

Willingness to pay for driverless cars

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Abstract

Driverless cars represent a significant opportunity for the transport sector and society. Driverless cars have the potential to improve safety, reduce travel times and improve mobility. Attitudes toward driverless cars are increasingly important as governments around the world begin to develop their policies for the implementation of driverless cars. An area that has not been sufficiently addressed in the literature concerns the demand for driverless cars.

The aim of this paper was to provide an explorative assessment of the probability of driverless car usage and the likely willingness to pay. An online survey of 265 respondents was undertaken to measure attitudes to driverless cars. We found that the probability of driverless car usage is 75% and the average willingness to pay was \$6,903. This equated to \$1,015 per year or 15 cents per kilometre. At 100% probability of driverless car usage the average willingness to pay was \$9,727.

The rate at which driverless cars will penetrate the market depends primarily on whether consumers are willing to use and pay for the new technology. Young respondents (18 to 36) are the most likely to use driverless cars compared to other age groups and safety was considered the most important determinate of willingness to pay and driverless car usage. We found that there was a significant difference between willingness to pay and the estimated savings that driverless cars may offer such as travel time savings. This indicated that driverless car usage will depend on the level of travel cost savings possible from driverless cars.

Keywords:

Driverless car

Autonomous vehicle

Willingness to pay

Demand

Market penetration

1. Introduction

Recent technological advances are having a significant impact on the transport sector. Uber has disrupted the traditional market for taxis and Tesla is challenging the long held notion that electric cars could never replace unleaded and diesel vehicles. The introduction of driverless car technology (also known as a self-driving, autonomous or automated vehicle) however has the potential to transform passenger and freight transportation monumentally.

Driverless cars should provide a number of benefits. According to Litman (2015) the main benefits will be reduced traffic and parking congestion and therefore road and parking facility supply requirements, independent mobility for low-income people and therefore reduced need to subsidise transit, increased safety, energy conservation and pollution reductions.

Driverless car technology has been evolving at a rapid rate and some driverless features (semi-autonomous) are already available in today's cars. For example, adaptive cruise control¹ for highway conditions is available in a number of cars and other similar systems such as BMW's 'traffic jam assistant' product allows the car's systems to control the car at speeds of up to 60km/h in dense traffic situations. Tesla's S model 'AutoPilot' system includes automated parallel parking, side collision warning, automatic emergency steering, auto steering and automatic lane changing. Currently (2016) Tesla's autopilot function is disabled on residential streets and on roads that do not have adequate lane markings. The 'AutoPilot' feature of the Tesla Model S is estimated to cost consumers \$3,800 on top of the retail price of \$197,738.²

While the development of driverless car technology is occurring at a rapid pace, a fully 'automated' driverless car is not commercially available. As such, there remains considerable debate around consumer acceptance and willingness to pay for a fully 'automated' driverless car. The rate at which driverless cars will penetrate the market depends primarily on whether consumers are willing to use and pay for the new technology.

The aim of this study is to provide an explorative assessment of the likely usage and willingness to pay for driverless car technology. The assessment uses the response to an internet survey of 265 Australia and New Zealand car users undertaken in April/May 2016. The results of this research are based on individuals continuing to 'own' a car.³

The remainder of this paper is as follows. Section 2 reviews the relevant literature, Section 3 provides an overview of the survey design and our approach to the analysis, Section 4 describes the sample. Section 5 describes the likely usage of driverless cars and Section 6 presents the willingness to pay results. Section 7 discusses some of the implications of the survey results for future demand and market penetration of driverless cars. Section 8 compares the results of this study to the literature. Section 9 makes some concluding remarks.

¹ Adaptive cruise control regulates a car's speed by automatically braking and accelerating based on the vehicle in front.

² <http://www.caradvice.com.au/433289/2016-tesla-model-s-p90d-review-long-term-report-one/> (assessed 19 June 2016).

³ As opposed to willingness to pay of 'robotaxis' or automated taxi fleets.

2. Literature review

While there is extensive literature concerning driverless cars, including major studies such as USDoT 2016⁴, DfT 2015⁵ and Morgan Stanley 2013⁶, there are limited studies on consumer preference and willingness to pay. Studies that have been undertaken include KPMG (2013), Kyriakidis et al (2015), Dai and Howard (2013) and Bansal and Kockelman (2016).

KPMG (2013) in the United States undertook a study of 32 participants in a focus group format. The study found that respondents with a low passion for driving were more likely to use a driverless car than those with a high passion for driving although the difference was not that marked (100% of low passion participants would use a driverless car compared to 80% of participants with a high passion for driving). Females were slightly more likely to use a driverless car than males (82% women compared to 75% men) but age was not a significant factor (here the small sample should be taken into account).

Kyriakidis et al (2015) conducted an online survey of 5,000 respondents from 109 countries. On average 22% of respondents did not want to pay anything at all for a fully automated driving system. At the other end of the scale, 5% were willing to pay over \$30,000 on top of the vehicle purchase price. Males were found to be willing to pay more than females with higher income respondents and those who drove more were willing to pay the most.

Dai and Howard (2013) investigated public attitudes toward driverless cars using the responses of 107 likely adopters in Berkeley, California. The study found that safety was the most attractive feature with the convenience of not having to find parking also important. On the downside, respondents were most concerned with liability issues and the cost of the technology.

Bansal and Kockelman (2016) conducted simulation modelling using data obtained from a survey of 2,167 Americans to assess preferences and willingness to pay for driverless car technology. The average willingness to pay was \$5,857 above the initial purchase price of the vehicle although 59% were not willing to pay anything at all. When respondents with a zero willingness to pay were removed from the sample, the average increased to \$14,196.

3. Survey approach

The aim of the survey was to determine the likelihood of people using driverless cars taking account the potential savings that such technology might provide and then assess respondents willingness to pay for the technology above the purchase price of the vehicle. An overview of the approach is shown in Figure 1.

A 30 question survey was designed and disseminated online from April 2016 to May 2016. The data and information recorded was anonymous. The survey instructions informed the respondents about the aim of the survey and described what driverless car technology provided in terms of automated control over the speed and steering of the car.⁷

The survey started by asking questions on gender, age, residence (Australian state or country), employment status, personal income and household size. The survey then asked if the respondents had a driver's license and owned a car (fuel type, purchase price, new or used, age of car and/or whether they had access to a car or shared their car with others).

⁴ http://www.its.dot.gov/research_areas/automation.htm (accessed 19 June 2016)

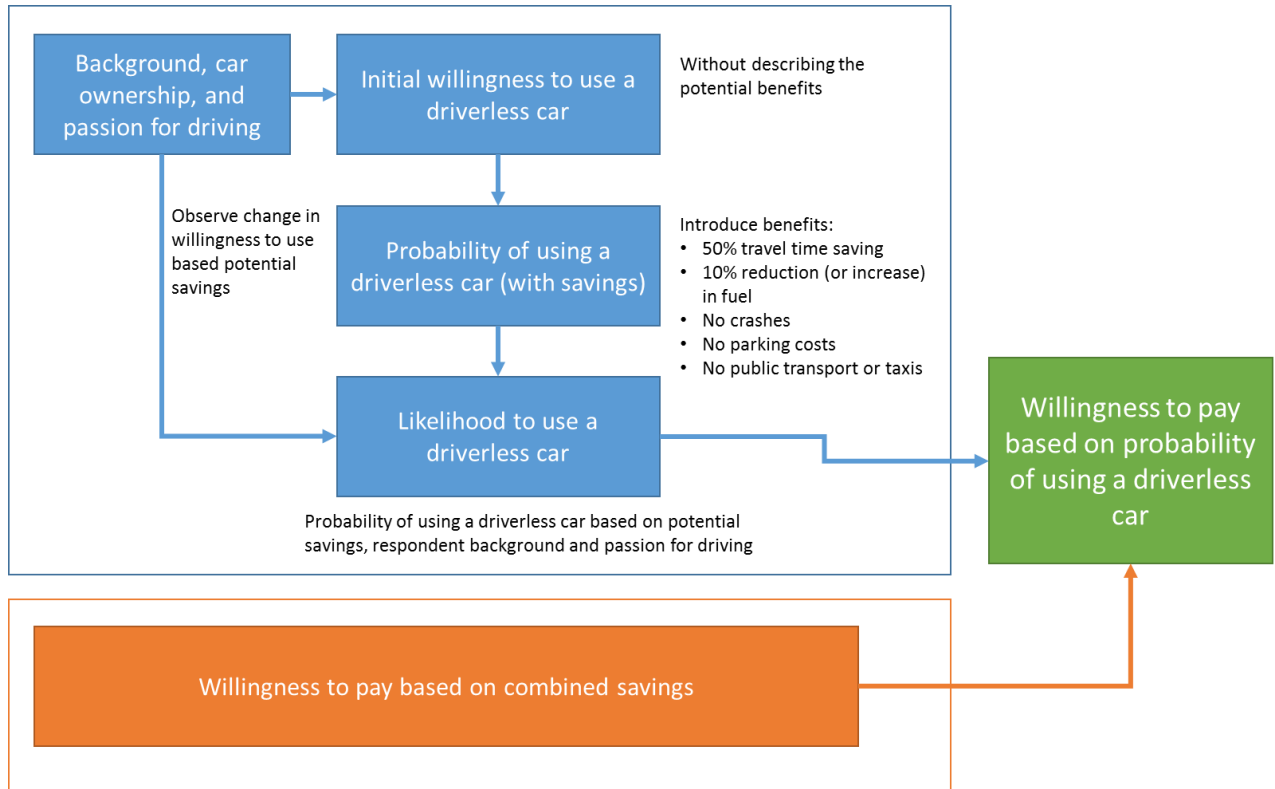
⁵ The United Kingdom the Department for Transport (2015) completed a large study of regulations for automated vehicle technologies.

⁶ Assessed a number of issues including the timeline for adoption of driverless cars, the socio-economic benefits, the investment implications of autonomous vehicles.

⁷ There was no explicit definition of whether the car had a steering wheel.

Respondents were then asked their passion for driving on a 1 to 10 scale (1 being not passionate and 10 being extremely passionate).

Figure 1: Overview of study approach



The core of the questionnaire was a set of likely driverless car usage questions. The aim was to understand respondent’s initial unprompted or ‘gut feel’ use of driverless cars without any specification of the potential savings. Usage was measured on a 1-10 scale with 1 being ‘not likely’ and 10 being ‘extremely likely’.

The survey then presented a series of cost savings that driverless cars could provide. These included a halving in drive time, a 10% fuel saving⁸, reduction in crashes to zero, zero parking costs and the saving in public transport and taxis costs by not having to use such services. A final question was asked which combined all the savings into a package.

Preceding each question, respondents were asked a context question. These included the average weekly kilometres driven per week, the amount spent on fuel per week, whether or not the respondent had been involved in a crash, the weekly parking cost and weekly expenditure on public transport and taxis.

4. Survey Response

A total of 276 people responded to the survey. Eleven responses were removed because they failed to answer the core questions which reduced the sample to 265. 212 (80%) respondents were resident in Australia, 48 from New Zealand and 5 from Europe. Queensland provided the most responses (93) followed by NSW (49), see Table 1.

⁸ A 10% fuel increase question was also asked.

Table 1: State / Country of Residence

Residency	Observations	Percent
Australian Capital Territory	5	2%
New South Wales	49	19%
Queensland	93	35%
South Australia	15	6%
Victoria	35	13%
Western Australia	15	6%
New Zealand	48	18%
Europe	5	2%
Total	265	100.0

Table 2 provides summary statistics of the sample. 91% of respondents owned a car. The average passion for driving (converted to a percentage scale with 0% no passion and 100% strong passion) was 50% with males (52%) slightly more passionate than females (46%). There was virtually no difference between the three age groups.

The average age of cars owned by respondents was 6.8 years. The average purchase price was \$29,100. On average, 130 kilometres were driven per week costing \$38 per week in fuel.

Around 70% of survey respondents had been involved in a car crash. The percentage increased with age and men (77%) were more likely to have experienced a crash than women (56%).

On average, \$22 was spent on public transport / taxi fares and \$19 on parking per week.

Table 2: Sample Descriptors

#	Statistic	Young < 36	Mid 36 – 60	Old > 60	Female	Male	ALL
1	Own a Car %	88%	95%	85%	91%	91%	91%
2	Passion for driving %	51%	49%	49%	46%	52%	50%
3	Car Age Years	6.3	6.9	8.0	6.2	7.1	6.8
4	Car Price \$	25,100	31,300	33,500	23,300	32,900	29,100
5	Drive Kms per Week	131	128	140	115	140	130
6	Car Fuel Spend \$/Week	34	41	44	36	40	38
7	Involved in Car Crash %	55%	78%	83%	56%	77%	69%
8	Parking Cost \$/Week	17	20	22	20	19	19
9	PT/Taxi Cost \$/Week	24	21	18	22	22	22
10	Income \$000 p.a.	74	101	91	70	102	89
11	Age (Years)	28	47	70	38	44	42
12	Female %	52%	31%	23%	100%	0%	38%
13	Observations	104	135	26	102	163	265

5. Willingness to use a driverless car

The likelihood (calculated as a percentage) of driverless car use (DLCU) is shown in Table 3. The initial likelihood was 52% (row 1) with males (54%) more likely than females (48%). In terms of age, 'young' respondents (under 36 year olds) were the most likely (56%) to use a driverless car with 'old' respondents (60 years old or more), the least likely (41%).

Rows 2 to 7 show DLCU by specified 'saving'. DLCU was highest for zero accidents (71%). For 'young' respondents DLCU was similar for halving drive time, zero parking costs and

zero public transport costs at 70%. For 'mid age' respondents halving drive time was the second most important factor.

Row 8 shows that DLCU increased to 75% with the five savings combined as a 'package' which was 23% points higher than initial DLCU of 52%.

Table 3: Willingness to use a driverless car (% score)

#	Statistic	Young < 36	Mid 36 – 60	Old > 60	Female	Male	ALL
1	Use DC – Initial	56%	50%	41%	48%	54%	52%
2	Use DC – 50% Time Saving	70%	62%	55%	61%	66%	64%
3	Use DC – 10% Fuel Saving	61%	55%	46%	56%	57%	57%
4	Use DC – 10% Fuel Increase	39%	34%	34%	30%	40%	36%
5	Use DC – No Crashes	75%	70%	55%	72%	70%	71%
6	Use DC – No Parking Cost	70%	60%	45%	63%	62%	62%
7	Use DC – No PT/Taxi Cost	70%	55%	31%	59%	58%	58%
8	Use DC – All +ve Factors	81%	74%	53%	76%	74%	75%
9	Income \$000 p.a.	74	101	91	70	102	89
10	Age (Years)	28	47	70	38	44	42
11	Female %	52%	31%	23%	100%	0%	38%
12	Number of Respondents	104	135	26	102	163	265

DC = driverless car

Table 4 shows the increase on initial DLCU for each saving. The greatest increase was for zero crashes with a 19% increase. Female use increased more than males (24% versus 16%).

The lowest increase in DLCU for any saving was for the 10% fuel saving (5%).

At 54%, the increase in usage calculated by adding the individual savings together was more than double that of the combined 'package' of 23%. In other words, the individual savings tended to 'duplicate' each other and therefore not add to overall DLCU.

Table 4: Increase in Driverless Car Usage with Specified Savings

#	Statistic	Young < 36	Mid 36 - 60	Old > 60	Female	Male	ALL
1	Use DC - 50% Time Saving	14%	12%	14%	13%	12%	13%
2	Use DC - 10% Fuel Saving	5%	5%	5%	8%	3%	5%
3	Use DC - No Crashes	19%	20%	14%	24%	16%	19%
5	Use DC - No Parking Cost	14%	9%	4%	15%	8%	11%
6	Use DC - No PT/Taxi Cost	14%	4%	-10%	11%	4%	7%
7	Sum (1,2,3,5,6)	65%	51%	26%	72%	43%	54%
8	Use DC - All +ve Factors	25%	24%	12%	28%	20%	23%
9	Factor (Ratio 7/8)	2.6	2.1	2.1	2.5	2.1	2.3

Table 5 presents the relative importance of each specified saving calculated as the increase in DLCU for each saving divided by the total increase (row 7 in Table 5). Overall, safety (zero crashes) was the most important saving accounting for 35% of the package increase in DLCU. Halved travel time was second (24%) and zero parking costs third (20%). Less important were zero PT/taxi costs (12%) and a 10% fuel saving (10%).

Table 5: Relative importance of Specified Savings

#	Statistic	Young < 36	Mid 36 - 60	Old > 60*	Female	Male	ALL
1	Use DC - 50% Time Saving	21%	23%	38%	19%	28%	24%
2	Use DC - 10% Fuel Saving	8%	10%	13%	12%	8%	10%
3	Use DC - No Crashes	29%	39%	38%	33%	37%	35%
5	Use DC - No Parking Cost	22%	19%	11%	20%	19%	20%
6	Use DC - No PT/Taxi Cost	21%	9%	0%	16%	8%	12%
7	Sum (1,2,3,5,6)	100%	100%	100%	100%	100%	100%

* PT/Taxi Cost share set to 0%

Regression was used to determine the important factors underlying DLCU which are presented in Table 6 and summary data is presented in the Appendix. Base Use (DC1) and final use with the package of savings (DCALL) were modelled as well as the change in use (Δ on the Base) for each saving. For the change models, base use (DC1) was included as an explanatory variable which allowed for the increase in use to decline as base use increased (if the base use was 100%, the saving offered should not increase use).

The estimated parameters largely reflect the statistics in Table 5. The only statistically significant saving was public transport and taxi (PTT) costs which increased not only the change in DLCU with zero PTT costs but also base DLCU. None of the other 'savings' (distance travelled, fuel saved, accidents and parking costs) were statistically significant. Due to the explorative nature of the research a 90% confidence level (t-value > 1.65) was used to determine statistical significance.

Females tended to have a lower base DLCU than males but a higher response to zero crashes. Young respondents tended to have a higher base use and were more responsive to zero parking charges and zero PTT costs. Old respondents had a similar base use to mid aged respondents but were less persuaded by zero crashes and zero PTT costs.

Table 6: Explanatory Regression Model of Driverless Car Use

#	Model	Parameter Estimate					
		β_0	DC1	FEM	YNG	OLD	PTTC
1	Base Use (DC1)	0.45	Na	-0.08	0.08	-	0.003
2	Δ Use - Halve Travel Time	0.23	-0.21	-	-	-	-
3	Δ Use - 10% Fuel Saving	0.16	-0.20	-	-	-	-
4	Δ Use - Zero Crashes	0.38	-0.39	0.05	-	-0.11	-
5	Δ Use - Zero Parking Cost	0.21	-0.26	-	0.08	-	-
6	Δ Use - Zero PTT Cost	0.19	-0.33	-	0.1	-0.14	0.0013
7	Δ Use - Package (2-6)	0.47	-0.42	-	-	-0.17	-
8	Final Use (DCALL)	0.45	0.58	0.05	-	-0.16	-

#	Model	t value					
		β_0	DC1	FEM	YNG	OLD	PTTC
1	Base Use (DC1)	12.1	Na	1.8	1.8	-	3.1
2	Δ Use - Halve Travel Time	11.6	6.5	-	-	-	-
3	Δ Use - 10% Fuel Saving	7.6	6.2	-	-	-	-
4	Δ Use - Zero Crashes	13.6	10.1	1.8	-	2.4	-
5	Δ Use - Zero Parking Cost	7.9	6.5	-	2.7	-	-
6	Δ Use - Zero PTT Cost	5.9	7.7	-	3.2	2.6	1.8
7	Δ Use - Package (2-6)	18.1	10.5	-	-	3.6	-
8	Final Use (DCALL)	15.4	14.6	1.6	-	3.4	-

6. Willingness to pay for a driverless car

The willingness to pay (WTP) for the package of driverless car savings averaged \$6,903 (which corresponded to DLCU of 75% probability to use a driverless car with all of the packages). WTP increased with the probability of DLCU use as Table 7 and Figure 2 show. At zero or low DLCU use, WTP was low. It then increased proportionately with usage to reach \$9,727 at 100% DLCU. At the initial DLCU usage of 52%, the predicted WTP was \$4,809.

Table 7: Willingness to Pay for Driverless Car Facilities

WTP (\$) for Driverless Car Functions	Probability of Using Driverless Cars										Av 75%
	0%	11%	22%	33%	44%	56%	67%	78%	89%	100%	
0	6%	2%	3%	1%	2%	1%	2%	2%	1%	2%	22%
2,500	1%	0%	1%	-	1%	1%	5%	5%	3%	7%	24%
7,500	-	-	0%	-	1%	1%	3%	5%	3%	16%	28%
12,500	-	-	-	-	1%	1%	-	2%	2%	9%	15%
17,500	-	-	0%	-	-	0%	0%	0%	-	3%	5%
22,500	-	-	-	-	0%	-	0%	-	2%	5%	7%
Av WTP \$	294	417	2,500	0	5,385	7,045	4,712	5,429	8,417	9,727	6,903
Response (N)	17	6	13	3	13	11	26	35	30	110	264

Figure 2: Willingness to Pay for Driverless Car Facilities

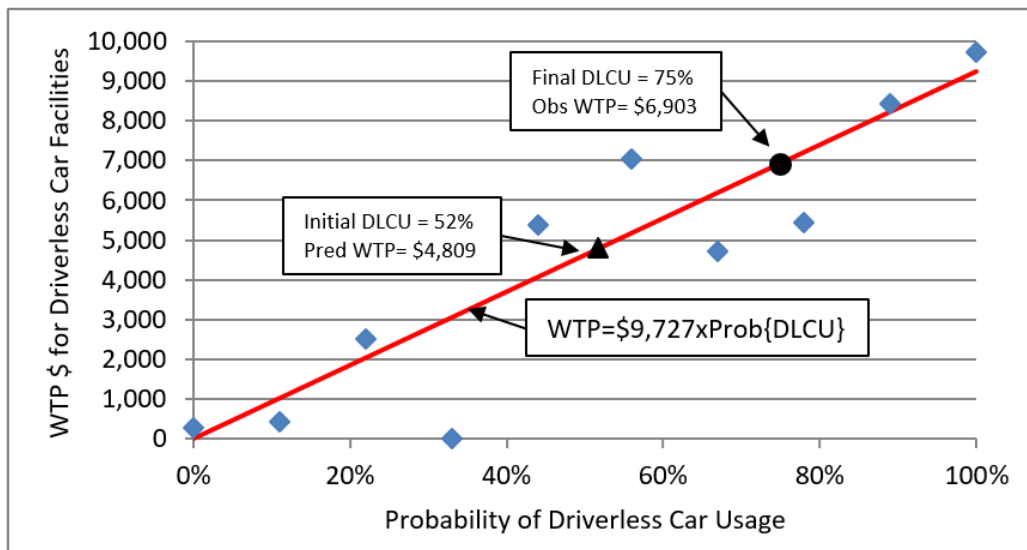


Table 8 presents the WTP by saving (using the shares in Table 5). When divided by the average car age of 6.8 years (Table 2), annual WTP (ignoring interest payments) was \$1,015. Dividing by annual average car kilometres of 6,765 (52 x 130kms per week as per Table 2) WTP amounted to 15 Cents per kilometre.

For safety (zero accidents) the annual WTP was \$355 (5C/km) and for a halving in drive time it was \$239 (4C/km).

Table 8: Willingness to Pay for Driverless Car Facilities versus Estimated Savings

Attribute	Survey DLC Usage & Willingness to Pay					Estimated Saving \$		WTP / Est Saving
	Est Attribute Share %	DLC Use %	WTP \$	WTP \$ per Year	WTP \$/km	Per Year	Per Km	
Halve Travel Time	24%	18%	1,623	239	0.04	1,004	0.15	24%
10% Petrol Cost Saving	10%	7%	663	97	0.01	197	0.03	49%
Safety - Zero Accidents	35%	26%	2,412	355	0.05	713	0.11	50%
No Parking Costs	20%	15%	1,366	201	0.03	988	0.15	20%
No PT/Taxi Cost	12%	9%	840	124	0.02	1,130	0.17	1%
Total	100%	75%	6,903	1,015	0.15	4,032	0.60	25%

On the right of Table 8 are the estimated annual and per kilometre savings. Drive time was valued \$17.90/hr based on 40% of hourly income (\$89,000 p.a. at 2,000 hours per year). An average speed of 60kph was assumed and multiplied by drive kilometres (130kms per week x 52). The estimated saving for a halving driving time worked out at \$1,004 per year or 15 Cents per kilometre. Thus the WTP of \$239 per year (4 Cents per kilometre) was only a quarter of the estimated time saving.

The 10% fuel saving worked out at \$197 per year based on the average weekly fuel cost of \$38. By comparison, the driverless car WTP for a 10% fuel saving was \$97 which was half the estimated saving.

For safety, NGTSM (2015) estimates were used which gave the cost of an accident at 11 Cents per kilometre.⁹ Given total kilometres driven, the estimated saving was \$713. At \$355, the WTP was half the estimated saving.

Parking savings were based on the survey estimates of \$19 per week which worked out at \$988 per year compared to the WTP of \$201. Thus WTP was around a quarter of the calculated saving.

Finally, savings in public transport and taxi fares were worth \$1,130 per year based on the weekly figures given by respondents. The DLCU WTP of \$124 was therefore only just over 10% of the estimated saving.

Table 9 sets of the WTP figures by market segment. Young respondents had the highest WTP at \$1,416 per year (36% of the estimated saving of \$3,981) with old respondents having the lowest WTP at \$409 per year (10% of the estimated saving of \$4,018).

⁹ NGTSM (2015) rates of \$8 million per fatality, \$460,000 per hospitalised injury, \$24,000 per minor injury and \$9,800 property damage with assumed crash rates of 0.01, 0.09, 0.19 and 0.21 per million vehicle kilometers travelled (VKT) respectively.

Table 9: Willingness to Pay for Driverless Car Facilities (Dollars per year)

Attribute	Young < 36	Mid 36 - 60	Old > 60*	Female	Male	ALL
Halve Travel Time	293	205	155	201	283	239
10% Petrol Cost Saving	116	90	54	125	75	97
- Zero Accidents	406	343	155	356	366	355
No Parking Costs	305	163	44	220	189	201
No PT/Taxi Cost	295	76	0	172	81	124
Total	1,416	876	409	1,074	994	1,015
Estimated Saving	3,981	4,078	4,018	3,634	4,314	4,032
WTP/ Estimate Saving %	36%	21%	10%	30%	23%	25%

8. Implications of results for market penetration

The survey results and analysis have a number of potential implications for the future of driverless cars such as the potential market penetration rate. A summary of the key results are shown in Table 10.

Table 10: Headline survey results

#	Statistic	Young < 36	Mid 36 - 60	Old > 60	Female	Male	ALL
1	Passion for driving %	51%	49%	49%	46%	52%	50%
2	Use DC - Initial	56%	50%	41%	48%	54%	52%
3	Use DC - 50% Time Saving	70%	62%	55%	61%	66%	64%
4	Use DC - 10% Fuel Saving	61%	55%	46%	56%	57%	57%
5	Use DC - 10% Fuel Increase	39%	34%	34%	30%	40%	36%
6	Use DC - No Crashes	75%	70%	55%	72%	70%	71%
7	Use DC - No Parking Cost	70%	60%	45%	63%	62%	62%
8	Use DC - No PT/Taxi Cost	70%	55%	31%	59%	58%	58%
9	Use DC - All +ve Factors	81%	74%	53%	76%	74%	75%
10	Car Price \$	25,100	31,300	33,500	23,300	32,900	29,100
11	WTP	8,921	6,044	3,272	6,659	7,057	6,903
12	WTP above Car Price %	36%	19%	10%	29%	21%	24%
13	Observations	104	135	26	102	163	265

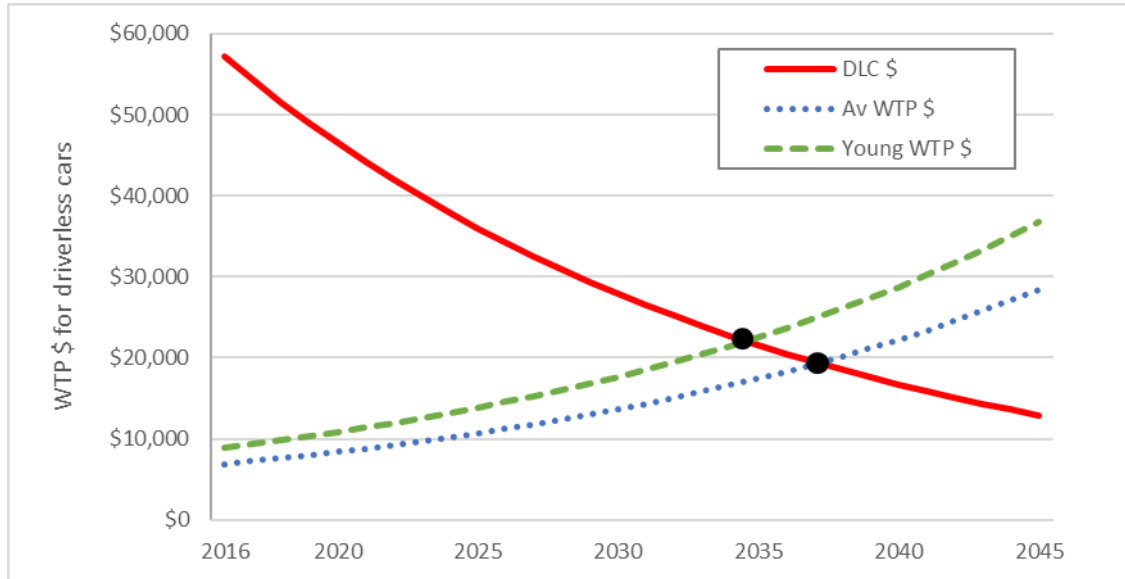
The results suggest that the take up of driverless cars is particularly high for younger people. Young respondents were most likely to use a driverless car 81% (row 9) and are willing to pay the most, \$8,921 (row 11) or 36% (row 12) above the initial purchase price, compared to the average WTP of 24% above the purchase price. Further, the survey results indicate that the potential level of savings (benefits) will significantly impact the likelihood of driverless car usage. For example, the likelihood to use a driverless car was highest if the technology reduced the number of crashes to zero.

The results of the study can be used to estimate the likely take up rate of driverless cars. According to Bansal and Kockelman (2016) the current price (\$2015) of driverless car technology is \$40,000 (USD) which equates to around \$57,000 AUD. Over time it is expected that the costs of driverless car technology will decrease. A scenario test was

undertaken assuming a 5% annual technology price reduction, accompanied by a 5% annual increase in WTP. The results are shown Figure 3.

The graph shows that the average WTP is \$6,903 and the 'young' respondent WTP is \$8,921 in 2016. Over time as technology prices decrease and WTP increase, the first year when WTP is equal to or greater than the technology costs (incremental cost of driverless car technology, DLC \$) in 2035 for young respondents. On average, the intersection is 2038. Under this scenario, it would take around 19 years for the market penetration rate of driverless cars to reach 100% for the young age group, while the overall average take up rate would occur over 22 years.

Figure 3: Market penetration scenario (5% p.a. increase in WTP, 5% p.a. decrease in DLC \$)



7. Comparison with other studies

The results of the survey are compared with the studies discussed in the literature review and summarised in Table 11. A common factor across the various studies is that safety is valued most highly by survey respondents. Also, the likelihood of respondents to use a driverless car was similar across the studies with around 80% of respondents likely to use a driverless car. While the willingness to pay results vary by currency, when converted to a common base (e.g. \$1AUD = \$0.70USD), the WTP results of Bansal and Kockelman (2016) equate to \$8,367 compared with \$9,727 presented in this study. Interesting, Bansal and Kockelman (2016) found that the majority of respondents would not be willing to pay anything for driverless car technology. This compared with only 22% of respondents not willing to pay anything in this study and also Kyriakidis et al (2015). KPMG (2013) estimated that the average WTP was 15% above the initial car price compared to 24% in this study.

Finally, Bansal and Kockelman (2016) undertook detailed simulation modelling to estimate the likely adoption and market penetration of driverless cars. They estimated that significant market penetration would not occur until 2045. This compares to 2038 estimated in this study using a simple scenario test. According to 69% of survey respondents in the Kyriakidis et al (2015), driverless cars will reach a 50% market share between now and 2050.

Detailed modelling of market penetration is an area for future research.

Table 11: Comparison with other studies

	KPMG (2013)	Kyriakidis et al (2015)	Dai and Howard (2013)	Bansal and Kockelman (2016)	This study (Ellis, Douglas, Frost)
Sample	32	5,000	107	2,167	265
Passion for driving	-	40% believe driving is enjoyable	-	75% enjoy driving	50% (score out of 100%)
Probability of driverless car usage	80%	-	42% yes 44% maybe	Appx 85%	75%
Most important factor	Handling and safety	Hacking and safety	Safety	-	Safety
WTP	\$4,500 USD *15%	-	-	\$5,857 USD	\$9,727 AUD (\$6,903 – 75%) *24%
Not WTP (WTP = \$0)	-	22%	-	59%	22%
Market penetration	50% market share by 2050			2045	2038 scenario test

* WTP above initial car purchase price

9. Conclusion

The survey results and modelling presented in this paper offers an initial insight into people's current likelihood to use and pay for driverless cars. In conclusion, the study showed that the average probability of using a driverless car was 75%, with respondents willing to pay \$6,903 for the technology on average. This equated to \$1,015 per year or 15 cents per kilometre. At 100% likelihood to use a driverless car, respondents were willing to pay \$9,727.

The younger generation are more likely to use and pay for driverless cars (81% and \$8,921), while the older age group are the least likely (53% and \$3,272). Across all groups safety was valued the highest attribute. On average, travel time savings and reduced parking costs were also important determinates of willingness to pay.

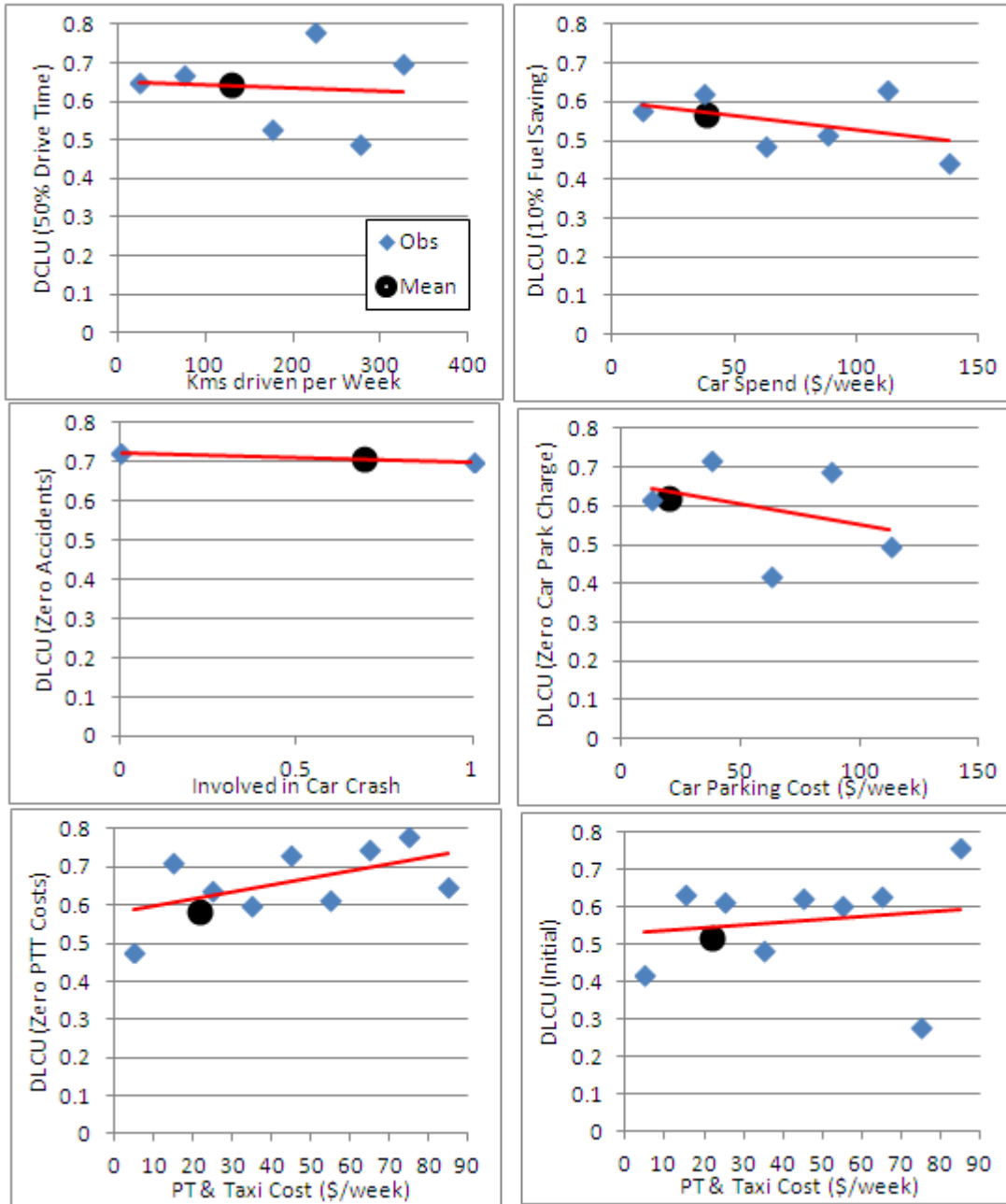
The results presented in this paper reflect the current perceptions of the survey respondents and should be considered exploratory in nature. Over time it is expected that responses and preferences for driverless cars will change as more information is disseminated to the public. For example, the likelihood to use a driverless car was based strongly on the potential savings (benefits) provided by the technology, such as the potential reduction in crashes. Therefore, if the technology is proven and the benefits confirmed, it is expected that the willingness to use and pay for a driverless car will increase.

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Appendix 1

Relationship between Travel Cost & Likelihood of Driverless Car Usage



Willingness to pay for driverless cars

DLCU 50% Travel Time Saving				DLCU 10% Fuel Saving			
Kms per week	Time Save DLCU	Obs	StDev	Fuel Cost per week \$	Fuel Save DLCU	Obs	StDev
25	65%	63	35%	12.5	58%	101	35%
75	67%	65	32%	37.5	62%	80	30%
125	64%	39	34%	62.5	49%	51	33%
175	53%	36	34%	87.5	52%	20	36%
225	78%	22	23%	112.5	63%	3	55%
275	49%	15	45%	137.5	44%	3	49%
325	70%	23	25%	-	-	-	-
Total	64%	263	33%	Total	57%	258	34%

DLCU Zero Crash				DLCU Zero Parking Cost			
Involved in Car Crash	Crash DLCU	Obs	StDev	Park Cost per week \$	Park DLCU	Obs	StDev
0	72%	80	29%	12.5	62%	219	0.3491
1	70%	180	31%	37.5	72%	26	0.302
-	-	-	-	62.5	42%	9	0.3887
-	-	-	-	87.5	70%	4	0.4748
-	-	-	-	112.5	50%	4	0.4312
Total	71%	260	31%	Total	62%	262	0.3501

DLCU Initial with PTT Cost				DLCU Zero PT & Taxi Cost			
PTT Cost per week \$	Initial DLCU	Obs	StDev	PTT Cost per week \$	PTT DCLU	Obs	StDev
5	48%	120	36%	5	42%	121	35%
15	71%	32	29%	15	64%	32	31%
25	64%	32	36%	25	62%	32	34%
35	60%	27	37%	35	49%	27	32%
45	73%	24	28%	45	63%	24	33%
55	62%	13	40%	55	61%	13	41%
65	75%	7	26%	65	63%	7	31%
75	78%	2	31%	75	28%	2	40%
85	65%	6	39%	85	76%	6	19%
Total	58%	263	36%	Total	52%	264	35%