

**TOMNET and D-STOP USDOT Tier 1 University Transportation Centers present
The ABCs (Attitudes – Behaviors – Choices) of Future Mobility**

Exploring Willingness to Pay for Autonomous Vehicles

Denise Capasso da Silva and Sara Khoeini
School of Sustainable Engineering and the Built Environment
Arizona State University
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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)

Autonomous Vehicle Definition

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.**



SAE J3016™ LEVELS OF DRIVING AUTOMATION

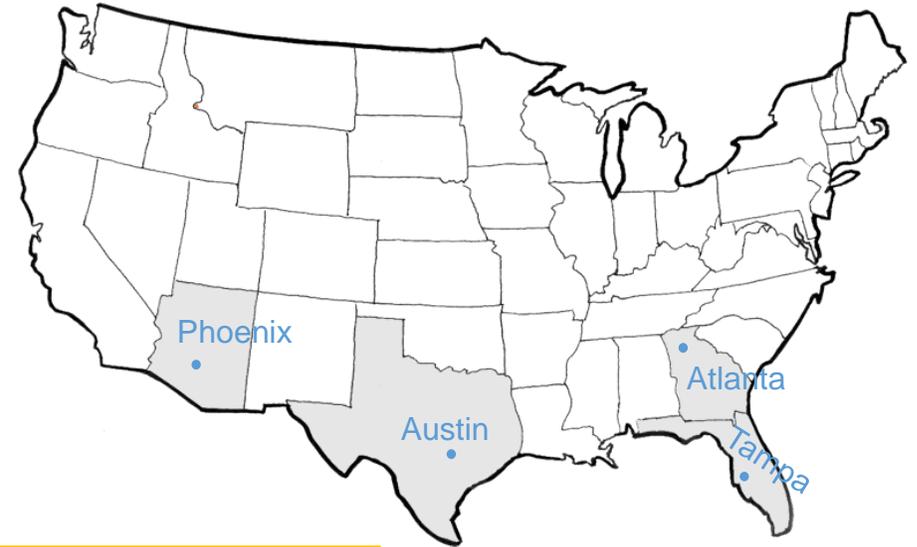
	SAE LEVEL 0	SAE LEVEL 1	SAE LEVEL 2	SAE LEVEL 3	SAE LEVEL 4	SAE LEVEL 5
What does the human in the driver's seat have to do?	You are driving whenever these driver support features are engaged – even if your feet are off the pedals and you are not steering			You are not driving when these automated driving features are engaged – even if you are seated in “the driver’s seat”		
	You must constantly supervise these support features; you must steer, brake or accelerate as needed to maintain safety			When the feature requests, you must drive	These automated driving features will not require you to take over driving	
	These are driver support features			These are automated driving features		
What do these features do?	These features are limited to providing warnings and momentary assistance	These features provide steering OR brake/acceleration support to the driver	These features provide steering AND brake/acceleration support to the driver	These features can drive the vehicle under limited conditions and will not operate unless all required conditions are met	This feature can drive the vehicle under all conditions	
Example Features	<ul style="list-style-type: none"> • automatic emergency braking • blind spot warning • lane departure warning 	<ul style="list-style-type: none"> • lane centering OR adaptive cruise control 	<ul style="list-style-type: none"> • lane centering AND adaptive cruise control at the same time 	<ul style="list-style-type: none"> • traffic jam chauffeur 	<ul style="list-style-type: none"> • local driverless taxi • pedals/steering wheel may or may not be installed 	<ul style="list-style-type: none"> • same as level 4, but feature can drive everywhere in all conditions

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



	Phoenix, AZ	Atlanta, GA	Austin, TX	Tampa, FL	Total
Sample Size	1,027	944	1,127	260	3,358
%	30.6%	28.1%	33.6%	7.8%	100%

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

Ranked Purchase Preference

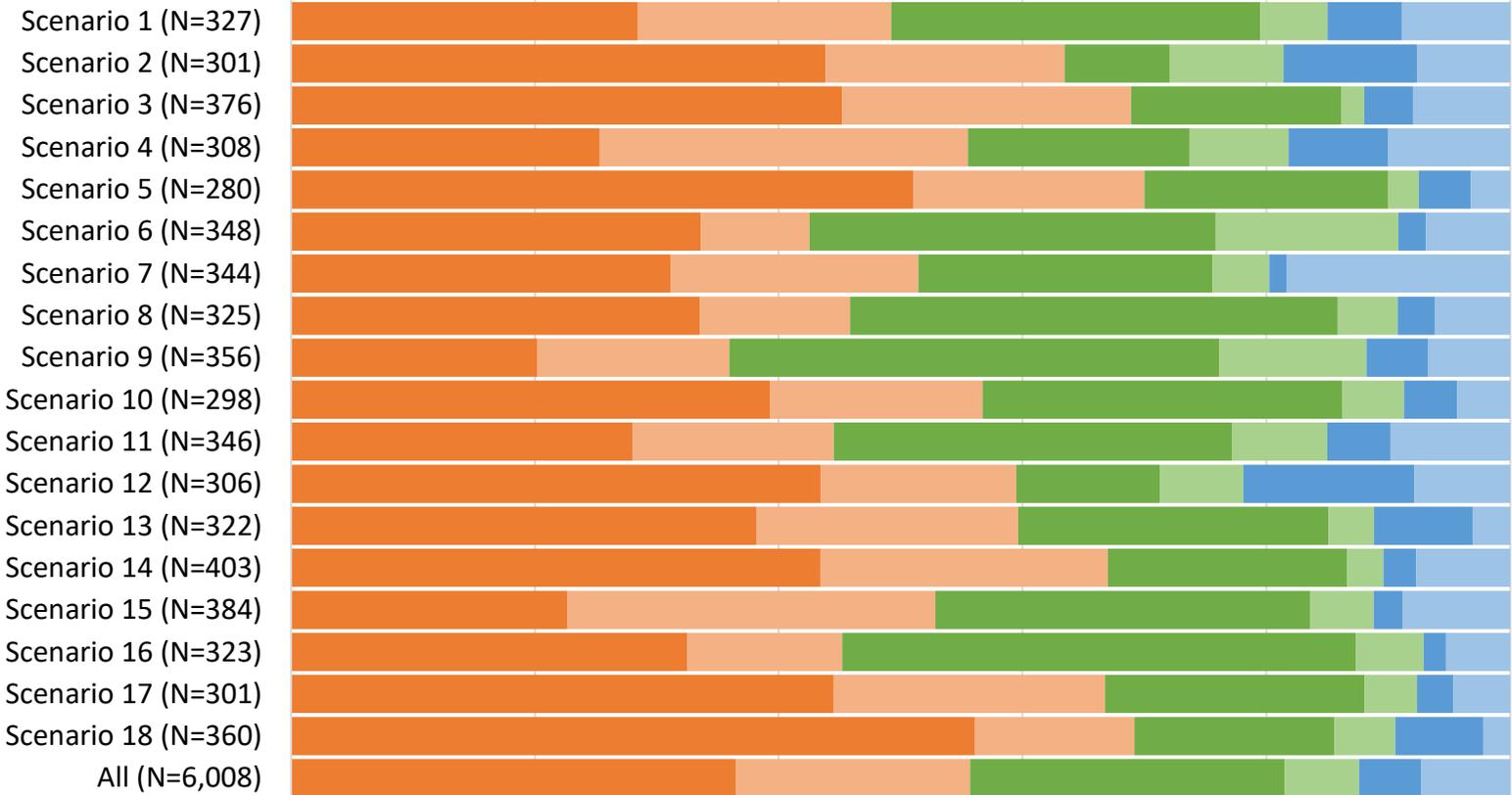
11. Suppose AVs are now available for purchase, lease/rent, or to use via automated ridehailing services, and **half of the vehicles on the streets are AVs**. What would you do when **faced with your next car purchase decision** in each of the following scenarios? Please rank the alternatives **based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

Scenario 1

Options	Option A: Buy a regular vehicle	Option B: Buy an AV	Option C: Don't buy a vehicle and use AV ridehailing/rental services
Costs	\$ 500/month + \$ 0.75/mile Average wait time: 0 minutes	\$ 500/month + \$ 0.75/mile Average wait time: 0 minutes	\$ 0/month + \$ 2.25/mile Average wait time: 6 minutes
Rank	_____	_____	_____

Ranked Purchase Preference

0% 20% 40% 60% 80% 100%



- 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)

Options	Option A: Buy a regular vehicle	Option B: Buy an AV	Option C: Don't buy a vehicle and use AV ridehailing/rental services
Costs	\$ 500/month + \$ 0.75/mile Average wait time: 0 minutes	\$ 500/month + \$ 0.75/mile Average wait time: 0 minutes	\$ 0/month + \$ 2.25/mile Average wait time: 6 minutes

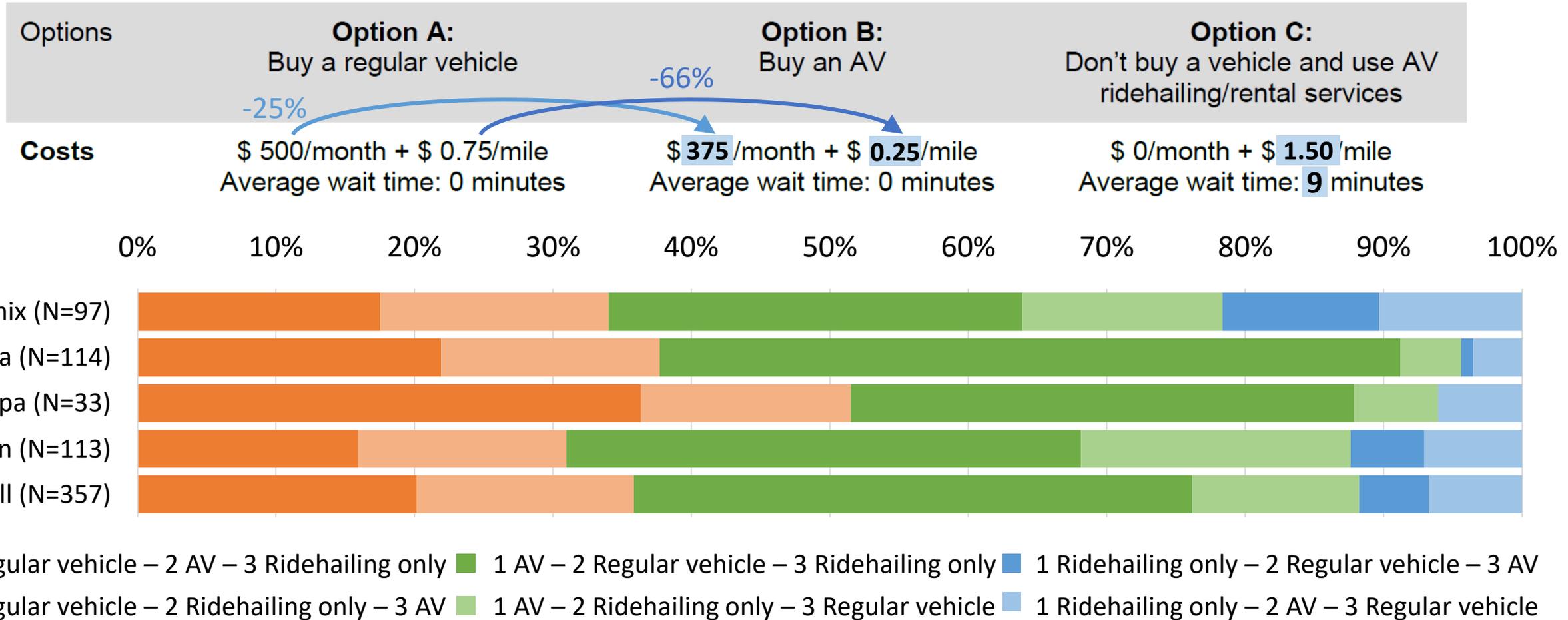
0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

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

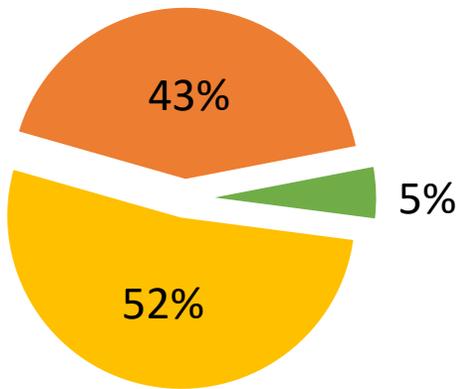
Ranked Purchase Preference (AV Cheaper)



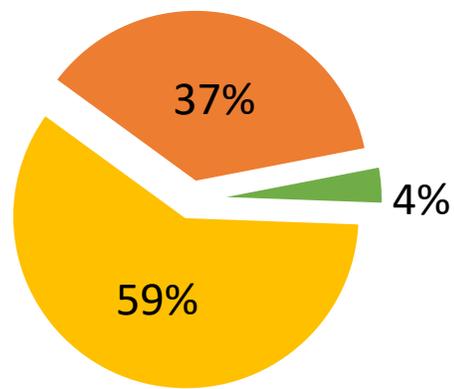
When do respondents expect to purchase an AV?

Would not buy Eventually buy One of the first to buy

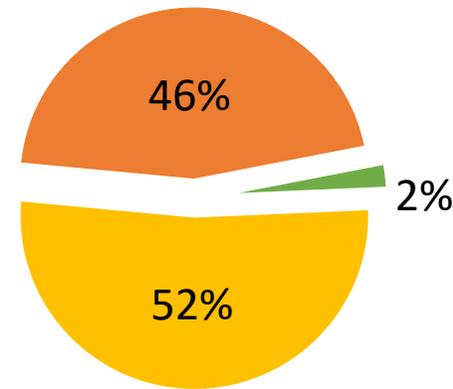
Phoenix (N=1014)



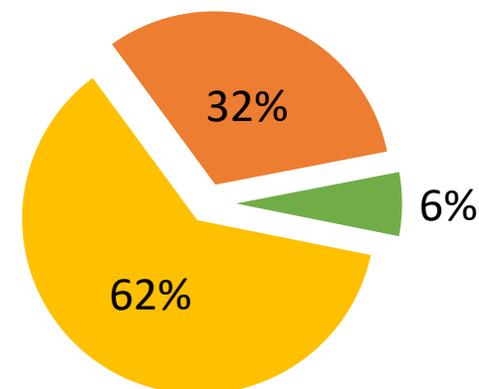
Atlanta (N=908)



Tampa (N=253)

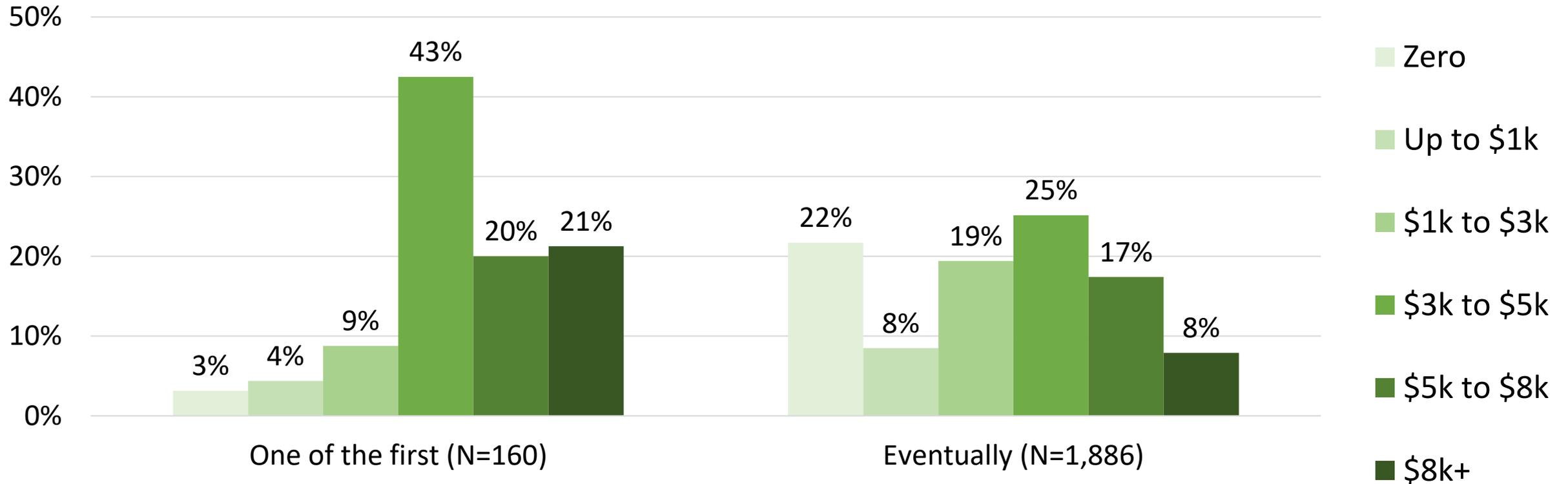


Austin (N=1109)



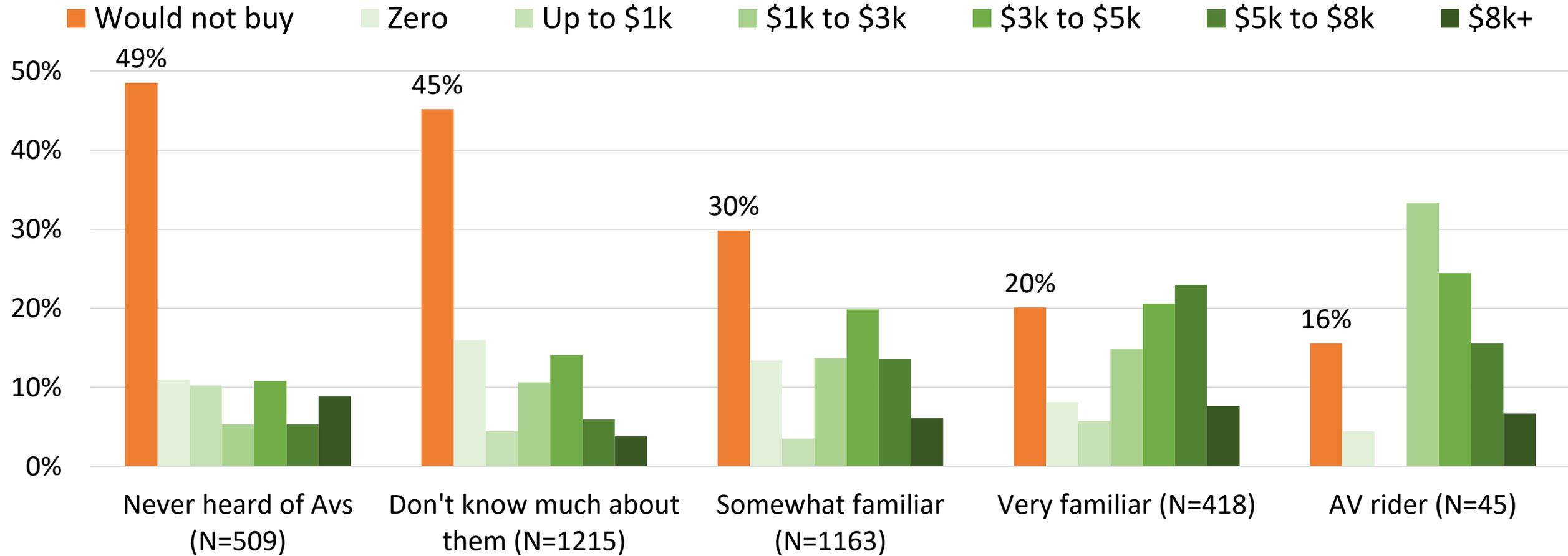
Among those who are willing to purchase an AV, how much are they willing to pay?

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

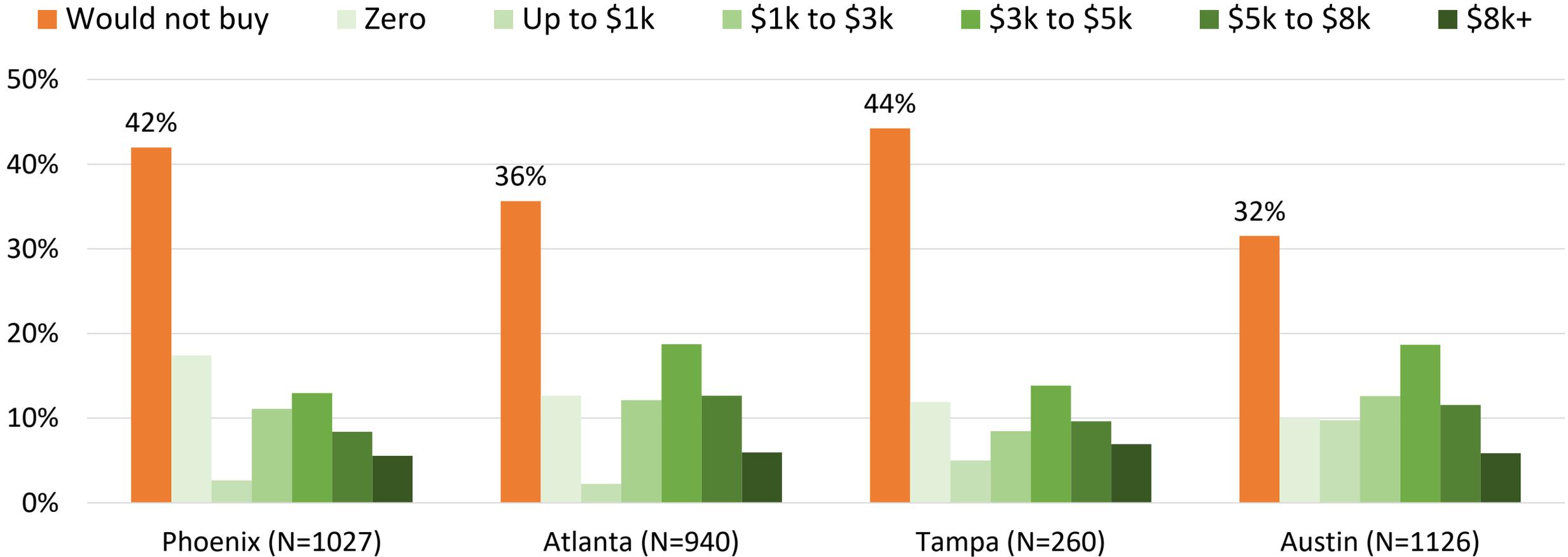


When respondent expects to purchase an AV

Willingness to Pay by AV Familiarity



Willingness to Pay by Location

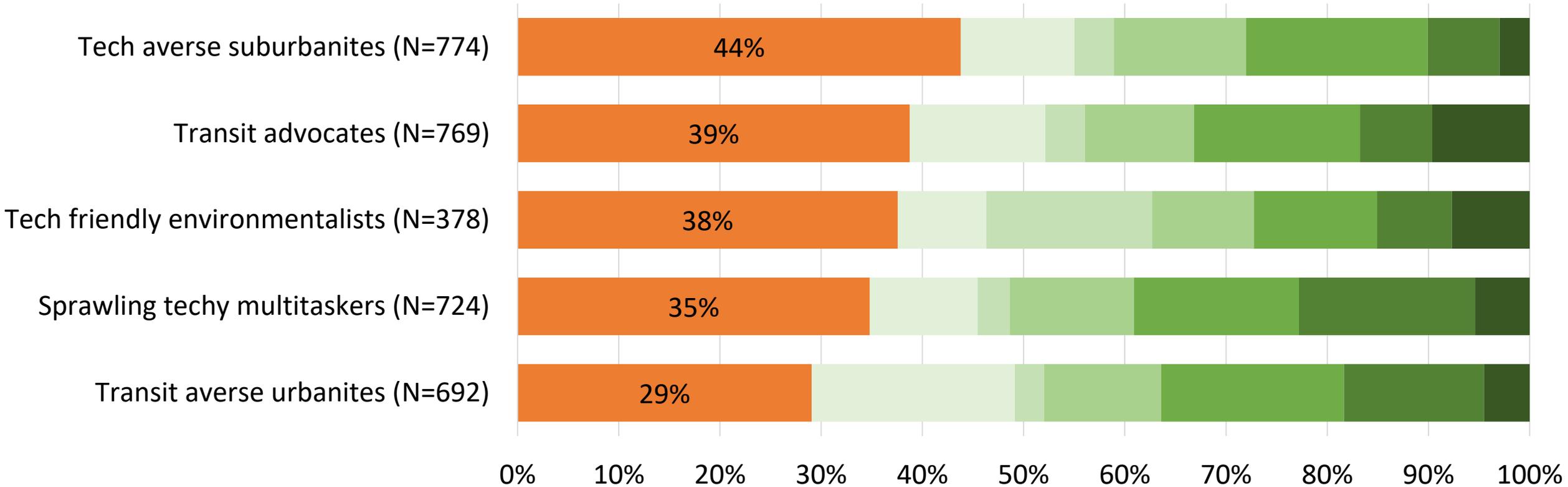


Attitudes &

Willingness to Pay

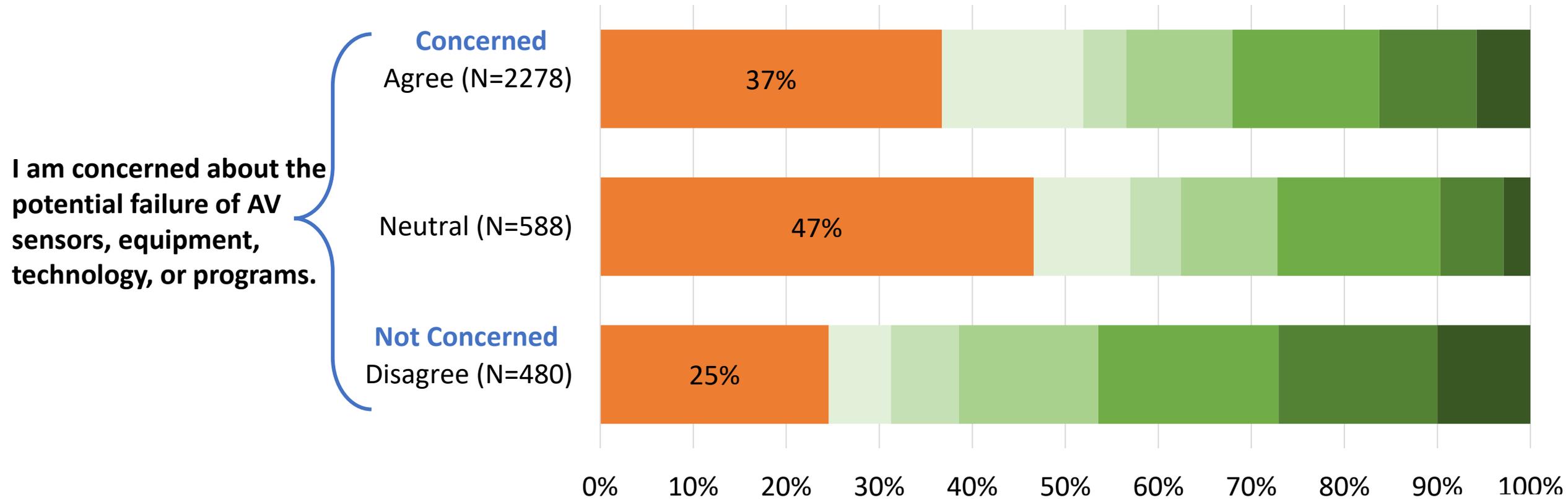
Willingness to Pay by Attitudinal Profile

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



Willingness to Pay by AV Concern

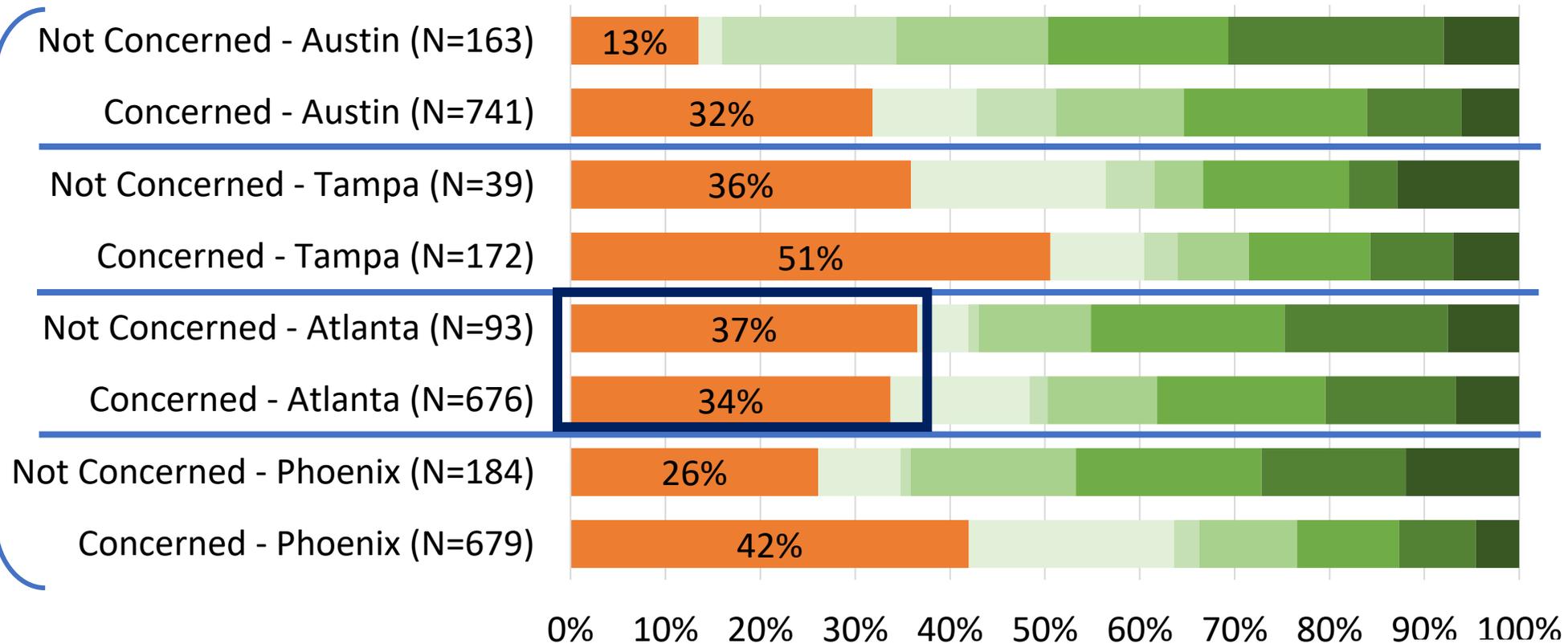
■ Would not buy
 ■ Zero
 ■ Up to \$1k
 ■ \$1k to \$3k
 ■ \$3k to \$5k
 ■ \$5k to \$8k
 ■ \$8k+



Willingness to Pay by AV Concern

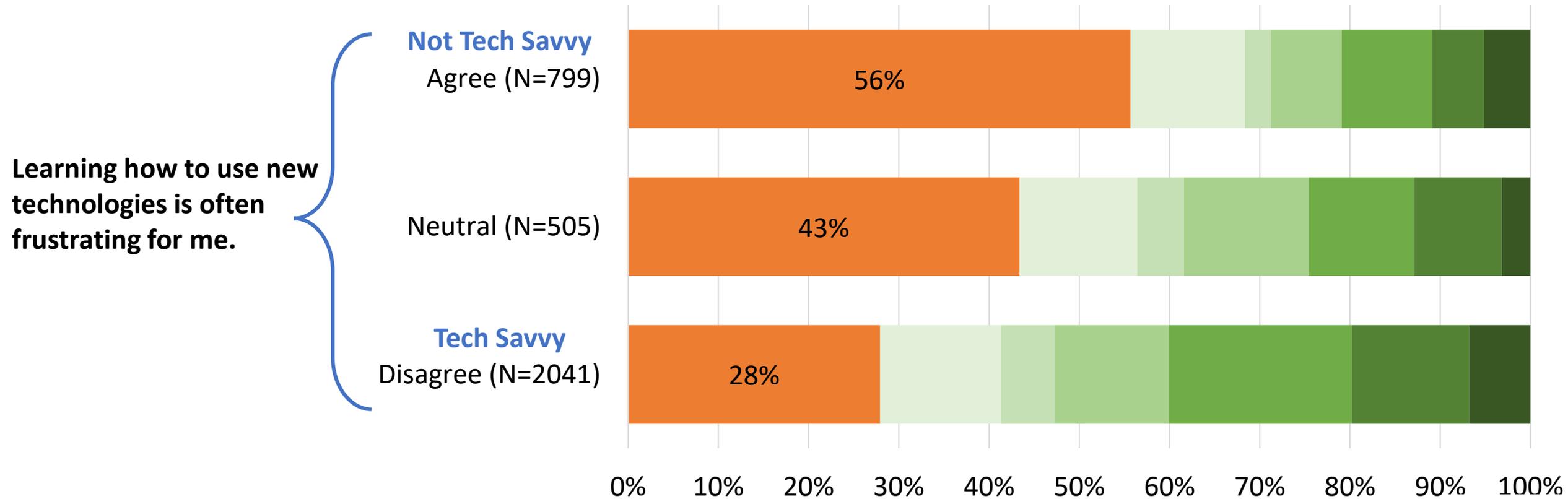
■ Would not buy
 ■ Zero
 ■ Up to \$1k
 ■ \$1k to \$3k
 ■ \$3k to \$5k
 ■ \$5k to \$8k
 ■ \$8k+

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



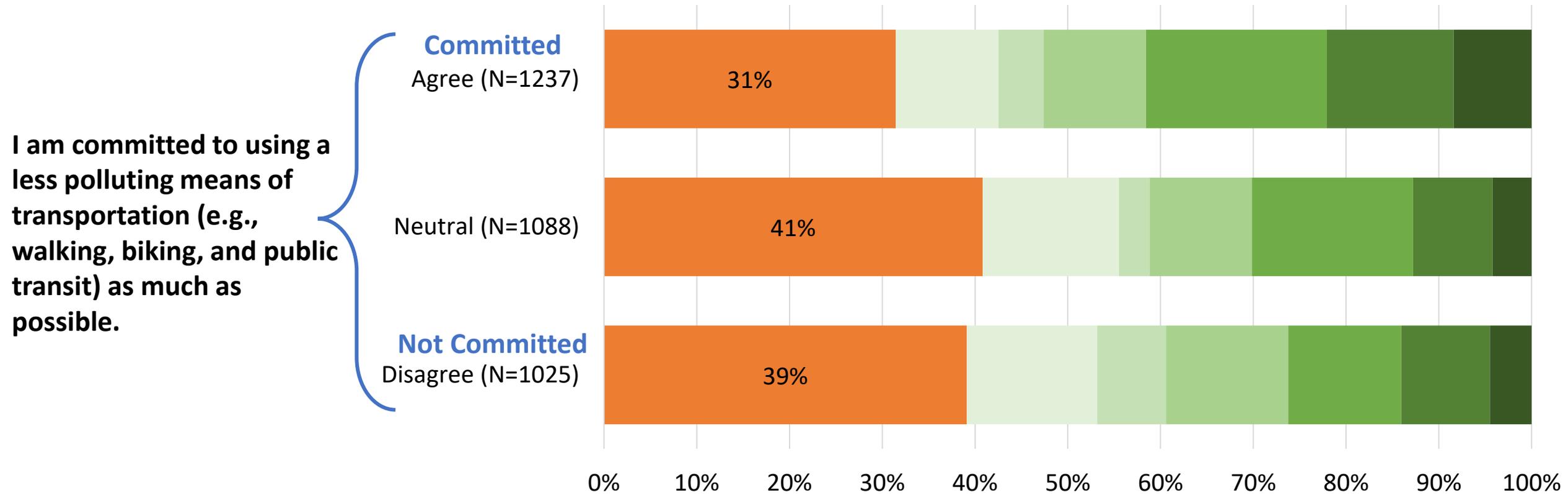
Willingness to Pay by Technology Savviness

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



WTP by Commitment to Green Transportation

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



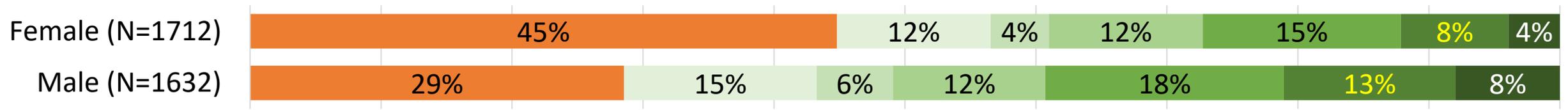
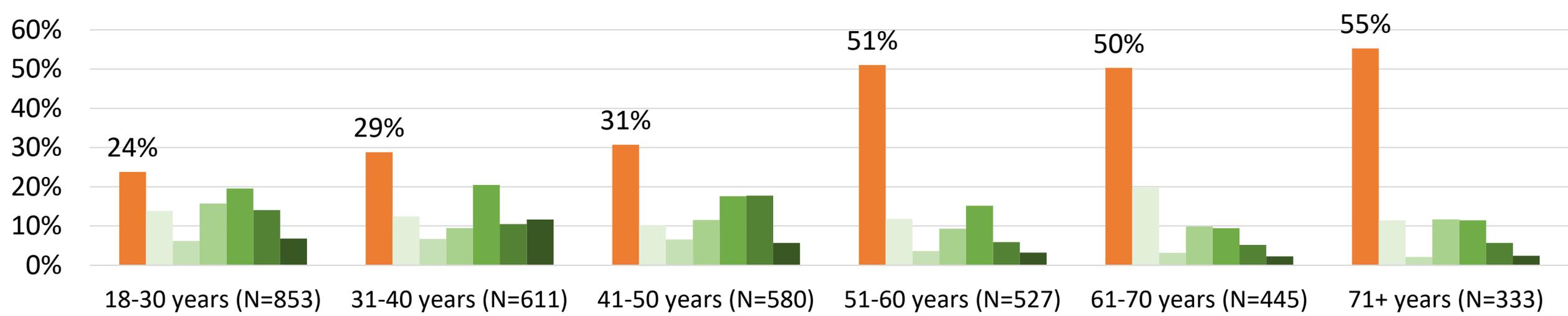
I am committed to using a less polluting means of transportation (e.g., walking, biking, and public transit) as much as possible.

Demographics, Travel &

Willingness to Pay

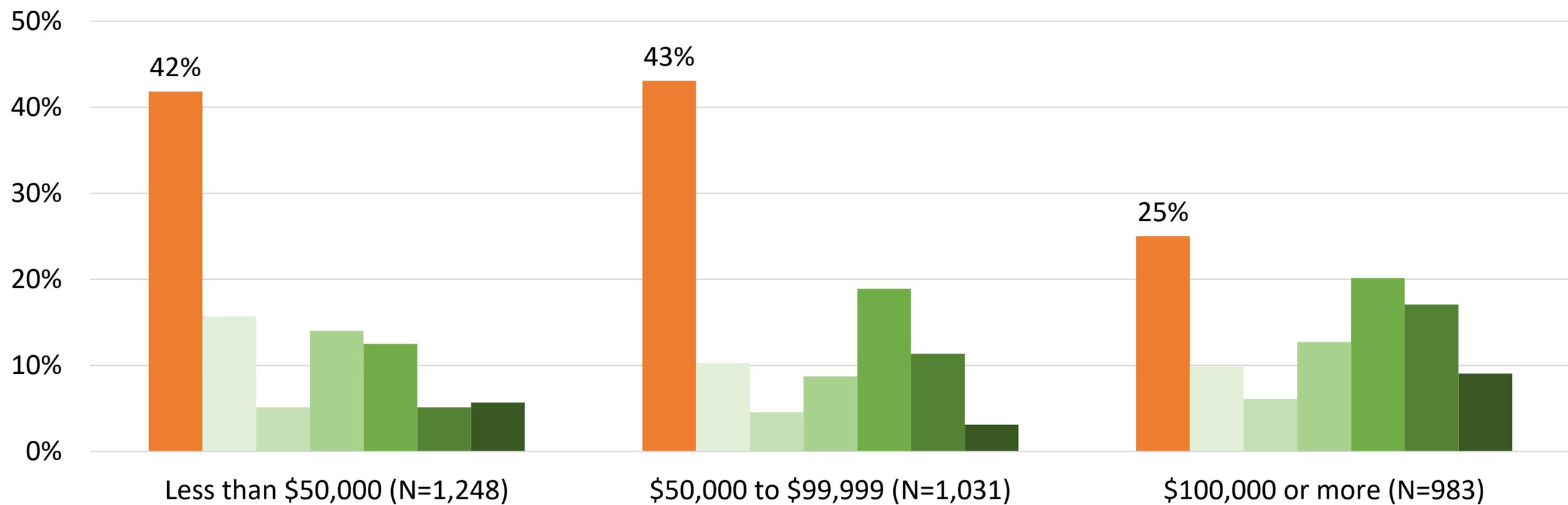
Willingness to Pay by Age and Gender

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



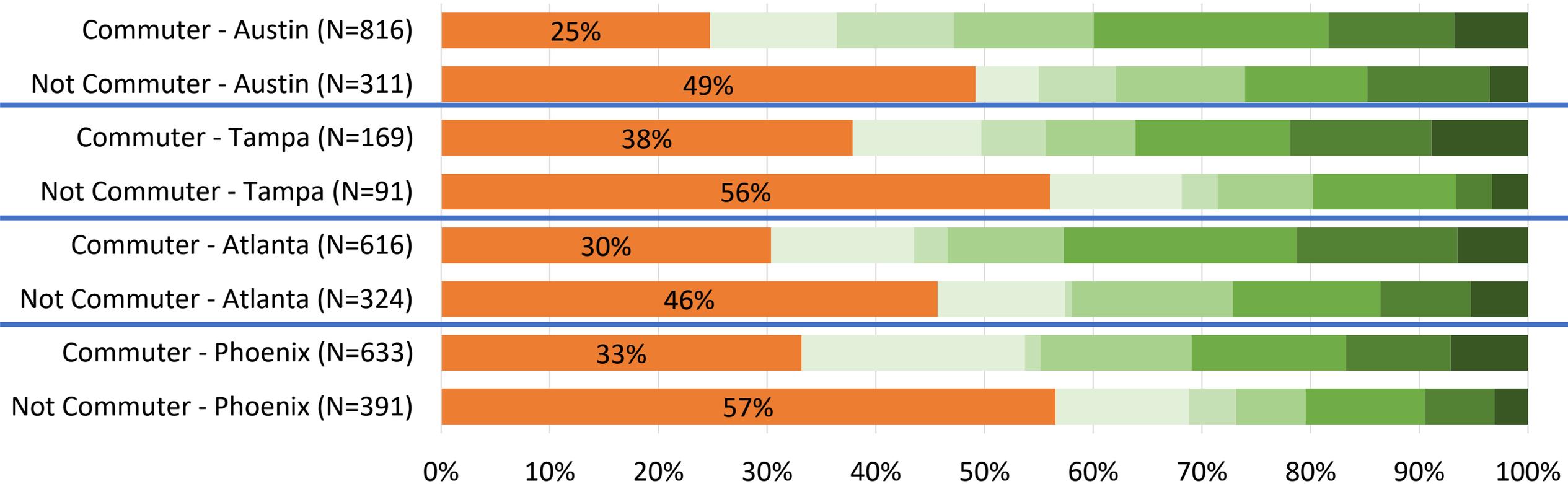
Willingness to Pay by Household Income

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



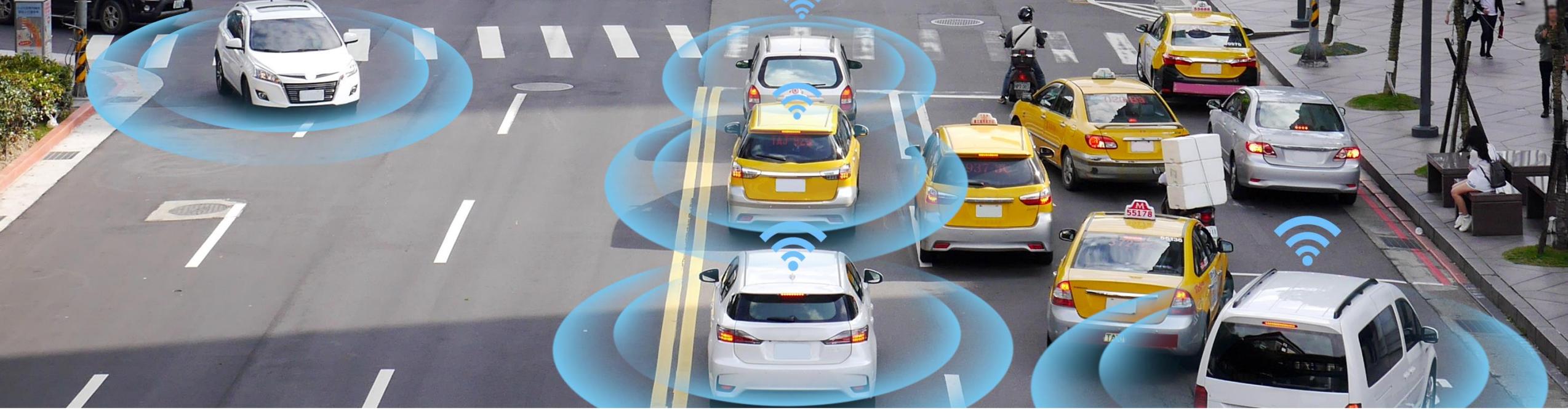
Willingness to Pay by Commuter Status

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



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!

Denise Capasso da Silva, denise.silva@asu.edu

Sara Khoeini, sara.khoeini@asu.edu