Term		Long Term	
Alternative 1 (We will drive as we did before the Middle East conflict (before 28th February)	**Mean**	**SD**	**Mean**	**SD**
Number of electric vehicles for alternative 1	0.062	0.287	0.068	0.296
Number of hybrid vehicles for alternative 1	0.118	0.37		
Female (1,0)	0.486	0.5	0.480	0.500
Age in years	47.303	16.049	47.513	16.061
Annual personal income ($"000s per annum)	80.098	52.161	---	---
Number of household members	2.826	1.341	---	---
Number of children aged 5-6 years old	0.124	0.345	0.129	0.346
Respondent is a student (1,0)	0.032	0.176	0.026	0.16
Household vehicles use unleaded 98 petrol (1 Yes 0 No)	0.199	0.4	0.573	1.160
Household vehicles use diesel (1 Yes 0 No)	0.191	0.394	0.180	0.384
Household vehicles with small engine (1.0L–1.5L) (1 Yes 0 No)	0.238	0.426	0.241	0.428
Household vehicles use Octane 98 (1 Yes 0 No)	---	---	0.205	0.403
Alternative 2 (We will reduce driving for unnecessary trips)	**Mean**	**SD**	**Mean**	**SD**
Price of diesel ($/litre) for alternative 2	0.669	1.401	0.768	1.474
Number of hybrid vehicles for alternative 2	0.106	0.352		
Number of weekly reduced trips for alternative 2	2.818	2.791	1.605	0.917
Number of household members	2.726	1.342	---	---
Reduced total petrol/diesel car kilometres (1,0)	0.292	0.455	0.290	0.454
Number of children aged 7-12 years old	0.293	0.634	0.248	0.560
Number of children aged 13-18 years old	0.198	0.546	0.202	0.481
Respondent is a student (1,0)	0.033	0.179	0.025	0.156
Reduced non-work-related travel (1,0)	0.294	0.456	0.305	0.461
Increased public transport trips (1,0)	0.072	0.259	---	---
Price of Octane 98 petrol ($/litre)	0.576	1.207	---	---
Price of Octane 95 petrol ($/litre)	---	---	0.574	1.159
Household vehicles with small engine (1.0L–1.5L) (1,0)	---	---	0.228	0.420
Reduced total petrol/diesel trips (1,0)	---	---	1.605	0.917
Fuel availability level at 40 % of service stations (1,0)	---	---	0.495	0.500
Fuel availability level at 70 % of service stations (1,0)	---	---	0.230	0.421
Alternative 3 (We will reduce driving for all trip types)	**Mean**	**SD**	**Mean**	**SD**
Price of diesel ($/litre) for alternative 3	0.983	1.637	0.853	1.561
Number of hybrid vehicles for alternative 3	0.119	0.392		
Number of weekly reduced trips for alternative 3	3.468	3.998		
Number of e-bikes owned	0.19	0.497	---	---
Number of household members	2.756	1.414	---	---
Reduced total petrol/diesel car kilometres (1,0)	0.371	0.484	0.371	0.484

Increased working from home (1,0)	0.069	0.253	---	---
Reduced non-work-related travel	0.367	0.482	0.333	0.472
Occupation is manager (1,0)	0.202	0.402	---	---
Price of Octane 98 petrol ($/litre)	0.519	1.157	---	---
Household vehicles use unleaded 98 petrol (1, 0)	---	---	0.160	0.367
Reduced total petrol/diesel trips (1,0)	---	---	3.017	3.100
Number of children aged 7-12 years old	---	---	0.270	0.659
Increased public transport trips (1,0)	---	---	0.099	0.299
Alternative 4 (We will re-arrange the use of our vehicles to reduce cost)	**Mean**	**SD**	**Mean**	**SD**
Price of diesel ($/litre) for alternative 4	0.965	1.65	0.844	1.532
Number of electric vehicles for alternative 4	0.186	0.537	0.111	0.426
Number of hybrid vehicles for alternative 4	0.225	0.484	0.191	0.482
Decided to purchase an electric vehicle (1,0)	0.038	0.192	---	---
Price of Octane 98 petrol ($/litre)	0.487	1.122	0.159	0.367
Fuel availability level at 40 % of service stations (1,0)	0.191	0.394	0.208	0.406
Alternative 5 (We will not drive at all)	**Mean**	**SD**	**Mean**	**SD**
Price of diesel ($/litre) for alternative 5	0.415	1.203	0.439	1.221
Price of Octane 98 petrol ($/litre)	0.201	0.785	0.309	0.959
Number of household members	2.368	1.435	2.476	1.484
Increased working from home (1,0)	0.012	0.107	---	---
Increased public transport trips (1,0)	0.058	0.234	0.069	0.253
Respondent is a student (1,0)	0.035	0.183	---	---
Occupation is manager (1,0)	0.183	0.387	---	---
Household lives in GSMA and not the other locations in NSW (1,0)	0.736	0.441	0.732	0.443
Household vehicles use E10 (1,0)	0.087	0.282	---	---
Household vehicles use Unleaded 91 (1,0)	0.186	0.389	---	---
Household vehicles use Unleaded 95 (1,0)	0.107	0.310	---	---
Household vehicles use Unleaded 98 (1,0)	0.064	0.245	0.097	0.297
Household vehicles use Diesel (1,0)	0.110	0.314	0.118	0.324
Household vehicles are all for personal use only (1,0)	0.406	0.492	0.476	0.500
Have children aged 5 or 6 (1,0)	---	---	0.329	0.471
Occupation is professional (1,0)	---	---	0.137	0.345

Table 6. The model results for the short-term and long-term behavioural responses

	Short Term Model		Long Term Model	
Random parameters:	**Coef.**	**T-stats**	**Coef.**	**T-stats**
Price of diesel ($/litre) for alternative 2	0.8970	15.55	0.5302	4.75
Price of diesel ($/litre) for alternative 3	0.9382	17.66	0.5108	4.89
Price of diesel ($/litre) for alternative 4	1.0496	18.16	0.5672	5.51
Price of diesel ($/litre) for alternative 5	1.2902	9.19	0.9478	4.29
Number of electric vehicles for alternative 1	1.4450	8.79	0.4502	3.21
Number of electric vehicles for alternative 4	3.0048	16.04	0.6930	4.44
Number of hybrid vehicles for alternative 1	2.0623	11.94	---	---
Number of hybrid vehicles for alternative 2	1.7811	10.25	---	---
Number of hybrid vehicles for alternative 3	1.7239	10.44	---	---
Number of hybrid vehicles for alternative 4	2.5899	14.14	0.5052	4.42
Number of weekly reduced trips for alternative 2	0.4572	23.22	---	---
Number of weekly reduced trips for alternative 3	0.3080	18.76	---	---
Non-random parameters:				
Alternative 1 (We will drive as we did before the Middle East conflict (before 28th February))	**Coef.**	**T-stats**	**Coef.**	**T-stats**
alternative specific constant for alternative 1	0.1638	0.64	0.4909	2.29
Female (1,0)	-0.2984	-4.02	-0.3439	-5.02
Age in years	-0.0113	-4.27	-0.0059	-2.49
Annual personal income ($"000s per annum)	.00176	2.27	---	---
Number of household members	-0.1544	-2.87	---	---
Number of children aged 5-6 years old	-0.3290	-2.92	-0.1579	-1.53
Respondent is a student (1,0)	-0.6719	-2.79	-0.5695	-2.74
Household vehicles use unleaded 98 petrol (1 Yes 0 No)	1.2560	2.93	0.8815	2.09
Household vehicles use diesel (1 Yes 0 No)	3.4492	15.04	1.6951	4.19
Household vehicles with small engine (1.0L–1.5L) (1 Yes 0 No)	0.1985	2.28	0.3494	3.65
Price of Octane 98 petrol $/litre	---	---	-0.2931	-2.08
Alternative 2 (We will reduce driving for unnecessary trips)	**Coef.**	**T-stats**	**Coef.**	**T-stats**
alternative specific constant for alternative 2	-1.4391	-7.18	-1.1593	-6.11
Number of household members	-0.1941	-3.34	---	---
Reduced total petrol/diesel car kilometres (1,0)	0.2595	2.65	0.1672	1.7200
Number of children aged 7-12 years old	0.2330	3.14	-0.2297	-3.06
Number of children aged 13-18 years old	-0.2472	-3.15	-0.1888	-2.43
Respondent is a student (1,0)	-0.7444	-2.98	-0.7992	-3.31
Reduced non-work-related travel (1,0)	0.2491	2.55	0.2985	3.11
Increased public transport trips (1,0)	0.2075	1.24	---	---
Price of Octane 98 petrol ($/litre)	0.4500	3.1	---	---
Price of Octane 95 petrol ($/litre)	---	---	0.0983	2.79
Household vehicles with small engine (1.0L–1.5L) (1,0)	---	---	0.2829	2.59

Reduced total petrol/diesel trips (1,0)	---	---	0.7694	20
Fuel availability level at 40 % of service stations (1,0)	---	---	-0.1525	-1.62
Fuel availability level at 70 % of service stations (1,0)	---	---	-0.2609	-2.36
Alternative 3 (We will reduce driving for all trip types)	**Coef.**	**T-stats**	**Coef.**	**T-stats**
alternative specific constant for alternative 3	-2.4492	-11.09	-1.4499	-8.2
Number of e-bikes owned	0.2392	1.94	---	---
Number of household members	-0.2610	-4.11	---	---
Reduced total petrol/diesel car kilometres (1,0)	0.5938	4.77	0.6798	6.14
Increased working from home (1,0)	0.9165	4.17	---	---
Reduced non-work-related travel	0.5419	4.35	0.3454	3.04
Occupation is manager (1,0)	0.4043	2.79	---	---
Price of Octane 98 petrol ($/litre)	0.4263	2.85	---	---
Household vehicles use unleaded 98 petrol (1, 0)	---	---	-0.1852	-1.48
Reduced total petrol/diesel trips (1,0)	---	---	0.1114	8.73
Number of children aged 7-12 years old	---	---	-0.1490	-1.82
Increased public transport trips (1,0)	---	---	0.8116	4.62
Alternative 4 (We will re-arrange the use of our vehicles to reduce cost)	**Coef.**	**T-stats**	**Coef.**	**T-stats**
alternative specific constant for alternative 4	-3.1859	-12.6	-1.3710	-7.75
Decided to purchase an electric vehicle (1,0)	-0.0800	-0.21	---	---
Price of Octane 98 petrol ($/litre)	0.4083	2.62	---	---
Fuel availability level at 40 % of service stations (1,0)	-0.4311	-2.37	-0.2783	-2.1
Alternative 5 (We will not drive at all)	**Coef.**	**T-stats**	**Coef.**	**T-stats**
Price of Octane 98 petrol ($/litre)	1.0047	2.45	0.8586	2.68
Number of household members	-0.1599	-2.34	-0.0870	-1.63
Increased working from home (1,0)	-0.9062	-1.69	---	---
Increased public transport trips (1,0)	0.7425	2.59	0.6800	2.94
Respondent is a student (1,0)	-1.4672	-3.86	---	---
Occupation is manager (1,0)	0.5313	2.99	---	---
Household lives in GSMA and not the other locations in NSW (1,0)	0.2070	1.38	0.4272	3.36
Household vehicles use E10 (1,0)	-2.0524	-8.58	---	---
Household vehicles use Unleaded 91 (1,0)	-1.4248	-7.23	---	---
Household vehicles use Unleaded 95 (1,0)	-1.5873	-7.27	---	---
Household vehicles use Unleaded 98 (1,0)	-3.9489	-3.01	-3.2269	-3.14
Household vehicles use Diesel (1,0)	-3.1597	-4.06	-2.4570	-2.31
Household vehicles are all for personal use only (1,0)	-1.0864	-6.79	-1.4985	-12.86
Have children aged 5 or 6 (1,0)	---	---	-0.3926	-2.52
Occupation is professional (1,0)	---	---	-0.5059	-3.22
Distribution of random parameters (Standard deviations or limits):	**Coef.**	**T-stats**	**Coef.**	**T-stats**
Price of diesel ($/litre) for alternative 2	0.8970	15.55	0.5302	4.75
Price of diesel ($/litre) for alternative 3	0.9382	17.66	0.5108	4.89
Price of diesel ($/litre) for alternative 4	1.0496	18.16	0.5672	5.51
Price of diesel ($/litre) for alternative 5	1.2902	9.19	0.9478	4.29

Number of electric vehicles for alternative 1	1.4450	8.79	0.4502	3.21
Number of electric vehicles for alternative 4	3.0048	16.04	0.6930	4.44
Number of hybrid vehicles for alternative 1	2.0623	11.94	0.5052	4.42
Number of hybrid vehicles for alternative 2	1.7811	10.25	---	---
Number of hybrid vehicles for alternative 3	1.7239	10.44	---	---
Number of hybrid vehicles for alternative 4	2.5899	14.14	---	---
Number of weekly reduced trips for alternative 2	0.4572	23.22	---	---
Number of weekly reduced trips for alternative 3	0.3080	18.76	---	---
Model Fits				
Sample Size (N)		1024		1024
Log-Likelihood		-4735.66		-5409.39
McFadden Pseudo R2		0.2816		0.1794
AIC		9583.3		10908.8

The evidence associated with the 13 hypotheses in Table 1 are now discussed. For H1 – Hybrid vehicle resilience (Supported – SR and LR): β{DRVSAME, HYBRID} > 0, there is a strong positive hybrid vehicle effect in the "drive as before" alternative (SR coefficients ~2.06–2.59; all highly statistically significant). In the LR model, the hybrid effect remains positive and statistically significant for rearrangement ('re-arrange the use of vehicles to reduce cost"). Thus, households with hybrids are more resilient to fuel shocks, maintaining driving patterns rather than reducing travel. This is classic risk-buffering via technology. For H2 – Hybrid adaptation (Supported – SR) β{REARCARS, HYBRID} > 0, there is a large, statistically significant hybrid coefficient in the rearrangement alternative (SR: 2.59, t=14.14). Hybrid ownership also enables active cost-minimising reallocation across vehicles (e.g., choosing the hybrid vehicle for more trips).

For H3 – EV dominance (Strongly supported – SR and LR) β{REARCARS,EV} > β{i,EV}, EV effects are largest and most statistically significant for vehicle rearrangement (SR: 3.00, LR: 0.69). The EV effect for "drive as before" is positive but smaller. EVs are a dominant long-run adaptation technology, acting not just as resilience but as a structural substitute for cost exposure. For H4 – Selective trip reduction (Supported), |β{RDRIVUT}| > |B{RDRVALLT}|, petrol price coefficients are larger and more consistently statistically significant in alternative 2 ('reduce unnecessary trips') than in Alternative 3 ('reduce all trips'), especially in the SR. There are very large effects of "reduced non-work travel" and "reduced trips" in alternative 2. Households appear to first shed discretionary/low-value trips, rather than core mobility. This is selective demand pruning rather than indiscriminate contraction.

For H5 – Fuel heterogeneity (Supported – very strong), |β{C_diesel}| > |β{C_petrol}|, diesel price coefficients are large, highly statistically significant, and random across individuals for all reduction and non-driving alternatives (SR t-stats >15 in many cases). Petrol price effects are smaller and more alternative-specific. Diesel users show stronger cost salience and heterogeneity, likely reflecting commercial exposure, longer average trip lengths, or fleet rigidity. This strongly supports asymmetric cost sensitivity by fuel type. For H6 – Non-marginal response (Supported), β{NOTDRV, DSL} > 0, diesel-related effects are statistically significant in the "not drive at all" alternative. When diesel costs rise sharply, some households exit driving altogether, not just reduce marginal trips.

For H7 – Income resilience (Supported – SR), β{DRVSAME, Y} > 0, this is a positive and statistically significant income effect for "drive as before"[6]. Higher-income households appear to absorb fuel shocks better, maintaining mobility. For H8 – Income-driven adjustment (Supported), β{i,Y} < 0 for i ≠ DRVSAME, income effects are negative or absent in the reduction and non-driving alternatives. Lower-income households are over-represented in behavioural adjustment and contraction, reinforcing distributional concerns.

For H9 – Remote work substitution (Supported – SR), β{RDRVALLT,WFH} > 0, there is a strong SR working from home (WFH) effect in "reduce all trips". WFH is a short-run elasticity appears to be an amplifier under fuel stress but fades in the LR where structural adaptations dominate. For H10 – Mode substitution (Supported – LR particularly), β{NOTDRV, PT} > 0, public transport use increases strongly predict "not drive at all" (SR and LR), suggesting that public transport acts as a true substitute, enabling complete withdrawal from car use for some households, although this will naturally be moderated by the availability of public transport alternatives.

For H11 – Short-run escalation (Supported), β{RDRVALLT, SR} > 0, there are strong effects of immediate trip reduction variables in the SR only. This suggests that crisis responses are front-loaded and sharp, with behavioural smoothing over time. For H12 – Supply constraint adaptation (Partially supported), β{REARCARS, AV} > 0, fuel availability variables that are statistically significantly affect rearrangement and reduction, but with mixed signs across alternatives. Supply shortages appear to force reorganisation more than outright cessation of travel. For H13 – Temporal asymmetry (Strongly supported), long-run EV effects are greater than short-run trip reduction effects. Also, EV coefficients

[6] We found that the personal income of the respondent was statistically significant compared to household income.

persist in LR while many SR behavioural effects disappear. Technology adoption seems to dominate behaviour change over time and households appear to adapt structurally rather than continuously cutting trips.

In summary, the MMNL model results suggest that households respond to fuel shocks first through selective trip pruning, then vehicle reallocation, and finally technology substitution, with strong asymmetry by fuel type and income. Short-run coping gives way to long-run structural change, dominated by electric and hybrid vehicles rather than sustained mobility reduction.

6. Elasticity Findings

Given that the parameter estimates of discrete choice models are behaviourally not strictly informative by themselves (given the non-linear nature of the model form), elasticities are computed to assist model interpretation. The explanatory variables in the choice models are a mixture of continuous and binary variables. Individual direct elasticities are calculated as the change in the probability of choosing a particular behavioural change response alternative *m* (P_m) given a marginal change in an explanatory variable X_j, as follows:

$$E_{m,x_j} = \frac{\partial P_m}{\partial x_j} \cdot \frac{x_j}{P_m} = \beta_j \cdot x_j \cdot (1 - P_m) \tag{6}$$

Individual arc elasticities are calculated as the difference in the probability of choosing a particular behavioural change response alternative *m* due to a change from 0 to 1 in the binary explanatory variable X_j, relative to the probability of it being zero (baseline), as follows:

$$E_{m,x_j} = \frac{P_m(x_j = 1) - P_m(x_j = 0)}{P_m(x_j = 0)} \tag{7}$$

To calculate the sample-mean elasticities, we used the model-predicted probabilities of each alternative to calculate weighted averages and standard deviations. Direct elasticities represent how much the probability of choosing an alternative would change, *ceteris paribus*, given a 1% (continuous variable) and 100% (discrete binary variable) variation in the attribute of interest. The derived estimates provide the empirical basis for the hypothesis set reported in Table 1, evaluated using post-estimation elasticities derived from the estimated discrete choice model. For sign-based hypotheses we test whether the corresponding elasticity effect differs from zero. The computed direct elasticities for all variables are presented in Table 7 with the cross-elasticity evidence summarised in Appendix C. Interpretation of the mean direct elasticities can be illustrated by the mean direct elasticity for hybrid cars in a household of 0.0423. A 10% increase in the number of hybrid cars in a household result, *ceteris paribus*, in a 0.423% increase in the probability of driving as before the fuel crisis. A doubling of the number of hybrid cars from 0.116211 to 2*0.116211 results, *ceteris paribus*, in a 4.23% increase in the probability of driving as before the fuel crisis. The equivalent increase in the probability for reducing driving for unnecessary trips is 2.89%; 1.84% for reducing driving for all trip types, and 8.57% for re-arranging the use of household vehicles to reduce cost.

Table 7. Short run and long run direct elasticities with regards to the five behavioural responses

Short Run	**Drive the same way as before**	**Reduce unnecessary trips**	**Reduce all trips**	**Re-arrange household car trips**	**Not drive all**
Number of hybrid vehicles	0.0423	0.0289	0.0184	0.0857	---
Number of EV	0.0122	---	---	0.122	---
Cost of Octane 98 ($/litre)	---	0.0495	0.0256	0.011	---
Cost of Diesel ($/litre)	---	0.0928	0.1099	0.1145	0.0577
Personal annum income ($)	0.0295	---	---	---	---
Reduced total petrol/diesel car kilometres	---	---	0.0283	---	---
Increased work from home	---	---	0.012	---	-0.0006

Reduced non-work-related travel	---	0.0131	0.0249	---	---
Increased public transport trips	---	0.0027	---	---	0.0051
Decided to purchase an electric vehicle	---	---	---	-0.0004	---
Reduced trips (short run)	---	0.2097	0.1059	---	---
Fuel availability level at 40% of service stations	---	---	---	-0.0061	---
Long Run	**Drive the same way as before**	**Reduce unnecessary trips**	**Reduce all trips**	**Re-arrange household car trips**	**Not drive all**
Number of hybrid vehicles	---	---	---	0.0154	---
Number of EV	0.0069	---	---	0.0137	---
Cost of Octane 98 ($/litre)	-0.0384	---	---	---	---
Cost of Diesel ($/litre)	---	0.0771	0.0705	0.0652	0.0437
Reduced total petrol/diesel car kilometres	---	---	0.0433	---	---
Reduced non-work-related travel	---	0.0182	0.0186	---	---
Increased public transport trips	---	---	---	---	0.0069
Reduced trips (short run)	---	---	0.0571	---	---
Fuel availability level at 70% of service stations	---	-0.0112	---	---	---

In Table 1, we formalised an adaptation hierarchy in which households move from selective adjustments (e.g., reducing unnecessary trips) toward broader adjustments (reducing all trips), vehicle re-allocation within the household, and (under sufficiently severe conditions) complete cessation of driving. These mechanisms are hypothesised to be systematically moderated by vehicle technology (HYBRID, EV), prices (COSTU98, COSTDSL), income (PINCOME), and substitution/adaptation channels (WFH, public transport, and short-run trip reduction), consistent with the model's probability derivatives and elasticities. We present empirical evidence to mirror Table 1 in four blocks: (1) Technology effects (H1–H3), (2) Price effects (H4–H6), (3) Income distribution (H7–H8), and (4) Adaptation/substitution (H9–H13).

6.1 Short Run Results

Vehicle Technology and Behavioural Resilience Hypotheses

H1: Hybrid vehicle ownership appears to increase behavioural resilience to the fuel crisis. Households with hybrid vehicles are more likely to continue driving as before during a fuel crisis, compared to households with fewer or no hybrid vehicles (consistent with existing evidence that EV owners tend to drive more after switching away from conventionally fuelled vehicles). A doubling in the number of hybrid vehicles, *ceteris paribus*, increases the probability of driving as before by 4.23%. H2: Hybrid vehicle households also adjust usage patterns rather than withdraw from driving and are more likely to re-arrange vehicle use to mitigate costs rather than reduce or cease travel. The largest elasticity for hybrid vehicles is associated with re-arranging vehicle use (+8.57%), not with stopping driving. H3: EV ownership primarily facilitates vehicle re-allocation rather than trip reduction, and increases the likelihood that households respond to fuel crises by re-allocating vehicles within the household rather than reducing trips. Doubling EV ownership increases the probability of re-arranging vehicle use by 12.2%, far larger than effects on trip reduction, in contrast to a 1.22% increase in the probability of driving as before the fuel crisis.

Fuel Price Sensitivity Hypotheses

H4: Fuel price increases tend to induce selective rather than blanket travel reduction, and lead households to selectively reduce discretionary travel before reducing all trips. A 10% increase in Octane 98 petrol price, *ceteris paribus*, increases the probability of reducing unnecessary trips by 4.95%, compared with 2.56% for reducing all trips. H5: Diesel price shocks induce stronger behavioural responses than petrol shocks, with increases in diesel prices tending to lead to greater reductions in driving and higher probabilities of completely ceasing driving than equivalent petrol price increases. Diesel price increases increase the probability of reducing all trips (10.99%) and not driving at all (5.77%), effects not observed for petrol. H6: Diesel price increases also trigger extreme behavioural responses. Severe cost pressure from diesel prices is more likely to trigger non-marginal responses, including stopping driving entirely. Only diesel prices exhibit a statistically meaningful elasticity for the "not driving at all" alternative.

Income and Equity Hypotheses

H7: Higher-personal income households appear more insulated from fuel price shocks and seem more likely to maintain pre-crisis driving behaviour during fuel price shocks. A 10% increase in personal income increases the probability of driving as before by 0.295%, *ceteris paribus*. H8: The fuel crisis disproportionately affects lower-income households who are more likely to reduce driving or re-structure travel behaviour in response to fuel shocks, noting that income only positively affects "drive as before," with negative derivatives for all adjustment behaviours.

Substitution and Adaptation Hypotheses

H9: Increased working from home increases the likelihood of reducing all trips, rather than only discretionary travel. It has a positive effect on reducing all trips (+1.20%) and a negative effect on not driving at all. H10: Public transport substitution complements driving cessation and is associated with a higher probability of not driving at all. Increased public transport trips raise the probability of not driving by 0.51%. H11: Households that reduce trips (short run), non-work travel, or kilometres driven are more likely to engage in broader reductions across all trip types, with greater elasticities linking short-run trip reduction and non-work travel reduction to "reduce all trips".

Supply Constraint Hypotheses

H12: Fuel availability constraints appear to promote vehicle re-allocation over trip suppression, suggesting that reduced fuel availability encourages households to re-arrange vehicle usage rather than completely cease travel. A 40% fuel availability scenario, *ceteris paribus*, increases the probability of re-arranging vehicles, and does not significantly increase "not driving at all".

Dynamic Transition Hypotheses

H13: Short-run behavioural responses differ markedly from long-run adjustments (see Section 6.2) with immediate trip reductions appearing to be much stronger than gradual adaptations such as EV purchase or mode switching. Short-run trip reduction elasticities are an order of magnitude larger than EV purchase or public transport changes.

6.2 Long Run Results

Vehicle Technology and Behavioural Resilience

Household vehicle portfolios appear to influence the capacity to absorb fuel-related shocks without reducing travel. The elasticity estimates indicate that hybrid and electric vehicle ownership increases the probability of maintaining driving levels and reallocating vehicles within the household, rather than suppressing trips. An increase in the number of hybrid vehicles in the household increases the probability of maintaining existing driving levels during fuel price or supply shocks. Hybrid and EV ownership increases the probability of within-household vehicle reassignment relative to trip reduction or complete non-driving, and the elasticity effect of EV ownership on vehicle reassignment is larger than its effect on any trip suppression or mode substitution response.

Fuel Prices and Selective Trip Suppression

The elasticity patterns show that fuel price increases do not induce uniform behavioural responses. Petrol price (Octane 98) elasticities are larger for reductions in discretionary or unnecessary travel, whereas diesel price elasticities are stronger and more widespread across all adjustment responses, including complete non-driving. We see selective suppression, with the absolute fuel price elasticity of unnecessary trip reduction exceeding that of overall trip reduction. In terms of fuel-type heterogeneity, behavioural elasticities with respect to diesel prices are larger than those with respect to Octane 98 petrol prices across all non-status-quo responses. Overall, we see non-marginal price responses, with increases in diesel prices significantly increasing the probability of complete non-driving, consistent with threshold or non-linear behavioural adjustment.

Income and Behavioural Inertia

Income elasticities are shown to be asymmetric across behavioural response alternatives, with higher personal income increasing the probability of maintaining existing driving patterns while reducing the likelihood of any adaptive response. This suggests that income operates as a resilience mechanism rather than a catalyst for change. In terms of income resilience, higher household income, *ceteris paribus*, increases the probability of maintaining existing driving behaviour during fuel shocks. Overall, income has a negative marginal effect on all adaptive responses, including trip reduction, vehicle reassignment, and non-driving, and appears to moderate fuel price sensitivities, reducing the magnitude of behavioural responses to fuel price increases.

Remote Work and Mode Substitution

The elasticity results indicate that working from home and public transport use operate as structural substitutes for driving rather than short-run coping strategies. Working from home increases the probability of reducing all travel rather than selectively suppressing discretionary trips, while public transport use increases the probability of complete non-driving under fuel shocks. The joint presence of WFH and public transport use further increases the probability of non-driving responses.

Temporal Asymmetry and Escalation Effects

Short-run behavioural responses have strong positive associations with long-run travel reduction, while vehicle technology choices primarily affect vehicle allocation rather than immediate travel suppression. This suggests temporal asymmetry between behavioural and investment responses. Short-run trip reduction significantly increases the probability of long-run reduction in overall driving, and vehicle technology adoption affects long-run vehicle allocation decisions more strongly than short-run behavioural response, with early short-run adjustments appearing to increase the likelihood of persistent long-run behavioural change.

Fuel Availability and Regime Shifts

Elasticities associated with fuel availability constraints suggest large and nonlinear responses that are distinct from price-based effects. Severe supply restrictions seem to generate abrupt shifts toward vehicle reassignment and non-driving behaviours. Vehicle reassignment appears to be the dominant household adaptation mechanism under severe fuel availability constraints; however, the evidence suggests that fuel supply shocks induce discrete behavioural regime shifts rather than smooth marginal adjustments.

6.3 Synthesis

In the short run, households primarily adjust through selective trip reduction rather than uniform reduction of mobility. Petrol price increases are significantly associated with reducing unnecessary trips and, to a lesser extent, reducing all trips, indicating that discretionary travel is shed first. This pattern is reinforced by large, highly significant effects of reduced non-work travel and trip frequency on the probability of choosing partial reduction strategies, providing strong support for selective demand pruning. At the same time, income effects confirm a resilience gradient with higher-income households significantly more likely to maintain pre-shock driving behaviour, while lower-income households are over-represented among trip-reducing and non-driving responses. Remote work and public transport increase play an important but largely short-lived role, amplifying short-run reductions, but declining in influence in the long run and will be influenced by any interventions from government.

Fuel type and vehicle technology emerge as dominant sources of behavioural heterogeneity. Diesel price coefficients are large, precisely estimated, and highly heterogeneous across individuals for all reduction and non-driving alternatives, indicating substantially stronger cost sensitivity among diesel users compared with (Octane 98) petrol users. In contrast, hybrid and electric vehicle ownership significantly increases the likelihood of maintaining driving or rearranging vehicle use to reduce costs, highlighting their role as resilience and adaptation technologies. Electric vehicles, in particular, exert the largest and most persistent effects on vehicle rearrangement choices in both the short and long run, supporting the presence of temporal asymmetry whereby long-run adjustment is increasingly driven by structural technology adoption rather than continued behavioural trip reduction. Overall, the results indicate a transition from short-run behavioural coping to long-run technological adaptation, with important distributional and fuel-specific implications.

7. Discussion and Conclusions

This paper has focussed on the behavioural responses of a sample of NSW residents in early April 2026 to increases in fuel prices and fuel availability, with reference to current car use. Although the global crisis has settled since April, there is still considerable uncertainty and hence the evidence herein is timely and indicative of what to expect if the conflict escalates and changes the retail price of fuel and its scarcity. The range of prices and availability investigated in the stated preference survey provides a rich marker of likely behavioural responses in the future if and when global circumstances change[7] or if any other significant major event causes such large changes in petrol and diesel prices and fuel availability.

We have distilled the main policy-relevant insights from short-run and long-run elasticity estimates of household travel responses to fuel price and supply shocks, and the evidence highlights how households adapt, who is most affected, and which policy instruments are likely to be effective. Fuel pricing trims discretionary travel, but not essential mobility. Fuel price elasticities show that households respond first by reducing low-value, discretionary travel, especially non-work trips. A 10% increase in petrol prices is associated with nearly twice the probability increase for reducing unnecessary trips compared with reducing all trips. This indicates that fuel pricing operates as a selective rationing mechanism, effective at pruning marginal travel but limited in suppressing core mobility. Policymakers should therefore avoid assuming that fuel price signals alone will deliver large, proportional reductions in total travel demand.

The evidence suggest that diesel price shocks are more disruptive than petrol price shocks. Behavioural elasticities with respect to diesel prices are larger, more pervasive, and qualitatively different from petrol elasticities. Diesel price increases significantly raise the probability of reducing all trips and uniquely increase the likelihood of not driving at all, indicating non-marginal adjustment. This asymmetry implies that diesel price shocks carry heightened economic and distributional risks, particularly for households and activities that are diesel-dependent. Uniform fuel pricing policies may therefore generate uneven and unintended impacts unless fuel-type differences are explicitly recognised.

Vehicle technology is the key long-run resilience mechanism. Hybrid and electric vehicle ownership substantially increases households' ability to absorb fuel shocks without reducing travel. The strongest elasticities associated with hybrids and EVs relate to reallocating vehicle use within the household, not

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[7] As on early May 2026, overall fuel supply conditions in Australia are stabilising, with improved confidence across transport, aviation, freight and maritime sectors, despite ongoing global uncertainty and continued price pressure. The updated Singapore–Australia Free Trade Agreement protocol took effect on 20 April. This supports the continued flow of essential supplies, including fuel, at a critical time following the refinery fire overseas. While the timing was unfortunate, industry response has been strong. Refinery output had temporarily fallen, particularly for petrol, but diesel and jet fuel production remained at around 80 percent of usual levels. Industry has advised the market it expects production across all fuels to rise above 90 percent in coming weeks. Additional supply is being secured. Four cargoes of diesel, totalling around 200 million litres, were locked in in early May through coordination between BP, Viva Energy and Export Finance Australia. Further cargoes are also arriving from the United States, including five deliveries contracted from ExxonMobil, which is unusual but reinforces supply resilience. Together, these shipments are expected to cover several weeks of national demand. Fuel stocks nationally have improved slightly. As at mid-April, Australia held around 46 days of petrol stock and 30 days of jet fuel under stockholding obligations. Diesel stocks remain steady at around 31 days. Retail fuel outages continue to ease. As of 20 April, 112 retail sites nationally were out of diesel, down from 147 previously, and around 100 sites reported regular unleaded outages. This is small relative to the more than 8,300 fuel sites nationwide, many of which experience short outages from time to time. Prices remain volatile but have eased marginally. Fuel excise reductions are continuing to flow through to consumers, alongside changes in global benchmark prices. Government is monitoring price pass-through and has asked to be notified of any retailers not applying reductions appropriately.

trip suppression. Electric vehicles, in particular, dominate long-run adaptation, with effects on vehicle rearrangement far exceeding those on travel reduction. This implies that technological flexibility, rather than sustained behavioural restraint, underpins long-term mobility resilience. Policy efforts that accelerate access to hybrid and EV technologies are therefore likely to be more effective than repeated reliance on price-induced demand suppression, suggest that short-run behavioural responses are sharp but fragile.

While short-run travel reductions exhibit very large elasticities, reflecting immediate coping responses to fuel shocks, these behavioural changes do not persist automatically into the long run. The evidence points to a clear temporal asymmetry where short-run responses escalate rapidly, and long-run adjustments are dominated by structural changes such as vehicle portfolios. This suggests that fuel crises create brief policy windows; but without timely support for structural adaptation, early behavioural changes are likely to unwind.

Fuel shocks per se clearly have strong equity implications, with income elasticities indicating that higher-income households are significantly more likely to maintain pre-shock driving behaviour, while lower-income households are more likely to reduce trips or exit driving altogether. Even where aggregate elasticities appear modest, the behavioural burden of fuel shocks falls disproportionately on lower-income groups, highlighting the need for complementary equity measures, such as targeted transition support or improved alternatives, alongside fuel pricing policies. EVs in Australia tend to be owned by higher income households, limiting vehicle substitution to reduce costs for lower income households.

Supply shocks appear to require different policy tools than price shocks, with elasticities associated with fuel availability constraints differing fundamentally from price effects. Reduced availability appears to lead primarily to vehicle reallocation rather than gradual demand reduction, consistent with regime-shift behaviour. This implies that in supply disruptions, policies focused on maintaining minimum access and flexibility are more effective than relying on price signals, which are poorly suited to managing scarcity-driven behaviour.

Overall, the key policy takeaway from the evidence is that fuel pricing is most effective as a short-run signal and selective rationing tool, while long-run resilience depends on structural adaptation, especially vehicle technology, income buffering, and access to substitutes. Policies that integrate pricing with technology transition and equity safeguards are far more likely to achieve durable mobility, energy security, and emissions outcomes, than price-based measures alone.

In future research, we promote the need to repeat the survey on a regular bias in order to identify whether current circumstances in April have a bias associated temporally with the April period of a specific global crisis. Such continuous monitoring can be used to establish the currency and stability of evidence collected at a particular point in time and its association with a specific globally disruptive event.

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Appendix A. Categories of Vehicle Characteristics

Table A.1. Vehicle characteristics

<table>
<tr><td>

Vehicle Size
Vehicle size was classified into ten categories:

Category	Description
Micro	Very small vehicles
Small	Small passenger vehicles
Medium	Standard passenger vehicles
Upper medium	Larger mid-sized vehicles
Large	Large passenger vehicles
Upper large	Very large passenger vehicles
Luxury	Premium or luxury vehicles
Light commercial	Vans and small commercial vehicles
Utility/truck	Utes and trucks

</td><td>

Fuel Type
Fuel type was recorded using the following categories:

Category	Description
Unleaded E10	Ethanol-blended petrol
Unleaded 91	Standard petrol
Unleaded 95	Premium petrol
Unleaded 98	High-octane petrol
Diesel	Diesel fuel
Electric only	Battery electric vehicles
Hybrid (electric/petrol)	Hybrid vehicles
Other	Any other fuel type

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<tr><td>

Vehicle Use
Vehicle use was classified based on primary purpose:

Category	Description
Family only	Household and commuting use
Business only	Work-related use (e.g., trades)
Both family/business	Mixed use

</td><td>

Engine Size
Engine size was grouped into five categories:

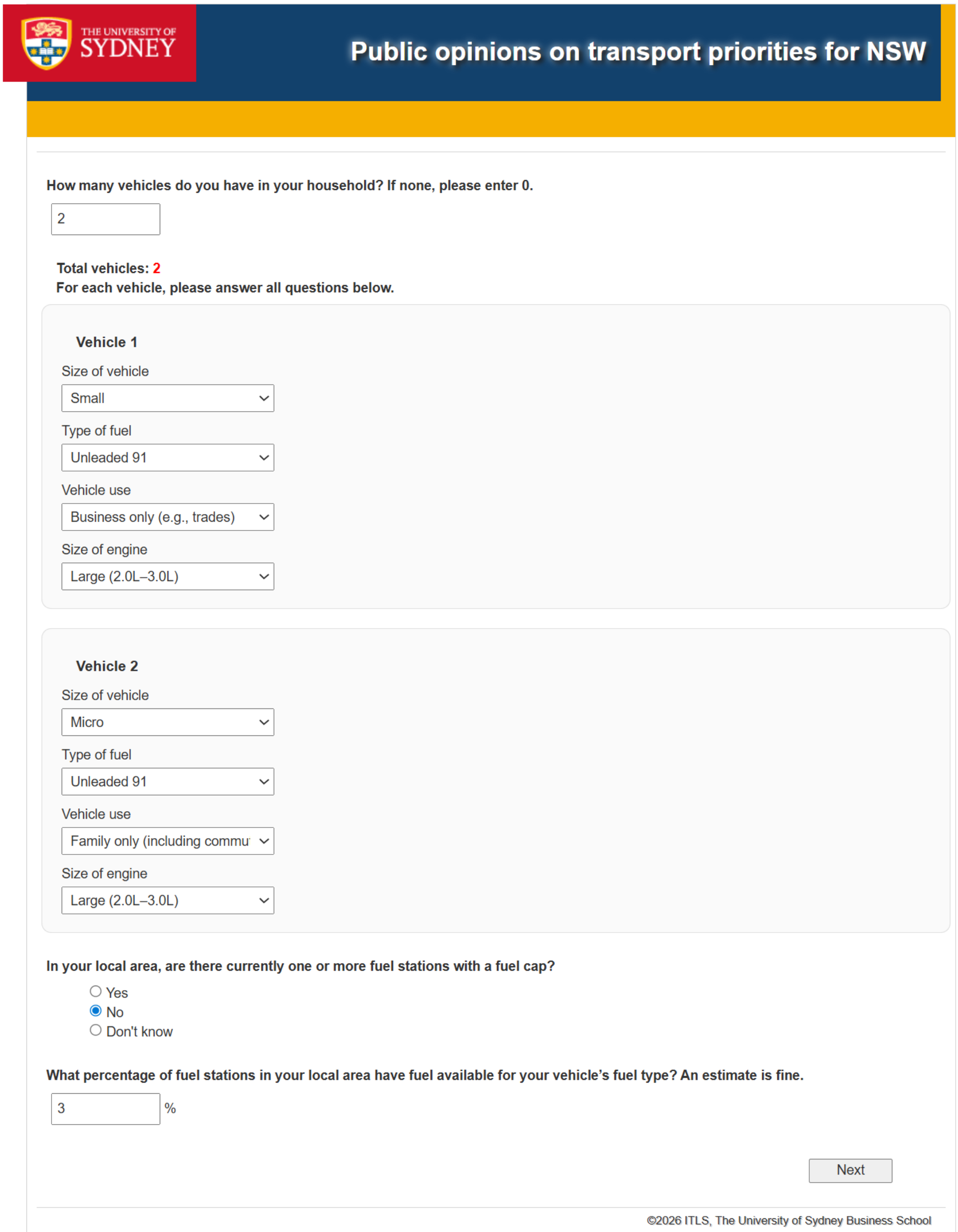
Category	Description
Small (1.0L–1.5L)	Small engines
Mid-size (1.6L–2.0L)	Medium engines
Large (2.0L–3.0L)	Large engines
> 3.0L	Very large engines

</td></tr>
</table>

Table A.2. Descriptive profiles of vehicles in NSW households

Household Vehicles		
Vehicle size	**Count**	**%**
Micro	9	0.6%
Small	367	25.9%
Medium	598	42.2%
Upper medium	125	8.8%
Large	173	12.2%
Upper Large	13	0.9%
Luxury	35	2.5%
Light Commercial	4	0.3%
Utility/truck	83	5.9%
Other	9	0.6%
Vehicle fuel types	**Count**	**%**
Unleaded E10	248	17.5%
Unleaded 91	329	23.2%
Unleaded 95	203	14.3%
Unleaded 98	223	15.7%
Diesel	242	17.1%
Electric only	45	3.2%
Hybrid (electric/petrol)	119	8.4%
Other	7	0.5%
Vehicle use	**Count**	**%**
Family use	1093	77.2%
Business use	34	2.4%
Both family and business use	289	20.4%
Vehicle engine size	**Count**	**%**
Small (1.0L–1.5L)	236	16.7%
Mid-size (1.6L–2.0L)	713	50.4%
Large (2.0L–3.0L)	320	22.6%
>=3.0L	99	7.0%
Other	48	3.4%

Appendix B. Survey Questions applicable to the current study



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Public opinions on transport priorities for NSW

How many vehicles do you have in your household? If none, please enter 0.

2

Total vehicles: 2
For each vehicle, please answer all questions below.

Vehicle 1

Size of vehicle
Small

Type of fuel
Unleaded 91

Vehicle use
Business only (e.g., trades)

Size of engine
Large (2.0L–3.0L)

Vehicle 2

Size of vehicle
Micro

Type of fuel
Unleaded 91

Vehicle use
Family only (including commu

Size of engine
Large (2.0L–3.0L)

In your local area, are there currently one or more fuel stations with a fuel cap?

- Yes
- No
- Don't know

What percentage of fuel stations in your local area have fuel available for your vehicle's fuel type? An estimate is fine.

3 %

Next

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Public opinions on transport priorities for NSW

Given the current concern about fuel supplies and prices, which of the following changes have your household made:
(Please select all that apply.)

- ☐ No change at all
- ☐ Reduced the total petrol/diesel car trips
- ☐ Reduced the total petrol/diesel car kilometres
- ☐ Increased work from home by [____] days per week
- ☐ Reduced non-work related travel
- ☐ Increased car sharing
- ☐ Increased public transport trips by [____] one-way trips per week
- ☐ Decided to purchase an electric vehicle
- ☐ Increased the use of EV
- ☐ Increased the use of hybrid car
- ☐ Other please explain: [____]

Has your employer provided any support to you?

- ◉ Yes
- ○ No

What support has your employer provided?
(List up to 3 support measures)

[____]
[____]
[____]

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Public opinions on transport priorities for NSW

Section 5 Fuel scenarios

There is uncertainty about fuel prices and fuel security in Australia because of the ongoing Middle East conflict. Within the next three to six months, there could be different scenarios of fuel prices and availability that may occur.

There are no right or wrong answers.

Scenario 1 of 4

Fuel price per litre

Unleaded E10	$2.20
Unleaded 91	$2.26
Unleaded 95	$2.40
Unleaded 98	$2.50
Diesel	$2.98
Fuel limit cap	30 litres cap
Availability of your fuel type	Available in 70% of service stations

Under the above scenario, which of the following would your household do in terms of driving: (1) in the short run (next few weeks), and (2) over the longer term (by the end of the year)? *(select one answer per column.)*

	In the short run (next few weeks)	Over the longer term (by the end of the year)
We will drive as we did before the Middle East conflict (before 28th February)	☐	☐
We will reduce driving for unnecessary trips	☑	☑
We will reduce driving for all trip types	☐	☐
We will re-arrange the use of our vehicles to reduce cost	☐	☐
We will not drive at all	☐	☐

Under the above scenario, roughly how would you adjust your car trips in the short run and longer term ***per week*****?**

	Short run	Longer term
Reducing total car trips per week	[____] trips	[▼]
Reducing total car kms per week	[____] kms	[▼]
Shifting to public transport	[____] trips	[▼]
Shifting to car sharing	[____] trips	[▼]
Shifting to cycling/walking	[____] trips	[▼]
Shifting petrol/diesel car use with EV use	[____] trips	[▼]
No longer undertaken	[____] trips	[▼]

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Public opinions on transport priorities for NSW

Section 5 Fuel scenarios

Scenario 2 of 4

Fuel price per litre

Unleaded E10	$2.60
Unleaded 91	$2.70
Unleaded 95	$2.90
Unleaded 98	$3.00
Diesel	$3.60
Fuel limit cap	No cap
Availability of your fuel type	Available in 10% of service stations

Under the above scenario, which of the following would your household do in terms of driving: (1) in the short run (next few weeks), and (2) over the longer term (by the end of the year)? ***(select one answer per column.)***

	In the short run (next few weeks)	Over the longer term (by the end of the year)
We will drive as we did before the Middle East conflict (before 28th February)	☐	☐
We will reduce driving for unnecessary trips	☐	☐
We will reduce driving for all trip types	☐	☐
We will re-arrange the use of our vehicles to reduce cost	☐	☐
We will not drive at all	☐	☐

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THE UNIVERSITY OF SYDNEY

Public opinions on transport priorities for NSW

Section 5 Fuel scenarios

Scenario 3 of 4

Fuel price per litre

Unleaded E10	$3.30
Unleaded 91	$3.40
Unleaded 95	$3.60
Unleaded 98	$3.80
Diesel	$4.50
Fuel limit cap	50 litres cap
Availability of your fuel type	Available in 10% of service stations

Under the above scenario, which of the following would your household do in terms of driving: (1) in the short run (next few weeks), and (2) over the longer term (by the end of the year)? ***(select one answer per column.)***

	In the short run (next few weeks)	Over the longer term (by the end of the year)
We will drive as we did before the Middle East conflict (before 28th February)	☐	☐
We will reduce driving for unnecessary trips	☐	☐
We will reduce driving for all trip types	☐	☐
We will re-arrange the use of our vehicles to reduce cost	☐	☐
We will not drive at all	☐	☐

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Section 5 Fuel scenarios

Scenario 4 of 4

Fuel price per litre

Unleaded E10	$2.00
Unleaded 91	$2.00
Unleaded 95	$2.20
Unleaded 98	$2.30
Diesel	$2.70
Fuel limit cap	40 litres cap
Availability of your fuel type	Available in 70% of service stations

Under the above scenario, which of the following would your household do in terms of driving: (1) in the short run (next few weeks), and (2) over the longer term (by the end of the year)? ***(select one answer per column.)***

	In the short run (next few weeks)	**Over the longer term (by the end of the year)**
We will drive as we did before the Middle East conflict (before 28th February)	☐	☐
We will reduce driving for unnecessary trips	☐	☐
We will reduce driving for all trip types	☐	☐
We will re-arrange the use of our vehicles to reduce cost	☐	☐
We will not drive at all	☐	☐

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Do you think the federal or state government should intervene in the current fuel crisis?

- (●) Yes
- ( ) No

Which actions should the government take for now? *Select all that apply.*

- ☐ Lower the fuel price by removing fuel excise/tax completely for a period until the crisis is over (e.g., a further 26 cents lower per litre)
- ☐ Rationing fuel supply to ensure a fair distribution of the limited supply
- ☐ Ensure fuel supply, even if it means paying high prices overseas for sourcing fuel supply.
- ☐ Provide adequate funding to industries in coping with the soaring costs of materials (e.g., increasing costs of construction materials for builders and increasing costs of fertilisers for farmers due to the fuel crisis)
- ☐ Other action 1 [ ]
- ☐ Other action 2 [ ]

Please name the top three priorities that the government should address in coping with the ongoing fuel price and supply crisis.
(List up to 3 support measures)

Priority 1: [ ]
Priority 2: [ ]
Priority 3: [ ]

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Public opinions on transport priorities for NSW

Section 6 Demographic questions

Finally, we would like to ask you a few questions about yourself so we can make sure we are speaking to a wide range of people. Your answers to these questions are confidential and cannot be used to identify you personally.

What is the highest level of education you have completed?

- Postgraduate degree or equivalent
- Graduate diploma and Graduate Certificate from university or equivalent
- Bachelor's degree or equivalent
- Advanced diploma, diploma or certificate from university/further education college or equivalent
- High or Senior school
- Prefer not to answer

Which of these categories best describes your annual personal income (before tax)?

- Under $10,400
- $10,400-$15,599
- $15,600-$20,799
- $20,800-$31,199
- $31,200-$41,599
- $41,600-$51,999
- $52,000-$64,999
- $65,000-$77,999
- $78,000-$103,999
- $104,000-$119,999
- $120,000-$139,999
- $140,000-$159,999
- $160,000-$179,999
- $180,000 or more
- Prefer not to answer

What is your total annual household income before taxes (i.e., the income of everyone in your household before tax)?

- Under $15,000
- $15,000 - $24,999
- $25,000 - $29, 999
- $30,000 - $39,999
- $40,000, - $49,999
- $50,000 - $59,999
- $60,000 - $69,999
- $70,000 - $79,999
- $80,000 - $89,999
- $90,000 - $99,999
- $100,000 - $124,999
- $125,000 - $149,999
- $150,000 - $199,999
- $200,000 - $249,999
- $250,000 - $299,999
- $300,000 - $349,999
- $350,000 - $399,999
- $400,000 or more
- Don't know
- Prefer not to answer

How many people, including yourself, live in your household?

[ ] people

Which of the following best describes the members of your family currently living with you?

- Family household
- Couple family without children
- Couple family with children not living at home
- Couple family with children living at home
- One parent family
- Other family
- Single person household
- Group household (i.e., shared)
- Prefer not to answer

How many bikes, e-bikes or e-scooters are owned by your household? If none, please enter 0.

[ ] push bike(s)

[ ] e-bike(s)

[ ] e-scooter(s)

Do you have a physical or other disability that impacts upon your ability to travel?

- Yes
- No
- I would prefer not to disclose

This concludes the survey. Before you submit the survey, please click on the stars (1 to 5) to rate the survey and share your comment.

★★★★★ Your rating: 0

I consent to my survey responses being used for research purposes.

- Yes
- No

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Appendix C. Direct and Cross Elasticities

Table C.1. Short run direct (bolded) and cross elasticities

Short Run Elasticities					
	Drive the same way as before	**Reduce unnecessary trips**	**Reduce all trips**	**Re-arrange household car trips**	**Not drive all**
Number of hybrid vehicles					
Drive the same way as before	**0.0423**	-0.0177	-0.0077	-0.0363	-0.0025
Reduce unnecessary trips	-0.018	**0.0289**	-0.0067	-0.0135	-0.0012
Reduce all trips	-0.0077	-0.0077	**0.0184**	-0.0067	-0.0005
Re-arrange household car trips	-0.0198	-0.0087	-0.0043	**0.0857**	-0.0012
Number of EV					
Drive the same way as before	**0.0122**	-0.0011	-0.0005	-0.0473	-0.0025
Re-arrange household car trips	-0.017	-0.0024	-0.0009	**0.122**	-0.0032
Cost of Octane 98 ($/litre)					
Reduce unnecessary trips	-0.0327	**0.0495**	-0.0124	-0.0031	-0.0018
Reduce all trips	-0.0109	-0.0115	**0.0256**	-0.0013	-0.0006
Re-arrange household car trips	-0.0062	-0.0032	-0.0014	**0.011**	-0.0003
Cost of Diesel ($/litre)					
Reduce unnecessary trips	-0.0486	**0.0928**	-0.0391	-0.0228	-0.01
Reduce all trips	-0.031	-0.0358	**0.1099**	-0.0159	-0.0068
Re-arrange household car trips	-0.0297	-0.0183	-0.0159	**0.1145**	-0.0064
Not drive all	-0.0187	-0.0144	-0.0121	-0.0121	**0.0577**
Personal annum income ($)					
Drive the same way as before	**0.0295**	-0.0124	-0.0058	-0.0079	-0.0103
Reduced total petrol/diesel car kilometres					
Reduce all trips	-0.0064	-0.0116	**0.0283**	-0.0013	-0.0009
Increased work from home					
Reduce all trips	-0.0025	-0.0025	**0.012**	-0.0008	-0.0001
Not drive all	0.0003	0.0002	0.0005	0.0002	**-0.0006**
Reduced non-work-related travel					
Reduce unnecessary trips	-0.0055	**0.0131**	-0.0057	-0.0009	-0.0011
Reduce all trips	-0.006	-0.0099	**0.0249**	-0.0011	-0.0012
Increased public transport trips					
Reduce unnecessary trips	-0.0009	**0.0027**	-0.001	-0.0002	-0.0005
Not drive all	-0.001	-0.0011	-0.0005	-0.0002	**0.0051**
Decided to purchase an electric vehicle					
Re-arrange household car trips	**0.0001**	0	0	-0.0004	0
Reduced trips (short run)					
Reduce unnecessary trips	-0.0477	**0.2097**	-0.0815	-0.0131	-0.0141
Reduce all trips	-0.0125	-0.0732	**0.1059**	-0.004	-0.0035
Fuel availability level at 40% of service stations					
Re-arrange household car trips	0.0026	0.0011	0.0006	-0.0061	0.0007

Table C.2. Long run direct (bolded) and cross elasticities

Long Run Elasticities					
	Drive the same way as before	**Reduce unnecessary trips**	**Reduce all trips**	**Re-arrange household car trips**	**Not drive all**
Number of hybrid vehicles					
Re-arrange household car trips	-0.0041	-0.0025	-0.0012	**0.0154**	-0.0015
Number of EV					
Drive the same way as before	**0.0069**	-0.0013	-0.0011	-0.005	-0.0008

Re-arrange household car trips	-0.0047	-0.0009	-0.0008	**0.0137**	-0.0005
Cost of Octane 98 ($/litre)					
Drive the same way as before	**-0.0384**	0.0196	0.0083	0.006	0.004
Cost of Diesel ($/litre)					
Reduce unnecessary trips	-0.0264	**0.0771**	-0.0247	-0.0151	-0.0057
Reduce all trips	-0.0196	-0.0231	**0.0705**	-0.0111	-0.0044
Re-arrange household car trips	-0.02	-0.0176	-0.0136	**0.0652**	-0.0041
Not drive all	-0.0146	-0.0169	-0.0134	-0.0108	**0.0437**
Reduced total petrol/diesel car kilometres					
Reduce all trips	-0.0094	-0.0134	**0.0433**	-0.0029	-0.0025
Reduced non-work-related travel					
Reduce unnecessary trips	-0.0054	**0.0182**	-0.0059	-0.0015	-0.0019
Reduce all trips	-0.0046	-0.0061	**0.0186**	-0.0014	-0.0017
Increased public transport trips					
Not drive all	-0.0009	-0.0011	-0.0022	-0.0004	**0.0069**
Reduced trips (short run)					
Reduce all trips	-0.0092	-0.0161	**0.0571**	-0.0035	-0.0046
Fuel availability level at 70% of service stations					
Reduce unnecessary trips	0.0053	**-0.0112**	0.0027	0.0016	0.0021