FINAL REPORT

Demand for electric vehicles

A discrete choice survey

Prepared for
Australian Automobile Association

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THE CENTRE FOR INTERNATIONAL ECONOMICS
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Introduction

Australian Automobile Association (AAA) commissioned the Centre for International Economics (CIE) to conduct a choice modelling study of the determinants of demand for electric vehicles (EVs) in Australia, the barriers that may be limiting the take-up of EVs in Australia, and how demand is likely to change as the relative price and performance of these vehicles improves in the near future.

An online survey instrument was used to collect data for the study. The instrument used a choice modelling (also known as a conjoint analysis or discrete choice experiment) approach (see figure 1). Under this technique, consumers respond to a very carefully constructed survey instrument designed to elicit preferences for vehicles attributes. The overall choice modelling technique is well established in marketing and economic research fields, and has been applied — to a degree — to EVs issues in the past. To date, however, there has not been a comprehensive national choice modelling study of EV demand in Australia that allows consideration of the range of policy and practical issues now at hand. This study addresses that gap.

1 Example of a choice question

Comparison question 1 of 6

	Medium car		
	Model A	**Model B**	**Model C**
Specifications			
Fuel type	Petrol	Battery electric	Plug-in hybrid battery electric
Driving range on battery	N/A	1000 km	50 km
Driving range on fuel tank	640 km	N/A	500 km
Acceleration (0-100 km/h)	7 sec	8 sec	5 sec
Towing capacity (braked)	1200 kg	1200 kg	Towing unavailable
Carbon emissions from fuel/electricity generation	230 g/km	161 g/km	92 g/km
Other	Other features are the same across models (including condition, warranty, drive, space, seating, airbags, audio, driver assist, climate control)		
Refuelling/charging away from home			
Availability of charging points at destinations	Refuelling at existing service stations	50% of major shopping centres and commercial car parks	50% of major shopping centres and commercial car parks
Time to charge to 80% at destination charging points		15 minutes	15 minutes
Availability of charging points on major highways		Charge points situated every 200 km	Charge points situated every 200 km
Time to charge to 80% at highway charging points		15 minutes	15 minutes
Costs			
Purchase price (after taxes and subsidies, includes cost of home charging kit for electric vehicles)	$40,000	$36,000	$42,000
Running cost (fuel and servicing after taxes and subsidies)	$19 /100 km	$14 /100 km	$5 /100 km
Which of these three vehicles would you be most likely to purchase?	○	○	○

Data source: CIE

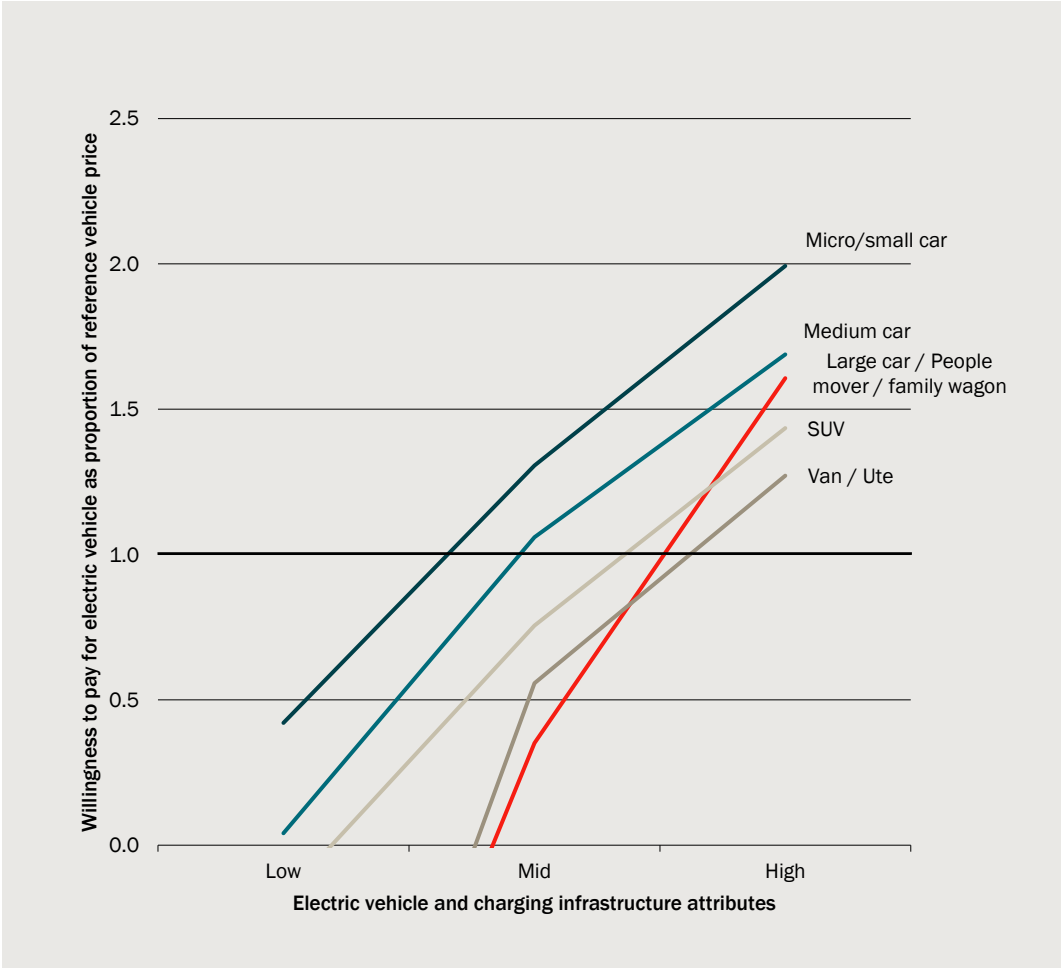
Demand for EVs

At the worst attribute levels included in the survey, the average consumer would not purchase an EV even at purchase price parity (see figure 2). This is the case for consumers with a range of vehicle preferences, other than those looking to purchase a hybrid micro/small car (who comprise only 3 per cent of the sample).

At the best attribute levels included in the survey, the average consumer would purchase an EV at purchase price parity. This is the case for consumers with a range of vehicle preferences, other than those looking to purchase a diesel SUV (who comprise only 4 per cent of the sample).

Consumers purchasing a micro/small car are more likely to switch to an EV than consumers purchasing other vehicle types.

2 Demand for battery electric vehicles relative to a petrol vehicle, by vehicle type



Micro/small car n=547, Medium car n=1254, Large car/People mover/Family wagon n=336, SUV n=696, Van/Ute n=137, reweighted to account for oversampling of persons with university degrees

Average reference vehicle prices: Micro/small car $18 775, Medium car $27 289, Large car/People mover/Family wagon $33 952, SUV $34 670, Van/Ute $27 905

Data source: CIE

Determinants of demand for EVs

The attributes with the largest impact on demand are:

- purchase price;
- running cost; and
- battery range.

Towing is important for some vehicle types and fuel range is important for plug-in hybrid EVs (PHEVs).

Table 3 shows average consumer willingness to pay (WTP) for various changes in vehicle and charging attributes across all vehicle types (i.e. the reduction in purchase price that would have the same impact on demand as the specified improvement in the vehicle/charging).

3 Average willingness to pay for a marginal change in vehicle/charging attributes

Attribute	Unit	Marginal WTP ($ in purchase price)
Fuel range (PHEV only)	per 50 km	1548
Acceleration	per second (decrease)	388
Towing capacity	per 250 kg	1244
Carbon emissions	per 50 g/km (decrease)	244
Destination charging time	Change from 120 to 60 minutes	686
Destination charging time	Change from 60 to 15 minutes	25
Highway charging time	Change from 60 to 30 minutes	1350
Highway charging time	Change from 30 to 15 minutes	1137
Highway charging time	Change from 15 to 5 minutes	1120
Running cost	per $/100km (decrease)	1792

All vehicle types n=3021, reweighted to account for oversampling of persons with university degrees

Source: CIE

The value placed on improvements in battery range decreases as destination and highway charging availability improve (see table 4 and table 5).

4 Average willingness to pay for a 50 km increase in battery range ($) by availability of highway charging

Battery range	Availability of charging on major highways		
km	every 300 km	every 200 km	every 100 km
150	3286	2366	1446
250	2230	1678	1126
350	1777	1383	988
450	1526	1219	912

All vehicle types n=3021, reweighted to account for oversampling of persons with university degrees

Note: Assumes charging available at 10 per cent of major shopping centres and commercial car parks

Source: CIE

5 Average willingness to pay for a 50 km increase in battery range ($) by availability of destination charging

Battery range	Availability of charging at major shopping centres and commercial car parks		
km	10 per cent	50 per cent	100 per cent
150	3286	2805	2205
250	2230	1941	1581
350	1777	1571	1314
450	1526	1365	1165

All vehicle types n=3021, reweighted to account for oversampling of persons with university degrees

Note: Assumes charging stations situated every 300 km on major highways

Source: CIE

The value of incremental improvements in charging availability decreases sharply with improvements in battery range, as shown in table 6.

6 Average willingness to pay for improvements in availability of charging ($)

Battery range	Availability of charging on major highways		Availability of charging at major shopping centres and commercial car parks
km	every 300 km to every 200 km	every 200 km to every 100 km	per 10 percentage points
150	4782	2107	382
230	3602	927	228
320	2691	16	109

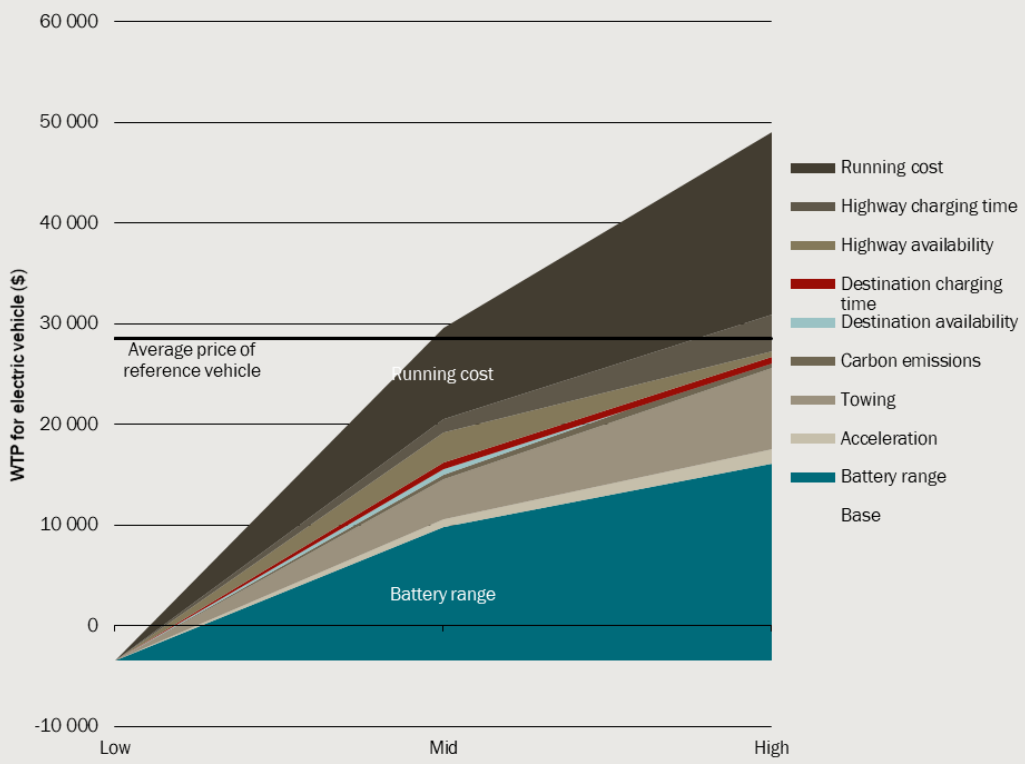
All vehicle types n=3021, reweighted to account for oversampling of persons with university degrees

Note: Assumes vehicle is a battery electric vehicle, rather than a plug-in hybrid electric vehicle

Source: CIE

Figure 7 shows that when moving from the worst to the best attribute levels in the survey, roughly one third of the overall demand impact for all vehicle types can be attributed to running cost (35 per cent), another third to battery range (37 per cent) and the remaining third to the other attributes in the study, the most significant of which are towing (15 per cent) and highway charging time (7 per cent).

7 Decomposition of demand for battery electric vehicles relative to petrol reference vehicle (all vehicle types)



All No screening	Petrol	Battery electric		
		Low	Mid	High
Battery range (km)		150	575	1000
Fuel range (km)	600	0	0	0
Acceleration (sec 0-100km/h)	10.7	12.3	10.5	8.6
Towing capacity (tonnes)	1.63	0.00	0.82	1.63
Carbon emissions (g/km)	239	167	84	0
Destination availability (% of shops/parking)		10	50	100
Destination charging time (minutes)		120	60	15
Highway availability (km between chargers)		300	200	100
Highway charging time (minutes)		60	30	5
Running cost ($/100km)	20.3	15.2	10.2	5.1

All vehicle types n=3021, reweighted to account for oversampling of persons with university degrees

Note: Reference vehicle is the conventional vehicle respondents indicated they would purchase the next time they purchase a vehicle.

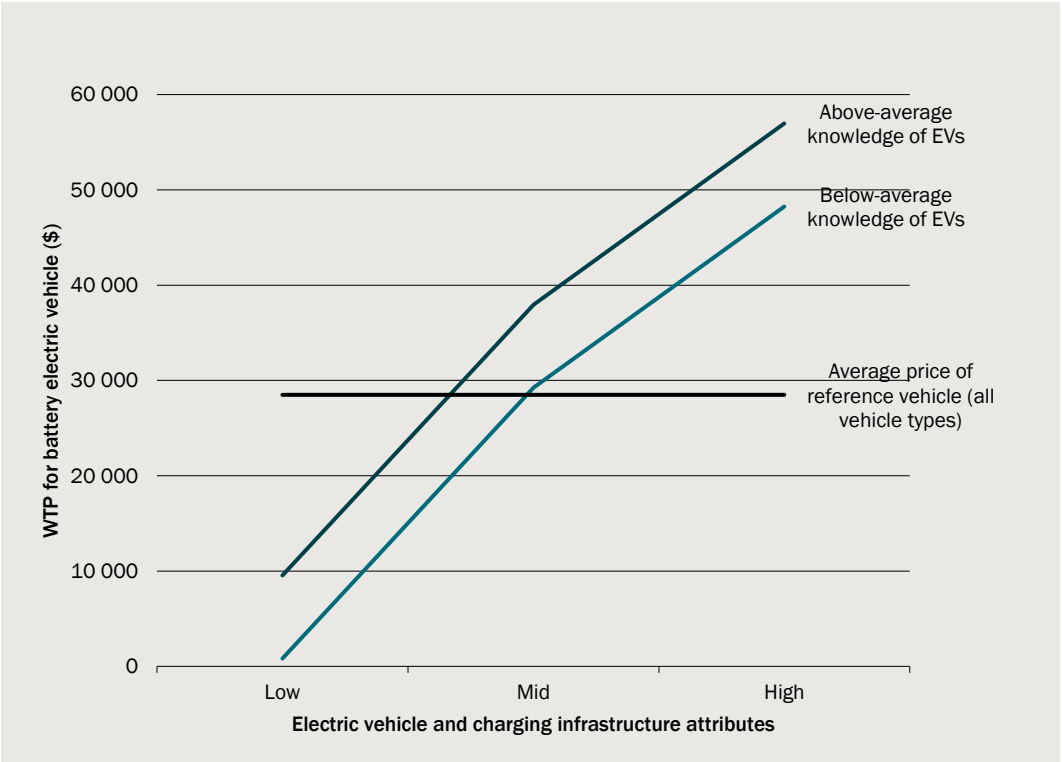
Data source: CIE

Relating demand to consumer characteristics

Demand for electric vehicles is higher among younger, female, university-educated, city-dwelling consumers, who are well-informed about electric vehicles, adopt new technology soon after it's released and have made lifestyle/shopping changes for environmental reasons.

The impacts on demand of three selected characteristics are shown in figures 8 to 10, holding other characteristics constant.

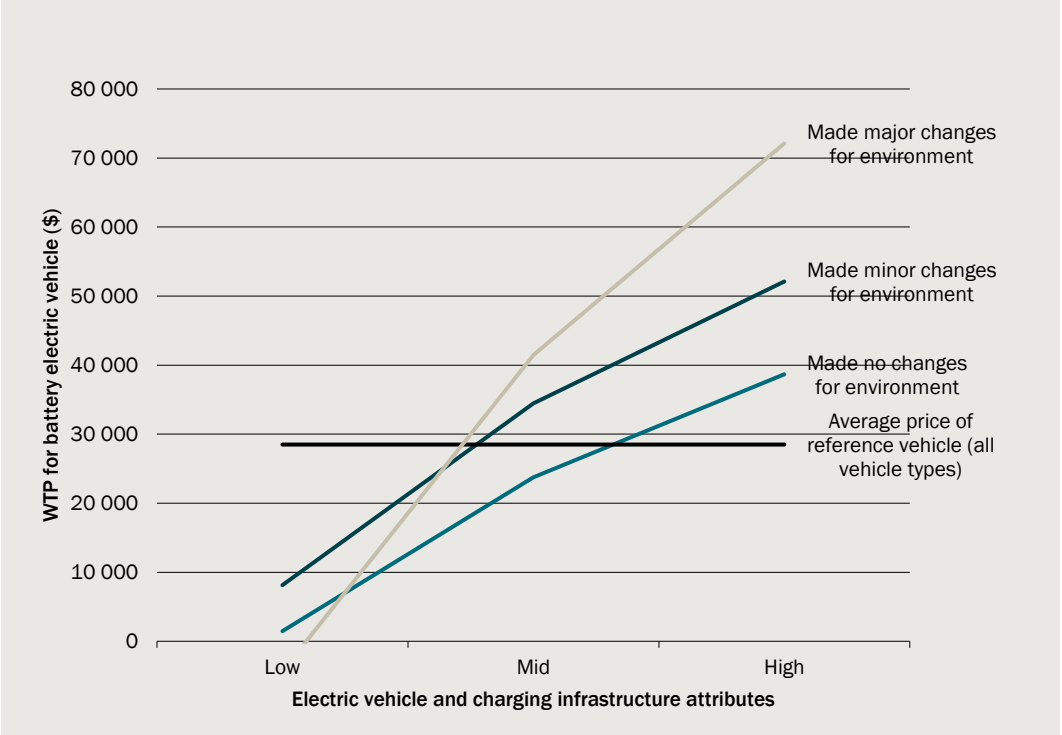
8 Impact of knowledge about electric vehicles



Above-average knowledge of EVs n=1608, Below-average knowledge of EVs n=1413

Data source: CIE

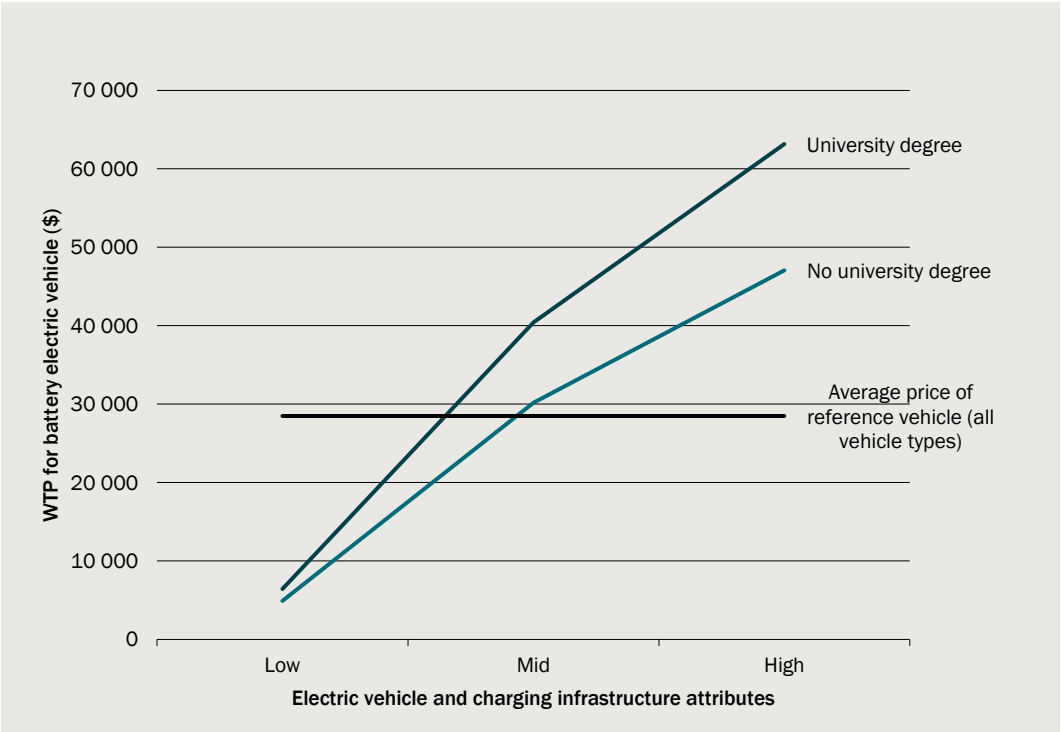
9 Impact of attitude to environment



Made major changes n=664, Made minor changes n=2014, Made no changes n=343

Data source: CIE

10 Impact of education



Do you have a university degree? Yes n=1309, No n=1712

Data source: CIE

Taste for specific vehicle and charging attributes also varies with consumer characteristics:

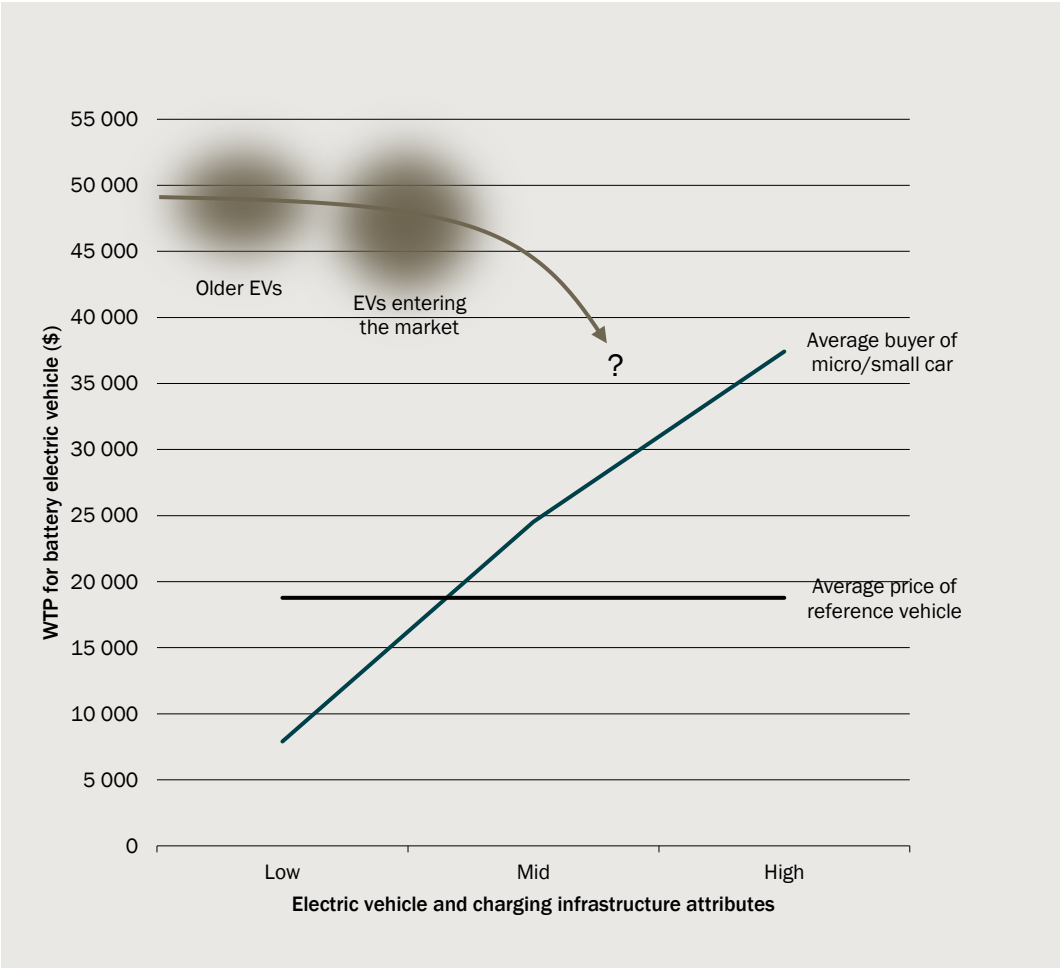
- Consumers in regional areas value towing and battery range more highly than other consumers.
- Older consumers value towing more highly than younger consumers, while younger consumers place a higher value on reducing carbon emissions.
- Only consumers without a garage value improvements in the availability of charging at shopping centres and car parks.

Discussion

The results of this study indicate that consumers will purchase an EV rather than their preferred conventional fuel vehicle once the vehicle attributes are good enough and/or once the price is low enough.

It is currently difficult to purchase an electric vehicle in Australia in the vehicle classes with highest demand. This is expected to change in the coming years, with the Nissan Leaf, Hyundai Kona, Hyundai Ioniq and Renault Zoe all advertised to be entering the Australian consumer market by 2019. While there is still some uncertainty regarding the price and final specifications for some of these vehicles, the modelling conducted in this report suggests that these vehicles are still some distance away from being preferred to conventional vehicles by a majority of consumers (see figure 11). This is true even when restricting the sample to demographic groups most likely to purchase an electric vehicle.

11 Willingness to pay for EVs compared to existing vehicles



Note: Older EVs are based on the 2012 Nissan Leaf (~$47 000) and the 2012 Mitsubishi MiEV (~$48 800), while EVs entering the market are based on the 2018 Nissan Leaf (~$50 000), Hyundai Ioniq (~$43 000) and Renault Zoe (~$51 000)

Data source: CIE

To develop an understanding of the extent to which EVs would need to improve to attract the average consumer, table 12 shows three hypothetical examples of vehicles that would be preferred to Australia's best-selling small car – the Toyota Corolla – by half of all consumers (i.e. the average consumer is indifferent). It shows that mass adoption of electric vehicles would require:

- significant cost reductions to the point of purchase price parity, with relatively minor improvements in EV technology (vehicle 1);
- significant cost reductions to the point of purchase price parity, with significant improvements in EV charging infrastructure (vehicle 2); or
- significant improvements in EV technology (particularly battery range and running cost), with small cost reductions (vehicle 3).

12 Hypothetical vehicles that are equally preferred to a Toyota Corolla

	Toyota Corolla	Vehicle 1	Vehicle 2	Vehicle 3
Fuel type	Petrol	Battery electric	Battery electric	Battery electric
Purchase price ($)	21 240	21 240	21 240	40 000
Fuel range (km)	520	0	0	0
Battery range (km)	0	500	250	1000
Acceleration (sec 0-100 km/h)	11	11	11	7
Towing capacity braked (kg)	700	0	0	700
Carbon emissions (g/km)	175	87.5	87.5	0
Running cost ($/100 km)	17	10	12.5	5
Availability of charging at destinations (per cent)	N/A	10	100	100
Time to charge to 80% at destinations (min)	N/A	120	15	15
Availability of charging on highways (km)	N/A	300	100	100
Time to charge to 80% on highways (min)	N/A	60	5	5

Source: CIE

2 Introduction

Background

Australian Automobile Association (AAA) commissioned the Centre for International Economics (CIE) to conduct a choice modelling study of the determinants of demand for electric vehicles (EVs) in Australia, the barriers that may be limiting the take-up of EVs in Australia, and how demand is likely to change as the relative price and performance of these vehicles improves in the near future.

Objective

The objectives of the project are to generate robust evidence of:

- the key determinants of demand for EVs in Australia;
- the key barriers that may be limiting the take-up of EVs in Australia;
- the likely change in demand for EVs from hypothetical changes in their performance and price;
- the consumer characteristics that are related to demand for current and hypothetical future EVs; and
- consumer perceptions of EVs and the role those perceptions may play in demand for EVs.

Approach

An online survey instrument was used to collect data for the study. The instrument used a choice modelling (also known as a conjoint analysis or discrete choice experiment) approach. Choice modelling is a survey and statistical technique designed to provide quantitative information about consumer preferences when there is limited actual market data available. Under this technique, consumers are asked to respond to a very carefully constructed survey instrument designed to elicit preferences for vehicles.

The overall choice modelling technique is well established in marketing and economic research fields, and has been applied — to a degree — to EVs issues in the past. To date, however, there has not been a comprehensive national choice modelling study of EV demand in Australia that allows consideration of the range of policy and practical issues now at hand (table 2.1). This study addresses that gap.

2.1 A national Australian choice modelling study of demand for EVs

Authors	Year	Location	Sample size
Large international studies			
Hirdue et al	2011	US	3 029
Tanaka et al	2014	US and Japan	8 202
Helveston et al	2015	US and China	956
Small Australian studies			
Beck et al	2016	Sydney	204
Smith et al	2017	Perth	440
This study			
CIE	2018	Australia	3 021

Source: CIE

A rigorous methodology was applied in this study, including:

- internal peer review by Dr Andrew Collins of the Institute of Transport and Logistics Studies at the University of Sydney, an expert in design of choice surveys and analysis of choice data (see Appendix A);
- consultation on the survey design with motoring clubs;
- testing the survey instrument using in-depth interviews;
- conducting fieldwork over multiple waves, with model estimation conducted and adjustments made to stated preference questions between each wave; and
- adapting efficient experimental designs (the combinations of attribute levels across vehicle alternatives) for each wave using data collected over previous waves.

3 Research method

Approach

This study used a choice modelling survey to elicit preferences for vehicles. The questionnaire (see Appendix G) included:

- a welcome, with instructions and information about privacy and contact details;
- screening questions to ensure representative samples of people in Australia aged 18 and over;
- questions about past experience and perceptions of EVs;
- questions about the respondent's existing vehicle(s) and the respondent's role in any purchase;
- questions about the respondent's next vehicle purchase, including the likelihood and timing of the purchase as well as the vehicle's type, price range, usage and parking;
- background information on electric vehicles, including the driving experience, the charging experience and potential environmental benefits;
- six vehicle comparison (choice) questions in which the respondent is presented with three vehicles described by several attributes and asked which they prefer;
- debriefing questions on how the respondent answered the choice questions; and
- questions about the respondent, including their attitudes to the environment and new technology.

Vehicle comparison questions

There are several important decisions that must be made when designing a choice modelling survey. These include:

- the vehicle attributes to be included in the choice tasks and how those attributes should be defined;
- the number of alternatives to be included in each choice task and whether one of the alternatives should represent some sort of reference alternative (e.g. the status quo);
- the number of questions to be answered by each respondent;
- the levels that the attributes can take in the questions;
- the combinations of attribute levels in each question (that is, the experimental design); and

- the information, instructions and/or questions used to prepare respondents for the choice.

The decisions taken in relation to these matters and the process for making those decisions are discussed in the remainder of this chapter.

Vehicle attributes

Three groups of attributes were used to describe vehicles in the choice tasks:

- Specifications
  - Fuel type
  - Driving range on battery
  - Driving range on fuel tank
  - Acceleration (0-100 km/h)
  - Towing capacity (braked)
  - Carbon emissions from fuel/electricity generation
- Refuelling/charging away from home
  - Availability of charging points at destinations
  - Time to charge to 80 per cent at destination charging points
  - Availability of charging points on major highways
  - Time to charge to 80 per cent at highway charging points
- Costs
  - Purchase price (after taxes and subsidies, includes cost of home charging kit for electric vehicles)
  - Running cost (fuel and servicing after taxes and subsidies).

The choice tasks also indicated that other vehicle attributes, including condition, warranty, drive, space, seating, airbags, audio, driver assist and climate control, are the same across the vehicle alternatives.

These attributes were identified as the most likely determinants of demand based on the literature review and consultation with representatives from the motoring clubs.

Number of alternatives in each task

Three alternatives were presented in each choice task. In every question the three alternatives were a reference vehicle (constant across questions for each respondent), a battery electric vehicle and a plug-in hybrid electric vehicle. The reference vehicle was the conventional vehicle the respondent indicated that they would purchase the next time they purchase a vehicle. There is a large body of evidence on reference-dependent decision making from behavioural economics (for a summary, see Kahneman 2011).

This design was judged to strike an appropriate balance between statistical power and task complexity. Previous studies have found that statistical significance for a given sample size has been low where choice tasks presented only a reference alternative and a single non-reference alternative (for example, see Rolfe and Bennett 2009). Presenting

four or more alternatives in each choice task was judged to be too cognitively demanding. Feedback from participants in testing interviews indicated that the tasks should not be any more complex than the three-alternative tasks presented in the interviews.

Number of questions per respondent

All respondents completed six choice tasks. The risk of respondents dropping out of self-administered questionnaires increases with the number of choice tasks presented. The number of respondents required to obtain statistically significant estimates of WTP reduces with the number of choice tasks presented to each respondent. A sequence of six choice tasks per respondent was judged to strike an appropriate balance between these two considerations.

Vehicle attribute levels

The attribute levels for the reference vehicle were constant within each respondent, but varied across respondents. They were based on the characteristics of the best-selling vehicles with the vehicle and fuel types identified by the respondent when asked about the vehicle they were most likely to purchase next time they purchase a vehicle (see table 3.1).

3.1 Non-price attribute levels for the reference vehicle

Fuel type	Vehicle type	Running cost	Carbon emissions	Towing capacity (braked)	Driving range on fuel	Acceleration (0-100km/h)
		$/100km	g/km	kg	km	seconds
Petrol	Micro/small car	17	175	700	520	11
Petrol	Medium car	19	230	1200	640	7
Petrol	Large car	19	200	2100	720	7
Petrol	People mover / family wagon	25	340	2000	520	12
Petrol	Sports car	20	200	700	560	5
Petrol	SUV small-medium	19	220	1700	560	10
Petrol	SUV large	23	250	2700	720	10
Petrol	Van	23	270	1500	560	20
Petrol	Ute	22	300	2500	600	12
Diesel	Micro/small car	14	150	700	800	11
Diesel	Medium car	15	165	1600	920	8
Diesel	Large car	15	150	2000	960	7
Diesel	People mover / family wagon	18	230	2000	880	14
Diesel	Sports car	16	142	700	960	5

Fuel type	Vehicle type	Running cost	Carbon emissions	Towing capacity (braked)	Driving range on fuel	Acceleration (0-100km/h)
		$/100km	g/km	kg	km	seconds
Diesel	SUV small-medium	16	150	1700	800	10
Diesel	SUV large	20	220	2000	800	10
Diesel	Van	20	260	1500	640	20
Diesel	Ute	21	270	3000	720	12
Hybrid	Micro/small car	12	90	500	800	11
Hybrid	Medium car	13	110	1100	960	10
Hybrid	Large car	13	130	1400	800	8
Hybrid	People mover / family wagon	15	100	1400	800	12
Hybrid	Sports car	14	140	500	800	5
Hybrid	SUV small-medium	15	120	1360	800	10
Hybrid	SUV large	18	180	1600	800	10
Hybrid	Van	17	210	1200	640	20
Hybrid	Ute	18	220	2400	720	12

Source: CIE

The purchase price level for the reference vehicle was set using the response to a question in the survey about how much the respondent would be looking to spend on their next vehicle as described in table 3.2.

3.2 Purchase price levels for the reference vehicle

Response to 'How much would you be looking to spend on your next vehicle?'	Purchase price level for the reference vehicle
Less than $10 000	$8 000
$10 000 to $19 999	$15 000
$20 000 to $34 999	$28 000
$35 000 to $49 999	$40 000
$50 000 to $74 999	$60 000
$75 000 to $99 999	$85 000
More than $100 000	$100 000

Source: CIE

The attribute levels for the alternative vehicles varied across alternatives, questions and respondents. Some attribute levels were drawn from a set of fixed values and others were calculated within the survey as a percentage of the reference vehicle level (see table 3.3). This is termed a pivot design. These levels were informed by the literature review and

consultation with motoring club representatives on the current and plausible future characteristics of EVs.

3.3 Attribute levels for the alternative vehicles

Attribute	BEV levels	PHEV levels
Fuel type	Battery electric	Plug-in hybrid electric
Driving range on battery (km)	150, 300, 500, 700, 1000	50, 150, 300
Driving range on fuel (km)	N/A	300, 500
Acceleration (pivot)	-30%, -15%, +0%, +15%	-30%, -15%, +0%, +15%
Towing capacity (pivot)	-100%, -40%, -20%, +0%	-100%, -40%, -20%, +0%
Carbon emissions (pivot)	-100%, -60%, -30%	-60%, -30%, +0%
Availability of charging points at destinations (% of major shopping centres and commercial car parks)	10%, 50%, 100%	10%, 50%, 100%
Time to charge to 80% at destination charging points (minutes)	15, 60, 120	15, 60, 120
Availability of charging points on major highways (charge points situated every … km)	100, 200, 300	100, 200, 300
Time to charge to 80% at highway charging points (minutes)	5, 15, 30, 60	5, 15, 30, 60
Purchase price (pivot)	-40%, -15%, -10%, -5%, +0%, +5%, +10%, +15%, +25%, +50%	Phase 1: -40%, -15%, -10%, -5%, +0%, +5%, +10%, +15%, +25%, +50% Phase 2/3: -50%, -25%, -15%, -10%, -5%, +0%, +5%, +10%, +15%, +40%
Running cost (pivot)	-75%, -50%, -25%	-75%, -50%, -25%

Source: CIE

Experimental designs

To conduct a choice survey, the analyst needs to assign combinations of attribute levels to the various alternatives and questions. These combinations are referred to as the experimental design. The experimental design has a direct impact on the statistical significance of the results. If some information about preferences is known, it is possible to generate an experimental design that can elicit statistically significant results from a smaller number of respondents than a randomly generated design.

This study used an adaptive experimental design process, in which three separate designs were used for each wave of fieldwork. Each design included 60 questions, which were 'blocked' into 10 blocks of six questions. The designs were generated to minimise D-error (the determinant of the variance-covariance matrix) (Scarpa and Rose 2008).

The prior parameter estimates used to generate the efficiency criteria were based on estimates from basic multinomial logit models run on the data collected in the waves of fieldwork undertaken to that point. The design for the first wave of fieldwork used prior parameter estimates based on estimates of marginal willingness to pay from other choice

studies in the literature. Constraints were included in the design search to preclude highway charging time from exceeding destination charging time. The searches were performed using the Ngene software package.

An example of a choice question from the survey instrument is provided in figure 3.4.

3.4 Example of a vehicle comparison question

Comparison question 1 of 6

	Medium car		
	Model A	Model B	Model C
Specifications			
Fuel type	Petrol	Battery electric	Plug-in hybrid battery electric
Driving range on battery	N/A	1000 km	50 km
Driving range on fuel tank	640 km	N/A	500 km
Acceleration (0-100 km/h)	7 sec	8 sec	5 sec
Towing capacity (braked)	1200 kg	1200 kg	Towing unavailable
Carbon emissions from fuel/electricity generation	230 g/km	161 g/km	92 g/km
Other	Other features are the same across models (including condition, warranty, drive, space, seating, airbags, audio, driver assist, climate control)		
Refuelling/charging away from home			
Availability of charging points at destinations	Refuelling at existing service stations	50% of major shopping centres and commercial car parks	50% of major shopping centres and commercial car parks
Time to charge to 80% at destination charging points		15 minutes	15 minutes
Availability of charging points on major highways		Charge points situated every 200 km	Charge points situated every 200 km
Time to charge to 80% at highway charging points		15 minutes	15 minutes
Costs			
Purchase price (after taxes and subsidies, includes cost of home charging kit for electric vehicles)	$40,000	$36,000	$42,000
Running cost (fuel and servicing after taxes and subsidies)	$19 /100 km	$14 /100 km	$5 /100 km
Which of these three vehicles would you be most likely to purchase?	○	○	○

Data source: CIE

Instructions and debriefing

Prior to the choice questions, respondents were told:

- to imagine they are in the future at the point of their next vehicle purchase;
- that they could get more information on the meaning of each vehicle characteristic in a pop-up text box by positioning their mouse over the label in the choice questions;
- that, where characteristics are not described in the question, to assume they are the same across the vehicle options;
- that some vehicles may look strange, but this is because there are many technological changes that could happen in the future;
- that the choice questions are important and contain a lot of information; and
- to please take their time and consider their answers carefully.

A list of debriefing questions was included to probe the respondent's decision-making process. The questions covered:

- the extent of any difficulty experienced when answering choice questions;
- perceptions of the plausibility of the vehicle alternatives presented;
- the way respondents answered any questions with alternatives they perceived to be inaccurate or infeasible (where applicable); and
- reasons for choosing the reference alternative in all questions (where applicable).

Process for developing the survey instrument

Literature review

We conducted a review of other studies applying the choice modelling technique to electric vehicles, which are primarily published as articles in academic journals. See Appendix F for summary tables of the key features of the choice designs. This review informed a scoping paper, which was used to identify options for discussion in consultation on the survey instrument, including the sampling method, the sample size, the number of vehicles to include in each choice question, whether and how to include a reference conventional vehicle in each question, the number of choice questions to ask of each respondent, defining the vehicle and charging attributes to value in the study and the respondent characteristics to identify in the study.

Workshop with clubs

We prepared a draft survey approach, including a choice design, which formed the basis for a workshop with representatives from the motoring clubs in Canberra on 8 June 2018. The workshop led to significant improvements to the survey instrument, including:

- identifying important factual information to be included in the questionnaire relating to charging experience, driving experience, avoided pollution, safety, potential to combine the EV battery with home solar electricity generation to lower running costs, potential for downloading software upgrades, and resale value;
- adding questions on experience driving or travelling in an EV;
- clarifying that prices and running costs are post-subsidy;
- measuring charging time attributes as time required to charge to 80 per cent;
- measuring performance with two attributes – acceleration and towing capacity;
- including the cost of home charging infrastructure in the purchase price attribute;
- removing the home charging time attribute;
- define charging infrastructure in terms of the availability and time to charge at destinations and highway charging stations;
- adjusting the range of levels used for the battery range, carbon emissions and highway charging time; and

- inclusion of a free-text question in the questionnaire to ensure respondents felt they were able to express their views.

A number of attributes were identified that were not included in the choice experiment so as to limit complexity and cognitive burden for the self-administered survey, or if they related to specific potential policy options, including:

- a separate subsidy attribute;
- a whole-of-life cost attribute;
- an attribute indicating whether EVs can use bus lanes and priority parking; and
- proportion of journeys requiring a stop for refuelling.

We also presented an update on development of the survey design to motoring club representatives on 22 June 2018.

Testing interviews

In-depth one-on-one interviews were held with six volunteers, including three CIE economists and three volunteers from AAA on 28 June 2018. Each participant completed the draft questionnaire in Microsoft Excel and then immediately engaged in a discussion with us about the questionnaire. The questions we asked participants during these interviews included:

- How long did it take to complete the questionnaire?
- Was the reading material too long?
- Which questions, other than the vehicle comparisons, did you need to think most about?
- How did you go about answering the vehicle comparisons?
- Did any of the vehicles look strange to you?
- Which fuel type did you choose most often? Why?
- Did the questionnaire seem neutral with respect to EVs?
- Did you have a clear idea about the type of vehicle you would buy next?

These interviews confirmed that most of the questionnaire was operating as intended, but they resulted in some minor amendments to the survey instrument, including redefining the highway charging availability attribute to avoid confusion with battery range.

Testing by clubs

The motoring clubs were provided with a version of the questionnaire programmed in Microsoft Excel for their review and feedback. Testing and feedback from the clubs resulted in several improvements to the survey instrument, including:

- increasing the minimum level for the running cost attribute for electric vehicles;
- reducing the maximum level for the carbon emissions attribute for electric vehicles;
- adopting certainty scales for some questions, rather than yes/no responses; and
- minor edits to clarify text.

We also decided against making several of the changes suggested in feedback in order to keep the survey instrument from being overly complicated or biased either for or against electric vehicles.

Expert peer review

Further amendments were made in response to feedback from the expert peer reviewer, Dr Andrew Collins, including:

- adding text to alert respondents to the availability of mouse hover text on the vehicle attributes in the comparison questions;
- improving the attribute level balance in the experimental design by running a different design search algorithm;
- constraining the design search so that destination charging time can't be lower than highway charging time; and
- including a follow-up question after each vehicle comparison asking how likely the purchase would be if those were the only vehicles available;
- including a sentence in the mouse hover text explaining there is different charging technology with varying times.

4 The survey sample

Recruitment

The fieldwork was conducted in August and September 2018. All respondents were sampled through the Pureprofile online panel and were compensated for their time through Pureprofile's rewards system, which offers cash, e-gift cards and movie tickets.

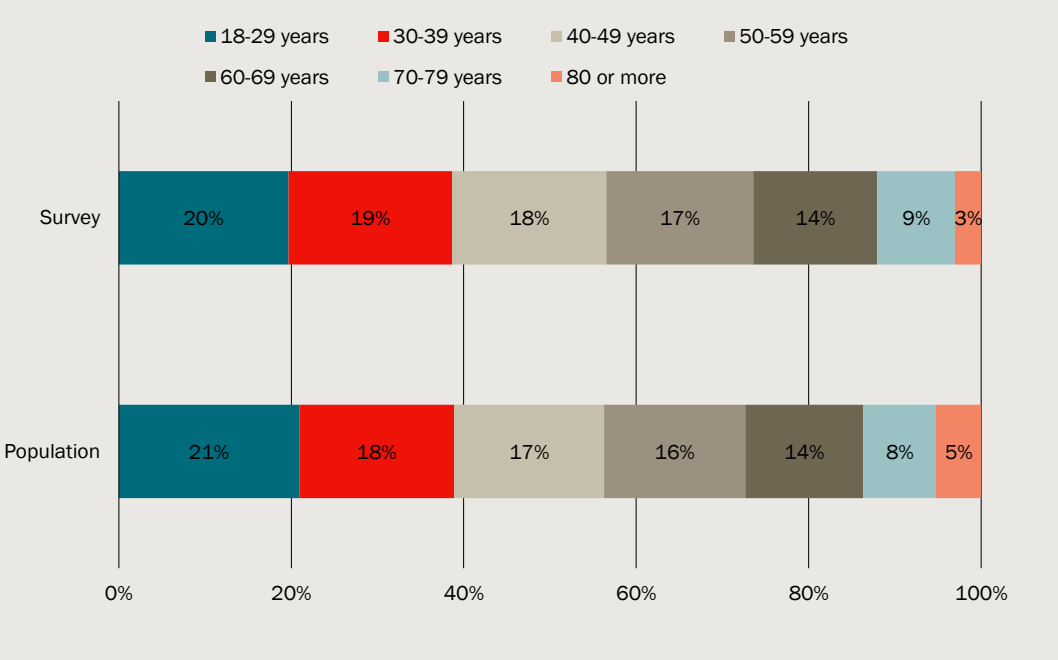
Respondents were screened out if they indicated they do not currently live in Australia or that they are aged less than 18 years. Quotas were set using Australian Bureau of Statistics census data for age, gender and location (state and urban vs regional) so that the sample was representative of the national population and would allow results to be generalised.

The fieldwork was conducted in three waves, with sample sizes of 305, 608 and 2108, giving a total sample size of 3021 respondents.

Age

The distribution across age groups was evenly spread and highly representative of the actual population with the oldest group (80 or more years old) forming the smallest proportion at 3 per cent as compared to 5 per cent in the actual population. Those aged under 30 years formed the largest group at 20 per cent of the sample as compared to 21 per cent of the actual population.

4.1 Respondents by age

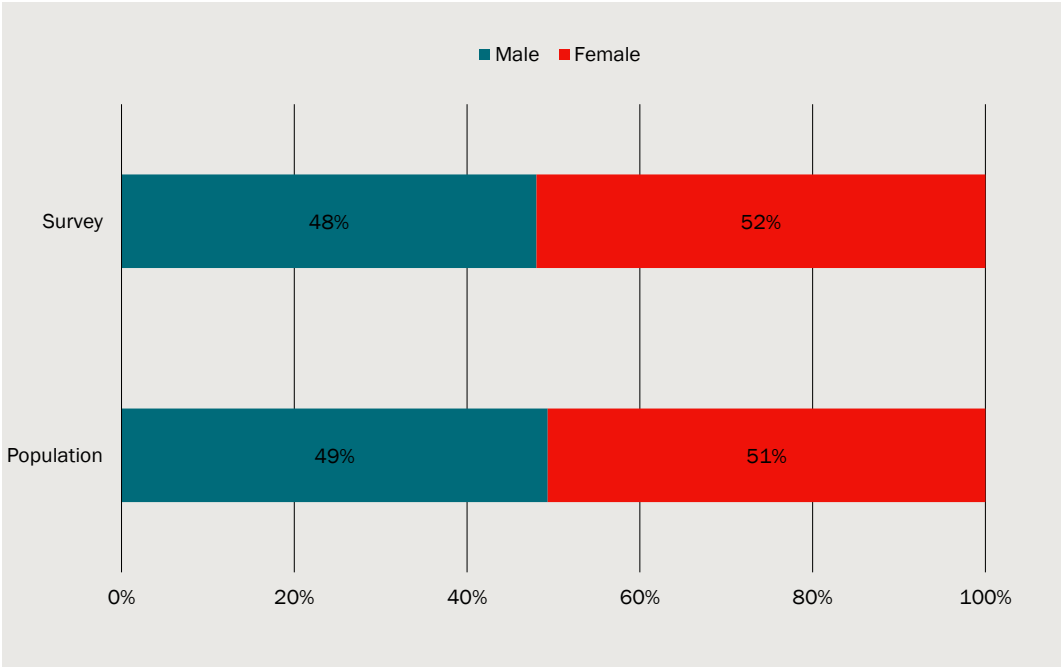


Data source: CIE, ABS

Gender

The sample was evenly split between male and female and was accurately reflective of the distribution of gender in the actual population.

4.2 Respondents by gender

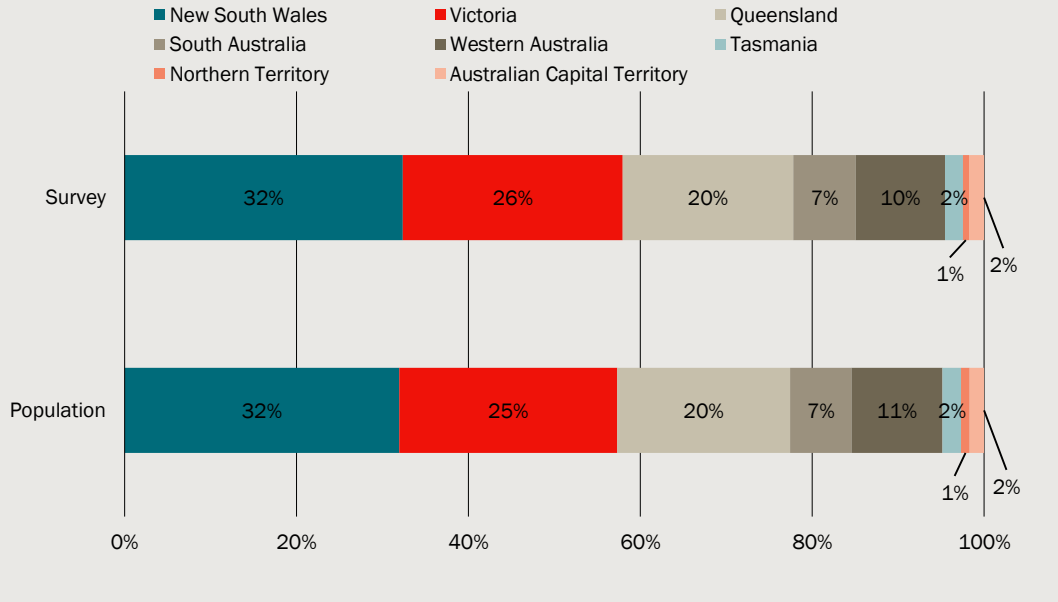


Data source: CIE, ABS

Location

The spread of respondents across different states was identical to that of the actual population, with the highest population in New South Wales and the lowest in the Northern Territory.

4.3 Respondents by State

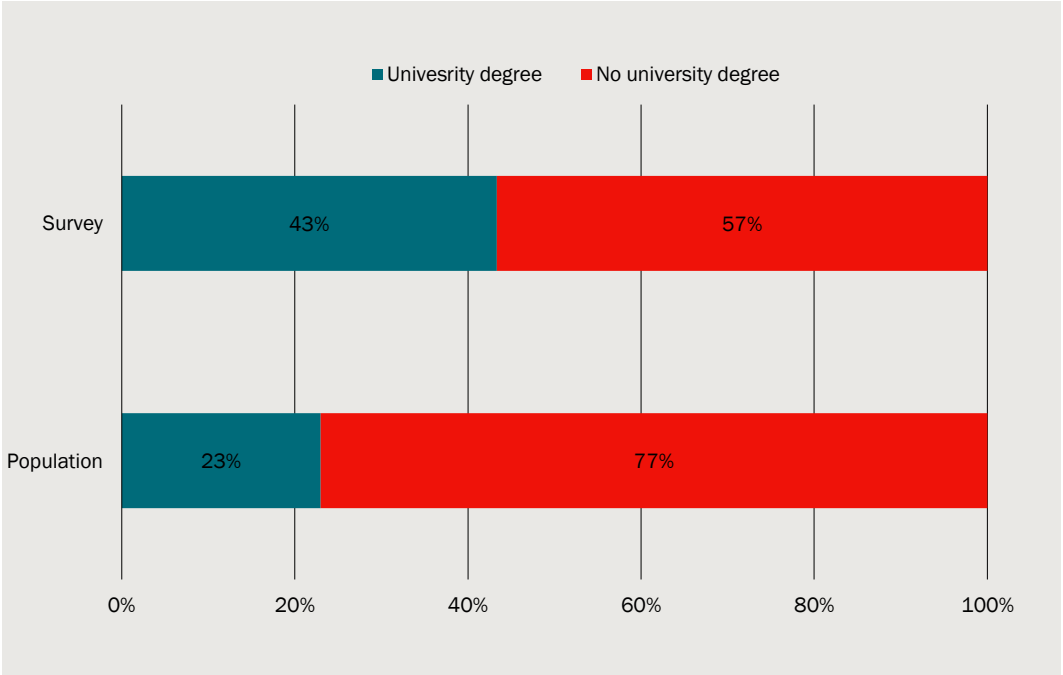


Data source: CIE, ABS

Education

The proportion of respondents with a university degree was higher in the sample, at 43 per cent, than the 23 per cent in the actual population. Since this difference is significant and education was found to be strongly related to vehicle preferences, we estimated models with reweighted data to account for this oversampling.

4.4 Respondents by education level

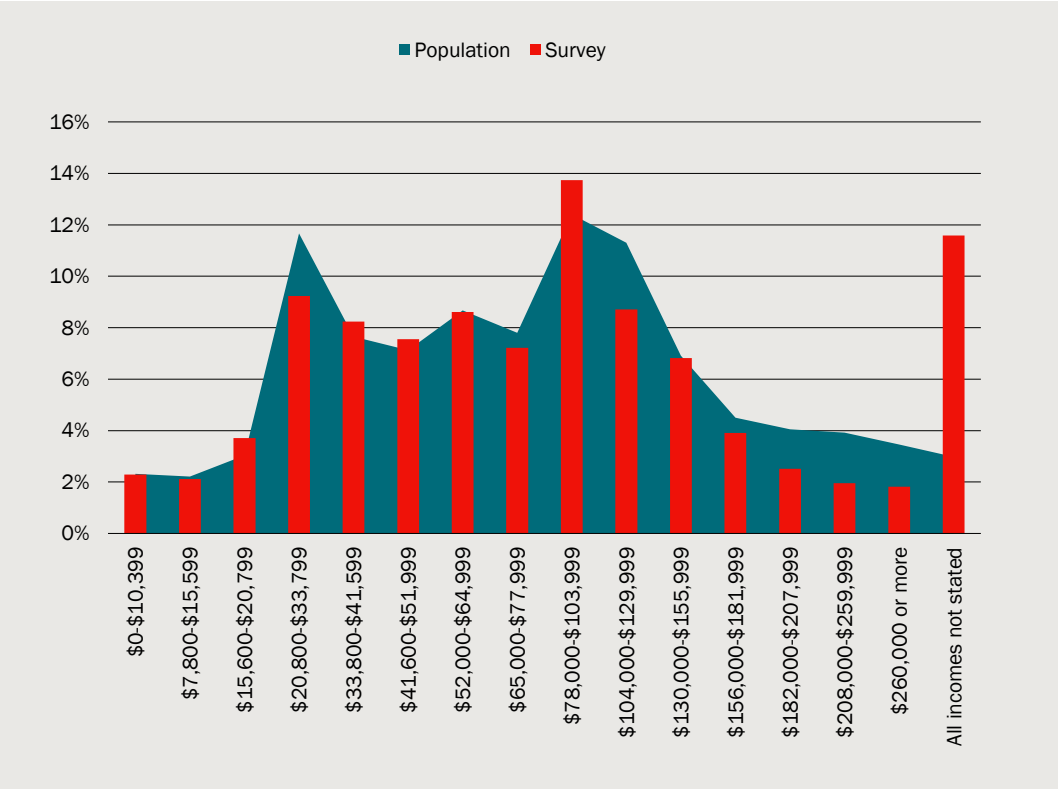


Data source: CIE, ABS

Income

Higher income groups are slightly underrepresented in the sample, but, overall, the income profile of the survey respondents is very similar to that of the actual population. As one would expect, fewer respondents were willing to provide information on their income in our survey than to the ABS.

4.5 Respondents by household income level

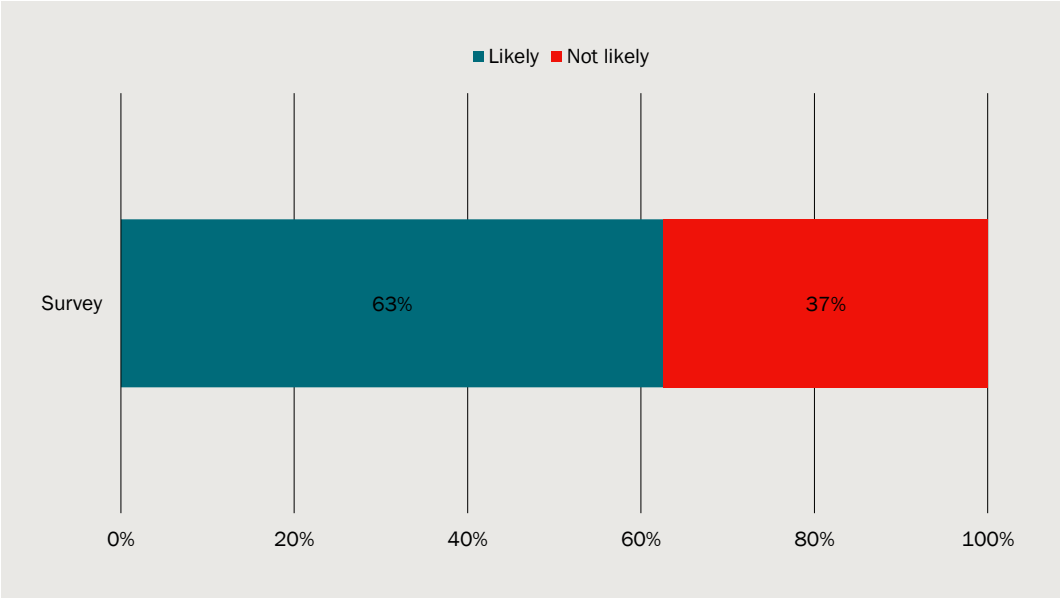


Data source: CIE, ABS

Likelihood of purchasing in next five years

Around two thirds of the survey respondents indicated they are likely to purchase a car in the next five years. This means there is a considerable sample size to analyse this group separately.

4.6 Likelihood of purchasing in next five years



Q: How likely are you to purchase a vehicle within the next 5 years?

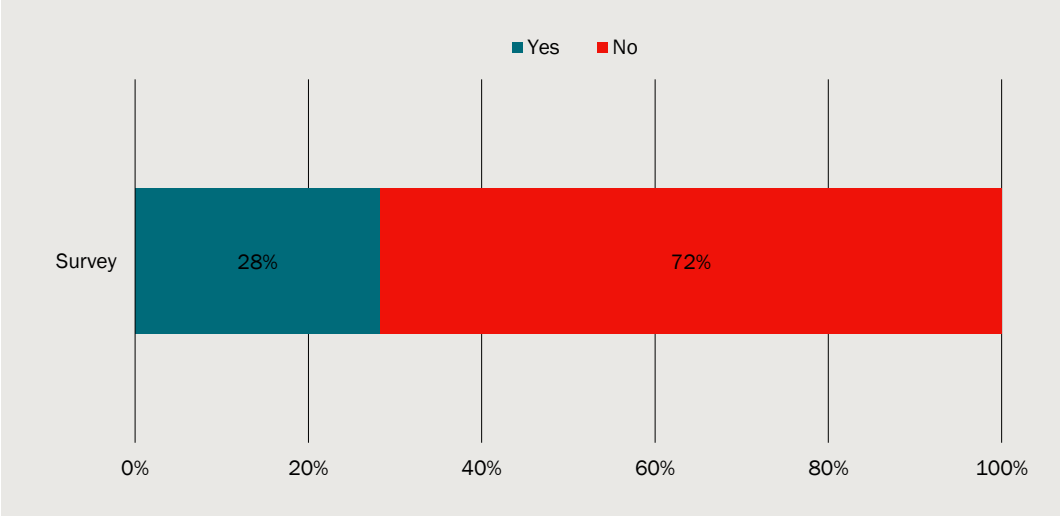
Likely denotes: Almost certain (>85%), Highly likely (70%-85%) or Likely (55%-70%). Unlikely denotes Neither likely nor unlikely (45%-55%), Unlikely (30%-45%), Highly unlikely (15%-30%) or Remote (<15%).

Data source: CIE

Experience of electric vehicles

Only 28 per cent of the respondents claimed to have experienced an electric vehicle, while a majority had never owned, driven or been a passenger in an electric car.

4.7 Experience of electric vehicles



Q: Have you ever owned an electric vehicle? Q: Have you ever driven or been a passenger in an electric vehicle?

Yes denotes: Yes to either question. No denotes: No to both questions.

Data source: CIE

5 Results

Demand for EVs

- **At the worst attribute levels included in the survey, the average consumer would not purchase an EV even at purchase price parity. This is the case for consumers with a range of vehicle preferences, other than those looking to purchase a hybrid micro/small car.**
- **At the best attribute levels included in the survey, the average consumer would purchase an EV at purchase price parity. This is the case for consumers with a range of vehicle preferences, other than those looking to purchase a diesel SUV.**
- **Consumers purchasing a micro/small car are more likely to switch to an EV than consumers purchasing other vehicle types**

Models of consumer choice

Consumer choice was estimated using multinomial logit models. Appendix D provides the results for a range of models, including separate models with and without reweighting for oversampling of persons with university degrees, for each vehicle type and models including only respondents who indicated they are likely to purchase a vehicle in the next five years and who indicated they would be looking to spend more than $10 000.

The coefficient signs, which accord with prior expectations, and high z-values indicate that respondents carefully considered the attribute levels in each option when making their choices. Furthermore, respondents took account of the way that attributes interact with each other. Our search for the best-fitting model specification found statistically significant interactions between charging availability and battery range and between highway charging availability and whether the vehicle was a PHEV or BEV. Both of these interactions have a logical explanation. Improvements in battery range are more important to consumers when there are fewer charging stations available, since the full extent of the range is more likely to be needed to get between stations. Likewise, increases in the availability of charging stations is more valuable to consumers when battery range is low, since charging away from home is more likely to be needed. It makes sense that charging availability is more relevant to the purchase of a BEV than a PHEV, since without a back-up fuel the BEV is more likely to need the charging infrastructure.

Demand for hypothetical future electric vehicles

In this section, we present the estimated demand for specified EVs in terms of the EV price at which consumers would be indifferent, on average, between the EV and a

reference vehicle. From the set of rich models estimated on our large data set, we can calculate this 'indifference price' or willingness to pay (WTP) for a range of vehicle types and reference vehicle fuel types. In each case, we estimate WTP for three hypothetical EVs – one with the worst-possible combination of vehicle and charging attribute levels used in the study, one with the best-possible combination of attribute levels, and a midpoint between the two extreme options. These scenarios vary for each vehicle type and fuel type (of both the reference vehicle and the EV). The scenarios for the petrol-BEV comparison are set out in table 5.1, with other combinations provided in appendix C.

5.1 BEV scenarios for comparison with petrol reference vehicle

Attribute	Petrol	Battery electric		
		Worst	Mid	Best
Micro/small car				
Battery range (km)		150	575	1000
Fuel range (km)	520	0	0	0
Acceleration (sec 0-100km/h)	11.0	12.7	10.8	8.9
Towing capacity (tonnes)	0.70	0.00	0.35	0.70
Carbon emissions (g/km)	175	123	61	0
Destination availability (% of shops/parking)		10	50	100
Destination charging time (minutes)		120	60	15
Highway availability (km between chargers)		300	200	100
Highway charging time (minutes)		60	30	5
Running cost ($/100km)	17.0	12.8	8.5	4.3
Medium car				
Battery range (km)		150	575	1000
Fuel range (km)	640	0	0	0
Acceleration (sec 0-100km/h)	7.0	8.1	6.8	5.6
Towing capacity (tonnes)	1.20	0.00	0.60	1.20
Carbon emissions (g/km)	230	161	81	0
Destination availability (% of shops/parking)		10	50	100
Destination charging time (minutes)		120	60	15
Highway availability (km between chargers)		300	200	100
Highway charging time (minutes)		60	30	5
Running cost ($/100km)	19.0	14.3	9.5	4.8
Large car / People mover / Family wagon				
Battery range (km)		150	575	1000
Fuel range (km)	620	0	0	0
Acceleration (sec 0-100km/h)	9.5	10.9	9.3	7.6
Towing capacity (tonnes)	2.05	0.00	1.03	2.05
Carbon emissions (g/km)	270	189	95	0
Destination availability (% of shops/parking)		10	50	100

Attribute	Petrol	Battery electric		
		Worst	Mid	Best
Destination charging time (minutes)		120	60	15
Highway availability (km between chargers)		300	200	100
Highway charging time (minutes)		60	30	5
Running cost ($/100km)	22.0	16.5	11.0	5.5
SUV				
Battery range (km)		150	575	1000
Fuel range (km)	640	0	0	0
Acceleration (sec 0-100km/h)	10.0	11.5	9.8	8.1
Towing capacity (tonnes)	2.20	0.00	1.10	2.20
Carbon emissions (g/km)	235	165	82	0
Destination availability (% of shops/parking)		10	50	100
Destination charging time (minutes)		120	60	15
Highway availability (km between chargers)		300	200	100
Highway charging time (minutes)		60	30	5
Running cost ($/100km)	21.0	15.8	10.5	5.3
Van/Ute				
Battery range (km)		150	575	1000
Fuel range (km)	580	0	0	0
Acceleration (sec 0-100km/h)	16.0	18.4	15.6	12.9
Towing capacity (tonnes)	2.00	0.00	1.00	2.00
Carbon emissions (g/km)	285	200	100	0
Destination availability (% of shops/parking)		10	50	100
Destination charging time (minutes)		120	60	15
Highway availability (km between chargers)		300	200	100
Highway charging time (minutes)		60	30	5
Running cost ($/100km)	22.5	16.9	11.3	5.6

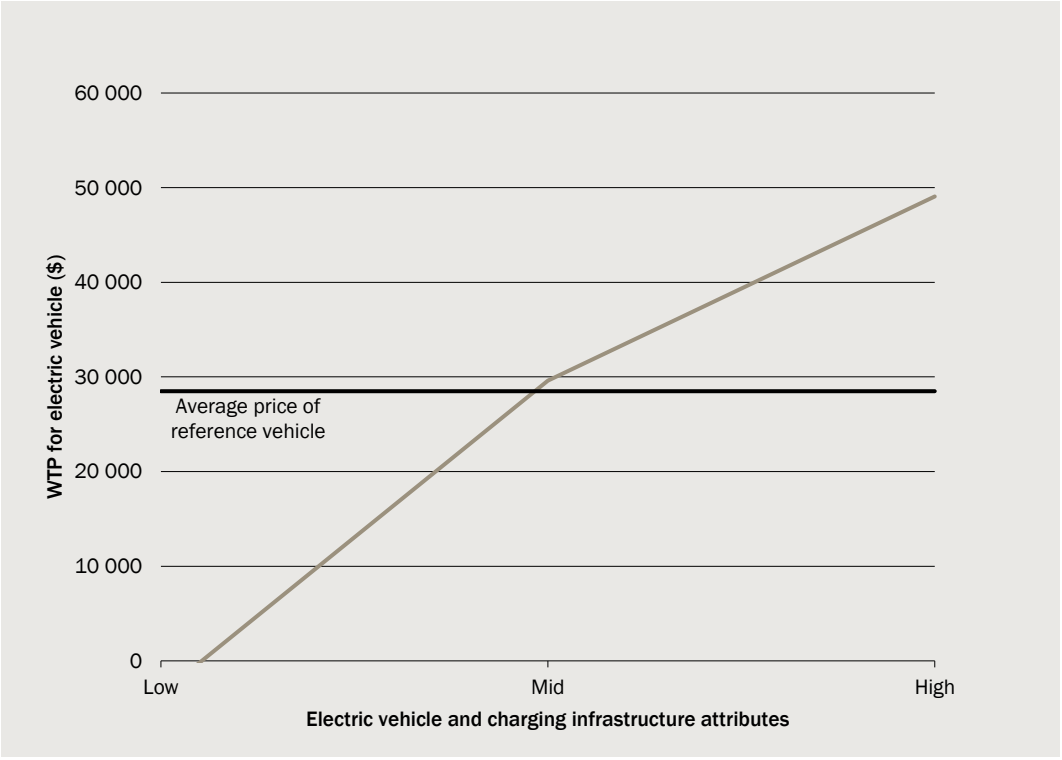
Source: CIE

The average WTP across all vehicle types is shown for the three scenarios in figure 5.2. These estimates are from a model using reweighted data accounting for the oversampling of persons with university degrees. The impact of this reweighting is illustrated in appendix E.

On average, consumers would not purchase BEVs with attribute levels at the lower end of those used in this study even if purchase prices were reduced to the same level as a reference petrol vehicle.

However, as BEV and charging attributes improve towards the midpoint of those used in this study, consumers would switch away from their reference petrol vehicle to a BEV at the same purchase price. When BEV and charging attributes are at the best levels used in this study, consumers would be prepared to pay significantly more for a BEV than for their reference petrol vehicle.

5.2 Average demand for battery electric vehicle relative to a petrol vehicle

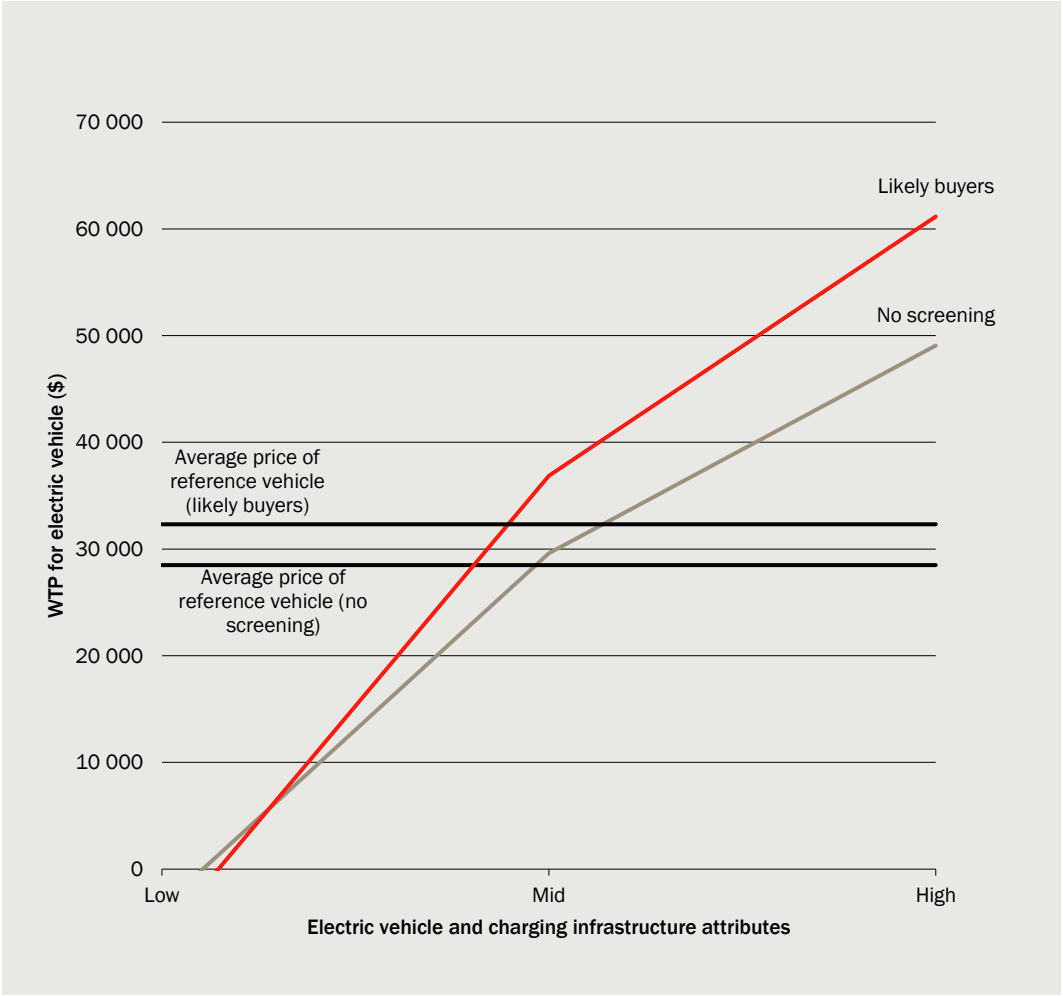


All respondents n=3021, reweighted to account for oversampling of persons with university degrees

Data source: CIE

Around 45 per cent of the sample either indicated they are not likely to buy a car in the next five years or were looking to spend less than $10 000 on their next vehicle purchase. Excluding these respondents from the estimation of demand will give a better indication of average demand among purchasers of new vehicles over the next five years. Figure 5.3 shows that demand is higher when estimated only on likely purchasers of new vehicles in the next five years, but their average reference vehicle is also more expensive, resulting in both groups' average WTP being similar to their respective reference vehicle prices at the midpoint attributes. Results discussed in the remainder of this paper are for the full sample unless otherwise stated.

5.3 Average demand for battery electric vehicles relative to a petrol vehicle, by likely purchasers of new vehicles in the next five years



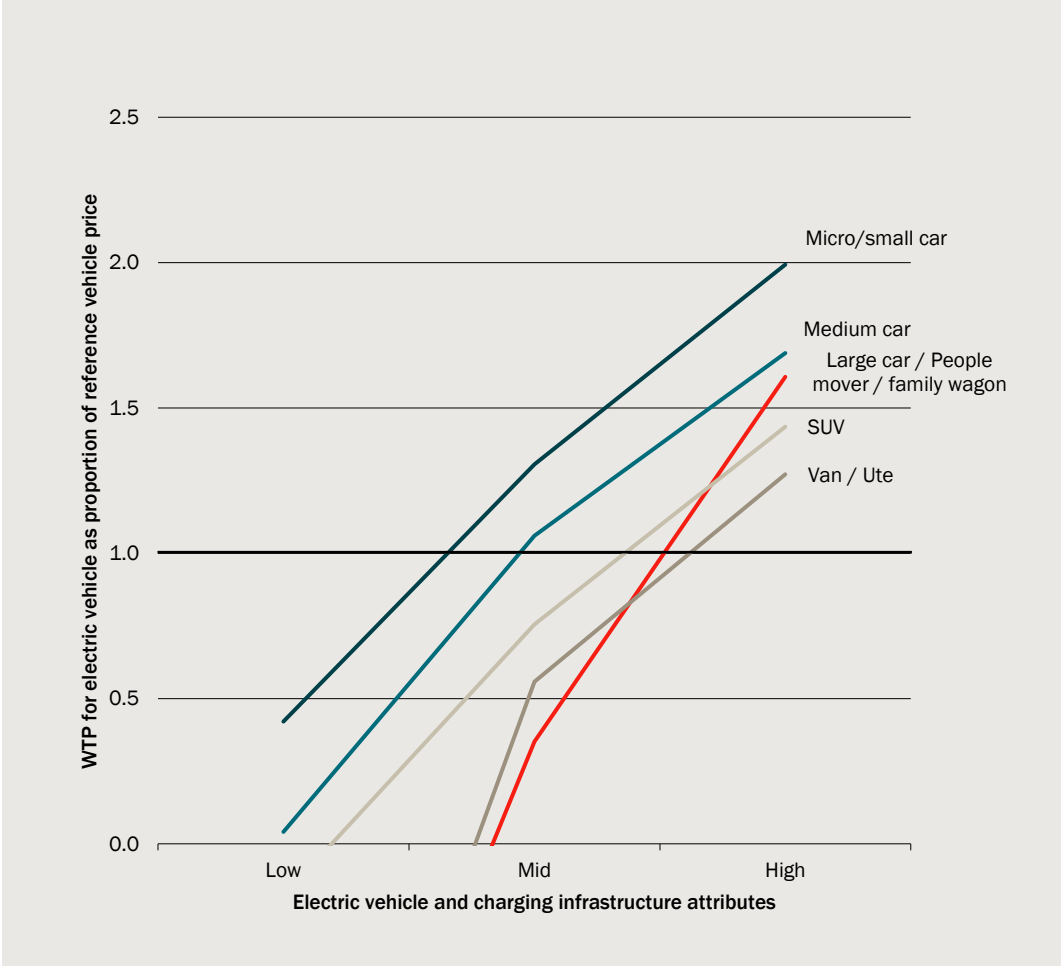
No screening n=3021, Likely buyers n=1666, reweighted to account for oversampling of persons with university degrees

Data source: CIE

Figure 5.4 shows, for each vehicle type, the WTP for EVs relative to a petrol reference vehicle. As BEV and charging attributes improve towards the midpoint of those used in this study, consumers looking to purchase micro/small or medium vehicles would switch away from their reference petrol vehicle to a BEV at the same purchase price. With attribute levels at the midpoint, consumers purchasing a micro/small vehicle would pay up to $5750 more and consumers purchasing a medium vehicle would pay $1630 more for a BEV than for a reference petrol vehicle.

As BEV and charging attributes improve towards the best levels used in this study, BEVs would be preferred to petrol vehicles at purchase price parity for other vehicle types as well, including SUVs, large cars and utes.

5.4 Demand for battery electric vehicles relative to a petrol vehicle, by vehicle type



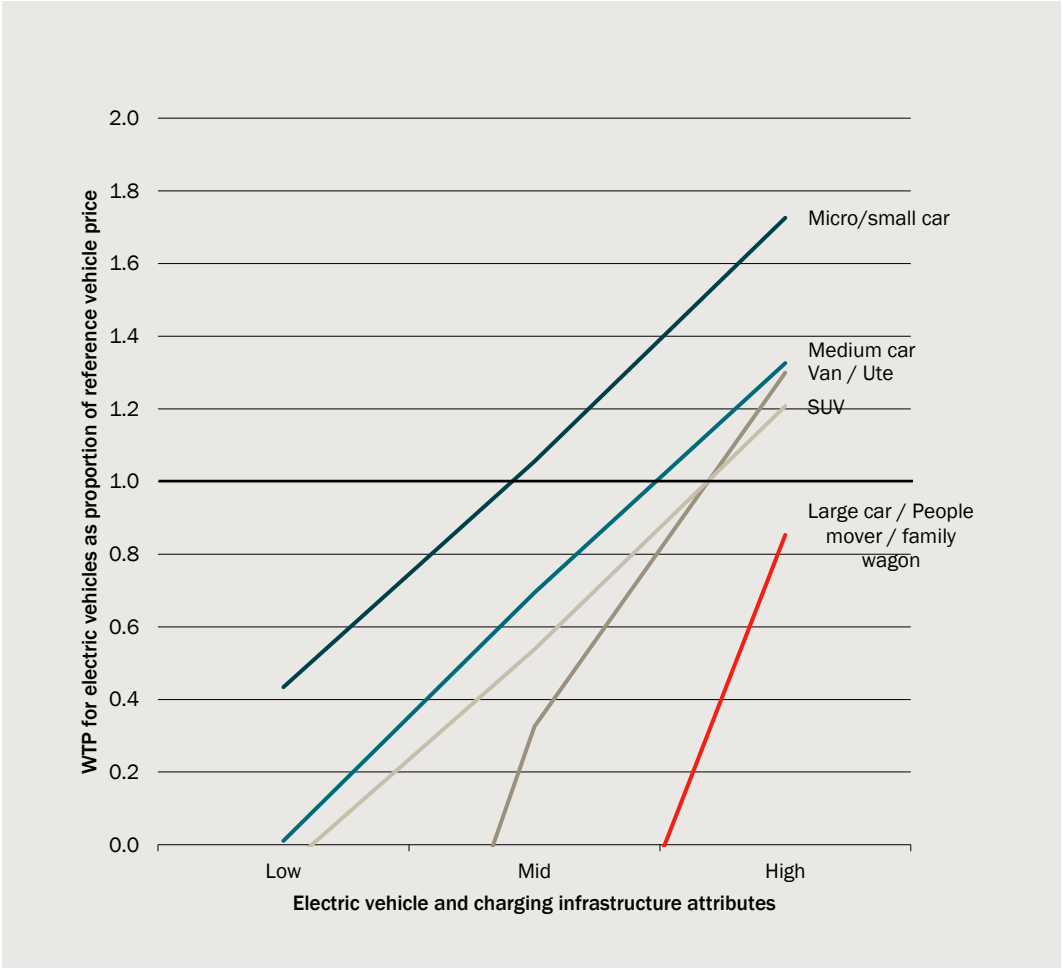
Micro/small car n=547, Medium car n=1254, Large car/People mover/Family wagon n=336, SUV n=696, Van/Ute n=137, reweighted to account for oversampling of persons with university degrees

Average reference vehicle prices: Micro/small car $18 775, Medium car $27 289, Large car/People mover/Family wagon $33 952, SUV $34 670, Van/Ute $27 905

Data source: CIE

Demand for PHEVs was lower than demand for BEVs (see figure 5.5) across all vehicle types. Only micro/small car PHEVs were valued above purchase price parity at the midpoint of PHEV attribute levels. Nevertheless, PHEVs of all vehicle types are valued above purchase price parity when their attributes are at the best levels.

5.5 Demand for plug-in hybrid electric vehicles relative to a petrol vehicle, by vehicle type



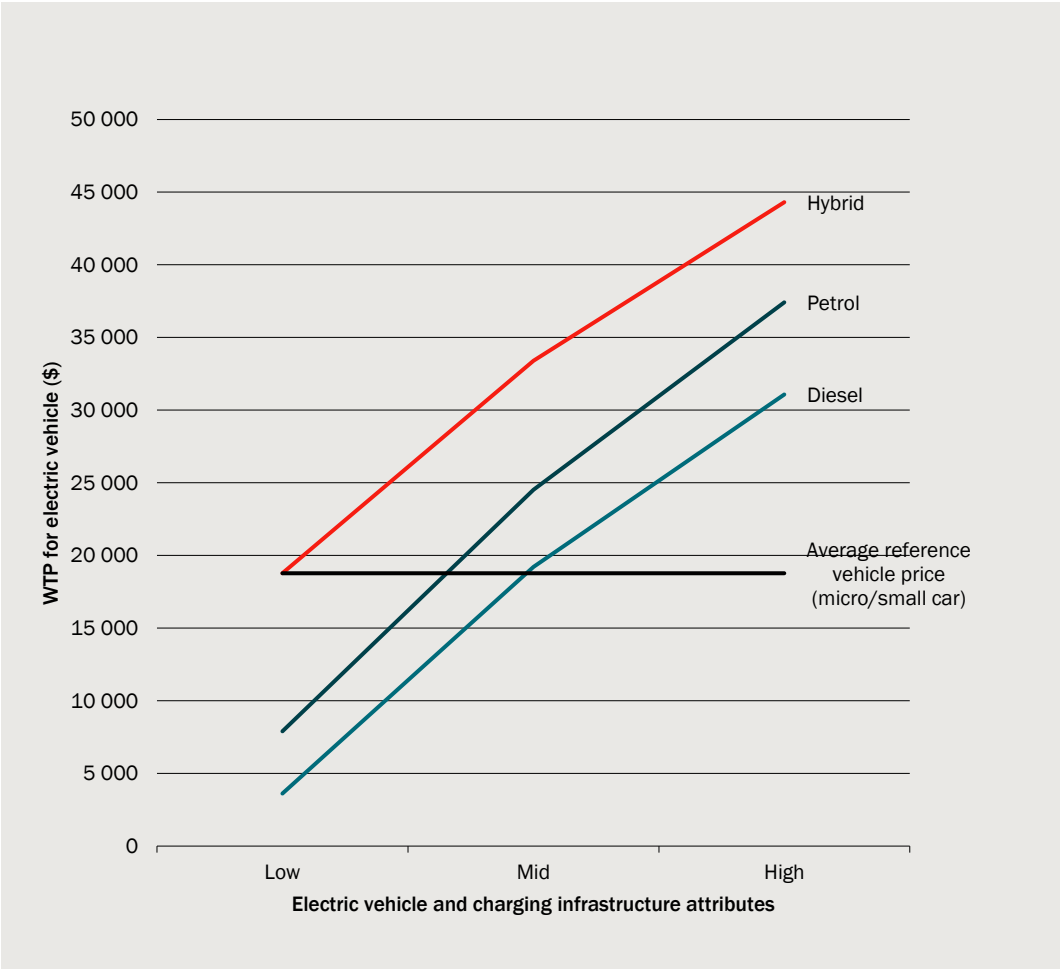
Micro/small car n=547, Medium car n=1254, Large car/People mover/Family wagon n=336, SUV n=696, Van/Ute n=137, reweighted to account for oversampling of persons with university degrees

Average reference vehicle prices: Micro/small car $18 775, Medium car $27 289, Large car/People mover/Family wagon $33 952, SUV $34 670, Van/Ute $27 905

Data source: CIE

Figure 5.6 shows the difference in demand for micro/small electric vehicles for consumers of different reference vehicle fuel types. It shows that consumers intending to purchase a small hybrid vehicle could switch to a BEV at purchase price parity even for a BEV with the worst attribute levels used in this study. Consumers intending to purchase a small diesel vehicle, in contrast, would not switch to a BEV at purchase price parity even at the midpoint of the attribute levels used in the study. The results for consumers intending to purchase a medium vehicle are similar (see figure 5.7).

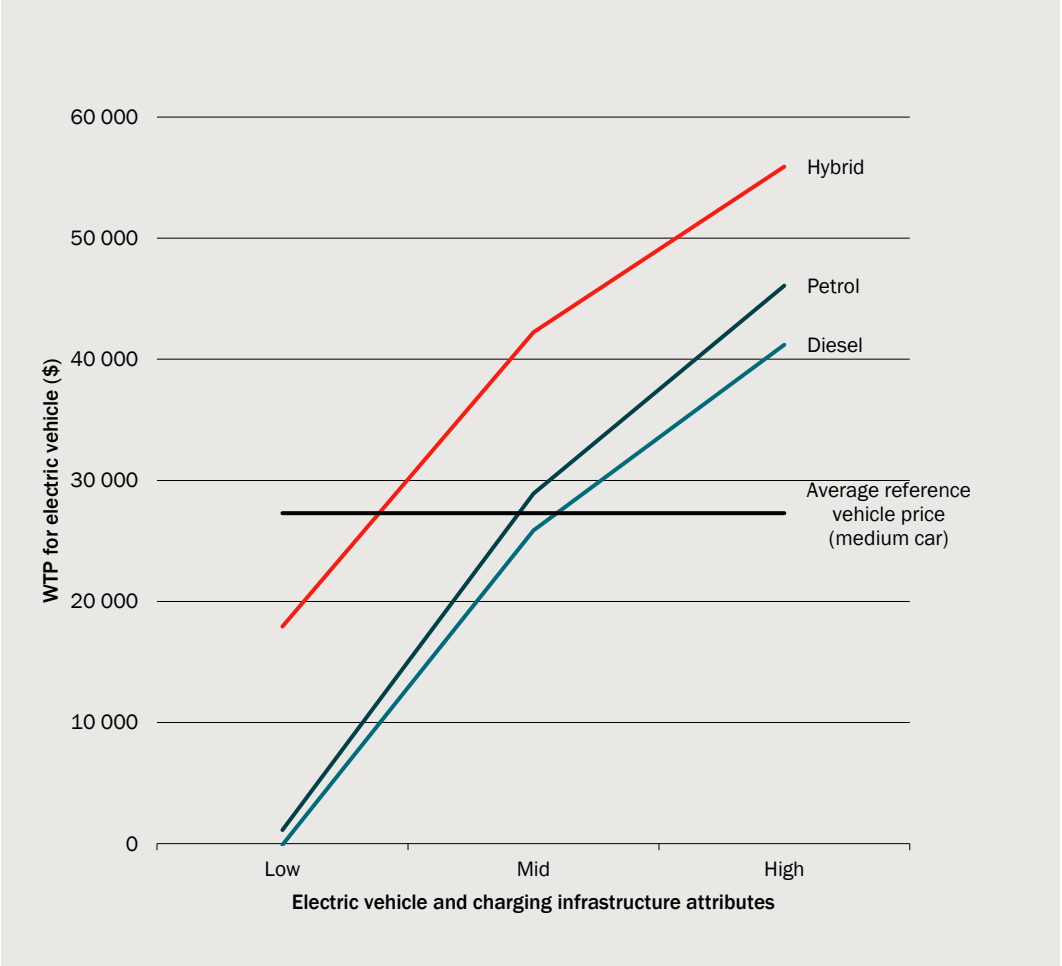
5.6 Demand for micro/small battery electric vehicles, by reference vehicle fuel type



Micro/small car petrol n=430, diesel n=18, hybrid n=99, reweighted to account for oversampling of persons with university degrees

Data source: CIE

5.7 Demand for medium battery electric vehicles, by reference vehicle fuel type

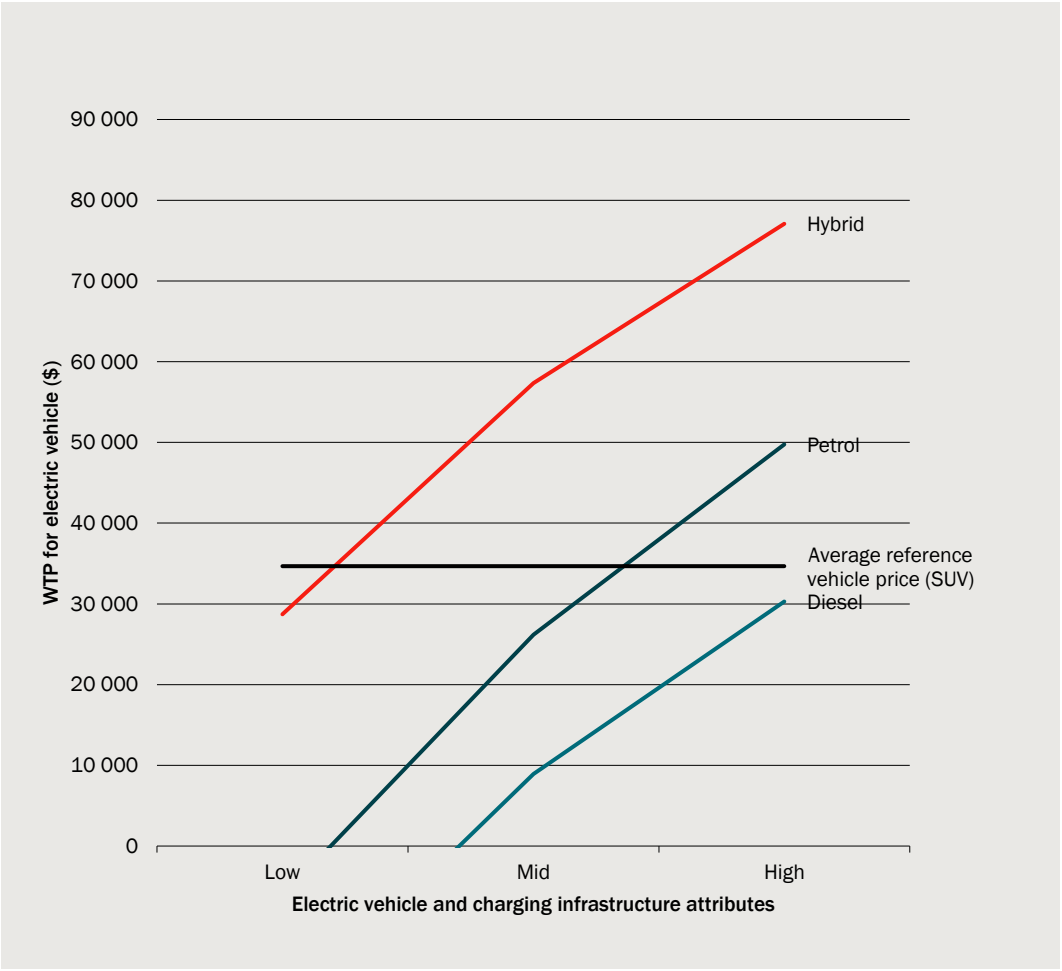


Medium car petrol n=904, diesel n=69, hybrid n=281, reweighted to account for oversampling of persons with university degrees

Data source: CIE

The same analysis applied to consumers intending to purchase an SUV is illustrated in figure 5.8. It shows that consumers intending to purchase a petrol SUV would switch to a BEV SUV at the best attribute levels used in the study, however consumers intending to purchase a diesel SUV would not make this switch.

5.8 Demand for SUV battery electric vehicles, by reference vehicle fuel type



SUV petrol n=461, diesel n=131, hybrid n=104, reweighted to account for oversampling of persons with university degrees

Data source: CIE

Determinants of demand for EVs

- **The attributes with the largest impact on demand are:**
  - **Purchase price;**
  - **Running cost; and**
  - **Battery range.**
- **Towing was also important for some vehicle types and fuel range was also important for PHEVs.**
- **The value placed on improvements in battery range decreases as destination and highway charging availability improves, and vice versa.**

The changes in the 'indifference price' or WTP for an EV resulting from changes in specific vehicle or charging attributes are shown in table 5.9.

5.9 Average willingness to pay for a marginal change in vehicle/charging attributes

Attribute	Unit	Marginal WTP ($ in purchase price)
Fuel range (PHEV only)	per 50 km	1548
Acceleration	per second (decrease)	388
Towing capacity	per 250 kg	1244
Carbon emissions	Per 50 g/km (decrease)	244
Destination charging time	Change from 120 to 60 minutes	686
Destination charging time	Change from 60 to 15 minutes	25
Highway charging time	Change from 60 to 30 minutes	1350
Highway charging time	Change from 30 to 15 minutes	1137
Highway charging time	Change from 15 to 5 minutes	1120
Running cost	per $/100km (decrease)	1792

All vehicle types n=3021, reweighted to account for oversampling of persons with university degrees

Source: CIE

The estimated WTP for some of the vehicle and charging attributes varies, depending on the levels of other attributes. The WTP for a 50 km improvement in battery range is shown in table 5.10 for various levels of battery range and the availability of charging stations on major highways. It shows that the value of incremental improvements in battery range decreases as battery range increases and as availability of charging on highways improves. For example, the value of improving battery range from 250 km to 300 km would be roughly halved if the distance between highway charging stations decreased from 300 km to 100 km.

5.10 Average willingness to pay for a 50 km increase in battery range ($) by availability of highway charging

Battery range	Availability of charging on major highways		
km	every 300 km	every 200 km	every 100 km
150	3286	2366	1446
250	2230	1678	1126
350	1777	1383	988
450	1526	1219	912

All vehicle types n=3021, reweighted to account for oversampling of persons with university degrees

Note: Assumes charging available at 10 per cent of major shopping centres and commercial car parks

Source: CIE

Figure 5.11 shows that the value of incremental improvement in battery range decreases with the availability of charging at shopping centres and car parks, but to a lesser extent than with improvements in highway charging availability.

5.11 Average willingness to pay for a 50 km increase in battery range ($) by availability of destination charging

Battery range	Availability of charging at major shopping centres and commercial car parks		
km	10 per cent	50 per cent	100 per cent
150	3286	2805	2205
250	2230	1941	1581
350	1777	1571	1314
450	1526	1365	1165

All vehicle types n=3021, reweighted to account for oversampling of persons with university degrees

Note: Assumes charging stations situated every 300 km on major highways

Source: CIE

The value of charging availability decreases sharply with improvements in battery range, as shown in table 5.12.

5.12 Average willingness to pay for improvements in availability of charging ($)

Battery range	Availability of charging on major highways		Availability of charging at major shopping centres and commercial car parks
km	every 300 km to every 200 km	every 200 km to every 100 km	per 10 percentage points
150	4782	2107	382
230	3602	927	228
320	2691	16	109

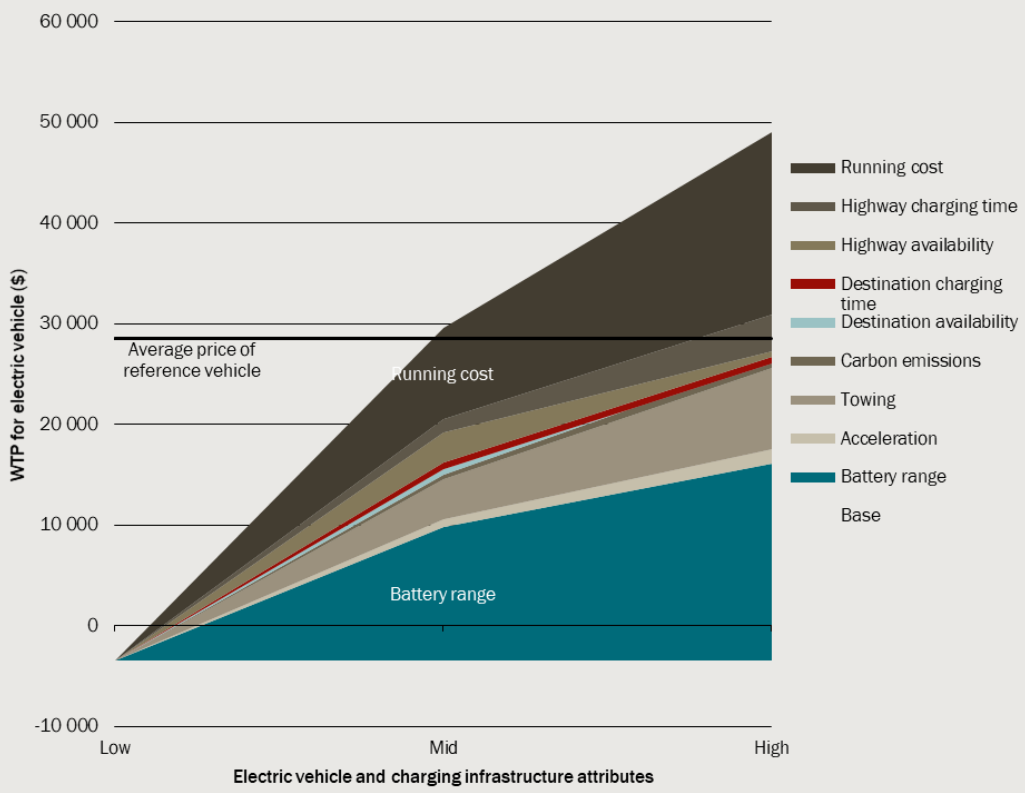
All vehicle types n=3021, reweighted to account for oversampling of persons with university degrees

Note: Assumes vehicle is a battery electric vehicle, rather than a plug-in hybrid electric vehicle

Source: CIE

Figure 5.13 shows that when moving from the worst to the best attribute levels in the survey, roughly one third of the overall demand impact for all vehicle types can be attributed to running cost (35 per cent), another third to battery range (37 per cent) and the remaining third to the other attributes in the study, the most significant of which are towing (15 per cent) and highway charging time (7 per cent).

5.13 Decomposition of demand for battery electric vehicles relative to petrol reference vehicle (all vehicle types)



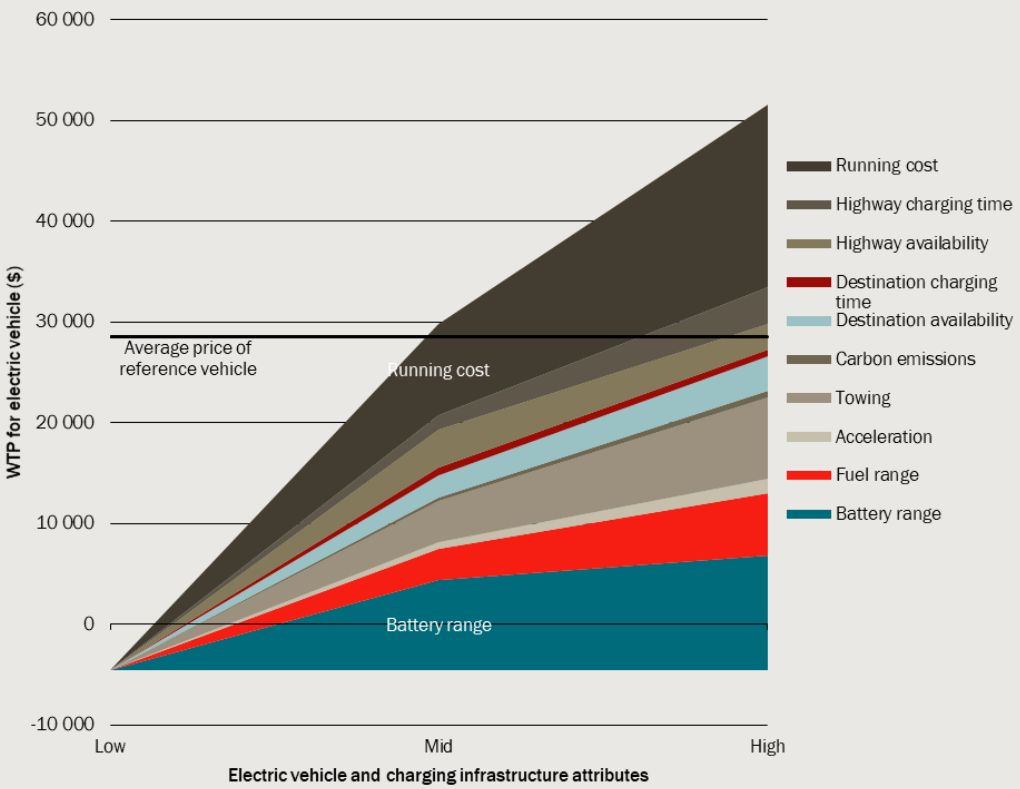
All No screening	Petrol	Battery electric		
		Low	Mid	High
Battery range (km)		150	575	1000
Fuel range (km)	600	0	0	0
Acceleration (sec 0-100km/h)	10.7	12.3	10.5	8.6
Towing capacity (tonnes)	1.63	0.00	0.82	1.63
Carbon emissions (g/km)	239	167	84	0
Destination availability (% of shops/parking)		10	50	100
Destination charging time (minutes)		120	60	15
Highway availability (km between chargers)		300	200	100
Highway charging time (minutes)		60	30	5
Running cost ($/100km)	20.3	15.2	10.2	5.1

All vehicle types n=3021, reweighted to account for oversampling of persons with university degrees

Data source: CIE

Figure 5.14 provides the same information for PHEVs relative to a petrol reference vehicle. The results are similar to those for BEVs, except that the contribution from battery range is lower (primarily because the battery range levels were lower for PHEVs, with a maximum of just 300 km) and fuel range also plays a role.

5.14 Decomposition of demand for plug-in hybrid electric vehicles relative to petrol reference vehicle (all vehicle types)



All No screening	Petrol	Plug-in hybrid electric		
		Low	Mid	High
Battery range (km)		50	175	300
Fuel range (km)	600	300	400	500
Acceleration (sec 0-100km/h)	10.7	12.3	10.5	8.6
Towing capacity (tonnes)	1.63	0.00	0.82	1.63
Carbon emissions (g/km)	239	239	167	96
Destination availability (% of shops/parking)		10	50	100
Destination charging time (minutes)		120	60	15
Highway availability (km between chargers)		300	200	100
Highway charging time (minutes)		60	30	5
Running cost ($/100km)	20.3	15.2	10.2	5.1

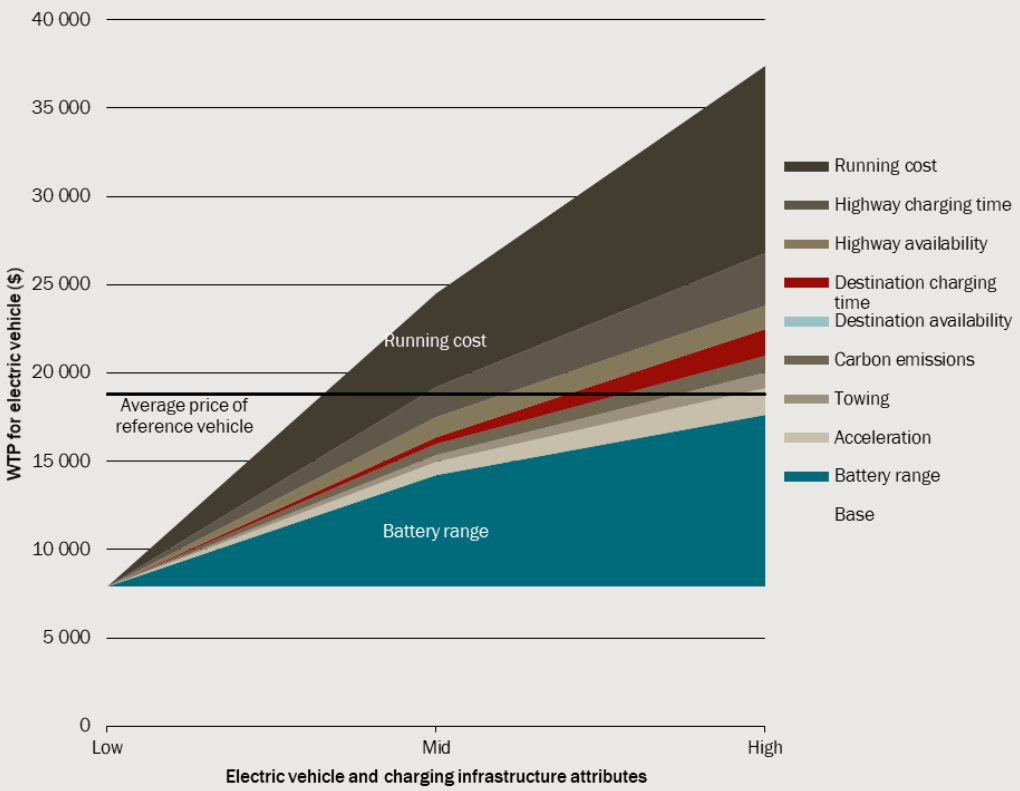
All vehicle types n=3021, reweighted to account for oversampling of persons with university degrees

Data source: CIE

Analysing the determinants of demand for each vehicle type separately (see figures 5.15 to 5.17 for the three vehicle types with the largest sample sizes) shows that:

- battery range is less important to consumers looking to purchase a micro/small vehicle than it is to other consumers, though it remains one of the two largest determinants;
- carbon emissions are more important to consumers looking to purchase a micro/small vehicle than it is to other consumers, though it remains a relatively minor influence on demand; and
- battery range and towing are valued more highly by consumers looking to purchase an SUV than by other consumers.

5.15 Decomposition of demand for micro/small battery electric vehicles relative to petrol reference vehicle

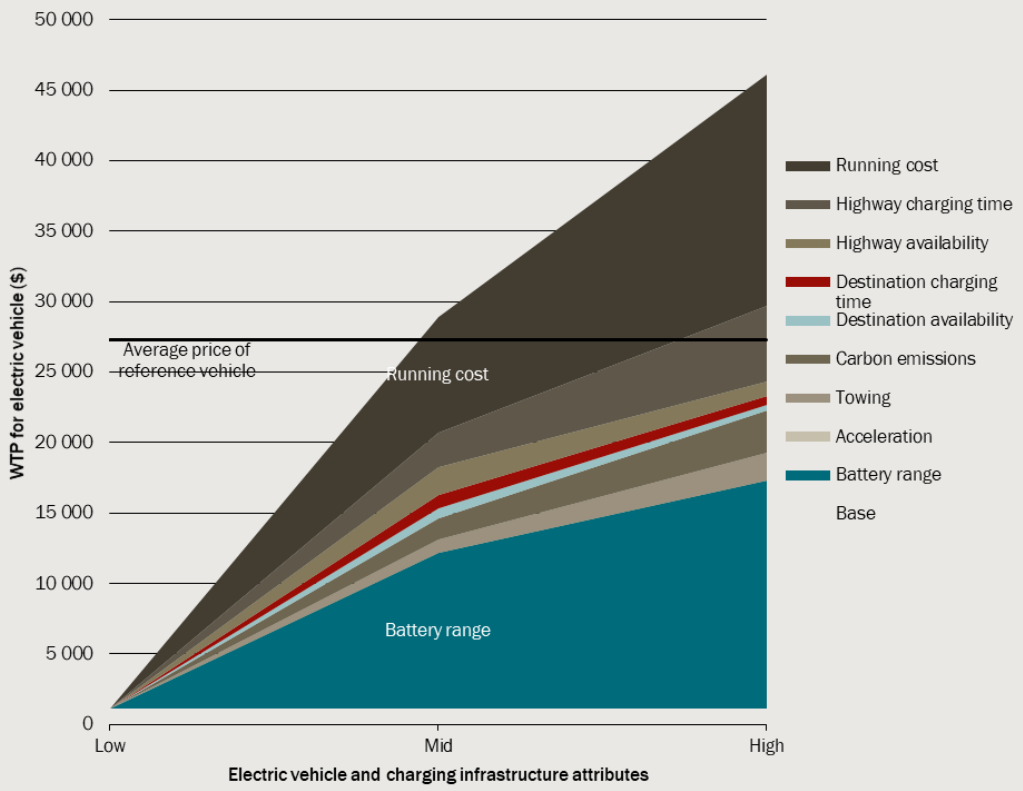


Micro/small car No screening	Petrol	Battery electric		
		Low	Mid	High
Battery range (km)		150	575	1000
Fuel range (km)	520	0	0	0
Acceleration (sec 0-100km/h)	11.0	12.7	10.8	8.9
Towing capacity (tonnes)	0.70	0.00	0.35	0.70
Carbon emissions (g/km)	175	123	61	0
Destination availability (% of shops/parking)		10	50	100
Destination charging time (minutes)		120	60	15
Highway availability (km between chargers)		300	200	100
Highway charging time (minutes)		60	30	5
Running cost ($/100km)	17.0	12.8	8.5	4.3

Micro/small car n=547, reweighted to account for oversampling of persons with university degrees

Data source: CIE

5.16 Decomposition of demand for medium battery electric vehicles relative to petrol reference vehicle

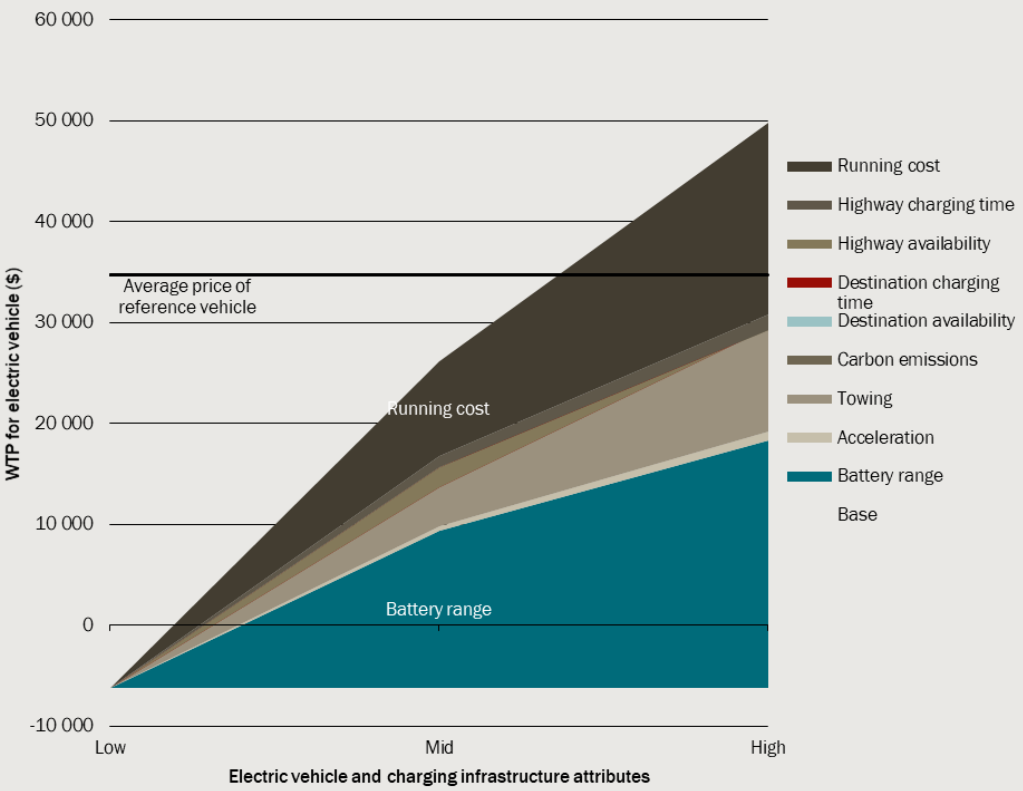


Medium car No screening	Petrol	Battery electric		
		Low	Mid	High
Battery range (km)		150	575	1000
Fuel range (km)	640	0	0	0
Acceleration (sec 0-100km/h)	7.0	8.1	6.8	5.6
Towing capacity (tonnes)	1.20	0.00	0.60	1.20
Carbon emissions (g/km)	230	161	81	0
Destination availability (% of shops/parking)		10	50	100
Destination charging time (minutes)		120	60	15
Highway availability (km between chargers)		300	200	100
Highway charging time (minutes)		60	30	5
Running cost ($/100km)	19.0	14.3	9.5	4.8

Medium car n=1254, reweighted to account for oversampling of persons with university degrees

Data source: CIE

5.17 Decomposition of demand for SUV battery electric vehicles relative to petrol reference vehicle



SUV No screening	Petrol	Battery electric		
		Low	Mid	High
Battery range (km)		150	575	1000
Fuel range (km)	640	0	0	0
Acceleration (sec 0-100km/h)	10.0	11.5	9.8	8.1
Towing capacity (tonnes)	2.20	0.00	1.10	2.20
Carbon emissions (g/km)	235	165	82	0
Destination availability (% of shops/parking)		10	50	100
Destination charging time (minutes)		120	60	15
Highway availability (km between chargers)		300	200	100
Highway charging time (minutes)		60	30	5
Running cost ($/100km)	21.0	15.8	10.5	5.3

SUV n=696, reweighted to account for oversampling of persons with university degrees

Data source: CIE

Relating demand to consumer characteristics

- **Demand for electric vehicles is higher among younger, female, university-educated, city-dwelling consumers, who are well-informed about electric vehicles, adopt new technology soon after it's released and have made lifestyle/shopping changes for environmental reasons**
- **Consumers in regional areas value towing and battery range more highly than other consumers**
- **Older consumers value towing more highly than younger consumers, while younger consumers place a higher value on reducing carbon emissions**
- **Only consumers without a garage value improvements in the availability of charging at shopping centres and car parks**

Models of consumer choice

We estimated separate models relating vehicle demand to consumer characteristics – one with the full range of consumer characteristics, including attitudes identified using the survey, and one with only characteristics readily observable without conducting a survey.

Model with all consumer characteristics

The model including the full range of consumer characteristics includes interactions between vehicle attributes and:

- location (urban vs regional);
- age;
- gender;
- knowledge of EVs;
- whether purchasing the vehicle as an only or secondary vehicle;
- attitude to the environment;
- attitude to new technology;
- education;
- household income; and
- car accommodation (garage vs other).

These consumer characteristics were interacted primarily with an indicator variable for EV fuel types, though other attributes including purchase price, running cost, towing capacity and battery range were interacted with some characteristics. The model was developed using an iterative process of running separate models on subgroups to identify attributes for interaction, running a pooled model with a large number of interactions and removing statistically insignificant interactions until only significant interactions remained. The detailed estimation output is provided at appendix D.

Model with only observable consumer characteristics

A second model including only consumer characteristics observable in ABS data included interactions between vehicle attributes and:

- location (urban vs regional);
- age;
- gender;
- education; and
- household income.

The results from this model were similar to those of the full model. Some minor differences include:

- the finding of variation in preferences towards carbon emissions and towing capacity between middle-aged respondents and respondents aged over 60 years; and
- an even larger difference in WTP for EVs between respondents with and without a university degree.

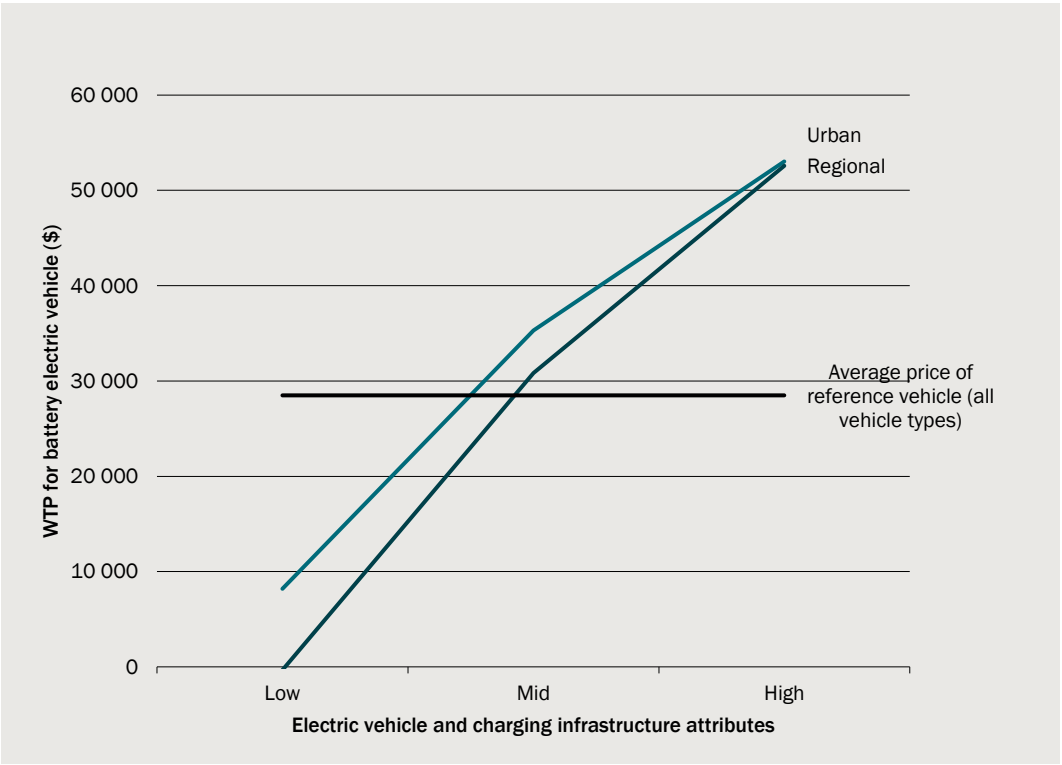
In the remainder of this chapter, we report only results from the larger model; however, the estimation output for both models is provided at appendix D.

Impact of consumer characteristics on demand for EVs

There is significant variation in demand for EVs across consumers. We illustrate the variation in demand across consumers with differing characteristics by plotting each group's WTP for the EV scenarios examined above and detailed in table 5.1.

It is important to remember impacts of consumer characteristics reported in this section are the impact of changing the specified respondent characteristic while holding all of the other characteristics constant.

5.18 Impact of location

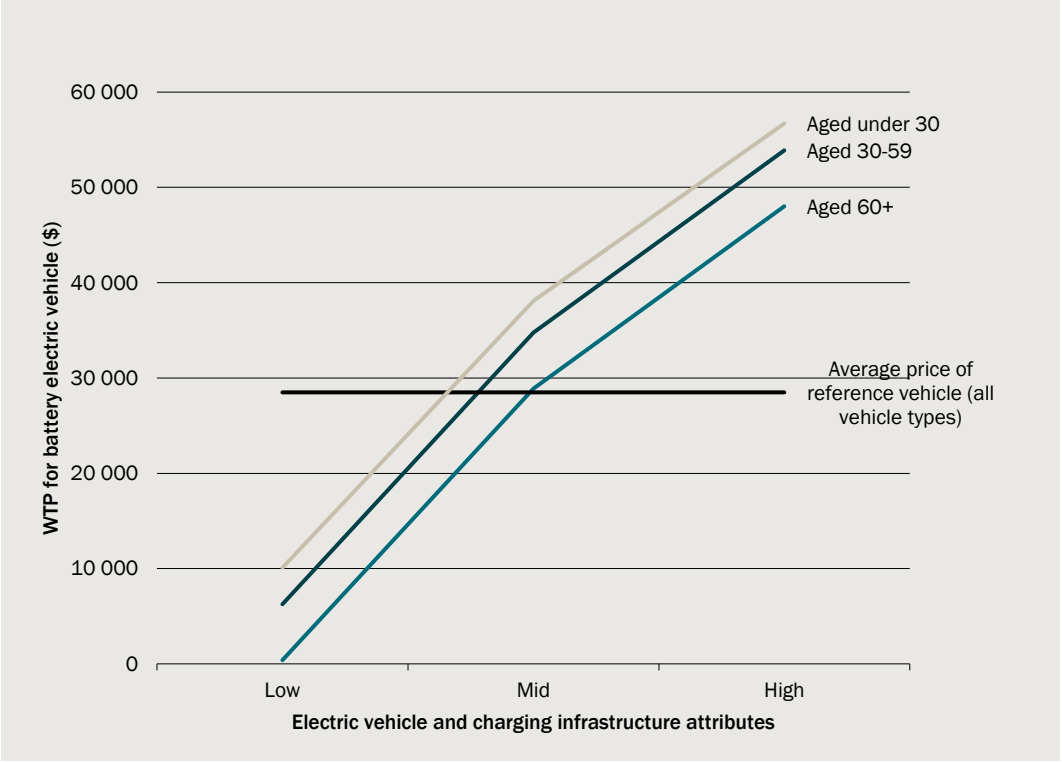


Urban n=2054, Regional n=967

Data source: CIE

Consumers in urban areas are likely to switch to EVs before consumers in regional areas, holding all other characteristics constant. Their WTP for an EV with the worst attributes used in the survey is around $8 500 higher than regional consumers' WTP, on average. This difference narrows as the battery range of EVs improves.

5.19 Impact of age



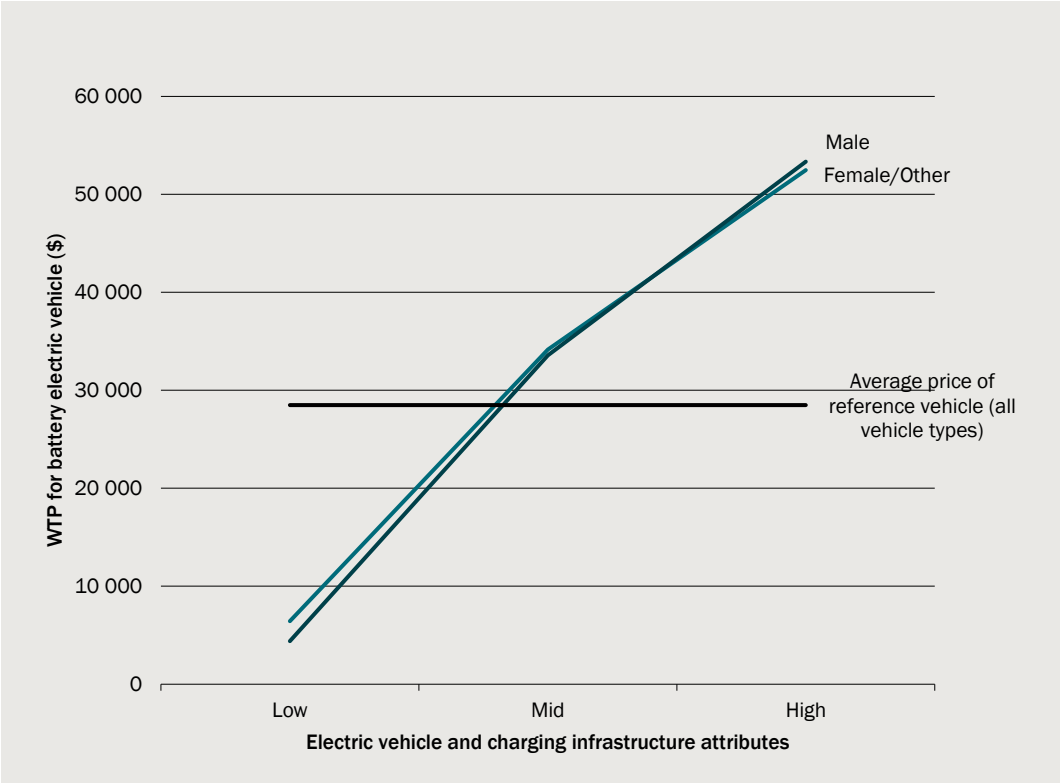
Aged under 30 n=594, Aged 30-59 n=1629, Aged 60+ n=798

Data source: CIE

Consumers aged under 30 years are likely to switch to EVs before older consumers, holding other characteristics constant. Their WTP for EVs is roughly $9 000 higher than that of consumers aged over 60 years, on average.

Although a statistically significant interaction with gender was included in the model, demand for EVs was similar across genders.

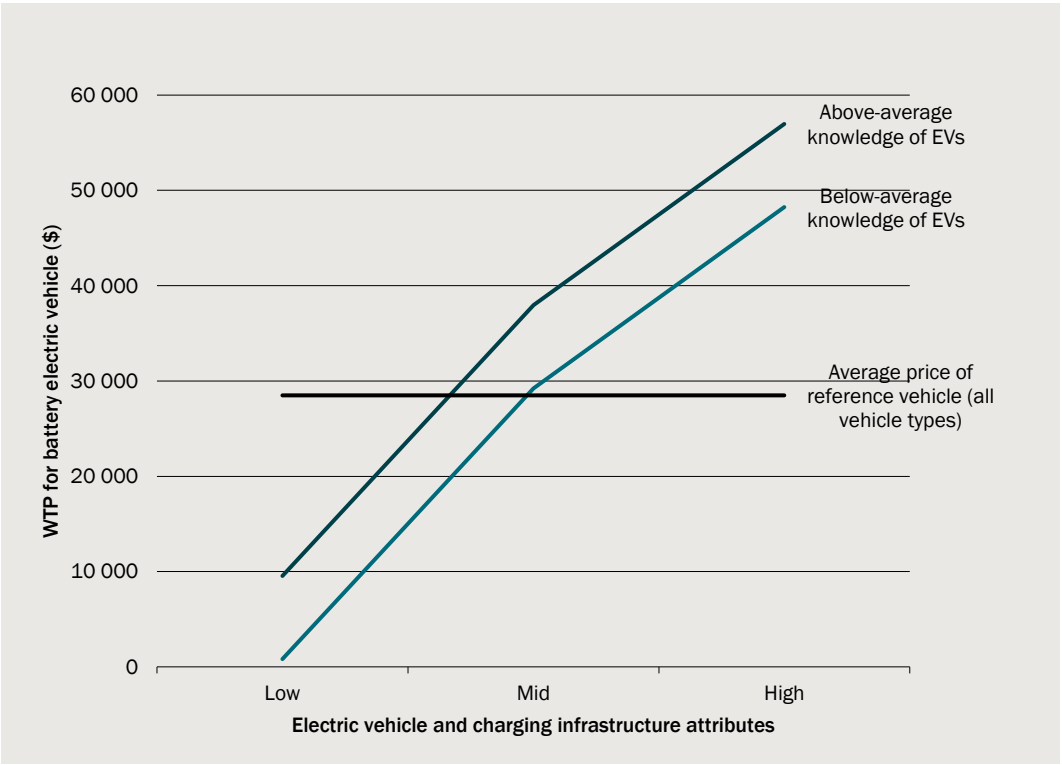
5.20 Impact of gender



Male n=1446, Female/other n=1575

Data source: CIE

5.21 Impact of knowledge about electric vehicles

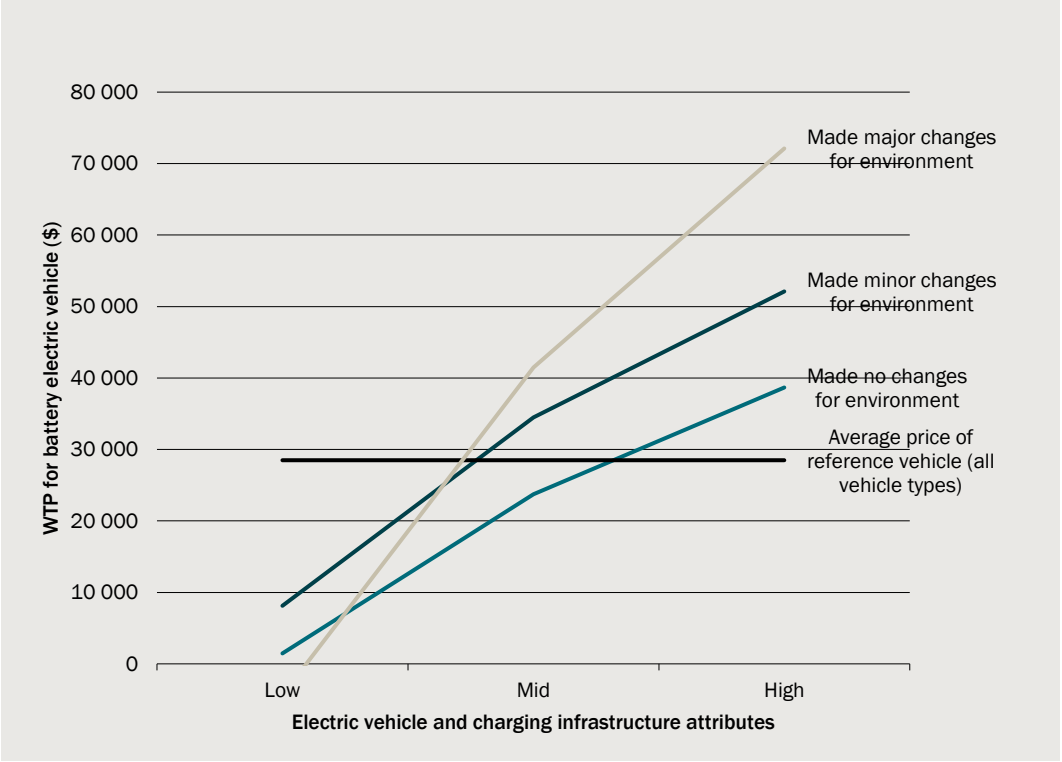


Above-average knowledge of EVs n=1608, Below-average knowledge of EVs n=1413

Data source: CIE

Consumers who are informed about EVs are more likely to switch to EVs before other consumers, holding other characteristics constant. Their WTP for EVs is around $8 700 higher than that of their less-informed counterparts. It is difficult to infer from this result the impact that an information campaign would have on demand. There may be some endogeneity, with demand causing knowledge as well as knowledge causing demand. In other words, people with an inherent taste for EVs may have informed themselves about EVs, so that some of the difference we see in the chart is due to correlation rather than causation.

5.22 Impact of attitude to environment

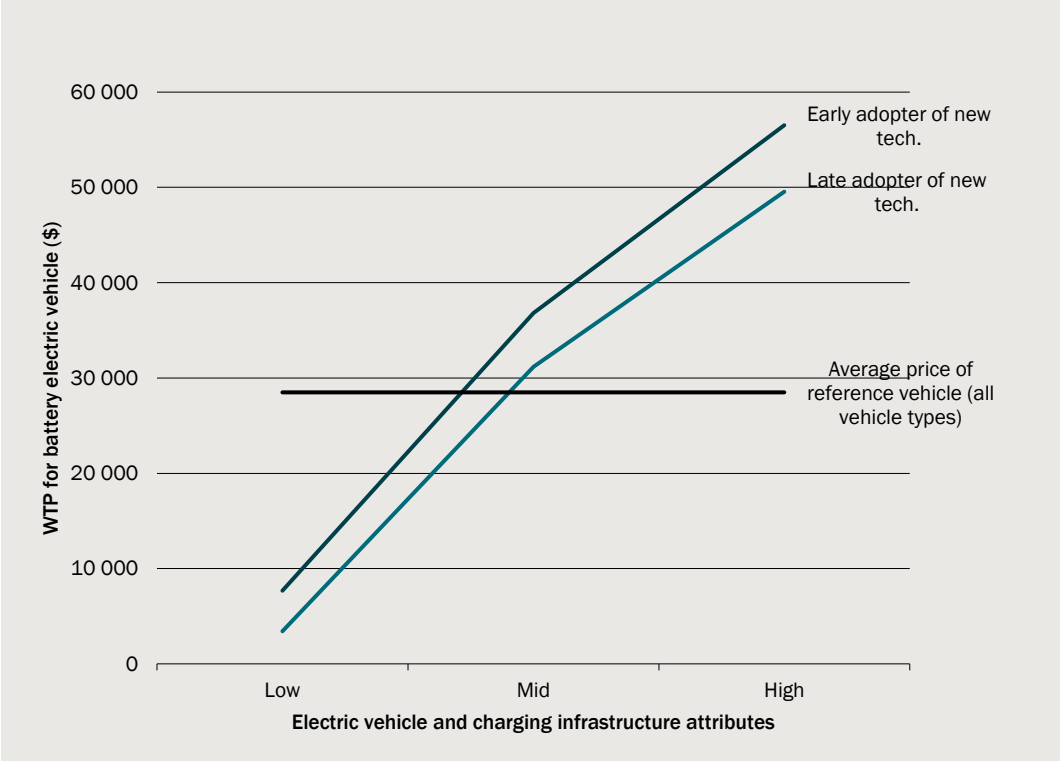


Made major changes n=664, Made minor changes n=2014, Made no changes n=343

Data source: CIE

As EV attributes improve beyond the midpoint of those used in the survey, consumers that have made larger changes to their lifestyle and shopping habits for environmental reasons are more likely to purchase EVs than consumers that have made smaller or no changes, holding other characteristics constant. Of all the consumer characteristics included in the model, this characteristic has the largest effect on demand. The most environmentally-conscious consumers are WTP around $18 000 more for an EV with midpoint attribute levels than the least environmentally-conscious consumers. This figure is even higher for EVs with the best attribute levels. Consumers that have made no changes to lifestyle or shopping for environmental reasons would not purchase an EV with mid-level attributes even at purchase-price parity.

5.23 Impact of attitude to new technology

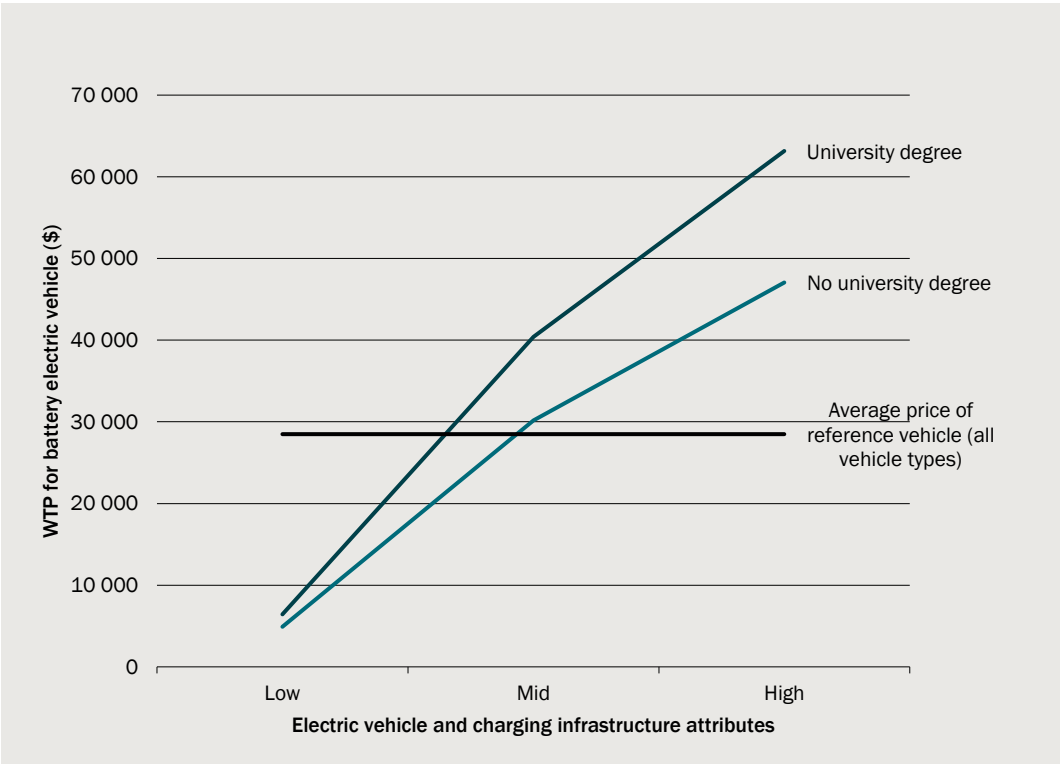


When buying products other than vehicles, do you usually buy the newest technology soon after it becomes available? Yes n=385, No n=1574, (not shown: Sometimes n=1062)

Data source: CIE

Consumers indicating they are usually or sometimes early adopters of new technology are more likely to purchase an EV before consumers identifying as late adopters, holding other characteristics constant. Early adopters' WTP for an EV is $4 000 to $7 000 higher than other consumers, on average, depending on the attributes of the EV.

5.24 Impact of education

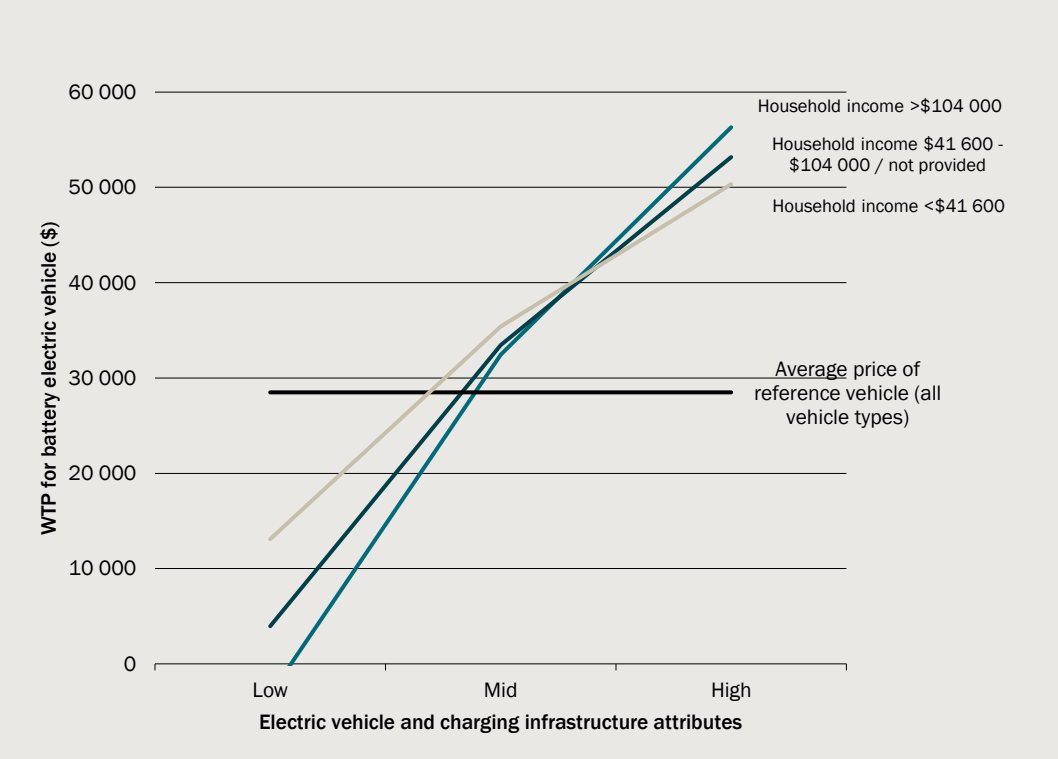


Do you have a university degree? Yes n=1309, No n=1712

Data source: CIE

Demand from consumers with university degrees is higher than demand from other consumers, holding other characteristics constant. The difference between the two groups increases as the attributes of EVs improve. For an EV with midpoint attribute levels, university graduates are willing to pay around $10 000 more than consumers without a degree, on average, holding other characteristics constant.

5.25 Impact of household income



Household income >$104k n=777, $41.6k-$104k/not provided n=1471, <$41.6k n=773

Data source: CIE

Household income does not have a major impact on demand for EVs (relative to a conventional vehicle) when all other characteristics are held constant. Income is likely to be correlated with other characteristics that are related to demand for EVs, such as urban location and university education (positively related to WTP) and age (negatively related to WTP). Higher income households appear likely to respond more to improvements in EV attributes than lower income households.

Consumers place different values on specific vehicle attributes

There is also variation in the values placed by different groups of consumers on specific vehicle attributes. The most significant differences are as follows.

Regional consumers were willing to pay twice as much (around $2 800 more per tonne) for additional towing capacity as urban consumers. They also placed a higher value on battery range (by $4 per km or 8 per cent).

Consumers aged over 60 years were willing to pay three times as much (around $3 400 more per tonne) for towing capacity as consumer aged under 30 years. In contrast, they were willing to pay 90 per cent less ($27 less per g/km) for reduced carbon emissions.

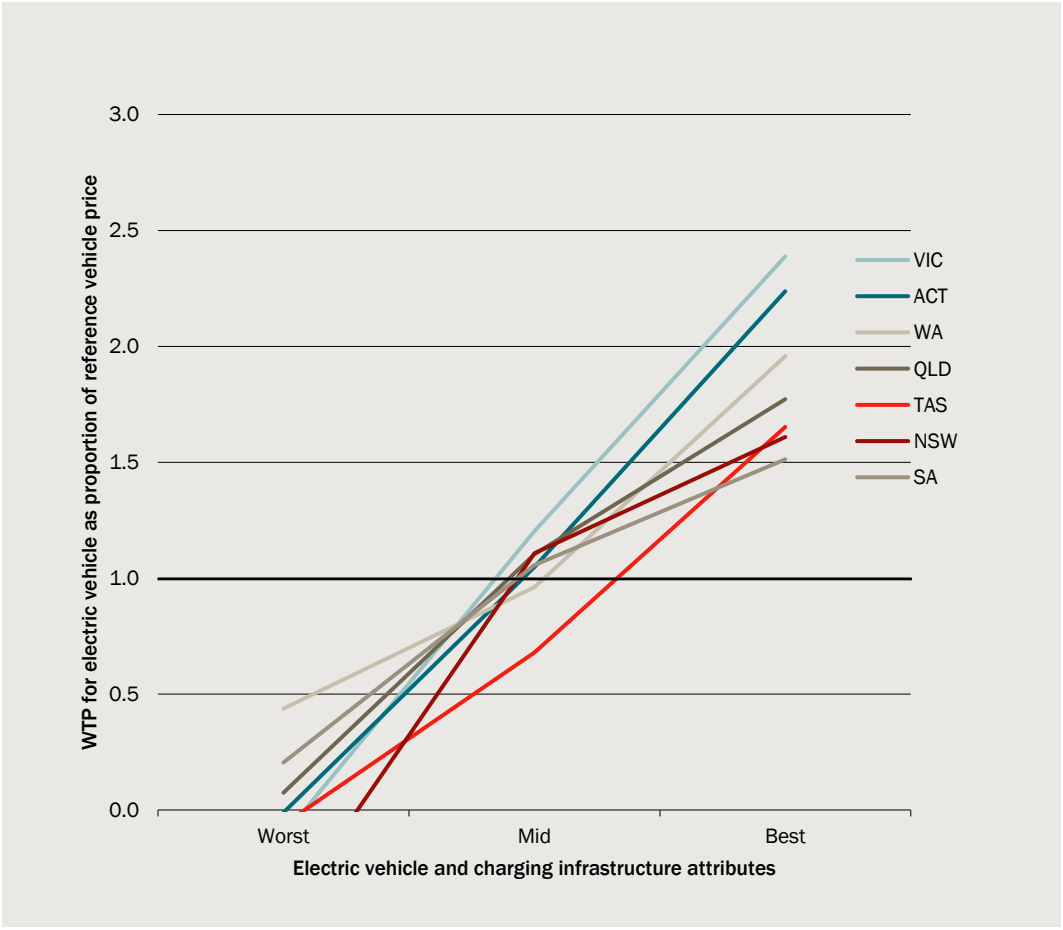
Consumers purchasing their only vehicle, as distinct from consumers with multiple vehicles after the purchase, were willing to pay three times more (around $500 more per second) for improvements in acceleration.

Consumers with a garage are not willing to pay anything for improvements in destination charging availability, whereas consumers without a garage are willing to pay an additional $660 on their vehicle purchase price for every 10 percentage point increase in the percentage of major shops and car parks with charging stations.

Demand variation across States and Territories

We ran separate models for each State and Territory (see the estimation output in appendix D). Demand for EVs with midpoint attribute levels was very similar across States and Territories, though it should be noted the sample sizes were small for Tasmania, the ACT and the Northern Territory. There is some variation in demand for EVs with the best attribute levels, with Victorian consumers willing to pay more than consumers in NSW, on average, though it should be noted this hypothetical vehicle is at the extreme of the range used in the study and demand is quite similar across most of that range.

5.26 Demand for electric vehicles by State



Data source: CIE

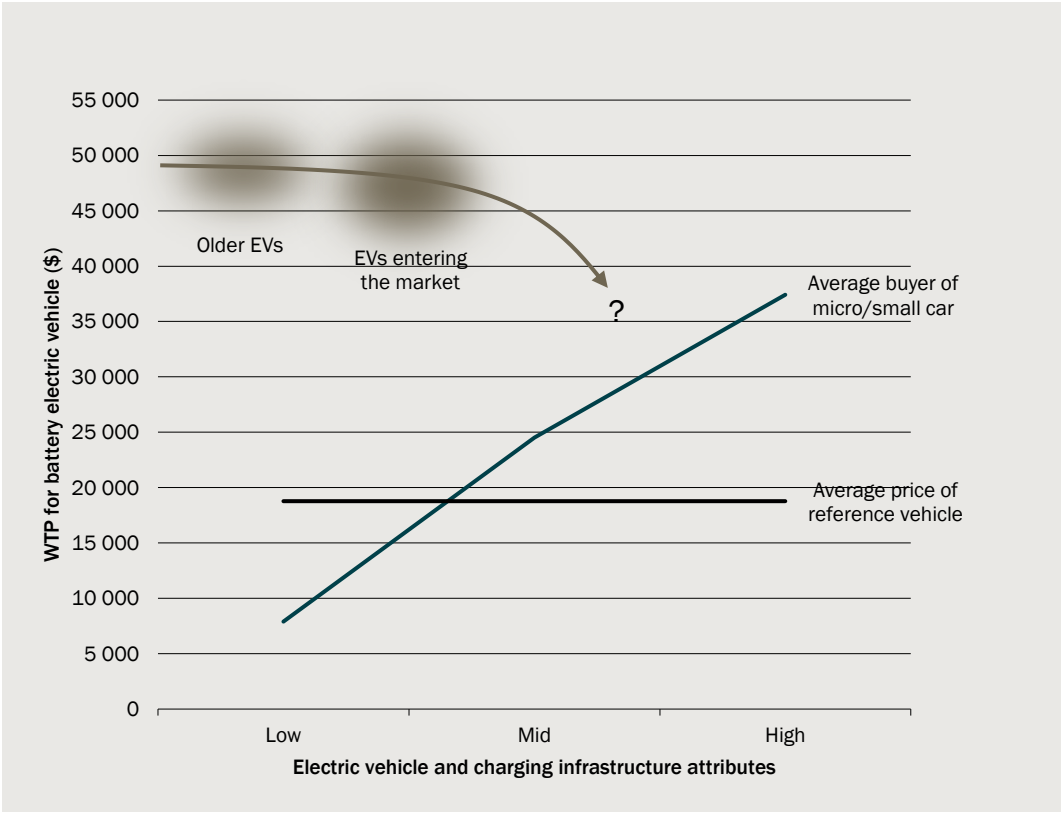
6 Discussion

Relating results to existing EVs

The results of this study indicate that consumers will purchase an EV rather than their preferred conventional fuel vehicle once the vehicle attributes are good enough and/or once the price is low enough.

It is currently difficult to purchase an electric vehicle in Australia in the vehicle classes with highest demand. This is expected to change in the coming years, with the Nissan Leaf, Hyundai Kona, Hyundai Ioniq and Renault Zoe all advertised to be entering the Australian consumer market by 2019. While there is still some uncertainty regarding the price and final specifications for some of these vehicles, the modelling conducted in this report suggests that these vehicles are still some distance away from being preferred to conventional vehicles by a majority of consumers. This is true even when restricting the sample to demographic groups most likely to purchase an electric vehicle.

6.1 Willingness to pay for EVs compared to existing vehicles



Note: Older EVs are based on the 2012 Nissan Leaf (~$47 000) and the 2012 Mitsubishi MiEV (~$48 800), while EVs entering the market are based on the 2018 Nissan Leaf (~$50 000), Hyundai Ioniq (~$43 000) and Renault Zoe (~$51 000)

Data source: CIE

To develop an understanding of the extent to which EVs would need to improve to attract the average consumer, Table 6.2 shows three hypothetical examples of vehicles that would be preferred to Australia's best-selling small car – the Toyota Corolla – by half of all consumers (i.e. the average consumer is indifferent). It shows that mass adoption of electric vehicles would require:

- significant cost reductions to the point of purchase price parity, with relatively minor improvements in EV technology (vehicle 1);
- significant cost reductions to the point of purchase price parity, with significant improvements in EV charging infrastructure (vehicle 2); or
- significant improvements in EV technology (particularly battery range and running cost), with small cost reductions (vehicle 3).

6.2 Hypothetical vehicles that are equally preferred to a Toyota Corolla

	Toyota Corolla	Vehicle 1	Vehicle 2	Vehicle 3
Fuel type	Petrol	Battery electric	Battery electric	Battery electric
Purchase price ($)	21 240	21 240	21 240	40 000
Fuel range (km)	520	0	0	0
Battery range (km)	0	500	250	1000
Acceleration (sec 0-100 km/h)	11	11	11	7
Towing capacity braked (kg)	700	0	0	700
Carbon emissions (g/km)	175	87.5	87.5	0
Running cost ($/100 km)	17	10	12.5	5
Availability of charging at destinations (per cent)	N/A	10	100	100
Time to charge to 80% at destinations (min)	N/A	120	15	15
Availability of charging on highways (km)	N/A	300	100	100
Time to charge to 80% on highways (min)	N/A	60	5	5

Source: CIE

Comparison with other literature

As far as we know, the present study is the largest study of consumer WTP for electric vehicles conducted in Australia to date and therefore provides the best estimates of likely demand for electric vehicles as technology improves. Nevertheless, it is informative to compare the results from this study with previous studies conducted in Australia and internationally. This serves two key purposes:

- it can identify if any estimated parameters appear to be poorly estimated (for instance, if an estimate had the opposite sign to the corresponding values found in other studies); and
- it can identify areas where Australian demand for electric vehicles may differ from demand in other countries.

Comparing the results from previous studies presents numerous challenges as these studies are conducted using different methodologies, in different periods and in different countries. In particular, the relative WTP for an EV compared to a conventional vehicle is defined differently in each study (and so no attempt is made here to compare these results). Moreover, the results from these studies must be converted into comparable units.[1] Bearing these concerns in mind, some selected comparisons to the results in this study are:

- **Battery range** – This study estimates that an additional dollar of range is valued at around $71 per kilometre, which is at the high end of estimates found in the literature. For instance, Helveston et al. (2015) estimates a value of $73 while Tanaka et al. (2014) find a value of around $20 per kilometre.
- **Carbon emissions** – The figure in this report equates to around $20 per percent reduction in carbon emissions. This compares to figures in the literature from $7 (Hackbarth and Madlener 2013) to $78-$113 (Hirdue et al. 2011).
- **Running costs** – This paper finds that people are willing to pay $2 060 more to reduce the running costs by $1 per kilometre. This is higher than similar figures in the literature such as $750-$1 000 in Tanaka et al. (2014) and $900 in Hirdue et al. (2011).
- **Acceleration** – The study finds a value of $425 per second to reach 100km/h. This is comparable to the figures of $240 (Hirdue et al. 2011) and $1 360 (Helveston et al. 2015).
- **Towing capacity -** This paper found a value of towing of $4870 per tonne which is comparable to a WTP of $4 700 for towing capability found by Bockarjova et al. (2013).
- **Charging station availability** – This paper estimates that improving highway charging availability from every 300km to 100km is valued at around $7 000 (when battery range is low), while Tanaka et al. (2014) estimates that making vehicle charging as common as existing gas stations is worth around $5 000. While these figures are not directly comparable, they are of a similar magnitude.

1 Figures from overseas studies are converted to 2018 Australian dollars using current exchange rates and an inflation rate of 2.5 per cent.

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A Expert peer review

19 November 2018

To whom it may concern

I am writing in my capacity as an expert peer reviewer for the study undertaken by The Centre for International Economics into the demand for electric vehicles in Australia. I conduct this review as an expert in the areas of travel behaviour modelling, and discrete choice experimental design and model estimation. I am a senior lecturer at the Institute of Transport and Logistics Studies at the University of Sydney, and a co-developer of Ngene, a widely used software package for the generation of discrete choice experimental designs.

One of my roles in this study has been to audit and provide feedback on the survey design, with a particular focus on the stated choice experimental design. It is clear that The CIE conforms to best practice in this regard, and demonstrate a high level of understanding. The development and deployment of the study was careful and consultative. In addition to seeking feedback from multiple stakeholders, and myself as a peer reviewer, the stated choice experimental design was updated from previous survey waves as is recommended in the stated choice experimental design literature. In areas such as automobile choice, the literature also advocates the reference alternative approach used by The CIE, that allows the choice task to be tailored to the respondent, with the attribute levels pivoting around this alternative.

An extensive range of multinomial logit models were estimated, after a thorough specification search. Whilst the academic literature often utilises more complex models such as mixed logit and latent class logit, such models are frequently less insightful, as they do not link preferences to specific consumer characteristics. This study exploits its large sample size to estimate a range of such influences. Making discrete choice model results approachable can be challenging, but the approach adopted in this study of reporting the value of the electric vehicle at three quality levels as a proportion of the reference vehicle price is intuitive and approachable. The authors also demonstrate an understanding of where caution is warranted in interpreting the results, for example the possible endogeneity issue when modelling the impact of knowledge on electric vehicle preference.

Overall, I am impressed with this study and consider it a rigorous body of work.

Sincerely

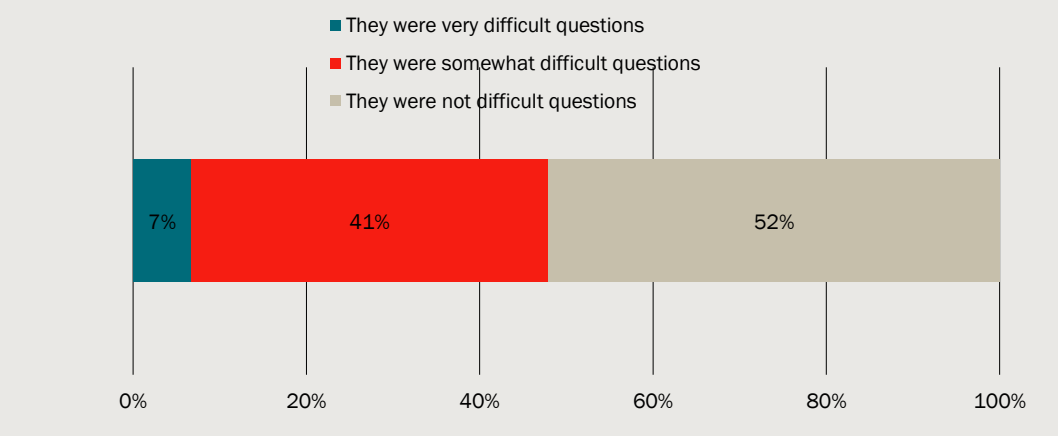
Andrew Collins

B Debriefing questions

Survey difficulty

Although complex, the cognitive burden of the vehicle comparison questions does not appear to have been excessive, with only 7 per cent indicating that they were very difficult.

B.1 Response to difficulty of the questions in the survey

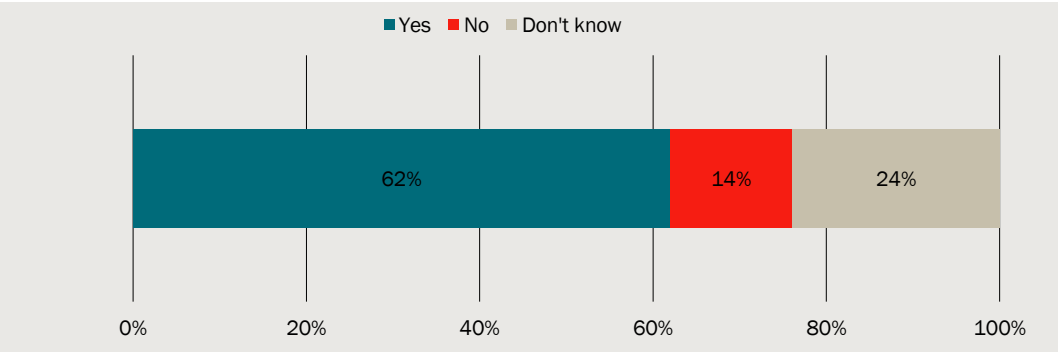


Data source: CIE

Survey plausibility

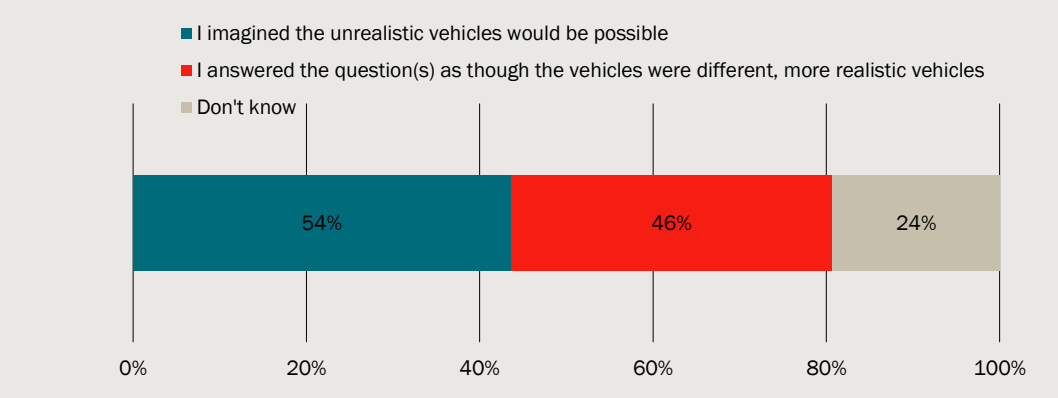
Only 14 per cent of respondents found one or more of the presented future scenarios of vehicles and charging infrastructure to be implausible. Around half of these respondents answered the choice questions as though the implausible scenarios would be possible.

B.2 Response to plausibility of vehicle scenarios



Data source: CIE

B.3 Response to unrealistic vehicle scenarios



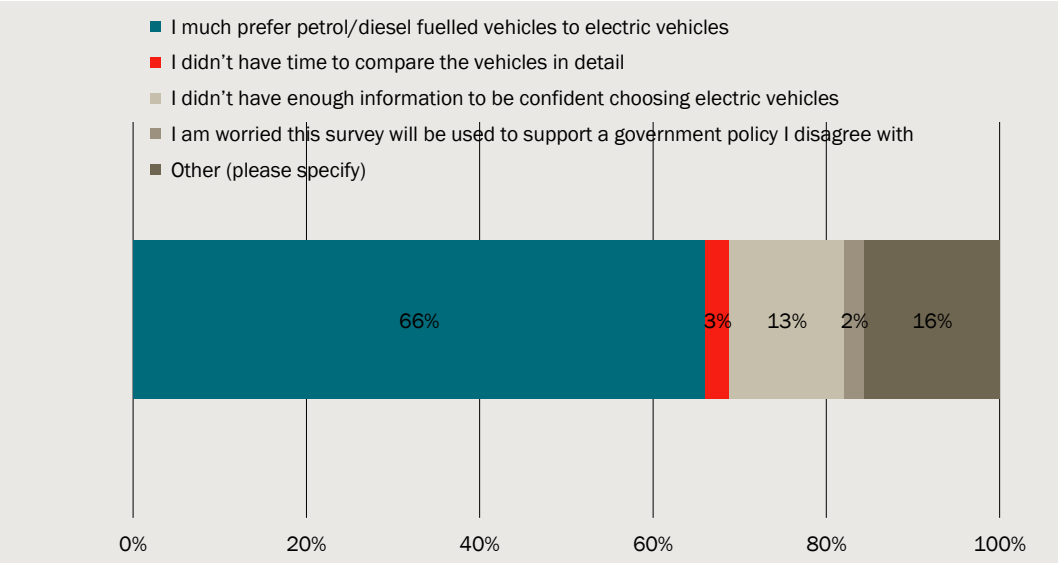
Data source: CIE

Reasons for preferring conventional vehicles

Respondents that chose the reference vehicle in all choice questions were asked the reason for this pattern of choices. Most of these respondents simply indicated a preference for petrol/diesel vehicles over electric vehicles, while 13 per cent revealed they weren't informed well enough for making the choices.

Some of the other reasons stated by the respondents revolved around the initial purchase price of the cars, the immature state of technology, and access to charging infrastructure in remote areas.

B.4 Reasons for preferring conventional vehicles

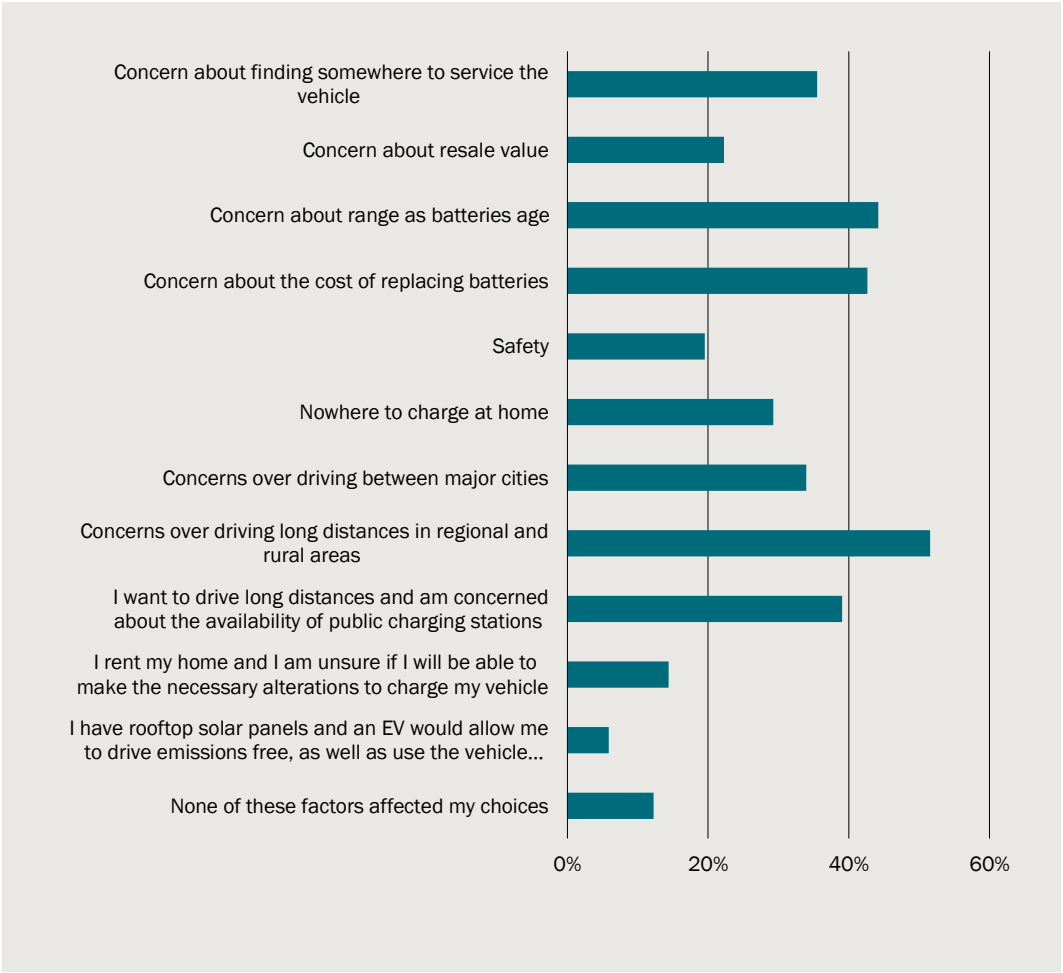


Data source: CIE

Other concerns about electric vehicles

Of the other factors that affected the choices made, some of the main concerns were over driving long distances in regional and rural areas, finding charging and service facilities over these long distances, battery range anxiety, and the cost of replacing the batteries.

B.5 Other concerns about electric vehicles



Data source: CIE

C Specifications for hypothetical vehicles

The specifications for comparisons between BEVs and a reference petrol vehicle are set out in the body of the document in table 5.1. Various other combinations are set out below.

C.1 PHEV scenarios for comparison with petrol reference vehicle

Attribute	Petrol	Plug-in hybrid electric		
		Low	Mid	High
Micro/small car				
Battery range (km)		50	175	300
Fuel range (km)	520	300	400	500
Acceleration (sec 0-100km/h)	11.0	12.7	10.8	8.9
Towing capacity (tonnes)	0.70	0.00	0.35	0.70
Carbon emissions (g/km)	175	175	123	70
Destination availability (% of shops/parking)		10	50	100
Destination charging time (minutes)		120	60	15
Highway availability (km between chargers)		300	200	100
Highway charging time (minutes)		60	30	5
Running cost ($/100km)	17.0	12.8	8.5	4.3
Medium car				
Battery range (km)		50	175	300
Fuel range (km)	640	300	400	500
Acceleration (sec 0-100km/h)	7.0	8.1	6.8	5.6
Towing capacity (tonnes)	1.20	0.00	0.60	1.20
Carbon emissions (g/km)	230	230	161	92
Destination availability (% of shops/parking)		10	50	100
Destination charging time (minutes)		120	60	15
Highway availability (km between chargers)		300	200	100
Highway charging time (minutes)		60	30	5
Running cost ($/100km)	19.0	14.3	9.5	4.8
Large car / People mover / Family wagon				
Battery range (km)		50	175	300
Fuel range (km)	620	300	400	500
Acceleration (sec 0-100km/h)	9.5	10.9	9.3	7.6
Towing capacity (tonnes)	2.05	0.00	1.03	2.05

Attribute	Petrol	Plug-in hybrid electric		
		Low	Mid	High
Carbon emissions (g/km)	270	270	189	108
Destination availability (% of shops/parking)		10	50	100
Destination charging time (minutes)		120	60	15
Highway availability (km between chargers)		300	200	100
Highway charging time (minutes)		60	30	5
Running cost ($/100km)	22.0	16.5	11.0	5.5
SUV				
Battery range (km)		50	175	300
Fuel range (km)	640	300	400	500
Acceleration (sec 0-100km/h)	10.0	11.5	9.8	8.1
Towing capacity (tonnes)	2.20	0.00	1.10	2.20
Carbon emissions (g/km)	235	235	165	94
Destination availability (% of shops/parking)		10	50	100
Destination charging time (minutes)		120	60	15
Highway availability (km between chargers)		300	200	100
Highway charging time (minutes)		60	30	5
Running cost ($/100km)	21.0	15.8	10.5	5.3
Van/Ute				
Battery range (km)		50	175	300
Fuel range (km)	580	300	400	500
Acceleration (sec 0-100km/h)	16.0	18.4	15.6	12.9
Towing capacity (tonnes)	2.00	0.00	1.00	2.00
Carbon emissions (g/km)	285	285	200	114
Destination availability (% of shops/parking)		10	50	100
Destination charging time (minutes)		120	60	15
Highway availability (km between chargers)		300	200	100
Highway charging time (minutes)		60	30	5
Running cost ($/100km)	22.5	16.9	11.3	5.6

Source: CIE

C.2 BEV scenarios for comparison with diesel reference vehicle

Attribute	Diesel	Battery electric		
		Low	Mid	High
Micro/small car				
Battery range (km)		150	575	1000
Fuel range (km)	800	0	0	0
Acceleration (sec 0-100km/h)	11.0	12.7	10.8	8.9

Attribute	Diesel	Battery electric		
		Low	Mid	High
Towing capacity (tonnes)	0.70	0.00	0.35	0.70
Carbon emissions (g/km)	150	105	53	0
Destination availability (% of shops/parking)		10	50	100
Destination charging time (minutes)		120	60	15
Highway availability (km between chargers)		300	200	100
Highway charging time (minutes)		60	30	5
Running cost ($/100km)	14.0	10.5	7.0	3.5
Medium car				
Battery range (km)		150	575	1000
Fuel range (km)	920	0	0	0
Acceleration (sec 0-100km/h)	8.0	9.2	7.8	6.4
Towing capacity (tonnes)	1.60	0.00	0.80	1.60
Carbon emissions (g/km)	165	116	58	0
Destination availability (% of shops/parking)		10	50	100
Destination charging time (minutes)		120	60	15
Highway availability (km between chargers)		300	200	100
Highway charging time (minutes)		60	30	5
Running cost ($/100km)	15.0	11.3	7.5	3.8
Large car / People mover / Family wagon				
Battery range (km)		150	575	1000
Fuel range (km)	920	0	0	0
Acceleration (sec 0-100km/h)	10.5	12.1	10.3	8.5
Towing capacity (tonnes)	2.00	0.00	1.00	2.00
Carbon emissions (g/km)	190	133	67	0
Destination availability (% of shops/parking)		10	50	100
Destination charging time (minutes)		120	60	15
Highway availability (km between chargers)		300	200	100
Highway charging time (minutes)		60	30	5
Running cost ($/100km)	16.5	12.4	8.3	4.1
SUV				
Battery range (km)		150	575	1000
Fuel range (km)	800	0	0	0
Acceleration (sec 0-100km/h)	10.0	11.5	9.8	8.1
Towing capacity (tonnes)	1.85	0.00	0.93	1.85
Carbon emissions (g/km)	185	130	65	0
Destination availability (% of shops/parking)		10	50	100
Destination charging time (minutes)		120	60	15
Highway availability (km between chargers)		300	200	100

Attribute	Diesel	Battery electric		
		Low	Mid	High
Highway charging time (minutes)		60	30	5
Running cost ($/100km)	18.0	13.5	9.0	4.5
Van/Ute				
Battery range (km)		150	575	1000
Fuel range (km)	680	0	0	0
Acceleration (sec 0-100km/h)	16.0	18.4	15.6	12.9
Towing capacity (tonnes)	2.25	0.00	1.13	2.25
Carbon emissions (g/km)	265	186	93	0
Destination availability (% of shops/parking)		10	50	100
Destination charging time (minutes)		120	60	15
Highway availability (km between chargers)		300	200	100
Highway charging time (minutes)		60	30	5
Running cost ($/100km)	20.5	15.4	10.3	5.1

Source: CIE

C.3 PHEV scenarios for comparison with diesel reference vehicle

Attribute	Diesel	Plug-in hybrid electric		
		Low	Mid	High
Micro/small car				
Battery range (km)		50	175	300
Fuel range (km)	800	300	400	500
Acceleration (sec 0-100km/h)	11.0	12.7	10.8	8.9
Towing capacity (tonnes)	0.70	0.00	0.35	0.70
Carbon emissions (g/km)	150	150	105	60
Destination availability (% of shops/parking)		10	50	100
Destination charging time (minutes)		120	60	15
Highway availability (km between chargers)		300	200	100
Highway charging time (minutes)		60	30	5
Running cost ($/100km)	14.0	10.5	7.0	3.5
Medium car				
Battery range (km)		50	175	300
Fuel range (km)	920	300	400	500
Acceleration (sec 0-100km/h)	8.0	9.2	7.8	6.4
Towing capacity (tonnes)	1.60	0.00	0.80	1.60
Carbon emissions (g/km)	165	165	116	66
Destination availability (% of shops/parking)		10	50	100
Destination charging time (minutes)		120	60	15

Attribute	Diesel	Plug-in hybrid electric		
		Low	Mid	High
Highway availability (km between chargers)		300	200	100
Highway charging time (minutes)		60	30	5
Running cost ($/100km)	15.0	11.3	7.5	3.8
Large car / People mover / Family wagon				
Battery range (km)		50	175	300
Fuel range (km)	920	300	400	500
Acceleration (sec 0-100km/h)	10.5	12.1	10.3	8.5
Towing capacity (tonnes)	2.00	0.00	1.00	2.00
Carbon emissions (g/km)	190	190	133	76
Destination availability (% of shops/parking)		10	50	100
Destination charging time (minutes)		120	60	15
Highway availability (km between chargers)		300	200	100
Highway charging time (minutes)		60	30	5
Running cost ($/100km)	16.5	12.4	8.3	4.1
SUV				
Battery range (km)		50	175	300
Fuel range (km)	800	300	400	500
Acceleration (sec 0-100km/h)	10.0	11.5	9.8	8.1
Towing capacity (tonnes)	1.85	0.00	0.93	1.85
Carbon emissions (g/km)	185	185	130	74
Destination availability (% of shops/parking)		10	50	100
Destination charging time (minutes)		120	60	15
Highway availability (km between chargers)		300	200	100
Highway charging time (minutes)		60	30	5
Running cost ($/100km)	18.0	13.5	9.0	4.5
Van/Ute				
Battery range (km)		50	175	300
Fuel range (km)	680	300	400	500
Acceleration (sec 0-100km/h)	16.0	18.4	15.6	12.9
Towing capacity (tonnes)	2.25	0.00	1.13	2.25
Carbon emissions (g/km)	265	265	186	106
Destination availability (% of shops/parking)		10	50	100
Destination charging time (minutes)		120	60	15
Highway availability (km between chargers)		300	200	100
Highway charging time (minutes)		60	30	5
Running cost ($/100km)	20.5	15.4	10.3	5.1

Source: CIE

C.4 BEV scenarios for comparison with hybrid reference vehicle

Attribute	Hybrid	Battery electric		
		Low	Mid	High
Micro/small car				
Battery range (km)		150	575	1000
Fuel range (km)	800	0	0	0
Acceleration (sec 0-100km/h)	11.0	12.7	10.8	8.9
Towing capacity (tonnes)	0.50	0.00	0.25	0.50
Carbon emissions (g/km)	90	63	32	0
Destination availability (% of shops/parking)		10	50	100
Destination charging time (minutes)		120	60	15
Highway availability (km between chargers)		300	200	100
Highway charging time (minutes)		60	30	5
Running cost ($/100km)	12.0	9.0	6.0	3.0
Medium car				
Battery range (km)		150	575	1000
Fuel range (km)	960	0	0	0
Acceleration (sec 0-100km/h)	10.0	11.5	9.8	8.1
Towing capacity (tonnes)	1.10	0.00	0.55	1.10
Carbon emissions (g/km)	110	77	39	0
Destination availability (% of shops/parking)		10	50	100
Destination charging time (minutes)		120	60	15
Highway availability (km between chargers)		300	200	100
Highway charging time (minutes)		60	30	5
Running cost ($/100km)	13.0	9.8	6.5	3.3
Large car / People mover / Family wagon				
Battery range (km)		150	575	1000
Fuel range (km)	800	0	0	0
Acceleration (sec 0-100km/h)	10.0	11.5	9.8	8.1
Towing capacity (tonnes)	1.40	0.00	0.70	1.40
Carbon emissions (g/km)	115	81	40	0
Destination availability (% of shops/parking)		10	50	100
Destination charging time (minutes)		120	60	15
Highway availability (km between chargers)		300	200	100
Highway charging time (minutes)		60	30	5
Running cost ($/100km)	14.0	10.5	7.0	3.5
SUV				
Battery range (km)		150	575	1000
Fuel range (km)	800	0	0	0
Acceleration (sec 0-100km/h)	10.0	11.5	9.8	8.1

Attribute	Hybrid	Battery electric		
		Low	Mid	High
Towing capacity (tonnes)	1.48	0.00	0.74	1.48
Carbon emissions (g/km)	150	105	53	0
Destination availability (% of shops/parking)		10	50	100
Destination charging time (minutes)		120	60	15
Highway availability (km between chargers)		300	200	100
Highway charging time (minutes)		60	30	5
Running cost ($/100km)	16.5	12.4	8.3	4.1
Van/Ute				
Battery range (km)		150	575	1000
Fuel range (km)	680	0	0	0
Acceleration (sec 0-100km/h)	16.0	18.4	15.6	12.9
Towing capacity (tonnes)	1.80	0.00	0.90	1.80
Carbon emissions (g/km)	215	151	75	0
Destination availability (% of shops/parking)		10	50	100
Destination charging time (minutes)		120	60	15
Highway availability (km between chargers)		300	200	100
Highway charging time (minutes)		60	30	5
Running cost ($/100km)	17.5	13.1	8.8	4.4

Source: CIE

C.5 PHEV scenarios for comparison with hybrid reference vehicle

Attribute	Hybrid	Plug-in hybrid electric		
		Low	Mid	High
Micro/small car				
Battery range (km)		50	175	300
Fuel range (km)	800	300	400	500
Acceleration (sec 0-100km/h)	11.0	12.7	10.8	8.9
Towing capacity (tonnes)	0.50	0.00	0.25	0.50
Carbon emissions (g/km)	90	90	63	36
Destination availability (% of shops/parking)		10	50	100
Destination charging time (minutes)		120	60	15
Highway availability (km between chargers)		300	200	100
Highway charging time (minutes)		60	30	5
Running cost ($/100km)	12.0	9.0	6.0	3.0
Medium car				
Battery range (km)		50	175	300
Fuel range (km)	960	300	400	500

Attribute	Hybrid	Plug-in hybrid electric		
		Low	Mid	High
Acceleration (sec 0-100km/h)	10.0	11.5	9.8	8.1
Towing capacity (tonnes)	1.10	0.00	0.55	1.10
Carbon emissions (g/km)	110	110	77	44
Destination availability (% of shops/parking)		10	50	100
Destination charging time (minutes)		120	60	15
Highway availability (km between chargers)		300	200	100
Highway charging time (minutes)		60	30	5
Running cost ($/100km)	13.0	9.8	6.5	3.3
Large car / People mover / Family wagon				
Battery range (km)		50	175	300
Fuel range (km)	800	300	400	500
Acceleration (sec 0-100km/h)	10.0	11.5	9.8	8.1
Towing capacity (tonnes)	1.40	0.00	0.70	1.40
Carbon emissions (g/km)	115	115	81	46
Destination availability (% of shops/parking)		10	50	100
Destination charging time (minutes)		120	60	15
Highway availability (km between chargers)		300	200	100
Highway charging time (minutes)		60	30	5
Running cost ($/100km)	14.0	10.5	7.0	3.5
SUV				
Battery range (km)		50	175	300
Fuel range (km)	800	300	400	500
Acceleration (sec 0-100km/h)	10.0	11.5	9.8	8.1
Towing capacity (tonnes)	1.48	0.00	0.74	1.48
Carbon emissions (g/km)	150	150	105	60
Destination availability (% of shops/parking)		10	50	100
Destination charging time (minutes)		120	60	15
Highway availability (km between chargers)		300	200	100
Highway charging time (minutes)		60	30	5
Running cost ($/100km)	16.5	12.4	8.3	4.1
Van/Ute				
Battery range (km)		50	175	300
Fuel range (km)	680	300	400	500
Acceleration (sec 0-100km/h)	16.0	18.4	15.6	12.9
Towing capacity (tonnes)	1.80	0.00	0.90	1.80
Carbon emissions (g/km)	215	215	151	86
Destination availability (% of shops/parking)		10	50	100
Destination charging time (minutes)		120	60	15

Attribute	Hybrid	Plug-in hybrid electric		
		Low	Mid	High
Highway availability (km between chargers)		300	200	100
Highway charging time (minutes)		60	30	5
Running cost ($/100km)	17.5	13.1	8.8	4.4

Source: CIE

D Estimation results

This section sets out the coefficients and z-values of the various models of consumer choice estimated on the survey data.

D.1 Model of consumer vehicle choice – all vehicle types, reweighted

	Full sample		Excluding unlikely buyers	
	Coef.	Z value	Coef.	Z value
Fuel type: Petrol (dummy coded)	1.9916	13.40	1.7432	8.61
Fuel type: Diesel (dummy coded)	2.3975	14.62	2.2447	10.11
Fuel type: Hybrid (dummy coded)	0.6970	4.19	0.5838	2.61
Fuel type: Battery electric (dummy coded)	0.6637	7.27	0.4522	3.64
Driving range on battery (km)	0.0005	4.82	0.0006	4.16
Driving range on fuel tank (km)	0.0012	8.20	0.0009	4.43
Acceleration (seconds 0-100 km/h)	-0.0154	-2.39	-0.0220	-2.53
Towing capacity, braked (tonnes)	0.1977	10.47	0.2092	8.46
Carbon emissions from fuel/electricity generation (g/km)	-0.0002	-1.05	-0.0006	-2.34
Availability of charging points at destinations (proportion*100)	0.0087	4.11	0.0052	1.83
Time to charge to 80% at destination charging points: 15 minutes (effects coded)	0.0098	0.31	0.0058	0.13
Time to charge to 80% at destination charging points: 60 minutes (effects coded)	0.0088	0.35	-0.0256	-0.75
Availability of charging points on major highways: 100 km (effects coded)	0.5798	7.15	0.4144	3.75
Availability of charging points on major highways: 200 km (effects coded)	0.0354	1.45	0.0889	2.63
Time to charge to 80% at highway charging points: 5 minutes (effects coded)	0.0694	2.36	0.0346	0.86
Time to charge to 80% at highway charging points: 15 minutes (effects coded)	0.0249	0.83	0.0250	0.61
Time to charge to 80% at highway charging points: 30 minutes (effects coded)	-0.0203	-0.61	0.0229	0.50
Purchase price (after taxes and subsidies, includes cost of home charging kit for electric vehicles) ($'000s)	-0.0398	-22.79	-0.0317	-16.73
Running cost (fuel and servicing after taxes and subsidies) ($/100 km)	-0.0712	-23.32	-0.0662	-15.82
Interactions				
Availability of charging points on major highways (km) * ln(Driving range on battery (km)) / 1000	1.0973	7.23	0.8167	3.96

	Full sample		Excluding unlikely buyers	
	Coef.	Z value	Coef.	Z value
Availability of charging points on major highways (km) * Fuel type: Battery electric (dummy coded)	-0.0009	-2.84	-0.0005	-1.24
Availability of charging points at destinations (%) * ln(Driving range on battery (km)) / 1000	-1.4327	-3.82	-0.7754	-1.54
Model fit				
Choice observations		18 126		9 996
Individuals		3 021		1 666
Log likelihood		-18 617		-9 483

Source: CIE

D.2 Model of consumer vehicle choice – Micro/small cars, reweighted

	Full sample		Excluding unlikely buyers	
	Coef.	Z value	Coef.	Z value
Fuel type: Petrol (dummy coded)	1.7321	5.09	1.3562	2.46
Fuel type: Diesel (dummy coded)	1.7421	3.93	1.4537	2.05
Fuel type: Hybrid (dummy coded)	0.4610	1.17	0.0870	0.14
Fuel type: Battery electric (dummy coded)	0.4735	2.00	0.3950	1.00
Driving range on battery (km)	0.0005	2.07	0.0011	2.53
Driving range on fuel tank (km)	0.0009	2.15	0.0015	2.18
Acceleration (seconds 0-100 km/h)	-0.0324	-2.60	-0.0578	-2.85
Towing capacity, braked (tonnes)	0.0994	1.08	-0.1089	-0.73
Carbon emissions from fuel/electricity generation (g/km)	-0.0008	-1.57	-0.0020	-2.32
Availability of charging points at destinations (proportion*100)	0.0029	0.59	0.0006	0.07
Time to charge to 80% at destination charging points: 15 minutes (effects coded)	0.0733	0.87	0.0413	0.29
Time to charge to 80% at destination charging points: 60 minutes (effects coded)	-0.0226	-0.34	-0.0787	-0.71
Availability of charging points on major highways: 100 km (effects coded)	0.5318	2.79	0.3062	0.99
Availability of charging points on major highways: 200 km (effects coded)	-0.0024	-0.04	-0.0133	-0.13
Time to charge to 80% at highway charging points: 5 minutes (effects coded)	0.1172	1.51	0.1807	1.38
Time to charge to 80% at highway charging points: 15 minutes (effects coded)	-0.0078	-0.10	0.1241	0.92
Time to charge to 80% at highway charging points: 30 minutes (effects coded)	0.0142	0.16	0.0059	0.04
Purchase price (after taxes and subsidies, includes cost of home charging kit for electric vehicles) ($'000s)	-0.0815	-11.05	-0.0706	-7.92
Running cost (fuel and servicing after taxes and subsidies) ($/100 km)	-0.1020	-13.75	-0.1129	-9.12

	Full sample		Excluding unlikely buyers	
	Coef.	Z value	Coef.	Z value
Interactions				
Availability of charging points on major highways (km) * ln(Driving range on battery (km)) / 1000	0.9163	2.60	0.4670	0.81
Availability of charging points on major highways (km) * Fuel type: Battery electric (dummy coded)	-0.0009	-1.23	-0.0004	-0.30
Availability of charging points at destinations (%) * ln(Driving range on battery (km)) / 1000	-0.5090	-0.59	-0.1432	-0.10
Model fit				
Choice observations		3 282		1 242
Individuals		547		207
Log likelihood		-3 310		-1 128

Source: CIE

D.3 Model of consumer vehicle choice – Medium cars, reweighted

	Full sample		Excluding unlikely buyers	
	Coef.	Z value	Coef.	Z value
Fuel type: Petrol (dummy coded)	2.2764	9.71	1.8149	5.75
Fuel type: Diesel (dummy coded)	2.0649	7.14	1.7515	4.58
Fuel type: Hybrid (dummy coded)	1.2078	4.31	0.9466	2.51
Fuel type: Battery electric (dummy coded)	0.3949	2.53	0.2242	1.06
Driving range on battery (km)	0.0005	2.88	0.0005	2.35
Driving range on fuel tank (km)	0.0005	1.77	0.0002	0.44
Acceleration (seconds 0-100 km/h)	0.0042	0.33	-0.0018	-0.11
Towing capacity, braked (tonnes)	0.0752	2.09	0.0635	1.31
Carbon emissions from fuel/electricity generation (g/km)	-0.0008	-2.92	-0.0012	-2.97
Availability of charging points at destinations (proportion*100)	0.0073	2.20	0.0038	0.85
Time to charge to 80% at destination charging points: 15 minutes (effects coded)	0.0047	0.09	0.0133	0.19
Time to charge to 80% at destination charging points: 60 minutes (effects coded)	0.0195	0.50	-0.0172	-0.32
Availability of charging points on major highways: 100 km (effects coded)	0.5737	4.58	0.3882	2.30
Availability of charging points on major highways: 200 km (effects coded)	0.0120	0.32	0.0203	0.39
Time to charge to 80% at highway charging points: 5 minutes (effects coded)	0.1235	2.67	0.0459	0.73
Time to charge to 80% at highway charging points: 15 minutes (effects coded)	0.0073	0.16	-0.0045	-0.07
Time to charge to 80% at highway charging points: 30 minutes (effects coded)	-0.0094	-0.18	0.0362	0.50

	Full sample		Excluding unlikely buyers	
	Coef.	Z value	Coef.	Z value
Purchase price (after taxes and subsidies, includes cost of home charging kit for electric vehicles) ($'000s)	-0.0456	-15.41	-0.0352	-10.89
Running cost (fuel and servicing after taxes and subsidies) ($/100 km)	-0.0787	-15.78	-0.0676	-9.88
Interactions				
Availability of charging points on major highways (km) * ln(Driving range on battery (km)) / 1000	1.0475	4.48	0.6260	1.99
Availability of charging points on major highways (km) * Fuel type: Battery electric (dummy coded)	-0.0009	-1.82	-0.0004	-0.64
Availability of charging points at destinations (%) * ln(Driving range on battery (km)) / 1000	-1.1328	-1.94	-0.3698	-0.47
Model fit				
Choice observations		4 164		7 524
Individuals		694		1 254
Log likelihood		-7 601		-3 898

Source: CIE

D.4 Model of consumer vehicle choice – Large cars/People movers/Family wagons, reweighted

	Full sample		Excluding unlikely buyers	
	Coef.	Z value	Coef.	Z value
Fuel type: Petrol (dummy coded)	2.5941	5.41	2.1210	3.50
Fuel type: Diesel (dummy coded)	3.0122	5.67	2.8648	4.20
Fuel type: Hybrid (dummy coded)	1.4399	2.86	1.1204	1.77
Fuel type: Battery electric (dummy coded)	0.5327	1.85	0.2899	0.82
Driving range on battery (km)	0.0003	0.83	0.0005	1.16
Driving range on fuel tank (km)	0.0007	1.48	0.0006	0.96
Acceleration (seconds 0-100 km/h)	-0.0291	-1.25	-0.0232	-0.78
Towing capacity, braked (tonnes)	0.1622	3.30	0.1946	3.11
Carbon emissions from fuel/electricity generation (g/km)	-0.0004	-0.75	-0.0014	-1.87
Availability of charging points at destinations (proportion*100)	0.0119	1.80	0.0050	0.63
Time to charge to 80% at destination charging points: 15 minutes (effects coded)	-0.0804	-0.88	-0.1832	-1.56
Time to charge to 80% at destination charging points: 60 minutes (effects coded)	0.0469	0.64	0.0294	0.32
Availability of charging points on major highways: 100 km (effects coded)	0.6939	2.70	0.5142	1.60
Availability of charging points on major highways: 200 km (effects coded)	0.0354	0.49	0.1336	1.41

	Full sample		Excluding unlikely buyers	
	Coef.	Z value	Coef.	Z value
Time to charge to 80% at highway charging points: 5 minutes (effects coded)	0.0081	0.09	-0.0687	-0.62
Time to charge to 80% at highway charging points: 15 minutes (effects coded)	0.0376	0.44	0.0502	0.46
Time to charge to 80% at highway charging points: 30 minutes (effects coded)	-0.1433	-1.47	-0.0640	-0.51
Purchase price (after taxes and subsidies, includes cost of home charging kit for electric vehicles) ($'000s)	-0.0128	-3.14	-0.0162	-3.63
Running cost (fuel and servicing after taxes and subsidies) ($/100 km)	-0.0561	-5.87	-0.0513	-4.23
Interactions				
Availability of charging points on major highways (km) * ln(Driving range on battery (km)) / 1000	1.2738	2.66	0.9611	1.60
Availability of charging points on major highways (km) * Fuel type: Battery electric (dummy coded)	-0.0002	-0.21	0.0002	0.15
Availability of charging points at destinations (%) * ln(Driving range on battery (km)) / 1000	-1.8441	-1.57	-0.8478	-0.60
Model fit				
Choice observations		2 016		1 314
Individuals		336		219
Log likelihood		-1 991		-1 150

Source: CIE

D.5 Model of consumer vehicle choice – SUVs, reweighted

	Full sample		Excluding unlikely buyers	
	Coef.	Z value	Coef.	Z value
Fuel type: Petrol (dummy coded)	2.0021	6.24	1.9226	4.77
Fuel type: Diesel (dummy coded)	2.3676	6.89	2.2779	5.32
Fuel type: Hybrid (dummy coded)	0.4299	1.22	0.2200	0.50
Fuel type: Battery electric (dummy coded)	0.6879	3.41	0.6273	2.46
Driving range on battery (km)	0.0007	3.23	0.0007	2.45
Driving range on fuel tank (km)	0.0015	4.54	0.0015	3.51
Acceleration (seconds 0-100 km/h)	-0.0105	-0.83	-0.0175	-1.11
Towing capacity, braked (tonnes)	0.1984	5.87	0.2139	4.97
Carbon emissions from fuel/electricity generation (g/km)	0.0000	0.08	-0.0001	-0.27
Availability of charging points at destinations (proportion*100)	0.0054	1.19	0.0014	0.25
Time to charge to 80% at destination charging points: 15 minutes (effects coded)	0.0089	0.14	0.0227	0.27
Time to charge to 80% at destination charging points: 60 minutes (effects coded)	-0.0450	-0.89	-0.0895	-1.38

	Full sample		Excluding unlikely buyers	
	Coef.	Z value	Coef.	Z value
Availability of charging points on major highways: 100 km (effects coded)	0.4926	2.84	0.4165	1.90
Availability of charging points on major highways: 200 km (effects coded)	0.0231	0.46	0.1397	2.18
Time to charge to 80% at highway charging points: 5 minutes (effects coded)	0.0100	0.17	-0.0002	0.00
Time to charge to 80% at highway charging points: 15 minutes (effects coded)	0.0496	0.81	0.0414	0.54
Time to charge to 80% at highway charging points: 30 minutes (effects coded)	-0.0088	-0.13	0.0493	0.56
Purchase price (after taxes and subsidies, includes cost of home charging kit for electric vehicles) ($'000s)	-0.0397	-12.58	-0.0326	-9.48
Running cost (fuel and servicing after taxes and subsidies) ($/100 km)	-0.0717	-11.09	-0.0714	-8.74
Interactions				
Availability of charging points on major highways (km) * ln(Driving range on battery (km)) / 1000	1.0270	3.16	0.9326	2.28
Availability of charging points on major highways (km) * Fuel type: Battery electric (dummy coded)	-0.0012	-1.82	-0.0009	-1.03
Availability of charging points at destinations (%) * ln(Driving range on battery (km)) / 1000	-0.8617	-1.07	-0.1525	-0.15
Model fit				
Choice observations		4 176		2 676
Individuals		696		446
Log likelihood		-4 261		-2 568

Source: CIE

D.6 Model of consumer vehicle choice – Utes/Vans, reweighted

	Full sample		Excluding unlikely buyers	
	Coef.	Z value	Coef.	Z value
Fuel type: Petrol (dummy coded)	2.5890	3.58	3.0127	2.66
Fuel type: Diesel (dummy coded)	2.6290	3.55	3.4412	2.91
Fuel type: Hybrid (dummy coded)	0.5342	0.65	0.3340	0.26
Fuel type: Battery electric (dummy coded)	1.1170	2.14	0.6767	0.84
Driving range on battery (km)	0.0003	0.66	0.0000	0.05
Driving range on fuel tank (km)	0.0026	2.91	0.0008	0.59
Acceleration (seconds 0-100 km/h)	-0.0529	-2.24	-0.0484	-1.44
Towing capacity, braked (tonnes)	0.1696	2.93	0.2481	2.90
Carbon emissions from fuel/electricity generation (g/km)	-0.0005	-0.65	0.0004	0.39
Availability of charging points at destinations (proportion*100)	0.0050	0.47	0.0012	0.07

	Full sample		Excluding unlikely buyers	
	Coef.	Z value	Coef.	Z value
Time to charge to 80% at destination charging points: 15 minutes (effects coded)	-0.0738	-0.51	-0.0737	-0.35
Time to charge to 80% at destination charging points: 60 minutes (effects coded)	0.1594	1.43	0.3695	2.33
Availability of charging points on major highways: 100 km (effects coded)	0.6336	1.62	0.4724	0.75
Availability of charging points on major highways: 200 km (effects coded)	0.1614	1.49	0.2798	1.74
Time to charge to 80% at highway charging points: 5 minutes (effects coded)	0.0005	0.00	-0.1182	-0.60
Time to charge to 80% at highway charging points: 15 minutes (effects coded)	0.0569	0.41	0.1056	0.51
Time to charge to 80% at highway charging points: 30 minutes (effects coded)	-0.0747	-0.50	0.0195	0.09
Purchase price (after taxes and subsidies, includes cost of home charging kit for electric vehicles) ($'000s)	-0.0286	-3.77	-0.0175	-2.08
Running cost (fuel and servicing after taxes and subsidies) ($/100 km)	-0.0843	-6.23	-0.0951	-4.85
Interactions				
Availability of charging points on major highways (km) * ln(Driving range on battery (km)) / 1000	1.3395	1.77	1.4453	1.24
Availability of charging points on major highways (km) * Fuel type: Battery electric (dummy coded)	-0.0016	-0.95	-0.0015	-0.63
Availability of charging points at destinations (%) * ln(Driving range on battery (km)) / 1000	-0.9931	-0.52	-0.2997	-0.11
Model fit				
Choice observations		822		402
Individuals		137		67
Log likelihood		-877		-389

Source: CIE

D.7 Model of consumer vehicle choice – all vehicle types, unweighted

	Full sample		Excluding unlikely buyers	
	Coef.	Z value	Coef.	Z value
Fuel type: Petrol (dummy coded)	1.8259	13.03	1.5387	8.23
Fuel type: Diesel (dummy coded)	2.1922	14.27	1.9825	9.70
Fuel type: Hybrid (dummy coded)	0.6671	4.32	0.4918	2.41
Fuel type: Battery electric (dummy coded)	0.6259	7.47	0.4572	4.09
Driving range on battery (km)	0.0005	5.36	0.0006	4.26

	Full sample		Excluding unlikely buyers	
	Coef.	Z value	Coef.	Z value
Driving range on fuel tank (km)	0.0012	8.67	0.0009	5.03
Acceleration (seconds 0-100 km/h)	-0.0146	-2.49	-0.0201	-2.55
Towing capacity, braked (tonnes)	0.1675	9.57	0.1669	7.32
Carbon emissions from fuel/electricity generation (g/km)	-0.0003	-1.58	-0.0006	-2.62
Availability of charging points at destinations (proportion*100)	0.0086	4.52	0.0053	2.07
Time to charge to 80% at destination charging points: 15 minutes (effects coded)	0.0115	0.39	0.0172	0.43
Time to charge to 80% at destination charging points: 60 minutes (effects coded)	0.0025	0.11	-0.0265	-0.85
Availability of charging points on major highways: 100 km (effects coded)	0.5390	7.09	0.3846	3.80
Availability of charging points on major highways: 200 km (effects coded)	0.0331	1.46	0.0786	2.54
Time to charge to 80% at highway charging points: 5 minutes (effects coded)	0.0655	2.40	0.0281	0.76
Time to charge to 80% at highway charging points: 15 minutes (effects coded)	0.0333	1.21	0.0433	1.16
Time to charge to 80% at highway charging points: 30 minutes (effects coded)	-0.0335	-1.09	0.0052	0.12
Purchase price (after taxes and subsidies, includes cost of home charging kit for electric vehicles) ($'000s)	-0.0344	-23.99	-0.0274	-17.02
Running cost (fuel and servicing after taxes and subsidies) ($/100 km)	-0.0709	-24.74	-0.0655	-16.91
Interactions				
Availability of charging points on major highways (km) * ln(Driving range on battery (km)) / 1000	1.0116	7.15	0.7386	3.92
Availability of charging points on major highways (km) * Fuel type: Battery electric (dummy coded)	-0.0007	-2.44	-0.0004	-0.99
Availability of charging points at destinations (%) * ln(Driving range on battery (km)) / 1000	-1.4600	-4.28	-0.8446	-1.87
Model fit				
Choice observations		18 126		9 996
Individuals		3 021		1 666
Log likelihood		-18 732		-10 356

Source: CIE

D.8 Model of consumer vehicle choice – Micro/small cars, unweighted

	Full sample		Excluding unlikely buyers	
	Coef.	Z value	Coef.	Z value
Fuel type: Petrol (dummy coded)	1.7273	5.28	1.2643	2.39
Fuel type: Diesel (dummy coded)	1.9593	4.84	1.6193	2.52

	Full sample		Excluding unlikely buyers	
	Coef.	Z value	Coef.	Z value
Fuel type: Hybrid (dummy coded)	0.5275	1.43	0.2888	0.50
Fuel type: Battery electric (dummy coded)	0.4849	2.20	0.3955	1.08
Driving range on battery (km)	0.0005	2.01	0.0008	2.09
Driving range on fuel tank (km)	0.0010	2.42	0.0014	2.16
Acceleration (seconds 0-100 km/h)	-0.0359	-3.14	-0.0534	-2.89
Towing capacity, braked (tonnes)	0.0977	1.14	-0.0703	-0.51
Carbon emissions from fuel/electricity generation (g/km)	-0.0011	-2.20	-0.0023	-2.84
Availability of charging points at destinations (proportion*100)	0.0009	0.20	-0.0022	-0.31
Time to charge to 80% at destination charging points: 15 minutes (effects coded)	0.0477	0.62	0.0442	0.34
Time to charge to 80% at destination charging points: 60 minutes (effects coded)	-0.0095	-0.16	-0.0459	-0.46
Availability of charging points on major highways: 100 km (effects coded)	0.5128	2.81	0.2285	0.77
Availability of charging points on major highways: 200 km (effects coded)	0.0218	0.38	0.0291	0.30
Time to charge to 80% at highway charging points: 5 minutes (effects coded)	0.1353	1.88	0.1885	1.56
Time to charge to 80% at highway charging points: 15 minutes (effects coded)	-0.0013	-0.02	0.0661	0.55
Time to charge to 80% at highway charging points: 30 minutes (effects coded)	-0.0138	-0.17	0.0230	0.17
Purchase price (after taxes and subsidies, includes cost of home charging kit for electric vehicles) ($'000s)	-0.0783	-14.51	-0.0637	-9.36
Running cost (fuel and servicing after taxes and subsidies) ($/100 km)	-0.1020	-14.57	-0.1050	-9.15
Interactions				
Availability of charging points on major highways (km) * ln(Driving range on battery (km)) / 1000	0.9316	2.77	0.4369	0.79
Availability of charging points on major highways (km) * Fuel type: Battery electric (dummy coded)	-0.0008	-1.24	-0.0005	-0.45
Availability of charging points at destinations (%) * ln(Driving range on battery (km)) / 1000	-0.0779	-0.10	0.6567	0.51
Model fit				
Choice observations		3 282		1 242
Individuals		547		207
Log likelihood		-3244		-1 218

Source: CIE

D.9 Model of consumer vehicle choice – Medium cars, unweighted

	Full sample		Excluding unlikely buyers	
	Coef.	Z value	Coef.	Z value
Fuel type: Petrol (dummy coded)	2.0165	9.16	1.5210	5.28
Fuel type: Diesel (dummy coded)	1.8382	6.85	1.5181	4.38
Fuel type: Hybrid (dummy coded)	1.0489	4.05	0.6264	1.84
Fuel type: Battery electric (dummy coded)	0.4570	3.19	0.3836	2.02
Driving range on battery (km)	0.0005	3.30	0.0005	2.52
Driving range on fuel tank (km)	0.0006	2.29	0.0005	1.45
Acceleration (seconds 0-100 km/h)	0.0055	0.49	-0.0027	-0.19
Towing capacity, braked (tonnes)	0.0371	1.14	0.0300	0.69
Carbon emissions from fuel/electricity generation (g/km)	-0.0006	-2.42	-0.0008	-2.09
Availability of charging points at destinations (proportion*100)	0.0097	3.28	0.0075	1.91
Time to charge to 80% at destination charging points: 15 minutes (effects coded)	0.0251	0.55	0.0290	0.47
Time to charge to 80% at destination charging points: 60 minutes (effects coded)	0.0076	0.21	-0.0186	-0.38
Availability of charging points on major highways: 100 km (effects coded)	0.5316	4.55	0.3929	2.57
Availability of charging points on major highways: 200 km (effects coded)	0.0082	0.23	0.0077	0.16
Time to charge to 80% at highway charging points: 5 minutes (effects coded)	0.1052	2.46	0.0401	0.69
Time to charge to 80% at highway charging points: 15 minutes (effects coded)	0.0066	0.15	0.0158	0.27
Time to charge to 80% at highway charging points: 30 minutes (effects coded)	-0.0234	-0.49	0.0081	0.12
Purchase price (after taxes and subsidies, includes cost of home charging kit for electric vehicles) ($'000s)	-0.0358	-15.55	-0.0266	-10.54
Running cost (fuel and servicing after taxes and subsidies) ($/100 km)	-0.0730	-15.77	-0.0593	-9.53
Interactions				
Availability of charging points on major highways (km) * ln(Driving range on battery (km)) / 1000	0.9546	4.41	0.5993	2.11
Availability of charging points on major highways (km) * Fuel type: Battery electric (dummy coded)	-0.0007	-1.56	-0.0002	-0.30
Availability of charging points at destinations (%) * ln(Driving range on battery (km)) / 1000	-1.5887	-3.02	-1.1103	-1.60
Model fit				
Choice observations		4 164		7 524
Individuals		694		1 254
Log likelihood		-4362		-7838

Source: CIE

D.10 Model of consumer vehicle choice – Large cars/People movers/Family wagons, unweighted

	Full sample		Excluding unlikely buyers	
	Coef.	Z value	Coef.	Z value
Fuel type: Petrol (dummy coded)	2.2930	5.14	1.9200	3.50
Fuel type: Diesel (dummy coded)	2.4511	4.96	2.2092	3.62
Fuel type: Hybrid (dummy coded)	1.1937	2.58	0.9436	1.67
Fuel type: Battery electric (dummy coded)	0.4728	1.83	0.3441	1.08
Driving range on battery (km)	0.0003	0.92	0.0004	1.21
Driving range on fuel tank (km)	0.0008	1.78	0.0007	1.33
Acceleration (seconds 0-100 km/h)	-0.0250	-1.22	-0.0300	-1.15
Towing capacity, braked (tonnes)	0.1397	3.17	0.1648	2.97
Carbon emissions from fuel/electricity generation (g/km)	-0.0009	-1.84	-0.0017	-2.57
Availability of charging points at destinations (proportion*100)	0.0086	1.42	0.0043	0.59
Time to charge to 80% at destination charging points: 15 minutes (effects coded)	-0.0786	-0.92	-0.1335	-1.23
Time to charge to 80% at destination charging points: 60 minutes (effects coded)	0.0394	0.59	0.0334	0.39
Availability of charging points on major highways: 100 km (effects coded)	0.5480	2.35	0.3809	1.33
Availability of charging points on major highways: 200 km (effects coded)	0.0478	0.71	0.1398	1.63
Time to charge to 80% at highway charging points: 5 minutes (effects coded)	-0.0321	-0.41	-0.1269	-1.27
Time to charge to 80% at highway charging points: 15 minutes (effects coded)	0.0478	0.60	0.0527	0.52
Time to charge to 80% at highway charging points: 30 minutes (effects coded)	-0.1373	-1.52	-0.0548	-0.48
Purchase price (after taxes and subsidies, includes cost of home charging kit for electric vehicles) ($'000s)	-0.0133	-3.62	-0.0161	-4.00
Running cost (fuel and servicing after taxes and subsidies) ($/100 km)	-0.0628	-7.41	-0.0635	-5.91
Interactions				
Availability of charging points on major highways (km) * ln(Driving range on battery (km)) / 1000	1.0270	2.35	0.7641	1.42
Availability of charging points on major highways (km) * Fuel type: Battery electric (dummy coded)	0.0000	0.04	0.0001	0.09
Availability of charging points at destinations (%) * ln(Driving range on battery (km)) / 1000	-1.2929	-1.20	-0.6298	-0.49
Model fit				
Choice observations		2 016		1 314
Individuals		336		219
Log likelihood		-2070		-1352

Source: CIE

D.11 Model of consumer vehicle choice – SUVs, unweighted

	Full sample		Excluding unlikely buyers	
	Coef.	Z value	Coef.	Z value
Fuel type: Petrol (dummy coded)	1.7964	5.98	1.6795	4.43
Fuel type: Diesel (dummy coded)	2.2126	6.90	2.1525	5.33
Fuel type: Hybrid (dummy coded)	0.4168	1.27	0.2507	0.61
Fuel type: Battery electric (dummy coded)	0.6514	3.48	0.6032	2.60
Driving range on battery (km)	0.0008	3.86	0.0007	2.75
Driving range on fuel tank (km)	0.0017	5.22	0.0015	3.85
Acceleration (seconds 0-100 km/h)	-0.0102	-0.87	-0.0130	-0.91
Towing capacity, braked (tonnes)	0.1825	5.91	0.1883	4.93
Carbon emissions from fuel/electricity generation (g/km)	-0.0001	-0.20	-0.0002	-0.45
Availability of charging points at destinations (proportion*100)	0.0054	1.31	0.0013	0.25
Time to charge to 80% at destination charging points: 15 minutes (effects coded)	0.0015	0.02	0.0279	0.36
Time to charge to 80% at destination charging points: 60 minutes (effects coded)	-0.0558	-1.18	-0.0947	-1.58
Availability of charging points on major highways: 100 km (effects coded)	0.4603	2.84	0.4036	1.97
Availability of charging points on major highways: 200 km (effects coded)	0.0243	0.52	0.1423	2.40
Time to charge to 80% at highway charging points: 5 minutes (effects coded)	0.0375	0.67	0.0270	0.38
Time to charge to 80% at highway charging points: 15 minutes (effects coded)	0.0899	1.59	0.0924	1.31
Time to charge to 80% at highway charging points: 30 minutes (effects coded)	-0.0334	-0.53	0.0159	0.20
Purchase price (after taxes and subsidies, includes cost of home charging kit for electric vehicles) ($'000s)	-0.0371	-13.51	-0.0319	-10.36
Running cost (fuel and servicing after taxes and subsidies) ($/100 km)	-0.0739	-12.01	-0.0732	-9.57
Interactions				
Availability of charging points on major highways (km) * ln(Driving range on battery (km)) / 1000	0.9487	3.14	0.8924	2.34
Availability of charging points on major highways (km) * Fuel type: Battery electric (dummy coded)	-0.0010	-1.57	-0.0008	-1.00
Availability of charging points at destinations (%) * ln(Driving range on battery (km)) / 1000	-1.0426	-1.42	-0.3740	-0.42
Model fit				
Choice observations		4 176		2 676
Individuals		696		446
Log likelihood		-4205		-2690

Source: CIE

D.12 Model of consumer vehicle choice – Utes/Vans, unweighted

	Full sample		Excluding unlikely buyers	
	Coef.	Z value	Coef.	Z value
Fuel type: Petrol (dummy coded)	2.5781	3.66	2.9738	2.85
Fuel type: Diesel (dummy coded)	2.5555	3.55	3.1530	2.93
Fuel type: Hybrid (dummy coded)	0.4116	0.53	0.3990	0.33
Fuel type: Battery electric (dummy coded)	1.3442	2.80	0.9315	1.31
Driving range on battery (km)	0.0001	0.27	-0.0005	-0.66
Driving range on fuel tank (km)	0.0030	3.57	0.0013	1.02
Acceleration (seconds 0-100 km/h)	-0.0446	-2.19	-0.0467	-1.57
Towing capacity, braked (tonnes)	0.1680	3.10	0.2251	2.86
Carbon emissions from fuel/electricity generation (g/km)	-0.0003	-0.49	0.0003	0.34
Availability of charging points at destinations (proportion*100)	0.0052	0.53	-0.0047	-0.34
Time to charge to 80% at destination charging points: 15 minutes (effects coded)	-0.1045	-0.77	-0.0782	-0.41
Time to charge to 80% at destination charging points: 60 minutes (effects coded)	0.1460	1.37	0.2961	1.97
Availability of charging points on major highways: 100 km (effects coded)	0.8251	2.17	0.6548	1.16
Availability of charging points on major highways: 200 km (effects coded)	0.1208	1.15	0.2088	1.39
Time to charge to 80% at highway charging points: 5 minutes (effects coded)	-0.0329	-0.26	-0.1246	-0.68
Time to charge to 80% at highway charging points: 15 minutes (effects coded)	0.0851	0.66	0.1639	0.88
Time to charge to 80% at highway charging points: 30 minutes (effects coded)	-0.0356	-0.25	0.0660	0.32
Purchase price (after taxes and subsidies, includes cost of home charging kit for electric vehicles) ($'000s)	-0.0259	-3.90	-0.0193	-2.39
Running cost (fuel and servicing after taxes and subsidies) ($/100 km)	-0.0864	-6.74	-0.1044	-5.52
Interactions				
Availability of charging points on major highways (km) * ln(Driving range on battery (km)) / 1000	1.5600	2.16	1.5670	1.48
Availability of charging points on major highways (km) * Fuel type: Battery electric (dummy coded)	-0.0016	-1.02	-0.0012	-0.52
Availability of charging points at destinations (%) * ln(Driving range on battery (km)) / 1000	-0.8950	-0.51	0.9736	0.39
Model fit				
Choice observations		822		402
Individuals		137		67
Log likelihood		-800		-381

Source: CIE

D.13 Model of consumer vehicle choice with respondent characteristics – all vehicles

	Full sample	
	Coef.	Z value
Fuel type: Petrol (dummy coded)	1.8880	12.04
Fuel type: Diesel (dummy coded)	2.2947	13.55
Fuel type: Hybrid (dummy coded)	0.9479	5.50
Fuel type: Battery electric (dummy coded)	0.6738	7.95
Driving range on battery (km)	0.0007	5.97
Driving range on fuel tank (km)	0.0013	9.23
Acceleration (seconds 0-100 km/h)	-0.0062	-0.82
Towing capacity, braked (tonnes)	0.2810	8.81
Carbon emissions from fuel/electricity generation (g/km)	-0.0001	-0.59
Availability of charging points at destinations (proportion*100)	0.0087	4.45
Time to charge to 80% at destination charging points: 15 minutes (effects coded)	0.0166	0.56
Time to charge to 80% at destination charging points: 60 minutes (effects coded)	-0.0017	-0.07
Availability of charging points on major highways: 100 km (effects coded)	0.5127	6.68
Availability of charging points on major highways: 200 km (effects coded)	0.0346	1.49
Time to charge to 80% at highway charging points: 5 minutes (effects coded)	0.0702	2.52
Time to charge to 80% at highway charging points: 15 minutes (effects coded)	0.0363	1.29
Time to charge to 80% at highway charging points: 30 minutes (effects coded)	-0.0368	-1.17
Purchase price (after taxes and subsidies, includes cost of home charging kit for electric vehicles) ($'000s)	-0.0467	-16.04
Running cost (fuel and servicing after taxes and subsidies) ($/100 km)	-0.0672	-13.12
Interactions		
Availability of charging points on major highways (km) * ln(Driving range on battery (km)) / 1000	0.9701	6.79
Availability of charging points on major highways (km) * Fuel type: Battery electric (dummy coded)	-0.0008	-2.66
Availability of charging points at destinations (%) * ln(Driving range on battery (km)) / 1000	-1.1734	-3.41
Interactions with respondent characteristics		
Fuel type: Battery electric/Plug-in hybrid * Location: urban	0.1998	4.03
Driving range on battery * Location: urban	-0.0002	-2.37
Towing capacity * Location: urban	-0.1245	-3.34
Fuel type: Battery electric/Plug-in hybrid * Age: Under 30 years	-0.1627	-2.63
Fuel type: Battery electric/Plug-in hybrid * Age: 60+ years	-0.2586	-6.36
Carbon emissions * Age: Under 30 years	-0.0012	-3.19
Towing capacity * Age: Under 30 years	-0.1506	-3.43
Fuel type: Battery electric/Plug-in hybrid * Gender: Male	-0.1538	-2.55
Running cost * Gender: Male	-0.0126	-2.38
Fuel type: Battery electric/Plug-in hybrid * Knowledge of EVs: Above average	0.3843	11.47
Fuel type: Battery electric/Plug-in hybrid * Number of vehicles after purchase: One	-0.1867	-2.96
Acceleration * Number of vehicles after purchase: One	-0.0270	-2.29

	Full sample	
	Coef.	Z value
Purchase price * Number of vehicles after purchase: One	-0.0113	-4.03
Running cost * Number of vehicles after purchase: One	-0.0172	-3.15
Fuel type: Battery electric/Plug-in hybrid * Made changes to help the environment: Major changes	0.0698	1.65
Fuel type: Battery electric/Plug-in hybrid * Made changes to help the environment: No changes	-0.5505	-10.80
Purchase price * Made changes to help the environment: Major changes	0.0202	7.17
Purchase price * Made changes to help the environment: No changes	-0.0087	-1.67
Fuel type: Battery electric/Plug-in hybrid * Buy new technology soon after it becomes available: No	-0.1278	-2.13
Running cost * Buy new technology soon after it becomes available: No	0.0118	2.23
Fuel type: Battery electric/Plug-in hybrid * University degree: Yes	0.3566	9.82
Purchase price * University degree: Yes	0.0127	4.41
Fuel type: Battery electric/Plug-in hybrid * Annual household income: <$41 600	0.1774	4.27
Fuel type: Battery electric/Plug-in hybrid * Annual household income: >$104 000	-0.0714	-1.70
Purchase price * Annual household income: <$41 600	-0.0137	-3.17
Purchase price * Annual household income: >$104 000	0.0073	2.57
Availability of charging points at destinations * Best parking: Garage	-0.0029	-5.66
Model fit		
Choice observations		18 126
Individuals		3 021
Log likelihood		-18 286

Source: CIE

D.14 Model of consumer vehicle choice with observable respondent characteristics – all vehicles

	Full sample	
	Coef.	Z value
Fuel type: Petrol (dummy coded)	2.1361	14.22
Fuel type: Diesel (dummy coded)	2.5301	15.47
Fuel type: Hybrid (dummy coded)	1.0448	6.31
Fuel type: Battery electric (dummy coded)	0.6301	7.29
Driving range on battery (km)	0.0007	6.57
Driving range on fuel tank (km)	0.0013	8.91
Acceleration (seconds 0-100 km/h)	-0.0170	-2.80
Towing capacity, braked (tonnes)	0.2686	7.72
Carbon emissions from fuel/electricity generation (g/km)	-0.0005	-2.30
Availability of charging points at destinations (proportion*100)	0.0076	3.86
Time to charge to 80% at destination charging points: 15 minutes (effects coded)	0.0077	0.25

	Full sample	
	Coef.	Z value
Time to charge to 80% at destination charging points: 60 minutes (effects coded)	-0.0042	-0.18
Availability of charging points on major highways: 100 km (effects coded)	0.5063	6.45
Availability of charging points on major highways: 200 km (effects coded)	0.0328	1.40
Time to charge to 80% at highway charging points: 5 minutes (effects coded)	0.0712	2.53
Time to charge to 80% at highway charging points: 15 minutes (effects coded)	0.0465	1.64
Time to charge to 80% at highway charging points: 30 minutes (effects coded)	-0.0453	-1.42
Purchase price (after taxes and subsidies, includes cost of home charging kit for electric vehicles) ($'000s)	-0.0505	-18.74
Running cost (fuel and servicing after taxes and subsidies) ($/100 km)	-0.0743	-25.02
Interactions		
Availability of charging points on major highways (km) * ln(Driving range on battery (km)) / 1000	0.9607	6.58
Availability of charging points on major highways (km) * Fuel type: Battery electric (dummy coded)	-0.0007	-2.46
Availability of charging points at destinations (%) * ln(Driving range on battery (km)) / 1000	-1.2621	-3.59
Interactions with respondent characteristics		
Fuel type: Battery electric/Plug-in hybrid * Location: urban	0.1907	3.81
Driving range on battery * Location: urban	-0.0002	-2.71
Towing capacity * Location: urban	-0.1320	-3.44
Carbon emissions * Age: Under 30 years	-0.0008	-2.42
Carbon emissions * Age: 60+ years	0.0011	3.85
Towing capacity * Age: Under 30 years	-0.1166	-2.63
Towing capacity * Age: 60+ years	0.0996	2.43
Fuel type: Battery electric/Plug-in hybrid * University degree: Yes	0.4410	12.21
Purchase price * University degree: Yes	0.0168	5.75
Fuel type: Battery electric/Plug-in hybrid * Annual household income: <$41 600	0.1518	3.71
Fuel type: Battery electric/Plug-in hybrid * Annual household income: >$104 000	-0.0105	-0.25
Purchase price * Annual household income: <$41 600	-0.0126	-2.83
Purchase price * Annual household income: >$104 000	0.0118	4.02
Model fit		
Choice observations		17 328
Individuals		2 888
Log likelihood		-17 656

Source: CIE

Note: Respondents who took less than 5 minutes to answer the survey were dropped out of this model

D.15 Model of consumer vehicle choice - New South Wales, unweighted

	Full sample	
	Coef.	Z value
Fuel type: Petrol (dummy coded)	1.9274	7.69
Fuel type: Diesel (dummy coded)	1.9467	7.07
Fuel type: Hybrid (dummy coded)	0.4328	1.58
Fuel type: Battery electric (dummy coded)	0.9400	6.07
Driving range on battery (km)	0.0002	1.10
Driving range on fuel tank (km)	0.0017	6.98
Acceleration (seconds 0-100 km/h)	-0.0082	-0.77
Towing capacity, braked (tonnes)	0.1539	4.74
Carbon emissions from fuel/electricity generation (g/km)	-0.0006	-1.81
Availability of charging points at destinations (proportion*100)	0.0067	1.88
Time to charge to 80% at destination charging points: 15 minutes (effects coded)	0.0027	0.05
Time to charge to 80% at destination charging points: 60 minutes (effects coded)	0.0105	0.25
Availability of charging points on major highways: 100 km (effects coded)	0.5562	4.08
Availability of charging points on major highways: 200 km (effects coded)	0.0625	1.55
Time to charge to 80% at highway charging points: 5 minutes (effects coded)	0.0889	1.84
Time to charge to 80% at highway charging points: 15 minutes (effects coded)	0.0323	0.66
Time to charge to 80% at highway charging points: 30 minutes (effects coded)	0.0666	1.20
Purchase price (after taxes and subsidies, includes cost of home charging kit for electric vehicles) ($'000s)	-0.0300	-11.97
Running cost (fuel and servicing after taxes and subsidies) ($/100 km)	-0.0693	-13.17
Interactions		
Availability of charging points on major highways (km) * ln(Driving range on battery (km)) / 1000	1.1461	4.50
Availability of charging points on major highways (km) * Fuel type: Battery electric (dummy coded)	-0.0009	-1.80
Availability of charging points at destinations (%) * ln(Driving range on battery (km)) / 1000	-1.2567	-1.97
Model fit		
Choice observations		5 568
Individuals		928
Log likelihood		-5 752

Source: CIE

Note: Respondents who took less than 5 minutes to answer the survey were dropped out of this model

D.16 Model of consumer vehicle choice - Victoria, unweighted

	Full sample	
	Coef.	Z value
Fuel type: Petrol (dummy coded)	1.7878	6.30
Fuel type: Diesel (dummy coded)	2.2657	7.19

	Full sample	
	Coef.	Z value
Fuel type: Hybrid (dummy coded)	1.1038	3.54
Fuel type: Battery electric (dummy coded)	0.3523	2.13
Driving range on battery (km)	0.0007	3.76
Driving range on fuel tank (km)	0.0005	1.67
Acceleration (seconds 0-100 km/h)	-0.0345	-2.90
Towing capacity, braked (tonnes)	0.1360	3.87
Carbon emissions from fuel/electricity generation (g/km)	0.0002	0.57
Availability of charging points at destinations (proportion*100)	0.0128	3.39
Time to charge to 80% at destination charging points: 15 minutes (effects coded)	0.0953	1.55
Time to charge to 80% at destination charging points: 60 minutes (effects coded)	-0.0068	-0.14
Availability of charging points on major highways: 100 km (effects coded)	0.5265	3.42
Availability of charging points on major highways: 200 km (effects coded)	-0.0251	-0.54
Time to charge to 80% at highway charging points: 5 minutes (effects coded)	0.0683	1.21
Time to charge to 80% at highway charging points: 15 minutes (effects coded)	0.0352	0.62
Time to charge to 80% at highway charging points: 30 minutes (effects coded)	-0.0694	-1.11
Purchase price (after taxes and subsidies, includes cost of home charging kit for electric vehicles) ($'000s)	-0.0319	-11.74
Running cost (fuel and servicing after taxes and subsidies) ($/100 km)	-0.0711	-12.28
Interactions		
Availability of charging points on major highways (km) * ln(Driving range on battery (km)) / 1000	0.8714	3.05
Availability of charging points on major highways (km) * Fuel type: Battery electric (dummy coded)	-0.0006	-1.11
Availability of charging points at destinations (%) * ln(Driving range on battery (km)) / 1000	-2.0100	-3.00
Model fit		
Choice observations		4 428
Individuals		738
Log likelihood		-4 590

Source: CIE

Note: Respondents who took less than 5 minutes to answer the survey were dropped out of this model

D.17 Model of consumer vehicle choice – Queensland, unweighted

	Full sample	
	Coef.	Z value
Fuel type: Petrol (dummy coded)	1.7902	5.37
Fuel type: Diesel (dummy coded)	2.7211	7.49
Fuel type: Hybrid (dummy coded)	0.2639	0.70
Fuel type: Battery electric (dummy coded)	0.4880	2.46

	Full sample	
	Coef.	Z value
Driving range on battery (km)	0.0009	3.82
Driving range on fuel tank (km)	0.0011	3.42
Acceleration (seconds 0-100 km/h)	-0.0181	-1.32
Towing capacity, braked (tonnes)	0.2216	5.47
Carbon emissions from fuel/electricity generation (g/km)	-0.0006	-1.62
Availability of charging points at destinations (proportion*100)	0.0063	1.40
Time to charge to 80% at destination charging points: 15 minutes (effects coded)	-0.0165	-0.24
Time to charge to 80% at destination charging points: 60 minutes (effects coded)	0.0276	0.51
Availability of charging points on major highways: 100 km (effects coded)	0.4592	2.54
Availability of charging points on major highways: 200 km (effects coded)	0.0407	0.77
Time to charge to 80% at highway charging points: 5 minutes (effects coded)	0.0263	0.41
Time to charge to 80% at highway charging points: 15 minutes (effects coded)	0.0734	1.15
Time to charge to 80% at highway charging points: 30 minutes (effects coded)	-0.0165	-0.23
Purchase price (after taxes and subsidies, includes cost of home charging kit for electric vehicles) ($'000s)	-0.0533	-13.69
Running cost (fuel and servicing after taxes and subsidies) ($/100 km)	-0.0681	-10.33
Interactions		
Availability of charging points on major highways (km) * ln(Driving range on battery (km)) / 1000	0.8552	2.55
Availability of charging points on major highways (km) * Fuel type: Battery electric (dummy coded)	-0.0009	-1.34
Availability of charging points at destinations (%) * ln(Driving range on battery (km)) / 1000	-0.8035	-1.00
Model fit		
Choice observations		3 456
Individuals		576
Log likelihood		-3 452

Source: CIE

Note: Respondents who took less than 5 minutes to answer the survey were dropped out of this model

D.18 Model of consumer vehicle choice – South Australia, unweighted

	Full sample	
	Coef.	Z value
Fuel type: Petrol (dummy coded)	1.7816	3.30
Fuel type: Diesel (dummy coded)	2.4513	4.15
Fuel type: Hybrid (dummy coded)	0.6013	0.99
Fuel type: Battery electric (dummy coded)	0.3500	1.10
Driving range on battery (km)	0.0004	1.02
Driving range on fuel tank (km)	0.0006	1.20

	Full sample	
	Coef.	Z value
Acceleration (seconds 0-100 km/h)	0.0250	1.07
Towing capacity, braked (tonnes)	0.2459	3.53
Carbon emissions from fuel/electricity generation (g/km)	-0.0006	-0.92
Availability of charging points at destinations (proportion*100)	-0.0049	-0.66
Time to charge to 80% at destination charging points: 15 minutes (effects coded)	-0.0792	-0.71
Time to charge to 80% at destination charging points: 60 minutes (effects coded)	0.0564	0.64
Availability of charging points on major highways: 100 km (effects coded)	0.4459	1.52
Availability of charging points on major highways: 200 km (effects coded)	0.0518	0.59
Time to charge to 80% at highway charging points: 5 minutes (effects coded)	0.0061	0.06
Time to charge to 80% at highway charging points: 15 minutes (effects coded)	0.2359	2.16
Time to charge to 80% at highway charging points: 30 minutes (effects coded)	-0.1692	-1.40
Purchase price (after taxes and subsidies, includes cost of home charging kit for electric vehicles) ($'000s)	-0.0435	-6.57
Running cost (fuel and servicing after taxes and subsidies) ($/100 km)	-0.0902	-8.10
Interactions		
Availability of charging points on major highways (km) * ln(Driving range on battery (km)) / 1000	1.1538	2.14
Availability of charging points on major highways (km) * Fuel type: Battery electric (dummy coded)	-0.0017	-1.58
Availability of charging points at destinations (%) * ln(Driving range on battery (km)) / 1000	0.1238	0.09
Model fit		
Choice observations		1 248
Individuals		208
Log likelihood		-1 270

Source: CIE

Note: Respondents who took less than 5 minutes to answer the survey were dropped out of this model

D.19 Model of consumer vehicle choice – Western Australia, unweighted

	Full sample	
	Coef.	Z value
Fuel type: Petrol (dummy coded)	1.5964	3.49
Fuel type: Diesel (dummy coded)	1.7621	3.56
Fuel type: Hybrid (dummy coded)	0.3511	0.70
Fuel type: Battery electric (dummy coded)	0.7792	2.92
Driving range on battery (km)	0.0009	2.86
Driving range on fuel tank (km)	0.0021	4.70
Acceleration (seconds 0-100 km/h)	-0.0094	-0.50
Towing capacity, braked (tonnes)	0.2541	4.58

	Full sample	
	Coef.	Z value
Carbon emissions from fuel/electricity generation (g/km)	0.0001	0.24
Availability of charging points at destinations (proportion*100)	0.0088	1.48
Time to charge to 80% at destination charging points: 15 minutes (effects coded)	0.0256	0.27
Time to charge to 80% at destination charging points: 60 minutes (effects coded)	-0.1279	-1.75
Availability of charging points on major highways: 100 km (effects coded)	0.5841	2.34
Availability of charging points on major highways: 200 km (effects coded)	-0.0125	-0.17
Time to charge to 80% at highway charging points: 5 minutes (effects coded)	0.0197	0.22
Time to charge to 80% at highway charging points: 15 minutes (effects coded)	-0.0280	-0.32
Time to charge to 80% at highway charging points: 30 minutes (effects coded)	-0.1890	-1.93
Purchase price (after taxes and subsidies, includes cost of home charging kit for electric vehicles) ($'000s)	-0.0476	-9.23
Running cost (fuel and servicing after taxes and subsidies) ($/100 km)	-0.0847	-9.08
Interactions		
Availability of charging points on major highways (km) * ln(Driving range on battery (km)) / 1000	0.9057	1.96
Availability of charging points on major highways (km) * Fuel type: Battery electric (dummy coded)	0.0002	0.26
Availability of charging points at destinations (%) * ln(Driving range on battery (km)) / 1000	-1.4086	-1.33
Model fit		
Choice observations		1830
Individuals		305
Log likelihood		-1 839

Source: CIE

Note: Respondents who took less than 5 minutes to answer the survey were dropped out of this model

D.20 Model of consumer vehicle choice - Tasmania, unweighted

	Full sample	
	Coef.	Z value
Fuel type: Petrol (dummy coded)	1.4113	1.30
Fuel type: Diesel (dummy coded)	1.6463	1.39
Fuel type: Hybrid (dummy coded)	-0.7911	-0.64
Fuel type: Battery electric (dummy coded)	0.6322	1.03
Driving range on battery (km)	0.0015	2.02
Driving range on fuel tank (km)	0.0029	2.94
Acceleration (seconds 0-100 km/h)	0.0197	0.49
Towing capacity, braked (tonnes)	0.3153	2.53
Carbon emissions from fuel/electricity generation (g/km)	-0.0001	-0.06
Availability of charging points at destinations (proportion*100)	0.0179	1.32

	Full sample	
	Coef.	Z value
Time to charge to 80% at destination charging points: 15 minutes (effects coded)	-0.3097	-1.57
Time to charge to 80% at destination charging points: 60 minutes (effects coded)	-0.0238	-0.15
Availability of charging points on major highways: 100 km (effects coded)	0.4452	0.76
Availability of charging points on major highways: 200 km (effects coded)	-0.0346	-0.22
Time to charge to 80% at highway charging points: 5 minutes (effects coded)	0.2529	1.29
Time to charge to 80% at highway charging points: 15 minutes (effects coded)	0.0728	0.37
Time to charge to 80% at highway charging points: 30 minutes (effects coded)	-0.1645	-0.76
Purchase price (after taxes and subsidies, includes cost of home charging kit for electric vehicles) ($'000s)	-0.0410	-3.30
Running cost (fuel and servicing after taxes and subsidies) ($/100 km)	-0.0717	-3.53
Interactions		
Availability of charging points on major highways (km) * ln(Driving range on battery (km)) / 1000	0.5511	0.50
Availability of charging points on major highways (km) * Fuel type: Battery electric (dummy coded)	0.0019	0.89
Availability of charging points at destinations (%) * ln(Driving range on battery (km)) / 1000	-2.9685	-1.22
Model fit		
Choice observations		372
Individuals		62
Log likelihood		-369

Source: CIE

Note: Respondents who took less than 5 minutes to answer the survey were dropped out of this model

D.21 Model of consumer vehicle choice – Australian Capital Territory, unweighted

	Full sample	
	Coef.	Z value
Fuel type: Petrol (dummy coded)	2.7149	2.38
Fuel type: Diesel (dummy coded)	2.3734	1.88
Fuel type: Hybrid (dummy coded)	0.5168	0.42
Fuel type: Battery electric (dummy coded)	0.8414	1.25
Driving range on battery (km)	0.0007	0.81
Driving range on fuel tank (km)	0.0031	2.66
Acceleration (seconds 0-100 km/h)	-0.0853	-1.83
Towing capacity, braked (tonnes)	-0.0521	-0.32
Carbon emissions from fuel/electricity generation (g/km)	-0.0015	-1.08
Availability of charging points at destinations (proportion*100)	0.0308	1.91
Time to charge to 80% at destination charging points: 15 minutes (effects coded)	-0.1303	-0.55
Time to charge to 80% at destination charging points: 60 minutes (effects coded)	0.0629	0.33

	Full sample	
	Coef.	Z value
Availability of charging points on major highways: 100 km (effects coded)	0.7519	1.21
Availability of charging points on major highways: 200 km (effects coded)	0.3715	1.80
Time to charge to 80% at highway charging points: 5 minutes (effects coded)	0.2425	1.04
Time to charge to 80% at highway charging points: 15 minutes (effects coded)	-0.0704	-0.30
Time to charge to 80% at highway charging points: 30 minutes (effects coded)	-0.6258	-2.47
Purchase price (after taxes and subsidies, includes cost of home charging kit for electric vehicles) ($'000s)	-0.0365	-3.65
Running cost (fuel and servicing after taxes and subsidies) ($/100 km)	-0.1003	-4.35
Interactions		
Availability of charging points on major highways (km) * ln(Driving range on battery (km)) / 1000	1.1464	0.98
Availability of charging points on major highways (km) * Fuel type: Battery electric (dummy coded)	0.0026	1.09
Availability of charging points at destinations (%) * ln(Driving range on battery (km)) / 1000	-3.9712	-1.36
Model fit		
Choice observations		300
Individuals		50
Log likelihood		-283

Source: CIE

Note: Respondents who took less than 5 minutes to answer the survey were dropped out of this model

D.22 Model of consumer vehicle choice – Northern Territory, unweighted

	Full sample	
	Coef.	Z value
Fuel type: Petrol (dummy coded)	2.2350	1.51
Fuel type: Diesel (dummy coded)	2.3248	1.35
Fuel type: Hybrid (dummy coded)	2.0378	1.18
Fuel type: Battery electric (dummy coded)	-1.8534	-1.65
Driving range on battery (km)	0.0012	0.97
Driving range on fuel tank (km)	-0.0031	-1.71
Acceleration (seconds 0-100 km/h)	0.1094	1.32
Towing capacity, braked (tonnes)	-0.2047	-0.90
Carbon emissions from fuel/electricity generation (g/km)	0.0000	0.00
Availability of charging points at destinations (proportion*100)	0.0249	0.96
Time to charge to 80% at destination charging points: 15 minutes (effects coded)	-0.1104	-0.31
Time to charge to 80% at destination charging points: 60 minutes (effects coded)	-0.0117	-0.04
Availability of charging points on major highways: 100 km (effects coded)	-0.2105	-0.26
Availability of charging points on major highways: 200 km (effects coded)	0.3054	1.01
Time to charge to 80% at highway charging points: 5 minutes (effects coded)	0.3789	1.18

	Full sample	
	Coef.	Z value
Time to charge to 80% at highway charging points: 15 minutes (effects coded)	-0.2722	-0.79
Time to charge to 80% at highway charging points: 30 minutes (effects coded)	0.2253	0.58
Purchase price (after taxes and subsidies, includes cost of home charging kit for electric vehicles) ($'000s)	-0.0006	-0.04
Running cost (fuel and servicing after taxes and subsidies) ($/100 km)	-0.0518	-1.36
Interactions		
Availability of charging points on major highways (km) * ln(Driving range on battery (km)) / 1000	0.2601	0.17
Availability of charging points on major highways (km) * Fuel type: Battery electric (dummy coded)	0.0017	0.46
Availability of charging points at destinations (%) * ln(Driving range on battery (km)) / 1000	-5.5347	-1.17
Model fit		
Choice observations		126
Individuals		21
Log likelihood		-125

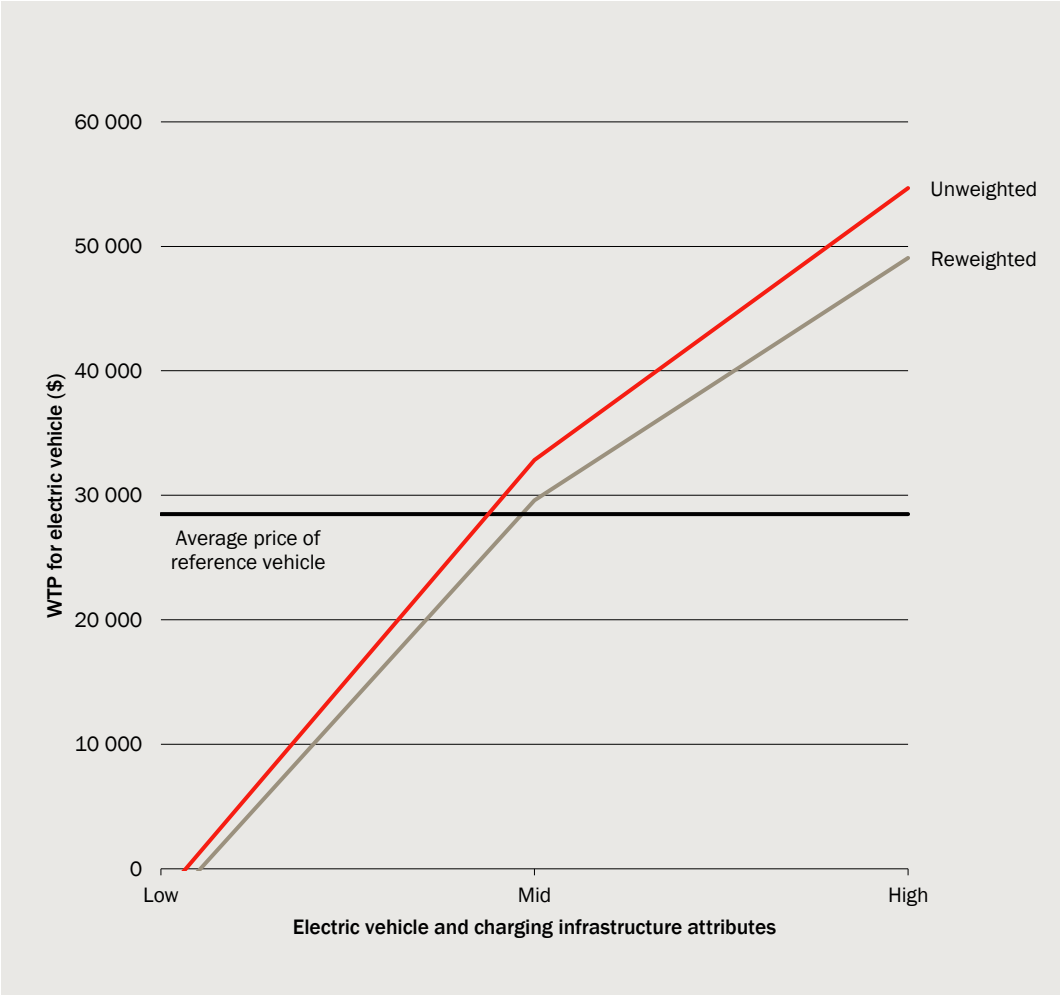
Source: CIE

Note: Respondents who took less than 5 minutes to answer the survey were dropped out of this model

E Impact of reweighting

The impact of reweighting the data to account for oversampling of persons with university degrees can be seen in figure E.1, which shows demand is slightly lower in the reweighted model.

E.1 Average demand for battery electric vehicle relative to a petrol vehicle, by weighting approach (all vehicle types)



n=3021

Data source: CIE

F Key parameters from other studies

F.1 Key survey design features from previous studies

	Sample size	Survey type	Screening	Choices at any time	Choices per participant	What vehicles
Hirdue et al (2011)	3029	Web based	US residents over 17 years Do you intend to spend more than $10000 next time you buy a vehicle? Match population stats on income, age, education and population by region	Conventional gas V versus two EVs	2 (They also asked two questions on vehicle-to-grid)	Conventional and EVs.
Tanaka et al. (2014)	4202 (Japan) + 4000 (US)	Web based	Match age and gender distribution of Population	1 conventional, 1 EV and 1 PEHV	8	Conventional, EVs, and plug in hybrids
Helveston et al. (2015)	384 (US) + 572 (china)	In person	Purchased a car in the last year, or intend to in the next 2 years	3	15 + one warm up	Conventional, Hybrid, EVs, PHEVs
Smith et al.	440	Online and mail out survey	Direct contact people at the Western Australian Electric Vehicle trial, and then email them a link.	4	6	EV, PHEV, petrol Diesel
Beck et al.	204	Web based panel – Pure Profile	Vehicle purchased in previous 2 years	5	4 Best-worst rankings	Petrol, Diesel, Hybrid, PHEV, EV

F.2 Main estimated parameters from previous studies

	EV v fuel	Range	Charging time	Fuel saving	Acceleration	Pollution	Charging station availability
Hirdue et al (2011)	-7060	$35-75 per mile (decreasing at higher distances)	$425-$3250 per hour for 50 mile charge (increasing as time approach zero)	5 years worth of savings capitalised into current price	About $2500 just between each category. (20% slower, 5% slower, 5% faster and 20% faster)	25% lower - $1935 70% lower $4346[2]	
Tanaka et al. (2014)		$21.50 per mile		$37-50 per percentage point fuel cost saved		$26-29 to reduce emission by 1%	$34-$50 per percent of station availability
Helveston et al. (2015) Based on US estimates	–$14000 BEV + $2600 HEV -$50HEV	$86 per mile	$3300 for fast charge	1500 to reduce op cost by 1 cent per mile.	$1000 to reduce 0-60 time by 1 second		

Note: All figures $US

F.3 Descriptions of parameters used in previous studies

	Price	Range	Charging time	Fuel saving	Acceleration	Pollution relative to GV
Hirdue et al (2011)	Same $1000 more $2000 more $3000 more $4000 more $8000 more $16000 more $24000 more	75 miles 250 miles 200 miles 300 miles	10 min 1h 5h 10h	Like $0.50/c gas Like $1.00/c gas Like $1.50/c gas Like $2.00/c gas	20% slower 5% slower 5% faster 20% faster	95% lower 75% lower 50% lower 25% lower
Tanaka et al. (2014)	$1000 more $2000 more $3000 more $4000 more	100 miles 200 miles 300 miles 400 miles		60% off 80% off		100% reduction 90% reduction 80% reduction 70% reduction
Helveston et al. (2015)	$15000 $18000 $24000 $32000 $50000 (CVs also use this list)	75 miles 100 miles 150 miles	Fast charging available Fast charging not available	Cent/miles	5.5 seconds 0-60 7 seconds 0-60 8.5 seconds 0-60 10 seconds 0-60	

2 These are the estimates of 50% and 95% lower with an excluded category of 25% lower.

	Price	Range	Charging time	Fuel saving	Acceleration	Pollution relative to GV
Smith et al. 2017	$34000 $42000 %50000 (other options all has 3 price choices).	100km 120km 140km	0.2 hours 1.5 hours 4 hours	Running costs of: $1.4/100km $1.7/100km $2.0/100km		11kg/100km 12kg/100km 13kg/100km

G Questionnaire

Thank you for participating in this survey, which is being run by Pureprofile and the Centre for International Economics on behalf of the Australian Automobile Association. This questionnaire is about electric vehicles. It will take around 20 minutes to complete. Published results will report on survey responses only in a grouped format, so that individuals' responses will not be identifiable.

Before we begin, just a few questions to make sure we have a good cross section of people.

1) Do you currently live in Australia?

   Yes
   No TERMINATE

2) What is your current age (in years)? CHECK QUOTAS
   Less than 18 TERMINATE
   18-29
   30-39
   40-49
   50-59
   60-69
   70-79
   80 or more

3) What is your postcode? CHECK QUOTAS

   _____

4) What is your gender? CHECK QUOTAS
   Male
   Female
   Other
   Prefer not to say

This survey is about electric vehicles.
It will cover:
Your views on electric vehicles
The type of vehicle you are most likely to buy
Your views on some vehicle comparisons
Some questions about you

Your views on electric vehicles

5) Have you ever owned an electric vehicle?
- Yes
- No

6) Have you ever driven or been a passenger in an electric vehicle?
- Yes
- No

7) How much do you know about electric vehicles?
- I have a good knowledge of electric vehicles, and am aware of their relative pros and cons relative to petrol/diesel vehicles
- I have some knowledge of electric vehicles, and their relative pros and cons compared to petrol/diesel vehicles
- I have very little or no knowledge of electric vehicles

We will now show you 10 statements. Please tell us how much you agree or disagree with each one.

8) Electric vehicles are currently more expensive to purchase than similar petrol/diesel vehicles
- Strongly Agree
- Slightly agree
- Neutral
- Slightly disagree
- Strongly disagree
- Don't know

9) Electric vehicles are currently more expensive to service than similar petrol/diesel vehicles
- Strongly Agree
- Slightly agree
- Neutral
- Slightly disagree

Strongly disagree
Don't know

10) The electricity used to charge an electric vehicle costs more than the cost of fuelling a petrol or diesel vehicle
Strongly Agree
Slightly agree
Neutral
Slightly disagree
Strongly disagree
Don't know

11) Electric vehicles are safer than petrol/diesel vehicles
Strongly Agree
Slightly agree
Neutral
Slightly disagree
Strongly disagree
Don't know

12) Electric vehicles are quieter to drive than petrol/diesel vehicles
Strongly Agree
Slightly agree
Neutral
Slightly disagree
Strongly disagree
Don't know

13) Electric vehicles are better for the environment than petrol/diesel vehicles
Strongly Agree
Slightly agree
Neutral
Slightly disagree
Strongly disagree
Don't know

14) It is hard to find somewhere to service an electric vehicle
Strongly Agree
Slightly agree
Neutral
Slightly disagree
Strongly disagree
Don't know

15) Electric vehicles depreciate in value faster than petrol/diesel vehicles
Strongly Agree

Slightly agree
Neutral
Slightly disagree
Strongly disagree
Don't know

16) Electric vehicles accelerate more quickly than petrol vehicles
Strongly Agree
Slightly agree
Neutral
Slightly disagree
Strongly disagree
Don't know

17) Existing electric vehicles are more powerful (have more torque) than diesel vehicles
Strongly Agree
Slightly agree
Neutral
Slightly disagree
Strongly disagree
Don't know

The type of vehicle you are most likely to buy
In the following questions 'your household' means the group of people you purchase and use vehicles with.

18) Including yourself, how many adults (18 years or over) live in your household?

1
2
3
4 or more

19) How many children (under 18) live in your household?
0
1
2
3
4
5
6 or more

20) In total, how many vehicles does your household currently own?
0 SKIP TO Q24
1
2
3
4
5
6 or more

21) Which types of vehicles do you currently own? (select all that apply)
Micro/small car
Medium car
Large car
People mover / family wagon
Sports car
SUV small-medium
SUV large
Van
Ute

22) Were you involved in choosing the vehicle(s) you own?
Yes. I chose or helped choose at least one of the vehicles I own
All of the vehicles I own were chosen by someone else SKIP TO Q24

23) When did you last choose or help choose a vehicle for purchase?
Within the last 12 months
1-2 years ago
3-5 years ago
More than 5 years ago

24) How likely are you to purchase a vehicle within the next 5 years?
Almost certain (>85%)
Highly likely (70%-85%)
Likely (55%-70%)
Neither likely nor unlikely (45%-55%)
Unlikely (30%-45%)
Highly unlikely (15%-30%)
Remote (<15%)

25) If you do purchase a vehicle, when is this most likely to happen?
- I am currently considering purchasing a vehicle
- Within the next 12 months
- Within 1-2 years
- In 3 years or more

26) Would this vehicle be in addition to the vehicles listed above, or to replace an existing vehicle?
- Replace an existing vehicle
- In addition to the existing vehicles

27) What type of vehicle are you most likely to purchase?
- Micro/small car
- Medium car
- Large car
- People mover / family wagon
- Sports car
- SUV small-medium
- SUV large
- Van
- Ute

28) How much would you be looking to spend on your next vehicle?
- Less than $10 000
- $10 000 to $19 999
- $20 000 to $34 999
- $35 000 to $49 999
- $50 000 to $74 999
- $75 000 to $99 999
- More than $100 000

29) What fuel type would you be most likely to choose in your next vehicle (based on the vehicles currently on the market in Australia)?
- Petrol
- Diesel
- Hybrid
- Other (including LPG, Battery Electric Vehicles, Plug-in Hybrid Electric Vehicles, and Hydrogen Fuel Cell Vehicles)
- Don't know

30) What transmission would you be most likely to choose in your next vehicle?
Automatic transmission
Manual transmission
Don't know

31) Do you want your next vehicle to be able to tow a caravan, trailer or boat?

Yes
No

32) How much do you expect to drive this vehicle?
Light use (0-200 km per week or 0 - 10 000 km/year)
Medium use (200 – 400km per week or 10 000 – 20 000 km/year)
Heavy use (>400km per week or >20 000 km/year)

33) What is the best parking you could use where you live?
Garage
Carport
Front yard
A personal space in a garage in multi-unit complex
A communal garage in a multi-unit complex
A personal space in an open-air car park in a multi-unit complex
A communal open-air car park in a multi-unit complex
On-street parking
Other

We want to get your views on some vehicle comparisons. These comparisons will include electric vehicles and plug-in hybrid vehicles.
Most people don't know a lot about these vehicles. So, before we ask you to make comparisons, here is some factual information about the vehicles.

What is an electric vehicle?
Electric vehicles are powered by electricity rather than petrol or diesel.
There are two types that we focus on in this survey:
- **battery electric vehicles** that are 100% powered by electricity, and are charged by plugging them into a power point
- **plug-in hybrid electric vehicles**, which can be charged by plugging into a power point, but also have a petrol/diesel engine that can be used with or instead of the electric motor.
Currently there are very few electric vehicles or plug-in hybrid electric vehicles in Australia. There are a number of hybrid vehicles on the road but these differ in that they do not plug in to charge and cannot be driven without petrol/diesel.

Recent advances in technology suggest that the number of electric vehicles will increase in the future.

Photo: Electric Vehicle Council

Charging experience

Electric vehicles are charged by plugging them into a power point.

Most electric vehicle charging is done at home. Home charging can take a few hours, but can be done overnight when you're not using the vehicle. This type of charging is possible only if you have access to electricity where you park.

Electric vehicles can also be charged at public charging stations in car parks. These stations tend to be located in places that people visit, such as shopping centres, so that they do not need to make a special stop to charge their vehicle.

Charging stations are available on some major highways and more are likely to be installed in the future. The newest chargers can charge a vehicle to 80% in less than 30 minutes.

Electricity tends to be cheaper than other fuel sources.

Most electric vehicles have a battery warranty of around 8 years. Older batteries need to be recharged more often.

Driving experience

Like all vehicles, electric vehicles come in different makes and models, with different levels of performance.

However, there are some features of electric motors that are different to petrol/diesel engines:

- Electric motors tend to provide a smoother path of acceleration, with no gear changes, and a more steady ride.
- Electric motors are quieter than petrol/diesel engines.
- Most existing fully electric vehicles have not had a towing option. This is changing, but it is expected that towing a heavy load will reduce the range of the vehicle by around 30%.

Environmental and social benefits

Electric vehicles produce no 'tailpipe emissions'.

The total amount of carbon dioxide released due to driving an electric vehicle depends on how the electricity is generated. With the current mix of coal, gas and renewables used in the Australian electricity grid, driving an electric vehicle creates around 30% fewer carbon emissions than a petrol vehicle (depending on your location).

Electric vehicles could improve urban environments and public health by reducing noise and smog.

Your views on some vehicle comparisons

We will now ask you six questions about vehicle comparisons. In each of these questions you will be presented with three vehicles. One vehicle will run on fuel. The other two vehicles will be different types of electric vehicles that could become available in the next

few years. In each question, we want to know which vehicle you would be most likely to purchase.
When answering these questions, please try to imagine you are in the future at the point of your next vehicle purchase.

The vehicles will be described by several characteristics. Each question will also describe the charging infrastructure available for electric vehicles. If you want to know more about the meaning of these characteristics, you can position your mouse over the labels and extra text will pop up.
Where characteristics are not described in the question, please assume they are the same across the vehicle options.
Some vehicles may look strange to you, but this is because there are many technological changes that could happen in the future.

These six questions are the most important questions in this survey. They contain a lot of information, so please take your time and consider your answers carefully.

<choice questions – 2 questions for each of 6 vehicle comparisons>

Text for mouse hover over each attribute label

Fuel type
A battery electric vehicle is 100% powered by connecting to electricity power points, while a plug-in hybrid electric vehicle has both electric and conventional fuel motors. Existing plug-in hybrid electric vehicles come in both petrol and diesel variants, but this survey is considering only petrol versions.
Driving range on battery
The maximum distance the vehicle can travel on a fully charged battery alone.
This figure is the maximum range of the vehicle across a mix of highway and city driving. The actual range of a vehicle may vary due to traffic conditions, weather, terrain, the age of the car and how smoothly you drive.
Towing a trailer will also reduce the range of an electric vehicle by around 30 per cent.
Driving range on fuel tank
The maximum distance the vehicle can travel on a full tank of fuel alone.
This figure is the maximum range of the vehicle across a mix of highway and city driving. The actual range of a vehicle may vary due to traffic conditions, weather, terrain, the age of the car and how smoothly you drive.
Towing a trailer will also reduce the range of a vehicle by around 30 per cent.
Acceleration
The time taken to accelerate from 0-100 km/h under ideal conditions.
Towing capacity
This is the maximum weight that the vehicle is rated to tow if the trailer or caravan has brakes.
Where the vehicle is rated for towing, please assume that towing equipment (towbar etc.) is fitted and included in the purchase price below.
Carbon emissions from fuel/electricity generation

These figures include the CO_2 emissions from conventional vehicles, as well as the CO_2 released when generating electricity. These figures don't include all 'lifecycle emissions' of producing the cars. However, these additional costs are relatively similar between conventional and electric vehicles.

Other

Where a vehicle characteristic is not specifically mentioned, please assume that it is the same across the three vehicle options. This includes whether the car is new or second hand.

Availability of charging points at destinations

These charging points are in addition to home charging, where the majority of charging is done.

Some charging stations are provided for free by car manufacturers, while others charge a fee.

Time to charge to 80% at destination charging points

The time it takes to charge a vehicle varies depending on the charger. Fast chargers use higher voltages and amperages and are built to cope with the extra heat that generates. It takes around the same amount of time to charge an electric vehicle from 0-80% as it does to charge an electric vehicle from 80-100%.

Availability of charging points on major highways

These charging points are in addition to home charging, where the majority of charging is done.

Some charging stations are provided for free, while others charge a fee.

Time to charge to 80% at highway charging points

The time it takes to charge a vehicle varies depending on the charger. Fast chargers use higher voltages and amperages and are built to cope with the extra heat that generates. It takes around the same amount of time to charge an electric vehicle from 0-80% as it does to charge an electric vehicle from 80-100%.

Purchase price

This price includes 'on-road' costs, including all taxes, subsidies and, for battery electric and plug-in hybrid vehicles, the cost of a home charging kit.

Running costs

This includes the cost of fuel (electricity and/or petrol/diesel) and servicing. On average, Australian vehicles are driven around 15,000 kilometres per year, so each dollar saved on running cost per 100km would save a typical driver around $150 per year.

40) Did you find the choice questions difficult to answer in the time you had available?

They were very difficult questions
They were somewhat difficult questions
They were not difficult questions

41) Did you believe that all of the vehicles and charging infrastructure presented would be possible in the future?

Yes SKIP TO Q43
No
Don't know SKIP TO Q43

42) How did you go about answering the question(s) with unrealistic vehicles?

I imagined the unrealistic vehicles would be possible

I answered the question(s) as though the vehicles were different, more realistic vehicles

IF RESPONDENT CHOSE A VEHICLE OTHER THAN *MODEL A* IN AT LEAST ONE VEHICLE COMPARISON, SKIP Q43 AND GO TO Q44

43) You did not choose an electric or plug-in hybrid vehicle in any of the vehicle comparisons. Why is that? (Tick all boxes that apply)

I much prefer petrol/diesel fuelled vehicles to electric vehicles

I didn't have time to compare the vehicles in detail

I didn't have enough information to be confident choosing electric vehicles

I am worried this survey will be used to support a government policy I disagree with

Other (please specify below)

_____

44) Did any of these other factors affect the choices you made in the vehicle comparison questions? (Tick all boxes that apply)

Concern about finding somewhere to service the vehicle

Concern about resale value

Concern about range as batteries age

Concern about the cost of replacing batteries

Safety

Nowhere to charge at home

Concerns over driving between major cities

Concerns over driving long distances in regional and rural areas

I want to drive long distances and am concerned about the availability of public charging stations

I rent my home and I am unsure if I will be able to make the necessary alterations to charge my vehicle

I have rooftop solar panels and an EV would allow me to drive emissions free, as well as use the vehicle battery to manage power flows from the solar panels.

45) Are there any other reasons that you would/wouldn't want to purchase an electric vehicle?

_____

Questions about you

46) In the last five years, have you made changes in lifestyle and shopping habits to help the environment?

I have made major changes to help the environment
I have made minor changes to help the environment
I have made no changes to help the environment

47) When buying products other than vehicles, do you usually buy the newest technology soon after it becomes available?
Yes
No

48) Do you have a university degree?
Yes
No

49) Are you currently studying?
Studying full time
Studying part time
Not studying

50) Are you currently working?
Full time
Part time
Not working

51) What is your yearly household income before tax?
$0-$10 399
$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 - $129 999
$130 000 - $155 999
$156 000 - $181 999
$182 000 - $207 999
$208 000 - $259 999
$260 000 or more

Do not wish to answer

52) If you have any further comments about this topic or this survey, please provide them below.

_____
_____
_____
_____

Thank you for participating in this survey. Your feedback is very important.

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