Exploring Willingness to Pay for Autonomous Vehicles

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Introduction

• Automated Vehicles (AVs) defining the future of transportation
  • Collision avoidance systems enhance traffic safety
  • Enhanced mobility for those who cannot drive
  • Convenience for those who can drive, but would rather not

• Success of automated mobility depends on consumer adoption and willingness-to-pay (WTP)
An **Autonomous Vehicle (AV)** is a vehicle that drives itself without human supervision or control. It picks up and drops off passengers including those who do not drive (e.g., children, elderly), goes and parks itself, and picks up and delivers laundry, groceries, or food orders on its own. When AVs become available, ridehailing companies (e.g., Uber and Lyft) will use them to provide rides without a human driver in the vehicle. When answering the questions in this section, please assume a future in which autonomous vehicles (AVs) are widely adopted, but human-driven vehicles are still present.
Recent Survey Findings in Literature

• Average WTP $3,252 with a human-driven-vehicle mode option or $2,783 without it (Quarles and Kockelman, 2019)

• 26.3% unwilling to pay extra for the AV version of the vehicle (Liua et al, 2019)

• 36% willing to maintain basic vehicle utilization. Average WTP varied from $652 for basic vehicles, to $1,769 for fully automated (Asgari and Jin, 2019)

• Average WTP (dynamic rideshare without additional time) in the US is $0.74/mile during the day, $0.87 during the night (Gurumurthy and Kockelman, 2020)
TOMNET D-STOP Transformative Technologies in Transportation Survey (T4 Survey)

- Phoenix, Atlanta, Austin, and Tampa metro areas
- Summer and Fall 2019
- Random address-based sample with online instrument
- Comprehensive attitudinal survey on MaaS and AV
- Weighted to better represent Census distributions

<table>
<thead>
<tr>
<th>City</th>
<th>Sample Size</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phoenix, AZ</td>
<td>1,027</td>
<td>30.6%</td>
</tr>
<tr>
<td>Atlanta, GA</td>
<td>944</td>
<td>28.1%</td>
</tr>
<tr>
<td>Austin, TX</td>
<td>1,127</td>
<td>33.6%</td>
</tr>
<tr>
<td>Tampa, FL</td>
<td>260</td>
<td>7.8%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>3,358</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>
Survey Instrument

Attitudes and Preferences
Vehicles You Have and Where You Live
Current Travel Patterns
Mobility on Demand and Shared Mobility Services
Autonomous Vehicles
Background Information
Overview

Willingness to Pay
11. Suppose AVs are now available for purchase, lease/rent, or to use via automated ridehailing services, and half of the vehicles on the streets are AVs. What would you do when faced with your next car purchase decision in each of the following scenarios? Please rank the alternatives based on your preference (1=most preferred; 3=least preferred). Please do not give the same rank to multiple alternatives.

### Scenario 1

<table>
<thead>
<tr>
<th>Options</th>
<th>Option A: Buy a regular vehicle</th>
<th>Option B: Buy an AV</th>
<th>Option C: Don’t buy a vehicle and use AV ridehailing/rental services</th>
</tr>
</thead>
<tbody>
<tr>
<td>Costs</td>
<td>$500/month + $0.75/mile</td>
<td>$500/month + $0.75/mile</td>
<td>$0/month + $2.25/mile</td>
</tr>
<tr>
<td></td>
<td>Average wait time: 0 minutes</td>
<td>Average wait time: 0 minutes</td>
<td>Average wait time: 6 minutes</td>
</tr>
<tr>
<td>Rank</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Ranked Purchase Preference

![Bar Chart]

- **Scenario 1 (N=327)**
- **Scenario 2 (N=301)**
- **Scenario 3 (N=376)**
- **Scenario 4 (N=308)**
- **Scenario 5 (N=280)**
- **Scenario 6 (N=348)**
- **Scenario 7 (N=344)**
- **Scenario 8 (N=325)**
- **Scenario 9 (N=356)**
- **Scenario 10 (N=298)**
- **Scenario 11 (N=346)**
- **Scenario 12 (N=306)**
- **Scenario 13 (N=322)**
- **Scenario 14 (N=403)**
- **Scenario 15 (N=384)**
- **Scenario 16 (N=323)**
- **Scenario 17 (N=301)**
- **Scenario 18 (N=360)**
- **All (N=6,008)**

- **1 Regular vehicle - 2 AV - 3 Ridehailing only**
- **1 Regular vehicle - 2 Ridehailing only - 3 AV**
- **1 AV - 2 Regular vehicle - 3 Ridehailing only**
- **1 AV - 2 Ridehailing only - 3 Regular vehicle**
- **1 Ridehailing only - 2 Regular vehicle - 3 AV**
- **1 Ridehailing only - 2 AV - 3 Regular vehicle**
## Ranked Purchase Preference (Same Price)

<table>
<thead>
<tr>
<th>Options</th>
<th>Option A: Buy a regular vehicle</th>
<th>Option B: Buy an AV</th>
<th>Option C: Don’t buy a vehicle and use AV ridehailing/rental services</th>
</tr>
</thead>
<tbody>
<tr>
<td>Costs</td>
<td>$500/month + $0.75/mile</td>
<td>$500/month + $0.75/mile</td>
<td>$0/month + $2.25/mile</td>
</tr>
<tr>
<td></td>
<td>Average wait time: 0 minutes</td>
<td>Average wait time: 0 minutes</td>
<td>Average wait time: 6 minutes</td>
</tr>
</tbody>
</table>

**Scenario 1 (N=327)**

- 1 Regular vehicle – 2 AV – 3 Ridehailing only
- 1 AV – 2 Regular vehicle – 3 Ridehailing only
- 1 Ridehailing only – 2 Regular vehicle – 3 AV
- 1 Regular vehicle – 2 Ridehailing only – 3 AV
- 1 AV – 2 Ridehailing only – 3 Regular vehicle
- 1 Ridehailing only – 2 AV – 3 Regular vehicle
Ranked Purchase Preference (AV Cheaper)

<table>
<thead>
<tr>
<th>Options</th>
<th>Option A: Buy a regular vehicle</th>
<th>Option B: Buy an AV</th>
<th>Option C: Don’t buy a vehicle and use AV ridehailing/rental services</th>
</tr>
</thead>
<tbody>
<tr>
<td>Costs</td>
<td>$ 500/month + $ 0.75/mile</td>
<td>$375/month + $ 0.25/mile</td>
<td>$ 0/month + $ 1.50/mile</td>
</tr>
<tr>
<td></td>
<td>Average wait time: 0 minutes</td>
<td>Average wait time: 0 minutes</td>
<td>Average wait time: 9 minutes</td>
</tr>
</tbody>
</table>

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Phoenix (N=97)
Atlanta (N=114)
Tampa (N=33)
Austin (N=113)
All (N=357)

1 Regular vehicle – 2 AV – 3 Ridehailing only
1 AV – 2 Regular vehicle – 3 Ridehailing only
1 Ridehailing only – 2 Regular vehicle – 3 AV
1 Regular vehicle – 2 Ridehailing only – 3 AV
1 AV – 2 Ridehailing only – 3 Regular vehicle
1 Ridehailing only – 2 AV – 3 Regular vehicle
When do respondents expect to purchase an AV?

Phoenix (N=1014)
- Would not buy: 43%
- Eventually buy: 52%
- One of the first to buy: 5%

Atlanta (N=908)
- Would not buy: 37%
- Eventually buy: 59%
- One of the first to buy: 4%

Tampa (N=253)
- Would not buy: 46%
- Eventually buy: 52%
- One of the first to buy: 2%

Austin (N=1109)
- Would not buy: 32%
- Eventually buy: 62%
- One of the first to buy: 6%
Among those who are willing to purchase an AV, how much are they willing to pay?

Additional price considering they are purchasing a new regular car of $25,000

<table>
<thead>
<tr>
<th>Price Range</th>
<th>One of the first (N=160)</th>
<th>Eventually (N=1,886)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zero</td>
<td>3%</td>
<td>3%</td>
</tr>
<tr>
<td>Up to $1k</td>
<td>4%</td>
<td>8%</td>
</tr>
<tr>
<td>$1k to $3k</td>
<td>9%</td>
<td>19%</td>
</tr>
<tr>
<td>$3k to $5k</td>
<td>20%</td>
<td>25%</td>
</tr>
<tr>
<td>$5k to $8k</td>
<td>21%</td>
<td>17%</td>
</tr>
<tr>
<td>$8k+</td>
<td>43%</td>
<td>8%</td>
</tr>
</tbody>
</table>

When respondent expects to purchase an AV
Willingness to Pay by AV Familiarity

- **Never heard of Avs (N=509)**
  - Would not buy: 49%
  - Zero: 16%
  - Up to $1k: 20%
  - $1k to $3k: 30%
  - $3k to $5k: 45%
  - $5k to $8k: 30%
  - $8k+: 30%

- **Don't know much about them (N=1215)**
  - Would not buy: 49%
  - Zero: 16%
  - Up to $1k: 20%
  - $1k to $3k: 30%
  - $3k to $5k: 45%
  - $5k to $8k: 30%
  - $8k+: 30%

- **Somewhat familiar (N=1163)**
  - Would not buy: 49%
  - Zero: 16%
  - Up to $1k: 20%
  - $1k to $3k: 30%
  - $3k to $5k: 45%
  - $5k to $8k: 30%
  - $8k+: 30%

- **Very familiar (N=418)**
  - Would not buy: 0%
  - Zero: 0%
  - Up to $1k: 20%
  - $1k to $3k: 20%
  - $3k to $5k: 20%
  - $5k to $8k: 20%
  - $8k+: 20%

- **AV rider (N=45)**
  - Would not buy: 0%
  - Zero: 0%
  - Up to $1k: 20%
  - $1k to $3k: 20%
  - $3k to $5k: 20%
  - $5k to $8k: 20%
  - $8k+: 20%

TOMNET Transportation Center
Teaching Old Models New Tricks

Arizona State University
Willingness to Pay by Location

- Phoenix (N=1027)
  - Would not buy: 42%
  - Zero: 36%
  - Up to $1k: 44%
  - $1k to $3k: 32%
  - $3k to $5k: 10%
  - $5k to $8k: 0%
  - $8k+: 0%

- Atlanta (N=940)
  - Would not buy: 36%
  - Zero: 10%
  - Up to $1k: 20%
  - $1k to $3k: 30%
  - $3k to $5k: 20%
  - $5k to $8k: 10%
  - $8k+: 10%

- Tampa (N=260)
  - Would not buy: 44%
  - Zero: 32%
  - Up to $1k: 44%
  - $1k to $3k: 20%
  - $3k to $5k: 10%
  - $5k to $8k: 0%
  - $8k+: 0%

- Austin (N=1126)
  - Would not buy: 32%
  - Zero: 30%
  - Up to $1k: 20%
  - $1k to $3k: 20%
  - $3k to $5k: 10%
  - $5k to $8k: 10%
  - $8k+: 10%
Attitudes &
Willingness to Pay
Willingness to Pay by Attitudinal Profile

- **Tech averse suburbanites (N=774)**
  - Would not buy: 44%
  - Up to $1k: 10%
  - $1k to $3k: 20%
  - $3k to $5k: 15%
  - $5k to $8k: 10%
  - $8k+: 11%

- **Transit advocates (N=769)**
  - Would not buy: 39%
  - Up to $1k: 12%
  - $1k to $3k: 20%
  - $3k to $5k: 15%
  - $5k to $8k: 15%
  - $8k+: 10%

- **Tech friendly environmentalists (N=378)**
  - Would not buy: 38%
  - Up to $1k: 10%
  - $1k to $3k: 20%
  - $3k to $5k: 15%
  - $5k to $8k: 15%
  - $8k+: 10%

- **Sprawling techy multitaskers (N=724)**
  - Would not buy: 35%
  - Up to $1k: 10%
  - $1k to $3k: 20%
  - $3k to $5k: 15%
  - $5k to $8k: 15%
  - $8k+: 10%

- **Transit averse urbanites (N=692)**
  - Would not buy: 29%
  - Up to $1k: 10%
  - $1k to $3k: 20%
  - $3k to $5k: 15%
  - $5k to $8k: 15%
  - $8k+: 10%

TOMNET Transportation Center
Teaching Old Models New Tricks

Arizona State University
Willingness to Pay by AV Concern

- Would not buy
- Zero
- Up to $1k
- $1k to $3k
- $3k to $5k
- $5k to $8k
- $8k+

I am concerned about the potential failure of AV sensors, equipment, technology, or programs.

Concerned
Agree (N=2278)
- 37% Would not buy
- 47% Zero
- 25% Up to $1k
- 37% $1k to $3k
- 37% $3k to $5k
- 47% $5k to $8k
- 50% $8k+

Neutral (N=588)
- 47% Would not buy
- 37% Zero
- 25% Up to $1k
- 37% $1k to $3k
- 37% $3k to $5k
- 47% $5k to $8k
- 50% $8k+

Not Concerned
Disagree (N=480)
- 25% Would not buy
- 37% Zero
- 47% Up to $1k
- 37% $1k to $3k
- 37% $3k to $5k
- 47% $5k to $8k
- 50% $8k+
## Willingness to Pay by AV Concern

<table>
<thead>
<tr>
<th>Concerned - Austin (N=741)</th>
<th>Would not buy</th>
<th>Zero</th>
<th>Up to $1k</th>
<th>$1k to $3k</th>
<th>$3k to $5k</th>
<th>$5k to $8k</th>
<th>$8k+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not Concerned - Austin (N=163)</td>
<td>13%</td>
<td>10%</td>
<td>20%</td>
<td>42%</td>
<td>26%</td>
<td>34%</td>
<td>37%</td>
</tr>
<tr>
<td>Concerned - Austin (N=741)</td>
<td>32%</td>
<td>10%</td>
<td>20%</td>
<td>42%</td>
<td>26%</td>
<td>34%</td>
<td>37%</td>
</tr>
<tr>
<td>Not Concerned - Tampa (N=39)</td>
<td>36%</td>
<td>10%</td>
<td>20%</td>
<td>42%</td>
<td>26%</td>
<td>34%</td>
<td>37%</td>
</tr>
<tr>
<td>Concerned - Tampa (N=172)</td>
<td>51%</td>
<td>10%</td>
<td>20%</td>
<td>42%</td>
<td>26%</td>
<td>34%</td>
<td>37%</td>
</tr>
<tr>
<td>Not Concerned - Atlanta (N=93)</td>
<td>37%</td>
<td>10%</td>
<td>20%</td>
<td>42%</td>
<td>26%</td>
<td>34%</td>
<td>37%</td>
</tr>
<tr>
<td>Concerned - Atlanta (N=676)</td>
<td>34%</td>
<td>10%</td>
<td>20%</td>
<td>42%</td>
<td>26%</td>
<td>34%</td>
<td>37%</td>
</tr>
<tr>
<td>Not Concerned - Phoenix (N=184)</td>
<td>26%</td>
<td>10%</td>
<td>20%</td>
<td>42%</td>
<td>26%</td>
<td>34%</td>
<td>37%</td>
</tr>
<tr>
<td>Concerned - Phoenix (N=679)</td>
<td>42%</td>
<td>10%</td>
<td>20%</td>
<td>42%</td>
<td>26%</td>
<td>34%</td>
<td>37%</td>
</tr>
</tbody>
</table>

I am concerned about the potential failure of AV sensors, equipment, technology, or programs.
Willingness to Pay by Technology Savviness

Learning how to use new technologies is often frustrating for me.

Not Tech Savvy
Agree (N=799)
- 56% would not buy
- 28% would buy

Neutral (N=505)
- 43% would not buy
- 37% would buy

Tech Savvy
Disagree (N=2041)
- 28% would not buy
- 72% would buy

Would not buy | Zero | Up to $1k | $1k to $3k | $3k to $5k | $5k to $8k | $8k+
---|---|---|---|---|---|---
Not Tech Savvy Agree (N=799) | 56% | 20% | 5% | 5% | 5% | 2% | 1%
Neutral (N=505) | 43% | 15% | 10% | 10% | 10% | 5% | 1%
Tech Savvy Disagree (N=2041) | 28% | 15% | 10% | 10% | 10% | 5% | 1%
WTP by Commitment to Green Transportation

I am committed to using a less polluting means of transportation (e.g., walking, biking, and public transit) as much as possible.

- Committed
  - Agree (N=1237)
    - Would not buy: 31%
  - Neutral (N=1088)
    - Would not buy: 41%
  - Not Committed
    - Disagree (N=1025)
      - Would not buy: 39%
Demographics, Travel &
Willingness to Pay
Willingness to Pay by Age and Gender

- **18-30 years (N=853)**
  - Would not buy: 24%
  - Zero: 29%
  - Up to $1k: 31%
  - $1k to $3k: 51%
  - $3k to $5k: 50%
  - $5k to $8k: 55%
  - $8k+

- **31-40 years (N=611)**

- **41-50 years (N=580)**

- **51-60 years (N=527)**

- **61-70 years (N=445)**

- **71+ years (N=333)**

**Gender Breakdown**

- **Female (N=1712)**
  - Would not buy: 45%
  - Zero: 12%
  - Up to $1k: 4%
  - $1k to $3k: 51%
  - $3k to $5k: 12%
  - $5k to $8k: 15%
  - $8k+

- **Male (N=1632)**
  - Would not buy: 29%
  - Zero: 15%
  - Up to $1k: 6%
  - $1k to $3k: 12%
  - $3k to $5k: 18%
  - $5k to $8k: 13%
  - $8k+
Willingness to Pay by Household Income

- Less than $50,000 (N=1,248):
  - Would not buy: 42%
  - Zero: 10%
  - Up to $1k: 10%
  - $1k to $3k: 7%
  - $3k to $5k: 6%
  - $5k to $8k: 6%
  - $8k+: 1%

- $50,000 to $99,999 (N=1,031):
  - Would not buy: 43%
  - Zero: 20%
  - Up to $1k: 10%
  - $1k to $3k: 10%
  - $3k to $5k: 6%
  - $5k to $8k: 4%
  - $8k+: 3%

- $100,000 or more (N=983):
  - Would not buy: 25%
  - Zero: 11%
  - Up to $1k: 11%
  - $1k to $3k: 7%
  - $3k to $5k: 6%
  - $5k to $8k: 5%
  - $8k+: 1%
Willingness to Pay by Commuter Status

- Commuter - Austin (N=816)
  - Would not buy: 25%
  - Zero: 25%
  - Up to $1k: 14%
  - $1k to $3k: 12%
  - $3k to $5k: 11%
  - $5k to $8k: 11%
  - $8k+: 11%

- Not Commuter - Austin (N=311)
  - Would not buy: 49%
  - Zero: 49%
  - Up to $1k: 4%
  - $1k to $3k: 4%
  - $3k to $5k: 4%
  - $5k to $8k: 4%
  - $8k+: 4%

- Commuter - Tampa (N=169)
  - Would not buy: 38%
  - Zero: 38%
  - Up to $1k: 23%
  - $1k to $3k: 13%
  - $3k to $5k: 13%
  - $5k to $8k: 13%
  - $8k+: 13%

- Not Commuter - Tampa (N=91)
  - Would not buy: 56%
  - Zero: 56%
  - Up to $1k: 27%
  - $1k to $3k: 27%
  - $3k to $5k: 27%
  - $5k to $8k: 27%
  - $8k+: 27%

- Commuter - Atlanta (N=616)
  - Would not buy: 30%
  - Zero: 30%
  - Up to $1k: 20%
  - $1k to $3k: 20%
  - $3k to $5k: 20%
  - $5k to $8k: 20%
  - $8k+: 20%

- Not Commuter - Atlanta (N=324)
  - Would not buy: 46%
  - Zero: 46%
  - Up to $1k: 34%
  - $1k to $3k: 34%
  - $3k to $5k: 34%
  - $5k to $8k: 34%
  - $8k+: 34%

- Commuter - Phoenix (N=633)
  - Would not buy: 33%
  - Zero: 33%
  - Up to $1k: 24%
  - $1k to $3k: 24%
  - $3k to $5k: 24%
  - $5k to $8k: 24%
  - $8k+: 24%

- Not Commuter - Phoenix (N=391)
  - Would not buy: 57%
  - Zero: 57%
  - Up to $1k: 43%
  - $1k to $3k: 43%
  - $3k to $5k: 43%
  - $5k to $8k: 43%
  - $8k+: 43%
Key Findings

• **Interest in purchasing AVs is mixed:** 38% would never buy an AV even when AVs are cheaper than regular vehicles (a significant share of respondents prefer a regular vehicle)

• **Results across jurisdictions are fairly similar.** Tampa has the lowest willingness to pay for and buy AVs.
  - High(er) willingness to pay was observed in Austin and Phoenix

• **Attitudes matter:** Those who are tech savvy, driving-oriented, and multi-taskers are more prone to pay higher amounts for AVs

• **Women and older individuals are less interested** in purchasing an AV and are less willing to pay a premium for it
Thank you!

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