

Travel Effects of Automated Vehicles

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National Planning Conference, April 23, 2018, New Orleans

Deep Dive: Automated Vehicle Effects on Urban Development



1900 5th Ave NYC: Where is the CAR?



1913 5th Ave
NYC: Where
is the
HORSE?



Introduction

- Automated Vehicles by 2025 or 2035?
- Need to Anticipate Effects to Craft Policies
- That Maximize Benefits and Minimize Costs.



Literature Review Questions

1. Mechanisms by which AV may impact travel and land use?
2. Relative magnitude of impacts?
3. Policy implications of research to date?



Automated Vehicle Research is Hard!

- Fully AV have yet to travel our roads
 - Can't directly observe their effects
- Available research
 - Extrapolates from observed data
 - Draws on models and theory



Travel Behavior Basics: Induced Travel

- If policies lower time/money cost of auto travel, then VMT increases because people will
 - Travel more frequently
 - To destinations farther away by
 - Driving alone rather than carpooling, riding transit, walking, and biking
- If policies increase cost of auto travel, then opposite is true

TIME COST

- Improved safety enables short headways:
 - Double or triple roadway capacity
 - Increase VMT by 30%-60% in short run and 60%-100% in long-run
- Research:
 - Headway-capacity relationship with traffic models
 - Evidence for Capacity and VMT relationship strong.



VALUE OF TRAVEL TIME

- Enables engagement in other activities in car:
 - Value reduced by 18% to 25%
 - Working may not be common
- Extrapolated from car and rail passenger experiences
 - Equivalent to AV travel?

MONETARY COST

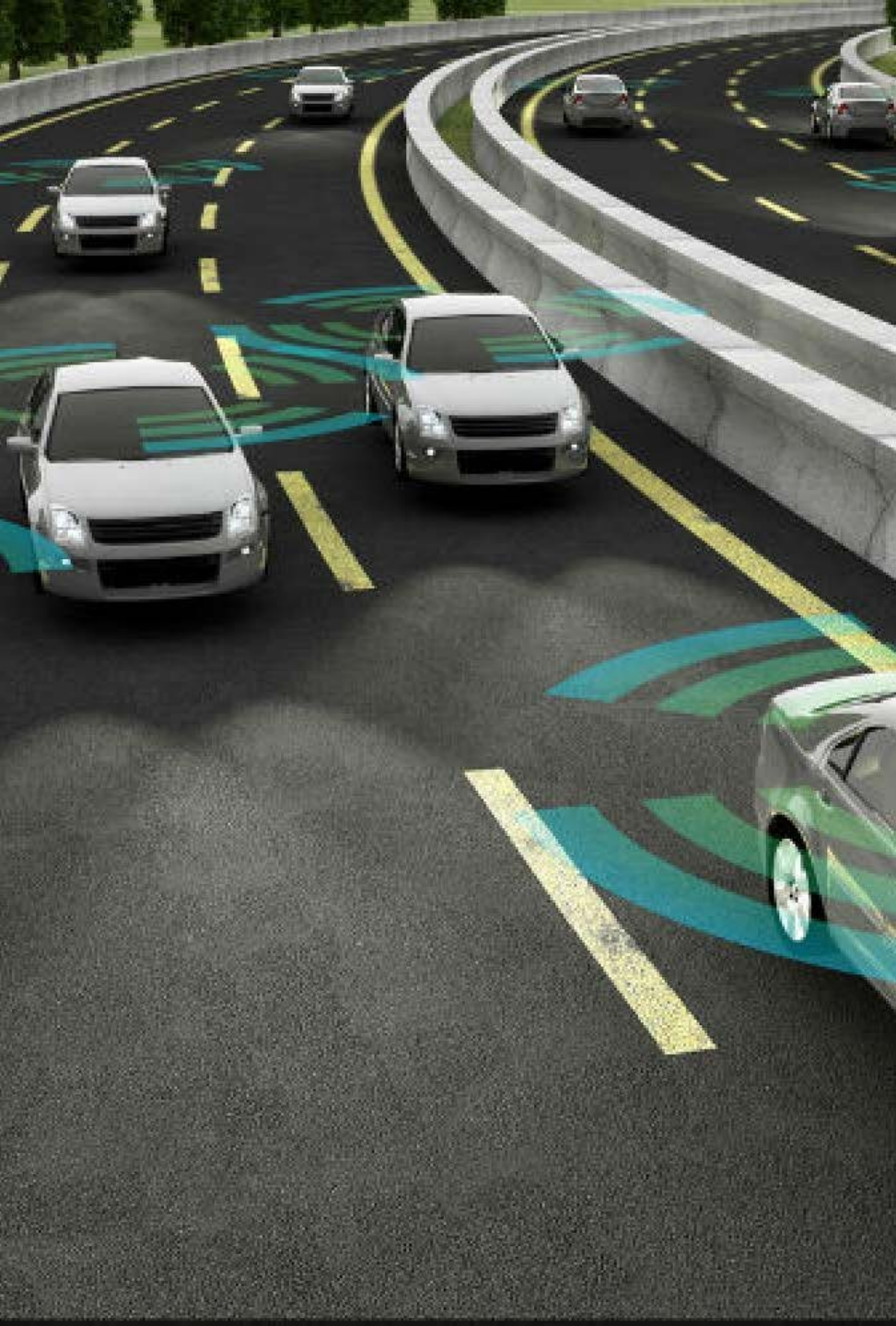
- User cost lower due to safety and less fuel
- Labor costs avoided enables AV taxis & shared taxi
- Reduced monetary costs increases VMT
 - 10% reduction in fuel price, VMT increases by 1% to 3%
 - 10% decrease in taxi fares, then trips increase by 2%



NEW TRAVELERS

- Allow travel for younger and disabled
- Shared AV taxis allow more travel for low car households
- Studies: 10% - 14% VMT increase
- Extrapolations: 2009 NHTS
- Magnitude of effects vary by study assumptions





CAR RELOCATES WITHOUT DRIVER

- Citywide shares of total VMT from 10%-20% (total market penetration)
- Empty relocation VMT increases with
 - Distance from urban core (2-4 times higher in outer areas)
 - Low parking availability
 - High parking prices
 - Low per mile user costs
 - Low transit service



<https://www.wsj.com/articles/the-end-of-car-ownership-1498011001>

VEHICLE FLEET SIZE

- AV taxis may reduce fleet by 80% to 90%.
- Shared AV taxis may reduce fleet by 85% to 95%.
- High quality transit could further improve fleet reduction.



PARKING

- AV taxis and shared taxis could reduce need for parking
 - Three studies: 90%
- However, reduction in parking supply could increase relocation travel
 - By as much as 87% for personal AVs, which is almost a nine-fold increase –**Yikes!**

Other insights

Studies show increase in auto travel and reduction in transit, walk, and bike travel with personal AVs and AV taxis.

2 studies show significantly reduced accessibility in city centers and increased accessibility in outlying areas, which could lead to urban flight, suburban sprawl.

Personal AVs and AV taxis tend to increase overall VMT while shared AV taxis reduce VMT.

Point estimates are uncertain: many models cannot represent the full range induced travel for AVs.

Conclusions

Personal AVs and AV Taxis could increase VMT/GHG and eliminating parking could create further increases!

Electrifying fleet could counter GHG growth, but reduce vehicle fuel costs and further increase VMT & congestion.

Shared AV taxis could reduce VMT and GHGs, but pricing policies are likely needed to get people to share.

City center congestion could increase with significantly higher freeway capacity.

Reinvest in rail transit to city centers and more first and last mile access in suburban areas with AV shuttles.

Cordon pricing around city centers to reduce congestion, make neighborhoods livable, and avoid sprawl.

Thank you!

Questions?

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