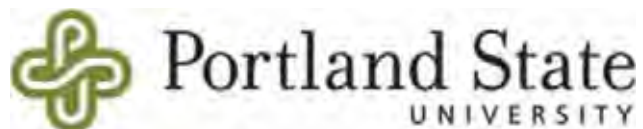


No. 20-05611

A Portrait of Zero-car and Car-owning Household Mobility Trends in the U.S.: Insights from the 2009 and 2017 National Household Travel Survey (NHTS)

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Initial objectives

- Better understand the mobility of zero car households through the lens of income and urban environment
- Evaluate travel of zero car households between 2009 and 2017 in the face of auto dependency and new mobility



Source: Jeenah Moon for The New York Times

Initial objectives

- Better understand the mobility of zero car households through the lens of income and urban environment
- Evaluate travel of zero car households between 2009 and 2017 in the face of auto dependency and new mobility



Source: Steve Morgan for Wikipedia; Forbes; Wired

Methods

- 2009 and 2017 National Household Travel Survey (NHTS)
- Per-person household level travel metrics
- Person miles traveled (PMT) and trips by mode, accounting for household size

Mode	Includes trips by...
Vehicle	Car; van; SUV; truck; RV; motor home; ATV, snowmobile; motorcycle; moped; rental car and carshare (such as Zipcar and Car2Go) ^a
Active	Walking; biking
Transit	Local public bus; commuter bus; subway/elevated train; streetcar/trolley; paratransit; dial-a-ride
Hired car	Taxi or limo (including Uber and Lyft.)
Other	Light electric vehicle (golf cart); segway; school bus; private/charter/tour/shuttle bus; city-to-city bus (Greyhound, Megabus); Amtrak / Commuter rail; Airplane; Boat/ferry/water taxi
<p>^aCarshare was grouped together with “Vehicle,” as the NHTS 2009 survey did not include a separate rental car mode that could be used to compare with rental/carshare in the NHTS 2017 data. Thus, our analysis of TNCs is limited to rideshare services only in the Hired car classification. Note that Uber and Lyft services were not included in the 2009 sample.</p>	

Methods

- Midpoints of 2009 income categories were adjusted for inflation from 2008 to 2016 dollars and aligned with 2017 income categories
- Limited to households in urban areas with populations $\geq 50,000$ to focus on urban transportation patterns
- The weighted sample represents 150,383,159 households



Methods

Weighted sample distribution

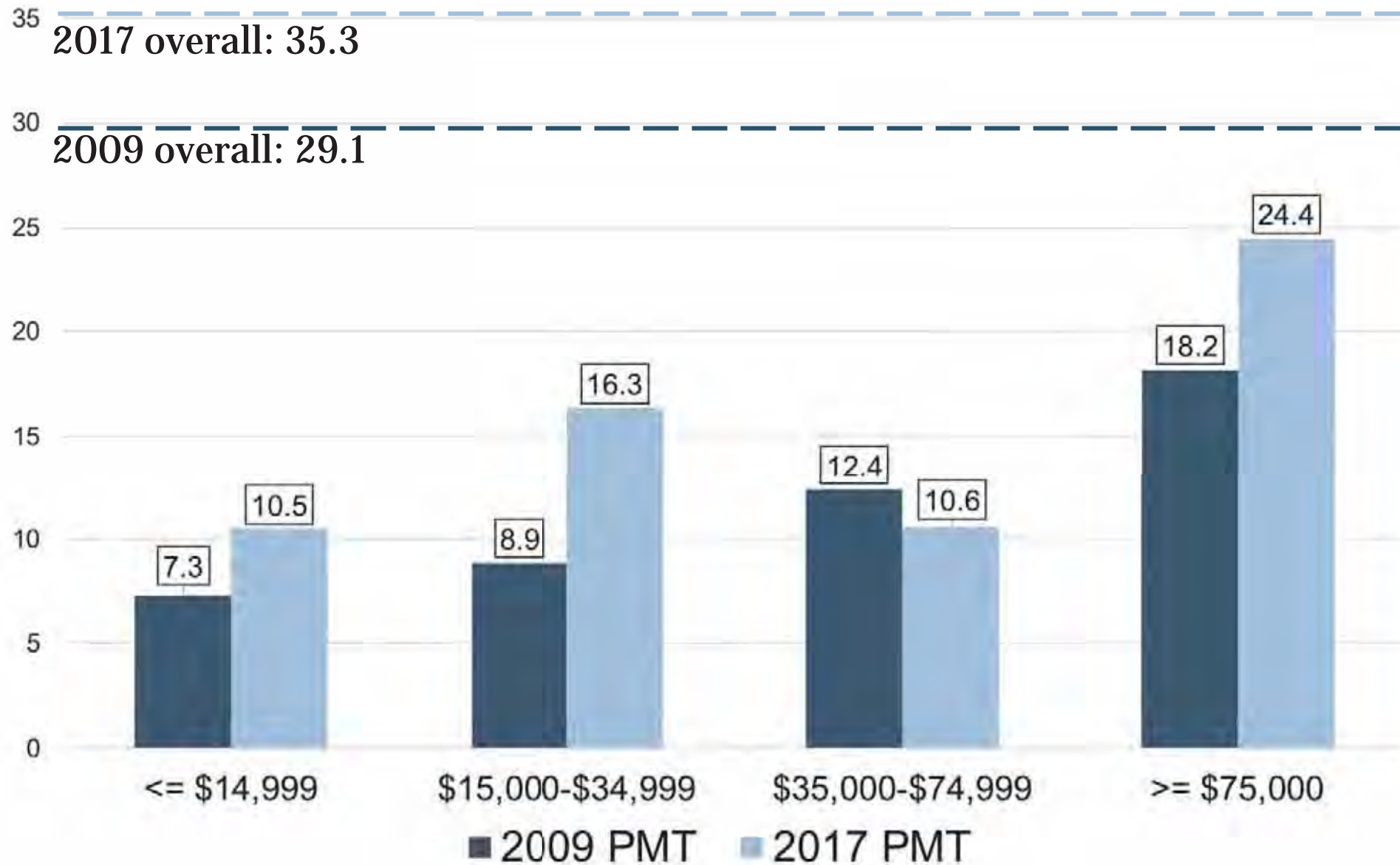
	Zero Car HH	1+ Car HH
2009	6,699,371 (9.9%)	61,042,871 (90.1%)
2017	8,357,021 (10.1%)	74,283,896 (89.9%)

Zero car households are under-represented in the sample for both years (~5%)

Car ownership status by income category (\$2016)



Average per-person person miles traveled (PMT)



Source: Congress for the New Urbanism



Active trip mode share

<= \$14,999		\$15,000 - \$34,999		\$35,999 - \$74,999		>= \$75,000	
2009	2017	2009	2017	2009	2017	2009	2017
43%	46%	45%	42%	51%	56%	50%	57%



Vehicle trip mode share

<= \$14,999		\$15,000 - \$34,999		\$35,999 - \$74,999		>= \$75,000	
2009	2017	2009	2017	2009	2017	2009	2017
25%	18%	22%	27%	18%	10%	13%	8%

Source: TriMet



Transit trip mode share

<= \$14,999		\$15,000 - \$34,999		\$35,999 - \$74,999		>= \$75,000	
2009	2017	2009	2017	2009	2017	2009	2017
24%	26%	22%	25%	26%	27%	23%	27%

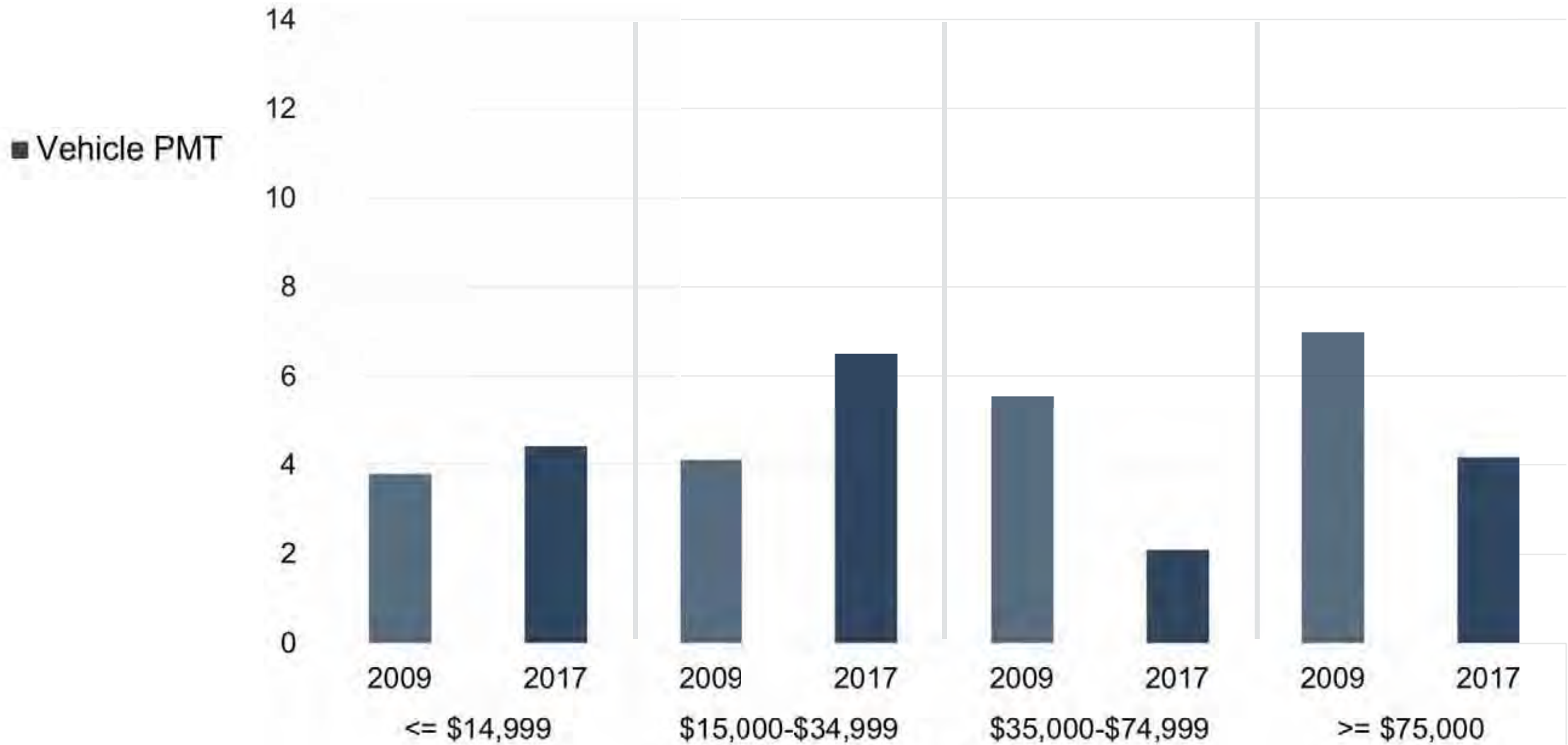
Source: Paste Magazine



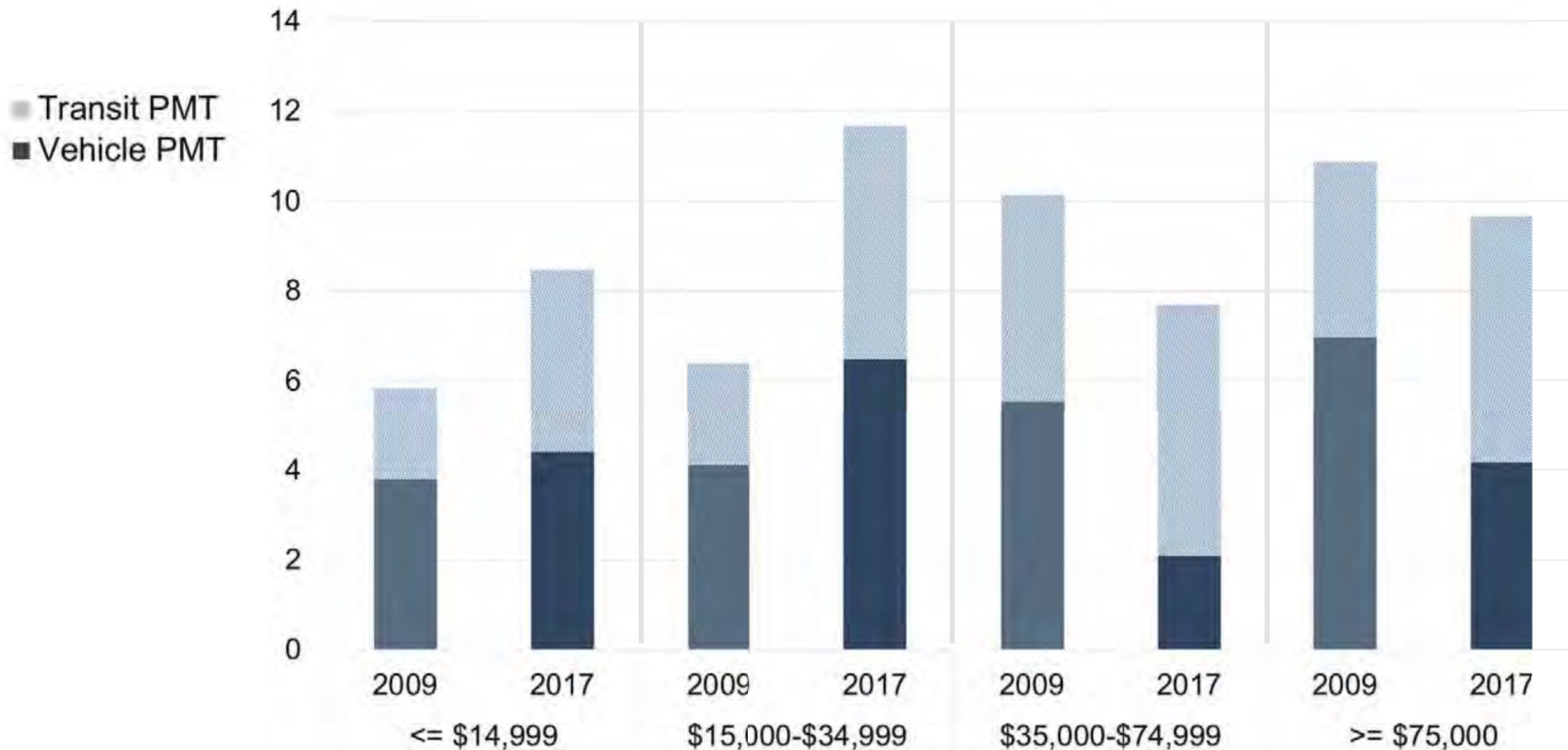
Hired car trip mode share

<= \$14,999		\$15,000 - \$34,999		\$35,999 - \$74,999		>= \$75,000	
2009	2017	2009	2017	2009	2017	2009	2017
2%	2%	3%	2%	1%	3%	5%	5%

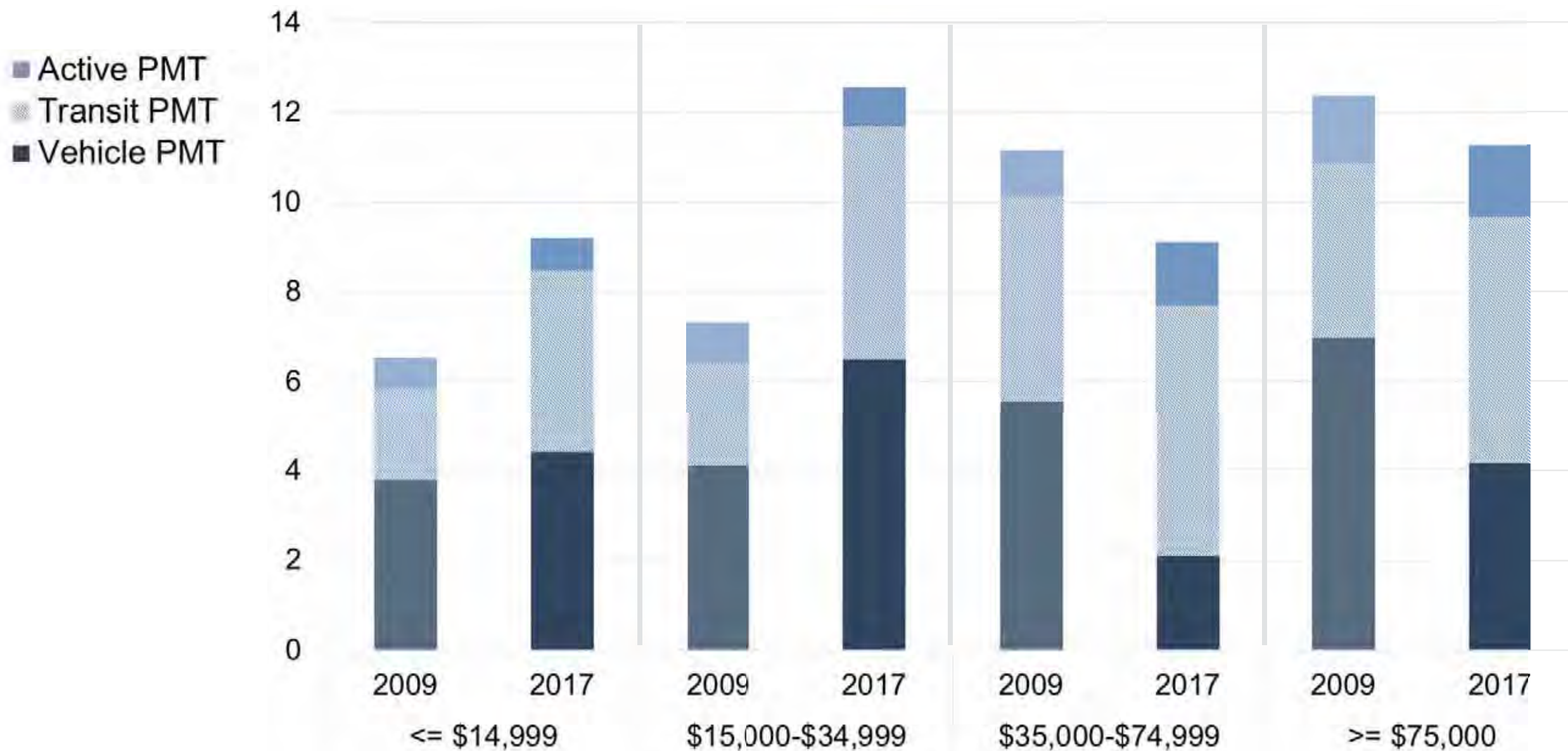
Per-person PMT breakdown



Per-person PMT breakdown

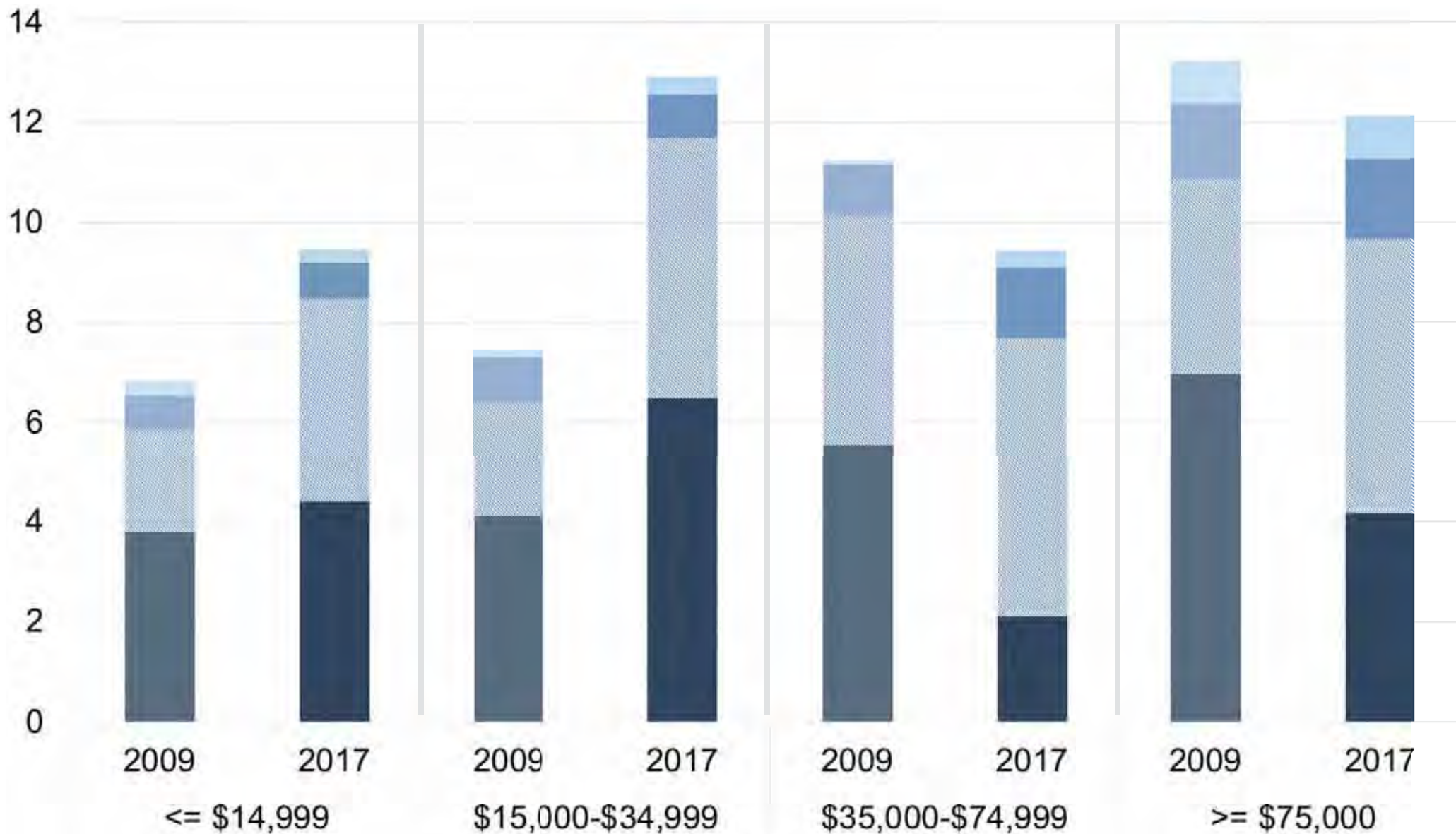


Per-person PMT breakdown



Per-person PMT breakdown

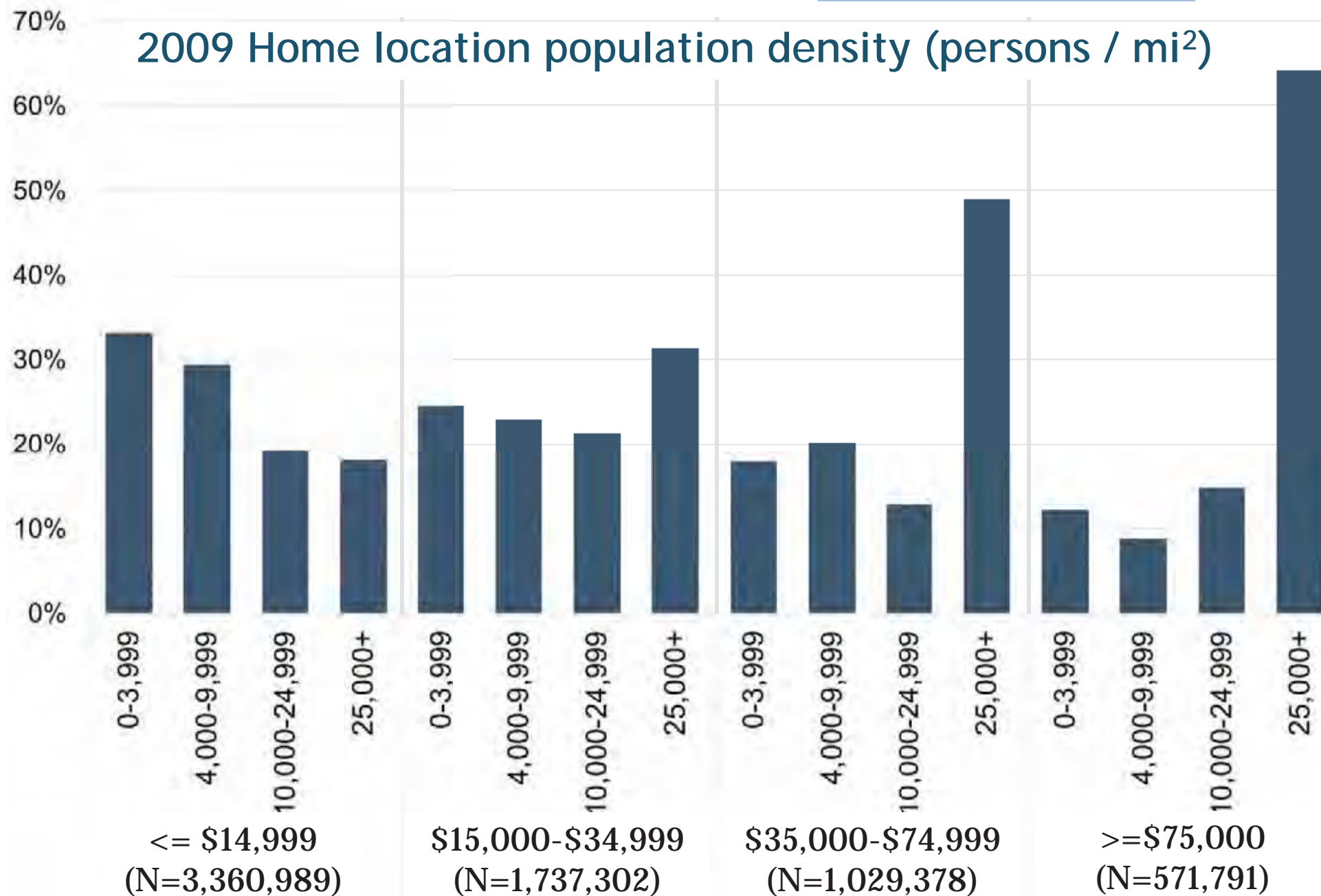
- Hired car PMT
- Active PMT
- Transit PMT
- Vehicle PMT

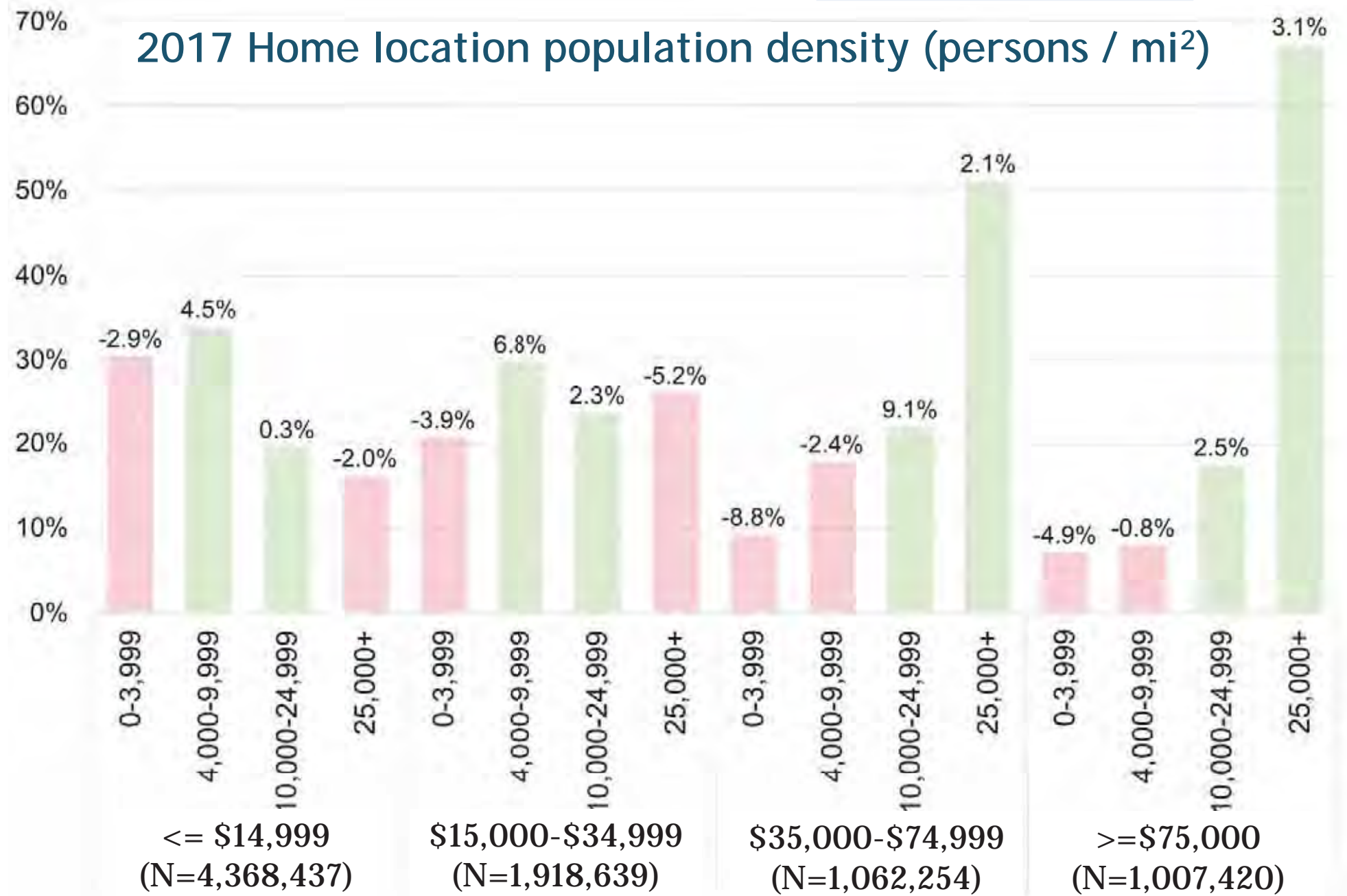


Per-person PMT breakdown

- Hired car PMT
- Active PMT
- Transit PMT
- Vehicle PMT







Transport impacts of e-commerce: online deliveries

- Significant difference between 2009 and 2017
- Significant differences across income groups and population densities



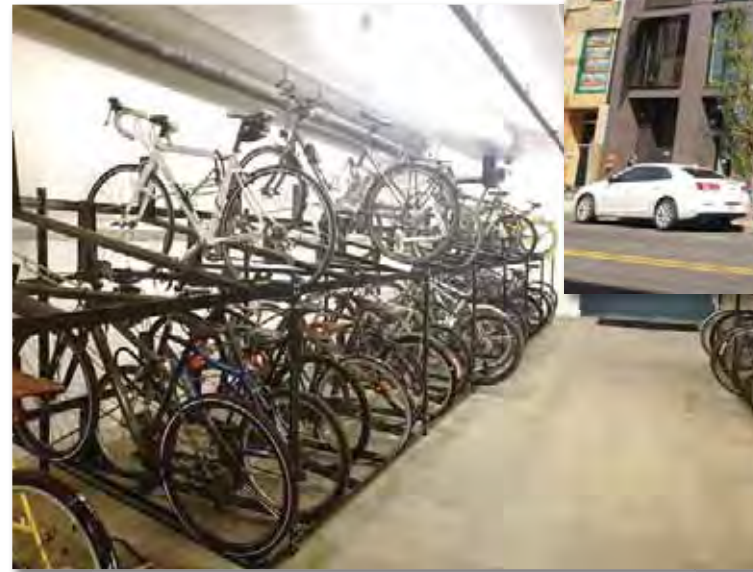
Source: Curbed

Key takeaways and limitations

- Zero car households are a heterogeneous and under-represented group in NHTS data
- Policies must reconcile efforts to reduce auto ownership and use with their mobility benefits for low-income households
- There is a need to investigate the impact of new mobility and e-commerce on this population

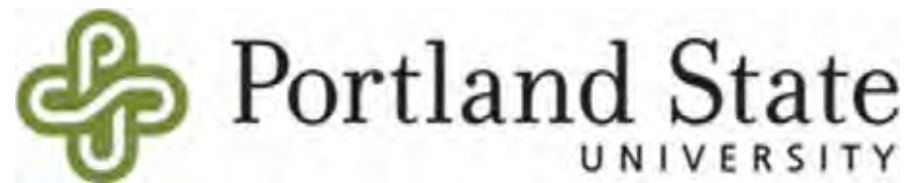
Ongoing work

- Trip generation and freight study at multifamily apartments in Portland, OR
- 14-hours of cordon counts, intercept surveys
- Assessment of freight and passenger travel at the development level



Acknowledgements

Thank you to the sponsors of our research team:



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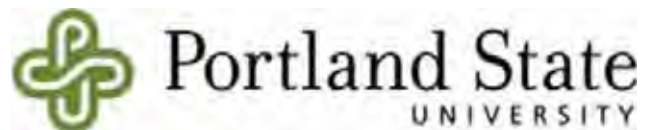


PBOT
PORTLAND BUREAU OF TRANSPORTATION
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Discussion & Questions

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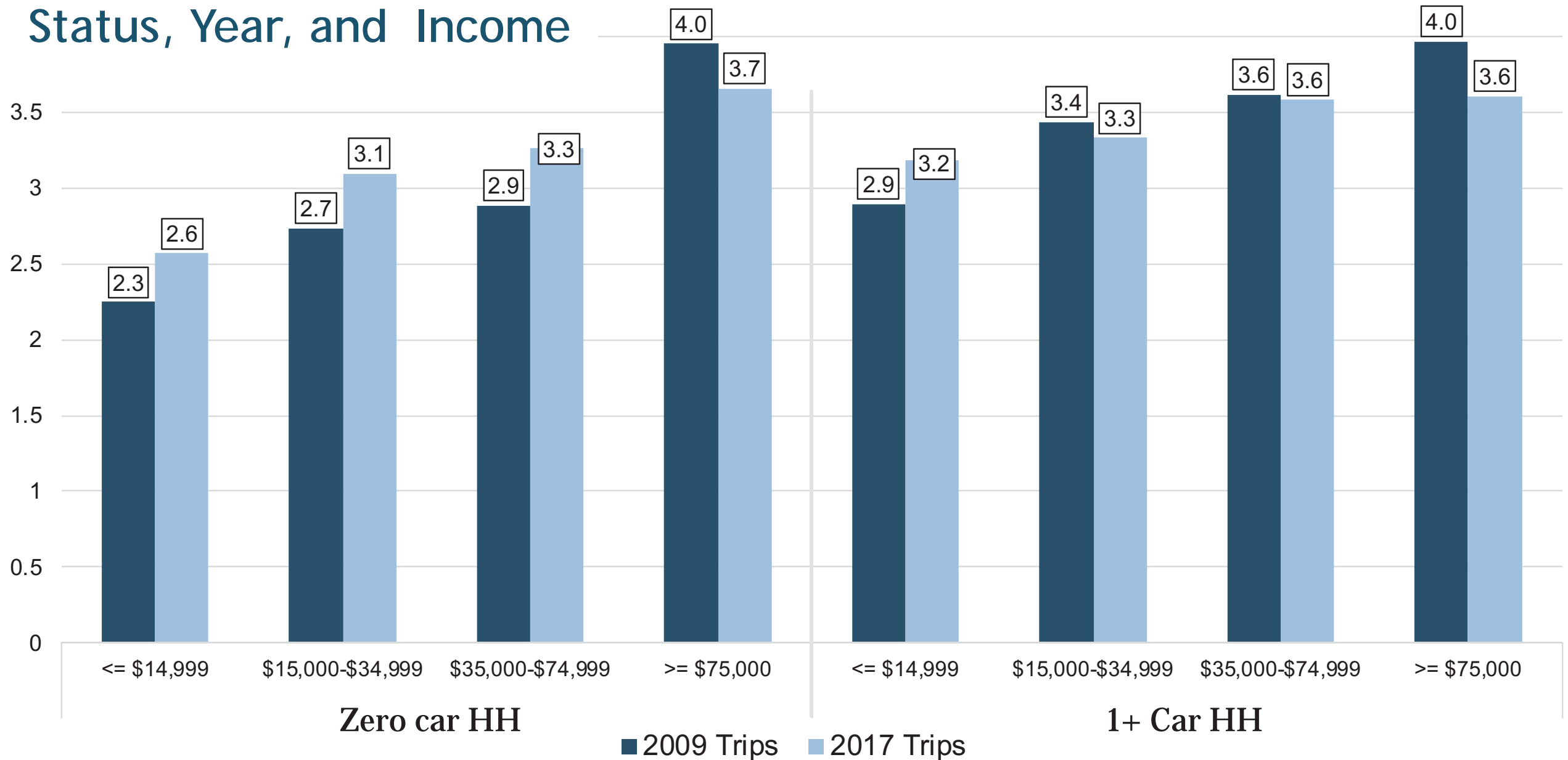
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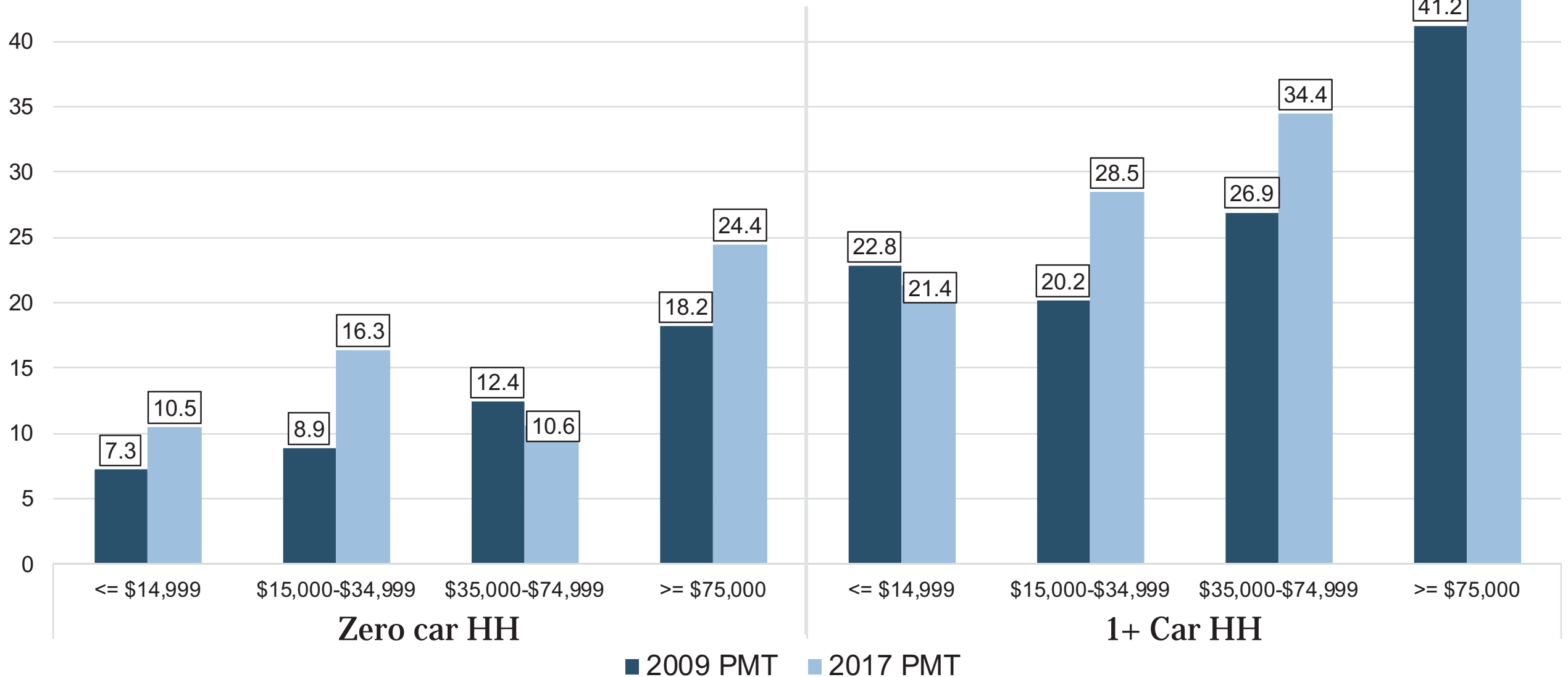
How do we reconcile the detrimental impacts of auto use and dependency with the mobility benefits it boosts, especially for low-income populations?

- **Strategies aimed at deterring auto use offer exemptions, graduation, or reinvestment**
- **The importance of land use – not just a transport problem**
 - **Shorting the distance between where people live and their necessary locations**
 - **Problem of affordable housing, auto dominant landscape, traditions and preferences**

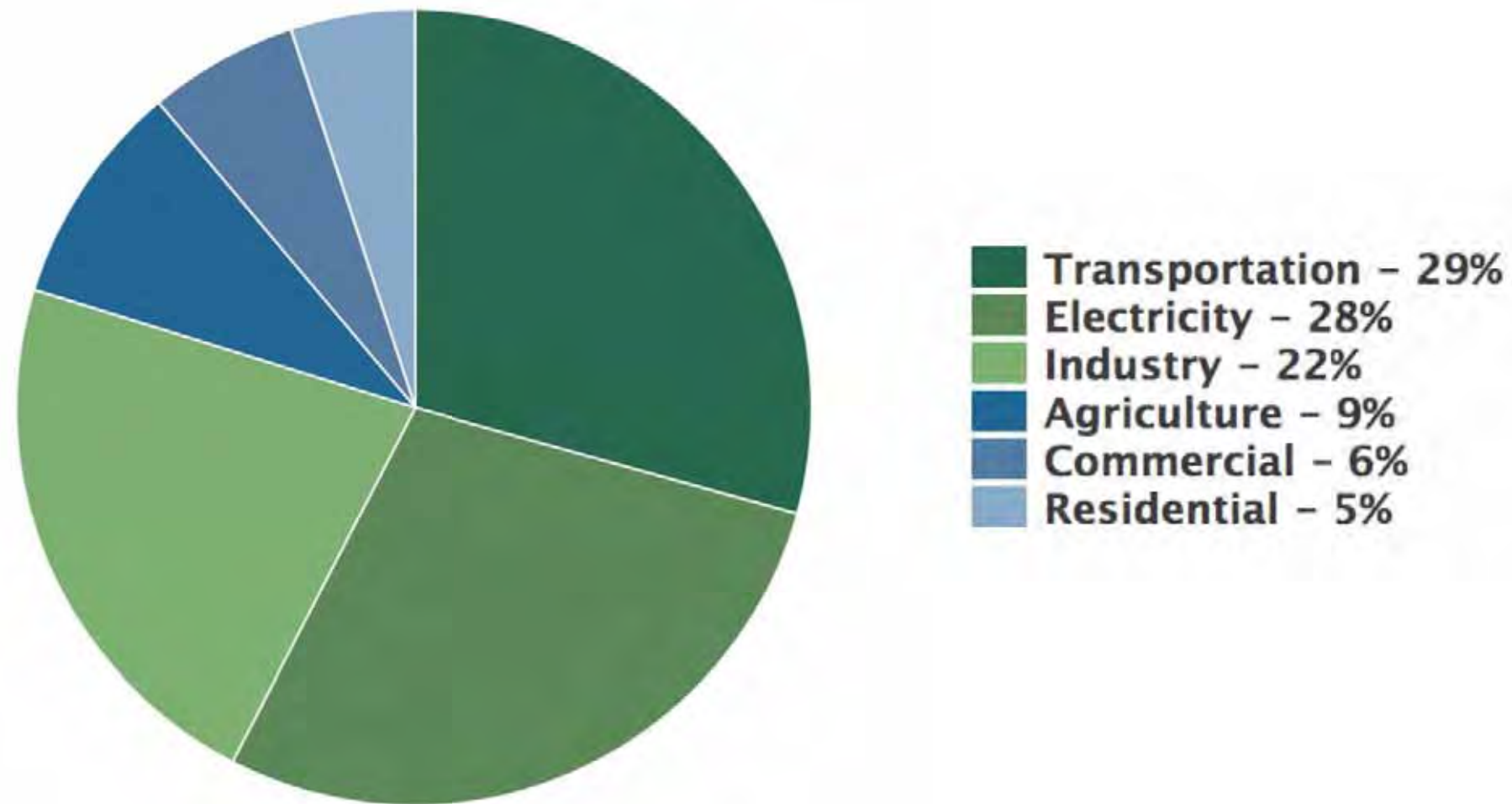
Average Household Trips on Travel Day / HH Size by Car Ownership Status, Year, and Income



Average Household Person Miles Traveled (PMT) / HH Size on Travel Day by Car Ownership Status, Year, and Income

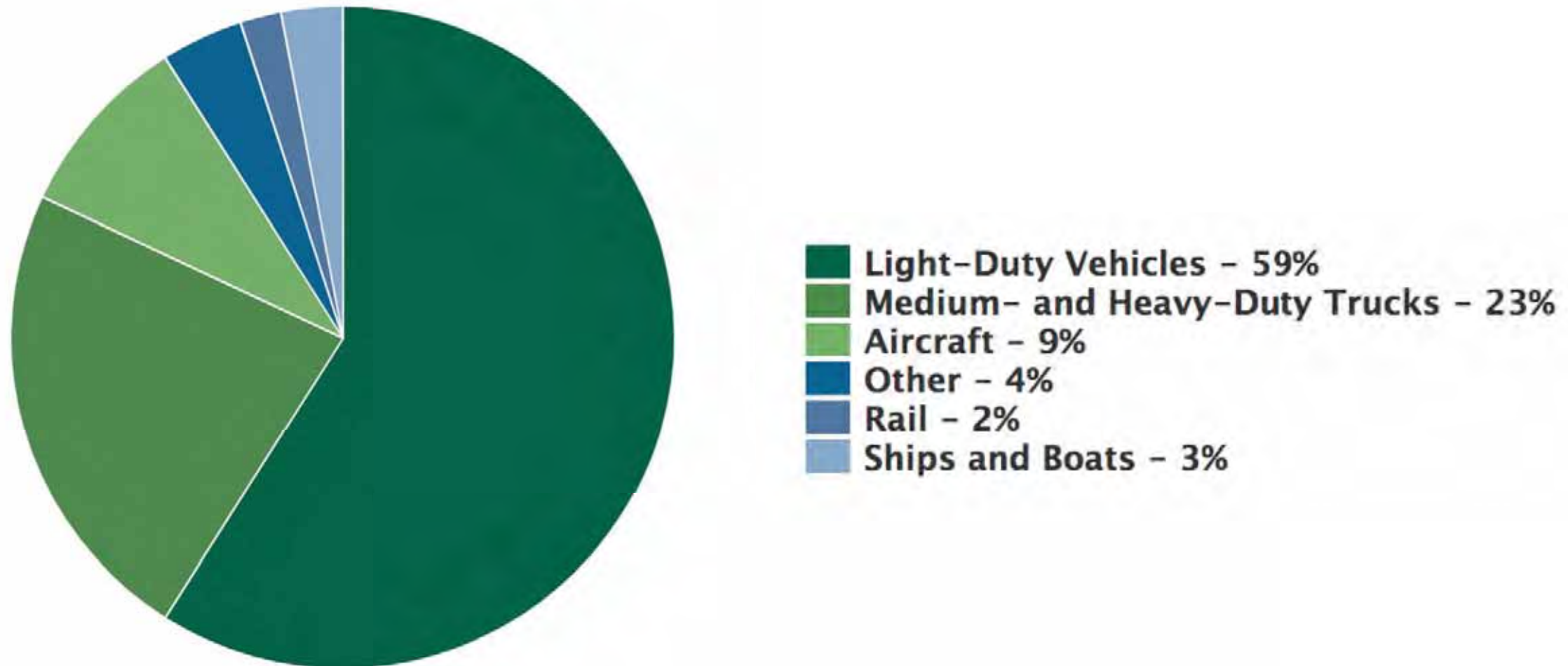


2017 U.S. GHG Emissions by Sector



Source: U.S. EPA

2017 U.S. GHG Transport Emissions



Note: Totals may not add to 100% due to rounding. Transportation emissions do not include emissions from non-transportation mobile sources such as agriculture and construction equipment. "Other" sources include buses, motorcycles, pipelines and lubricants.

Source: U.S. EPA

1 Introduction: NCA4 Vol II

- Earth's climate is now changing faster than at any point in modern civilization
- These changes are primarily the result of human activities, the evidence of which is overwhelming and continues to strengthen
- The impacts of climate change are already being felt across the country, and climate-related threats to Americans' physical, social, and economic well-being are rising
- Americans are responding in ways that can reduce risks, build resilience, and improve livelihoods
- However, neither global efforts to mitigate the causes of climate change nor regional efforts to adapt to the impacts currently approach the scales needed to avoid substantial damages to the U.S. economy, environment, and human health and well-being over the coming decades

Lower Scenario (RCP4.5)

Mid-21st Century



Higher Scenario (RCP8.5)

200 million climate migrants by 2050?

a

b

c

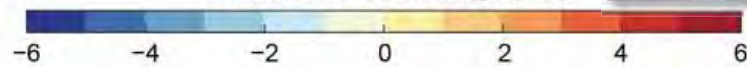
d

Heat Wave Season (days)

Percent of Land Area



Relative Sea Level Change (feet)



Non-emissions impacts of auto dependency

- Mental and physical health
- Safety
- Particulate matter

How does travel differ between years?

2009

PMT per person: 29.1

PVMT per person: 24.8

2017

PMT per person: 35.3

PVMT per person: 24.9

Both household PMT and VMT per person have increased significantly, albeit marginally in the case of VMT.

How does travel differ between years?

Car owning households

2009

PMT per person: 31.2

PVMT per person: 27.1

2017

PMT per person: 37.7

PVMT per person: 27.2

Both household PMT and VMT per person have increased significantly, albeit marginally in the case of VMT.

How does travel differ between years?

Zero car households

2009

PMT per person: 9.4

VPMT per person: 4.4

2017

PMT per person: 13.5

VPMT per person: 4.5

Both household PMT and VMT per person have increased significantly, albeit marginally in the case of VMT.

Car owning households had significantly higher PMT and VPMT than zero car households in both years.

Trip mode share for zero car households

	<= \$14,999		\$15,000 - \$34,999		\$35,999 - \$74,999		≥ \$75,000	
	2009	2017	2009	2017	2009	2017	2009	2017
Active	43%	46%	45%	42%	51%	56%	50%	57%
Vehicle	25%	18%	22%	27%	18%	10%	13%	8%
Transit	24%	26%	22%	25%	26%	27%	23%	27%
Hired car	2%	2%	3%	2%	1%	3%	5%	5%
Other	6%	8%	7%	3%	5%	3%	8%	3%

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Other	6%	8%	7%	3%	5%			



Key takeaways: focus on zero car households

- PMT tends to increase with rising income
 - \$35,000-\$74,999 an exception
- Shifting patterns in mode share
 - Use of active and transit modes in high income households
 - VPMT increasing for lower income households

Key takeaways: focus on zero car households

- **Changes in home location population density**
 - Higher income households tend to be located in more dense urban environments that better support non-auto travel
 - Potential displacement of lower-income households – unclear from this analysis
- **Changes in e-commerce**
 - Rise in deliveries between 2009 and 2017
 - Higher-income and higher-density households associated with higher number of deliveries

Key takeaways: travel survey data

- **Low-resolution of location-specific characteristics**
 - Basic information on home type (i.e., single family, multifamily) and parking would enable more sensitive analysis
- **Integrating new modal and technological innovations**
 - New mobility and micromobility
 - E-commerce and urban freight

Next steps: looking ahead

Research questions beget more research questions...

- How do we reconcile the detrimental impacts of auto use and dependency with the mobility benefits it boosts, especially for low-income populations?
- How can transport policy do better to analyze and plan for zero car households and their unique attributes?

Key limitations

- Descriptive, broad overview of high-level components of travel
- Lack of distinction of “car-less” vs. “car-free” households
 - Income used as a proxy
- National overview masks highly localized impacts

Rising e-commerce travel impacts?

Negative binomial regression model estimates for online deliveries in the last month

	B	Exp (B)	p
Intercept	-2.39	0.09	0.00
Year			
2017	1.65	5.20	0.00
2009	(base)		
Income			
<=\$75,000	2.04	7.66	0.00
\$35,999-\$74,999	1.18	3.25	0.00
\$15,000-\$34,999	0.66	1.87	0.00
<= \$14,999	(base)		
Population density (persons/mi²)			
25,000+	0.64	1.90	0.00
10,000-24,999	0.45	1.57	0.00
4,000-9,999	0.14	1.15	0.00
0-3,999	(base)		
Observations (N)	13,684,189		
Deviance	14,944,722		
Alkaline Information	29,145,054		
Log Likelihood	-14,572,519		

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