Disruptive Trends.

Poking at Autonomous Vehicle Effects Like a Lab Rat

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March 2018

Source: atheistuniverse.net
trends

Gasoline Prices  GDP, Real Income Growth  Household Formation  Labor Force Participation  Driving Age Population  Licensing Regulations  Non-Auto Mode Options  Suburban & Urban Migration

Congestion & Time Use  Tele-Commuting  Social Networking  Internet Shopping  Vehicle Ownership  Goods & Services Delivery  Autonomous Cars  Shared Mobility Marketplace
trends 1970-2004 = increase
VMT per capita will be 10% to 20% above its 2004 peak, suggesting a need to accelerate transportation investment to keep pace with population growth.

Your Forecast

\[
\frac{2040}{15,350}
\]

2040 Published Forecasts

- 17,100 VMT per capita (U.S. DOT)
- 16,300 VMT per capita (Transportation Financing Commission)
- 13,400 VMT per capita (U.S. Energy Administration)
- 12,200 VMT per capita (Public Interest Research Group: High)
- 8,200 VMT per capita (Public Interest Research Group: Low)
trend effects

- Internet Shopping
- Vehicle Ownership
- Gasoline Prices
- Autonomous Cars
- Shared Mobility Marketplace
trend effects

Projected Cost of EV with 200-mile range

95% of Passenger Miles TaaS (AEV) by 2030

Source: https://tonyseba.com/

2018 TRB Presentation
trend effects evidence


2018 TRB Presentation
What's Uber Displacing?
How people would travel if they weren't taking Uber or Lyft

60+ % of TNC Trips Are New Vehicle Trips

Source: University of California, Davis Institute of Transportation Studies
TNCs to AVs: shared vs owned

Decrease in total operating costs per mile.

<table>
<thead>
<tr>
<th>TODAY</th>
<th>66¢</th>
<th>traditional vehicle operating cost per mile</th>
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<tbody>
<tr>
<td>BY 2040</td>
<td>29¢</td>
<td>SAV operating cost per mile</td>
</tr>
<tr>
<td></td>
<td>12¢</td>
<td>PSAV operating cost per mile</td>
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</table>

Source: AAA, UMTRI, Fagnant et al, Columbia Earth Institute, Barclays Research estimates
TNCs to AVs: shared vs owned

- Popular: Affordable, everyday rides
  - uberX: $5.69
  - uberXL: $7.30
  - SELECT: $11.14

- Premium: High-end rides with professional drivers
  - BLACK: $17.92
  - SUV: $24.50

- More: Extra assistance from certified drivers
  - ASSIST: $5.69
  - WAY: $5.69
  - ESPAÑOL: $5.71
How will automated vehicles influence the future of travel?
• 9 Regional Travel Demand Models to date (more coming)

• Tests
  1. Decrease access time
  2. Decrease parking costs
  3. Decrease vehicle operating costs
  4. Decrease impact of time lost driving
  5. Increase auto availability
  6. Increase freeway capacity
  7. Increase non-work trip-making
  8. Increase auto occupancy
AV effects

- Auto Access Time: 0%
- Vehicle Occupancy: 30%
- Parking Costs: 50%
- Lost Auto Time Impact: 50%
- Auto Availability: 100%
- Non-Work Trip Making: 25%
- Freeway Lane Capacity: 3,300
- Arterial Lane Capacity: 0%
- Land Use Changes: 0%

Fehr & Peers testing
AV tests • Increase freeway capacity

Image Source: USDOT
http://www.its.dot.gov/communications/image_gallery/image36.htm/
Policy Response

Public and Shared

Private and Mine

FehrPeers
What’s your desired future?
AV tests

freeway capacity

FLOW COMPARISON
0% AVs* and 100% AVs

- Volume is gradually increased for entire simulation time.
- Flow rate in the 0% AV scenario reaches capacity, oversaturated conditions follow.
- Flow rate in the 100% AV scenario continues to increase before reaching capacity.
- Oversaturated flow oscillates with a standard deviation of 100 vph. Oscillation could be due to high vehicle acceleration of AVs.
- Oversaturated conditions for 0% AV scenario. Capacity ~70,000 vph.
- Oversaturated conditions for 100% AV scenario. Capacity ~23,000 vph.

* Assumes 0% trucks or buses (all passenger cars).

Flow Rate (vph)

Simulation Time (min)
AV Tests

Freeway Capacity

Automated Vehicle Fleet
Effect on Total Network Delay

Automated Vehicle Fleet
Effect on Network Average Speed

FEHR & PEERS

Scenario 1: High Congestion example
Scenario 2: Moderate Congestion example
### Bay Area County Model

<table>
<thead>
<tr>
<th>Model Input Assumption</th>
<th>Vehicle Trips</th>
<th>DA Trips</th>
<th>HOV Trips</th>
<th>VMT</th>
<th>VHD</th>
<th>Avg Trip Length</th>
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## Model Input Assumption

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• New Travel Demand Framework?