Tab 9

Disruptive Trends

In Transportation

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FEHR & PEERS
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Trends

2017 to 2040 **UNCERTAINTY**

Labor Force Participation

Driving Age Population

Vehicle Ownership

Licensing Regulations

Gasoline Prices

Congestion & Time Use

Non-Auto Mode Options

GDP, Real Income Growth

Suburban Migration

Householdd Formationn

Goods & Services Delivery

Tele-Commuting

Social Networking

Internet Shopping

Autonomous Cars

Driverless Vehicles

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

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

2004
13,200 VMT per capita

2012
12,100 VMT per capita

1970

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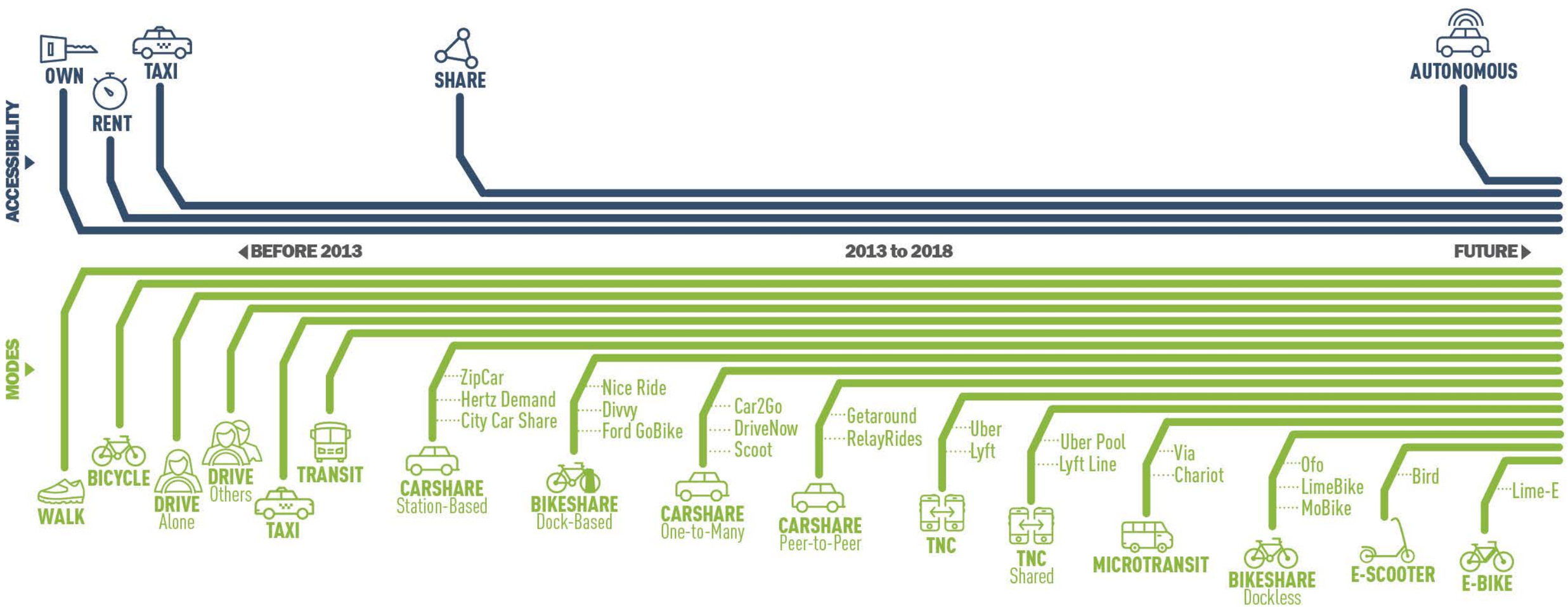
Trend Effects

Tipping Point

VEHICLE ACCESSIBILITY & TRAVEL MODE



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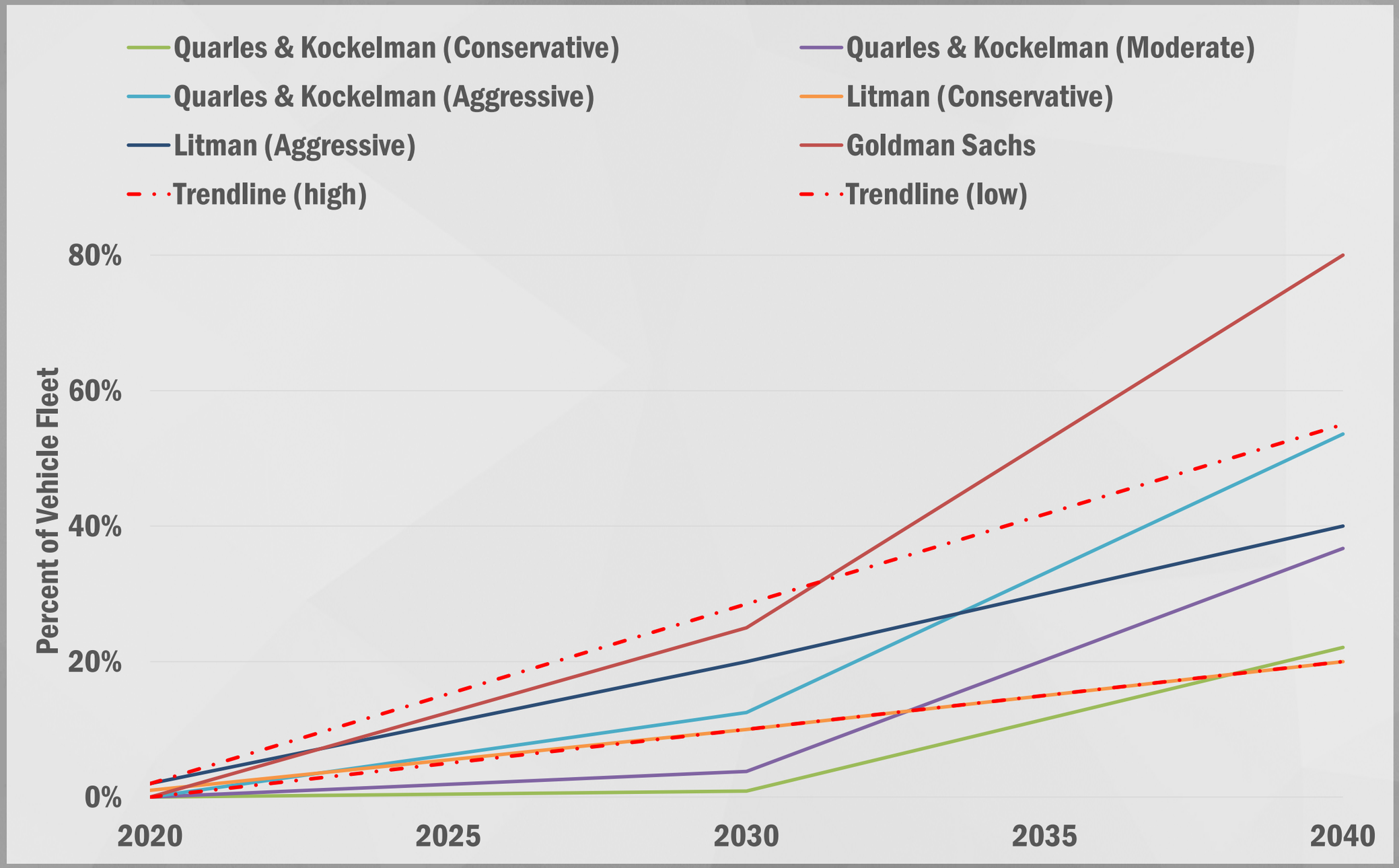
Trend Effects

Tipping Point



Potential Growth in Autonomous Vehicles as Percent of Vehicle Fleet

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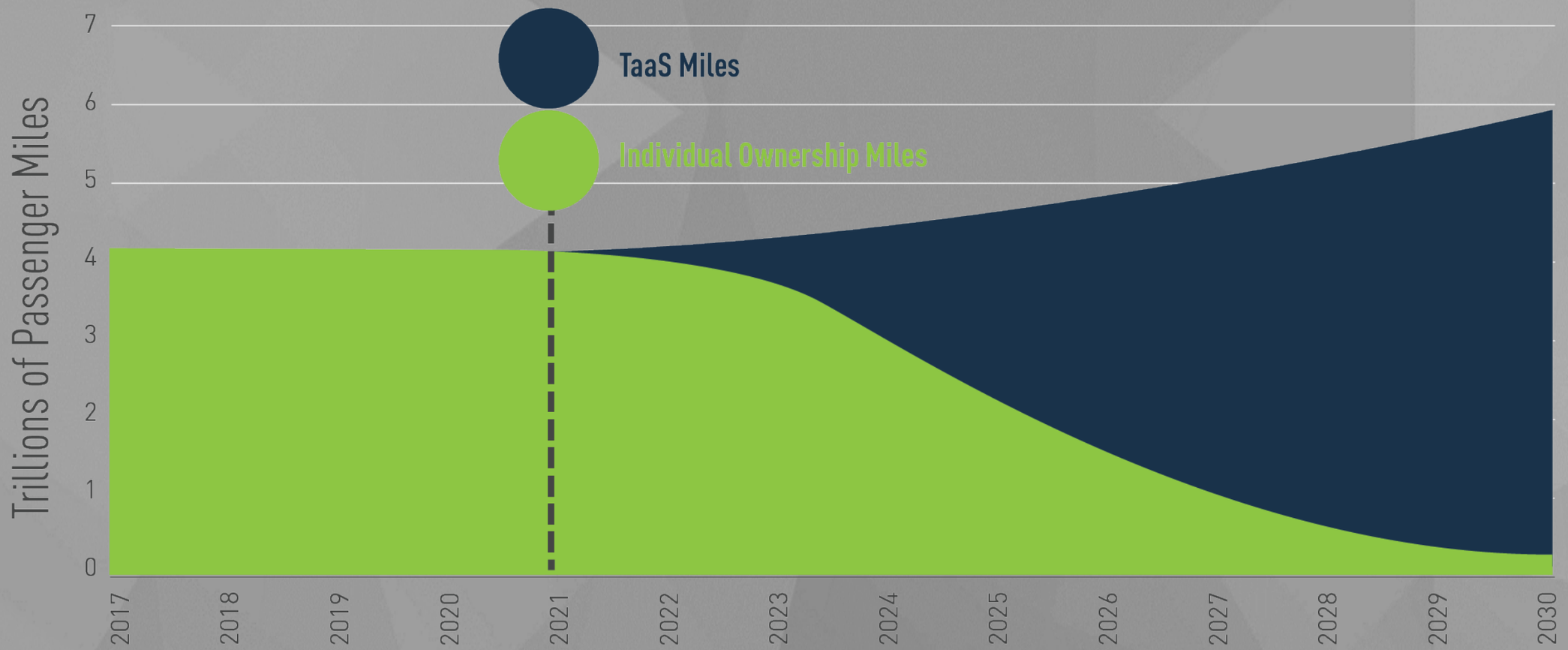
Trend Effects

Tipping Point

95% of Passenger Miles by 2030
Delivered by Transportation as a Service (TaaS) in Autonomous Electric Vehicles (AEVs)



https://tonyseba.com | 2018 TRB Presentation

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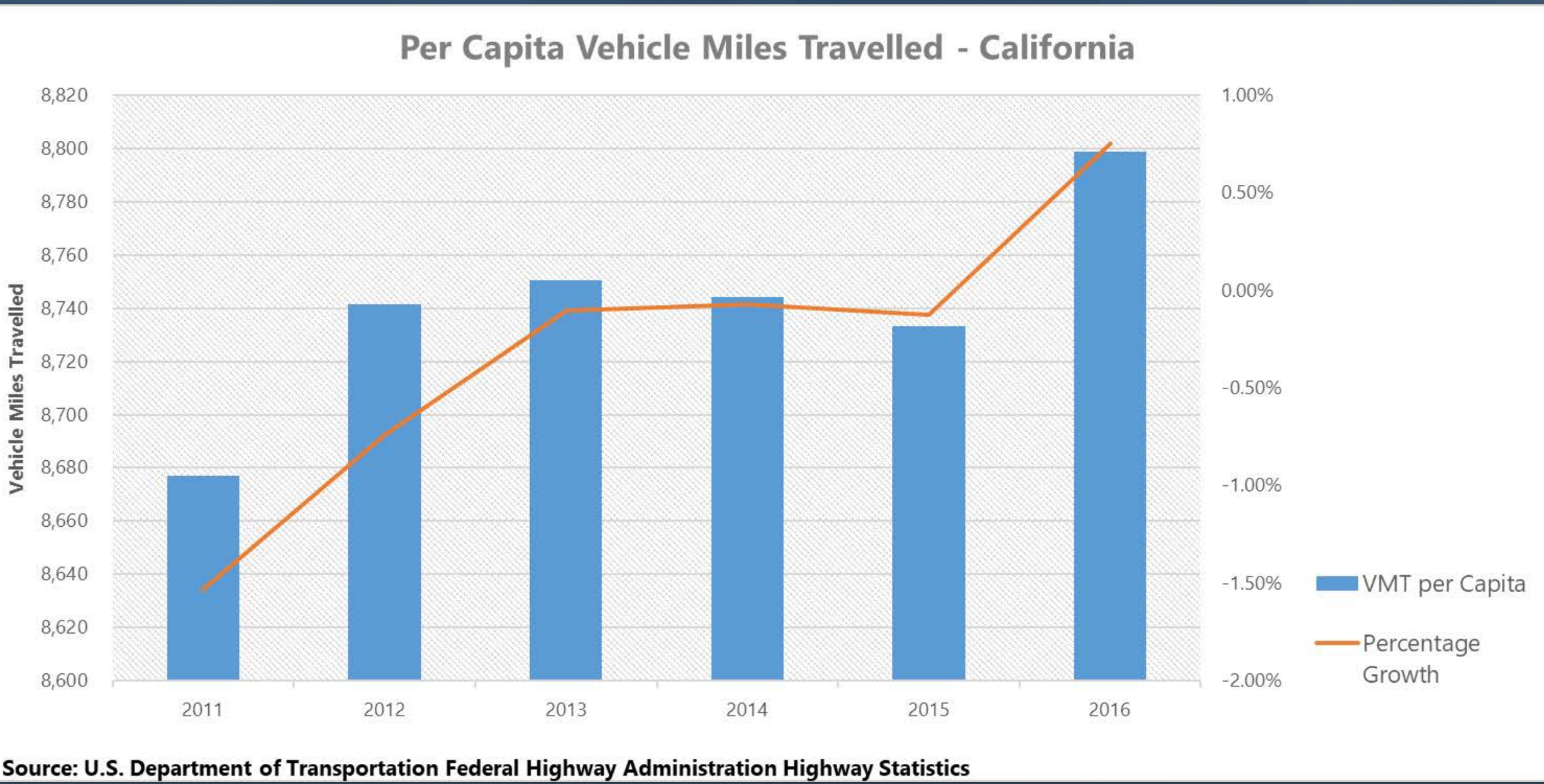
Trend Effects

Evidence



Source: U.S. Department of Transportation Federal Highway Administration Highway Statistics

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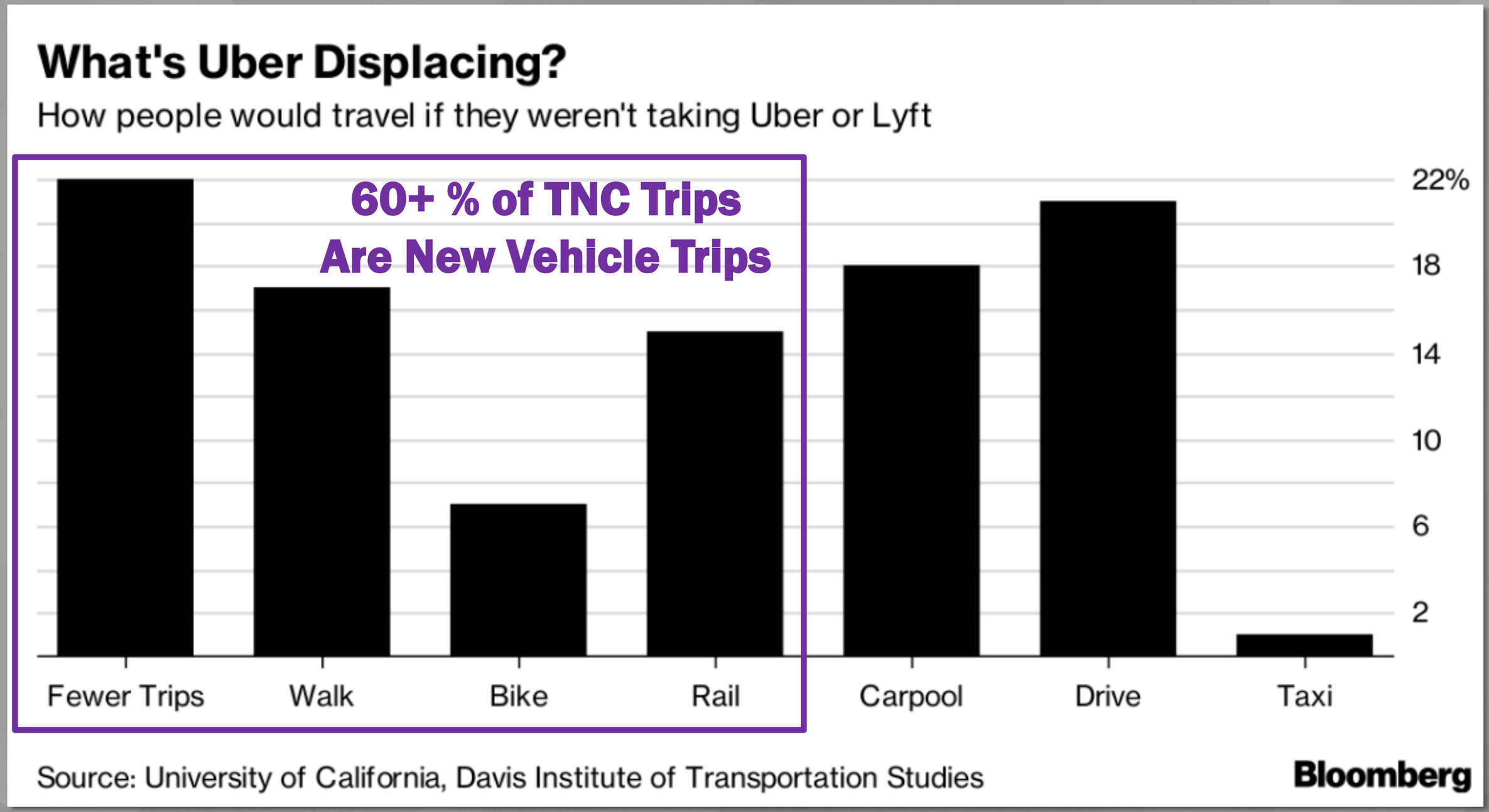
TNC Effects

Evidence



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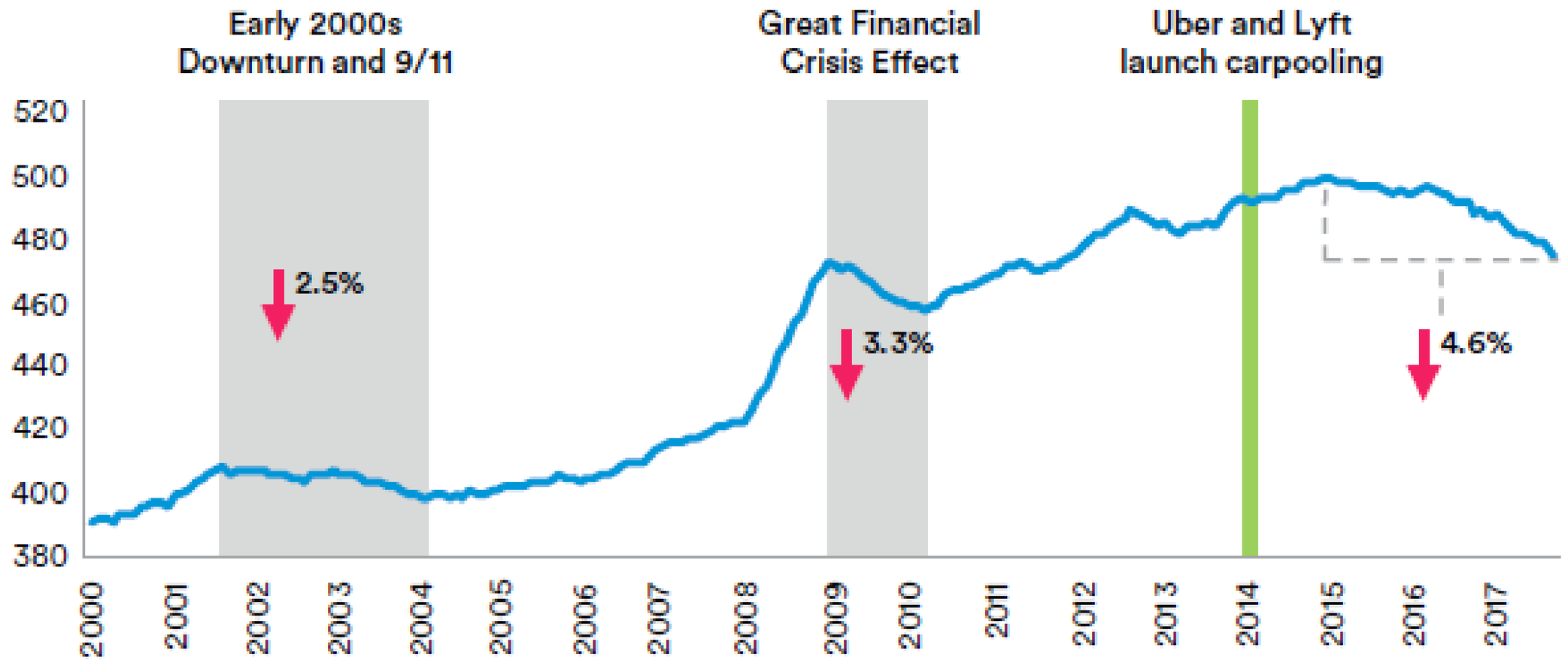
Trend Effects on Transit

Evidence

Exhibit 1 | U.S. Public Transit Ridership (millions of rides per month, 12-mo trailing average, major metros)



Sources: MetLife Investment Management, American Public Transportation Association

Note: Major metros include Boston, Chicago, Los Angeles, New York City, San Francisco, and Washington D.C.

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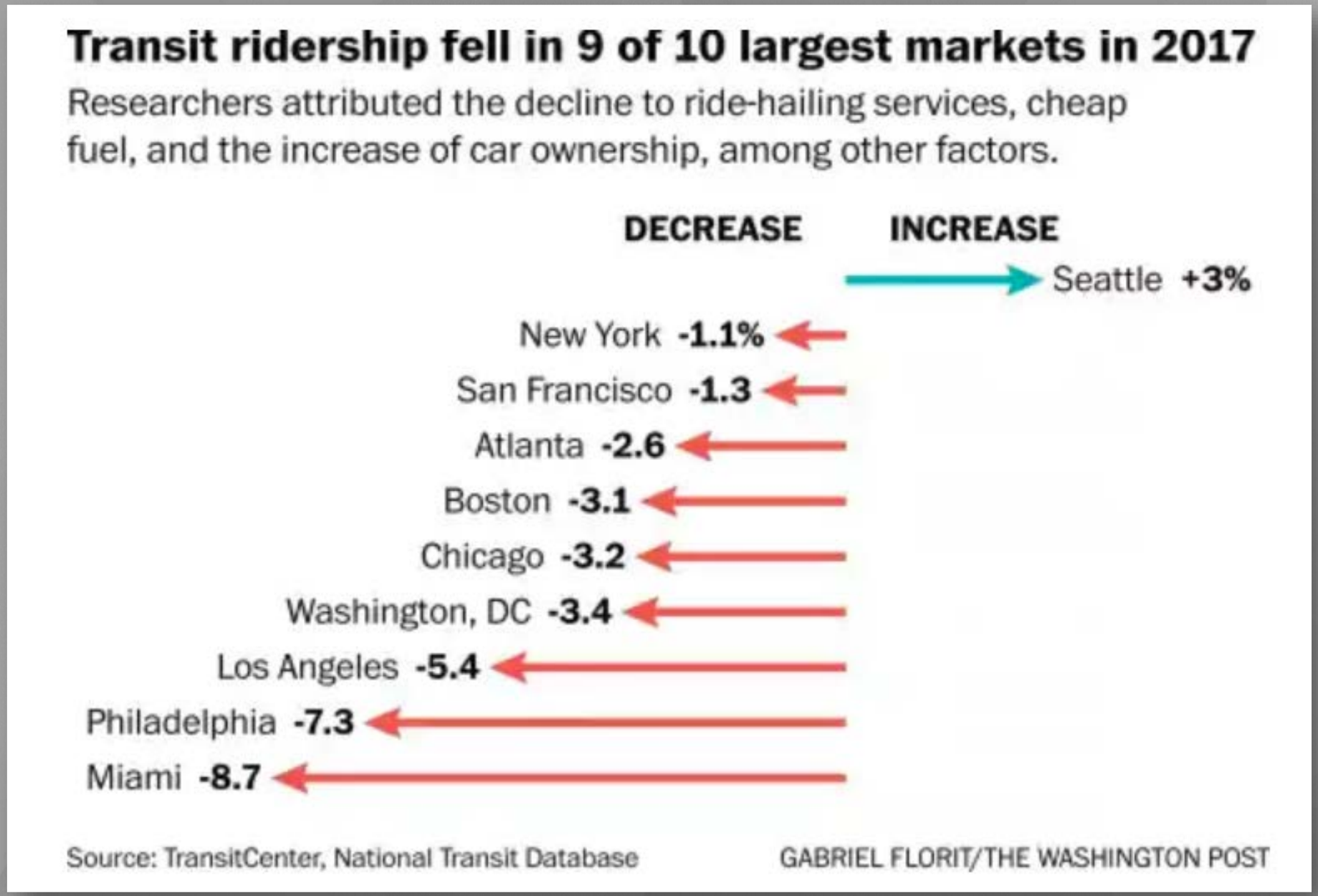
Trend Effects on Transit

Evidence



The Washington Post | Falling Transit Ridership Poses an 'Emergency' for Cities, Experts Fear | Faiz Siddiqui | 3.24.18

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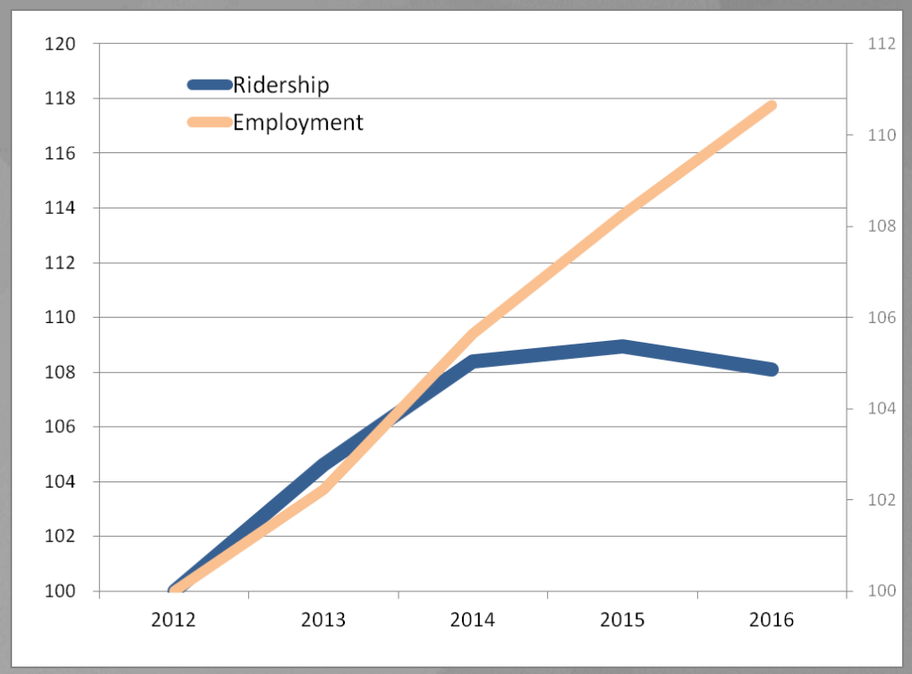
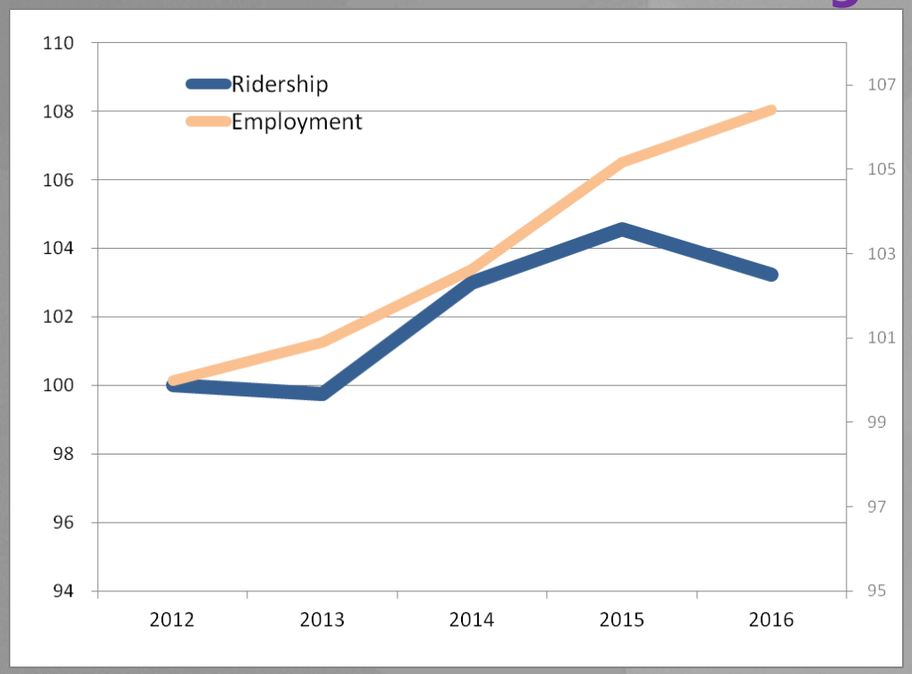
Trend Effects on Transit

Evidence

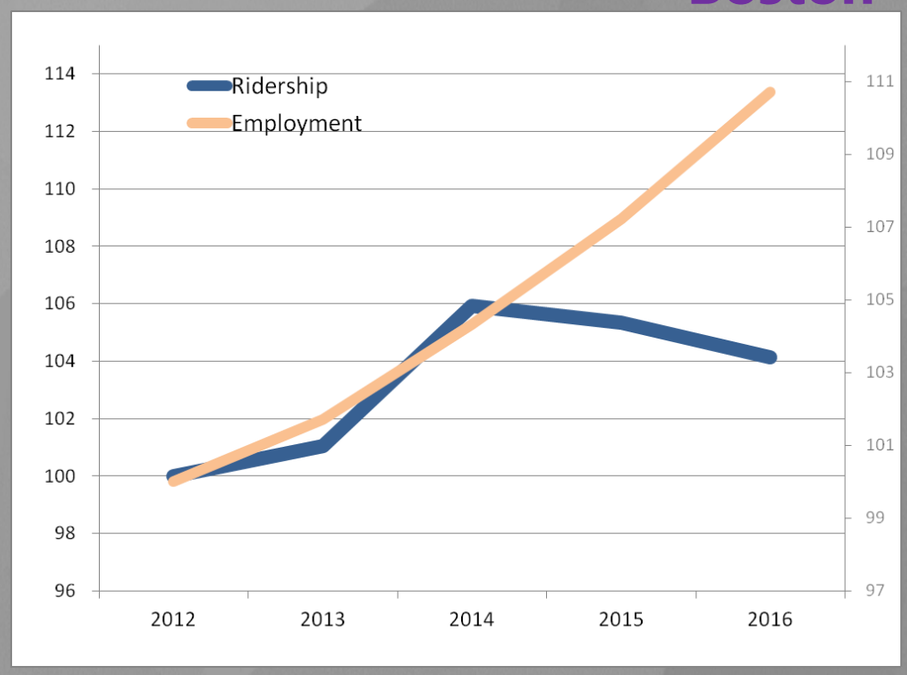
New York



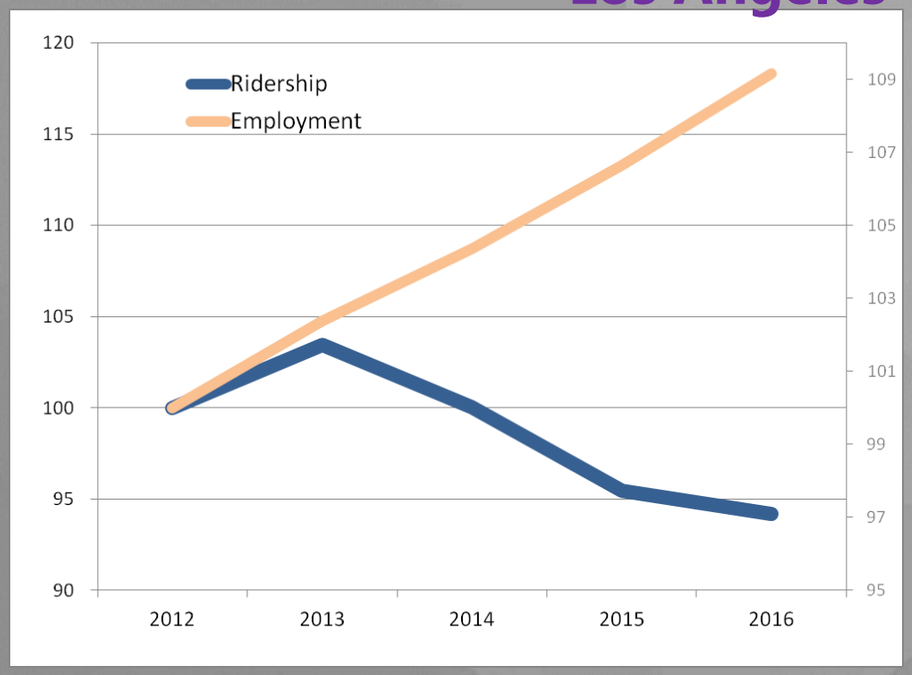
Chicago



Boston



Los Angeles



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TNCs to AVs

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9
Regional Travel Demand Models

2
Freeway Simulations

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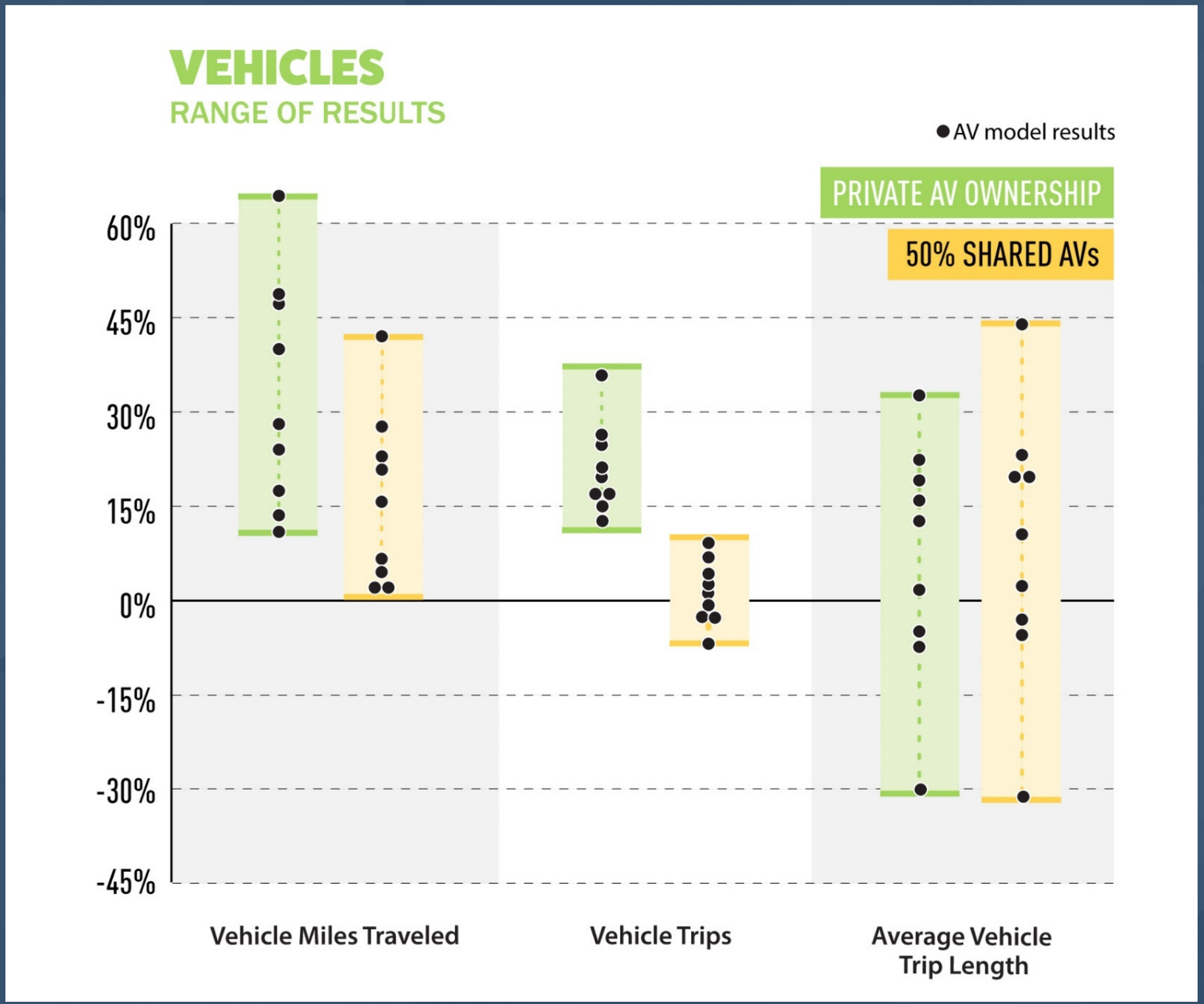
AV Tests

Vehicle Results



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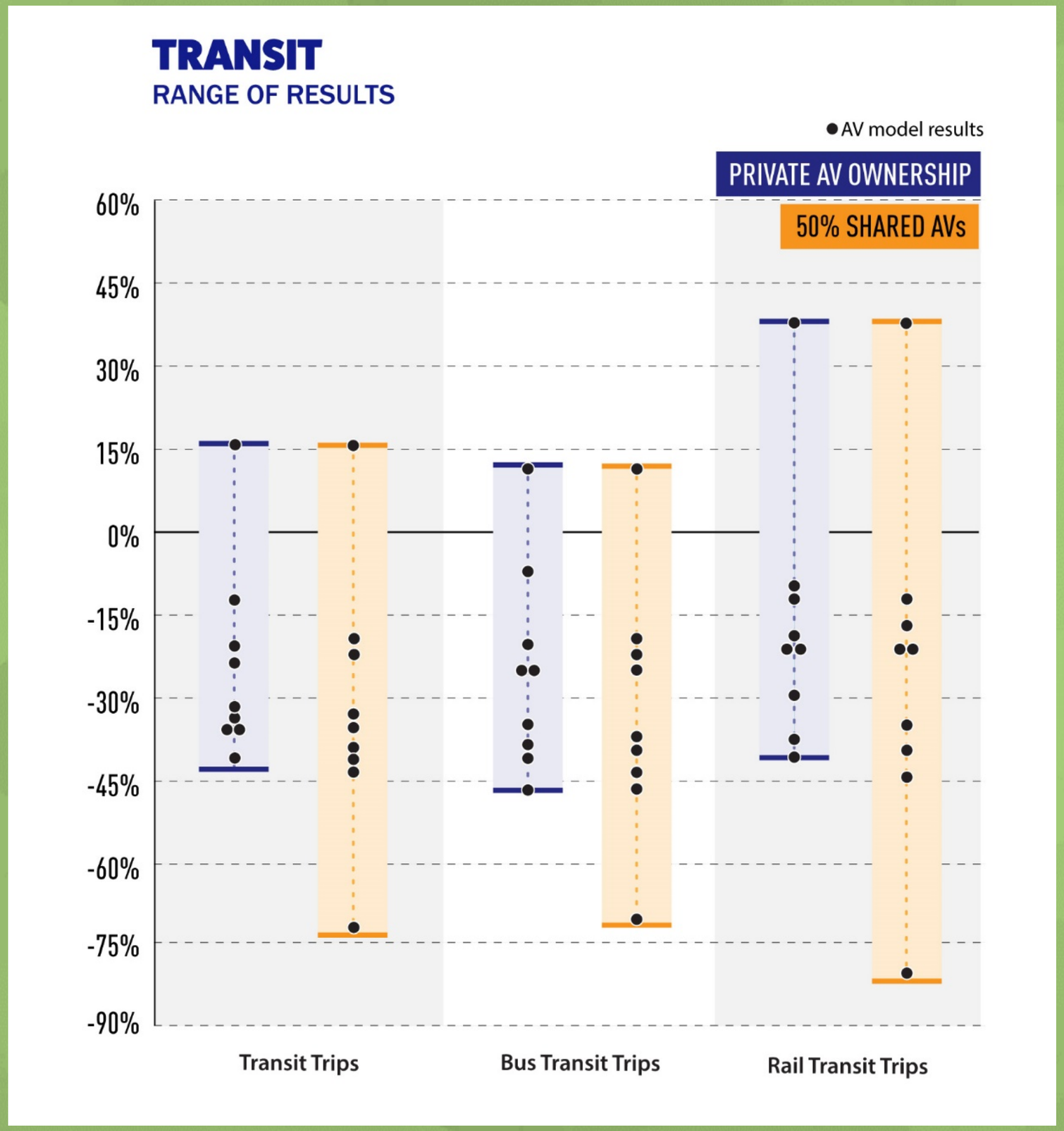
AV Tests

Transit Results



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AV Effects

Evidence

Research Findings: Chauffeur Experiment

(Harb et al., 2017)

- 13 San Francisco Bay Area subjects — *Cohorts: 4 Millennials, 4 Families, 5 Retirees*
- More auto travel
  - 76% increase in VMT — *Retirees increase most*
  - 22% of increased VMT were ghost trips — *Consistent across cohorts*
- Change in activity patterns
  - 94% increase in # longer trips (over 20 miles)
  - 80% increase in # evening trips (after 6 pm) — *Retirees increase most*
- Bimodal impact on miles walked — *Consistent across cohorts*
  - Half decreased (-28% on average), half increased (+49% on average)
- Virtually no biking, transit, TNC use in the sample — *Consistent across cohorts*

Berkeley
UNIVERSITY OF CALIFORNIA

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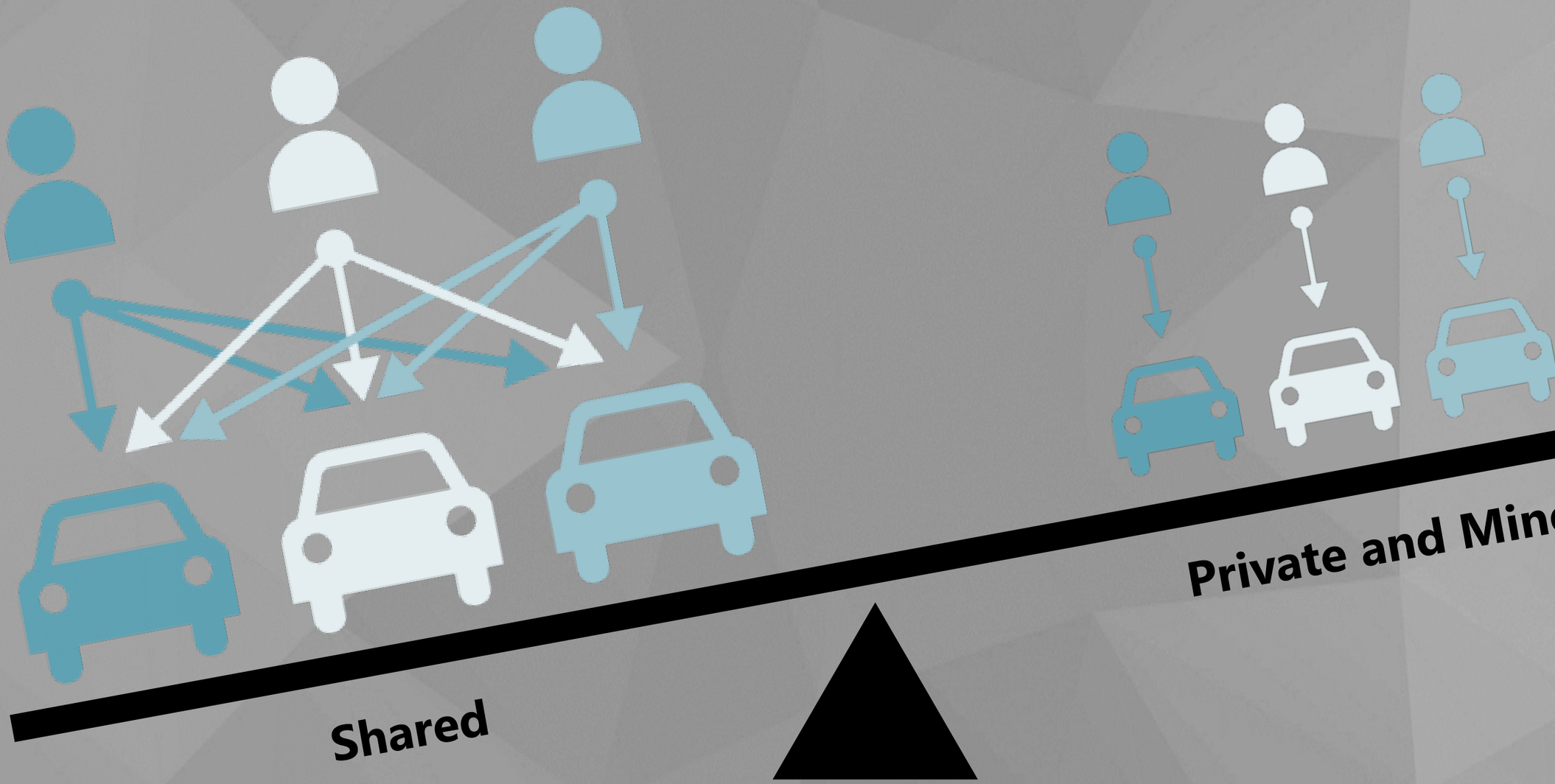
Policy Response

Depends on the desired outcome



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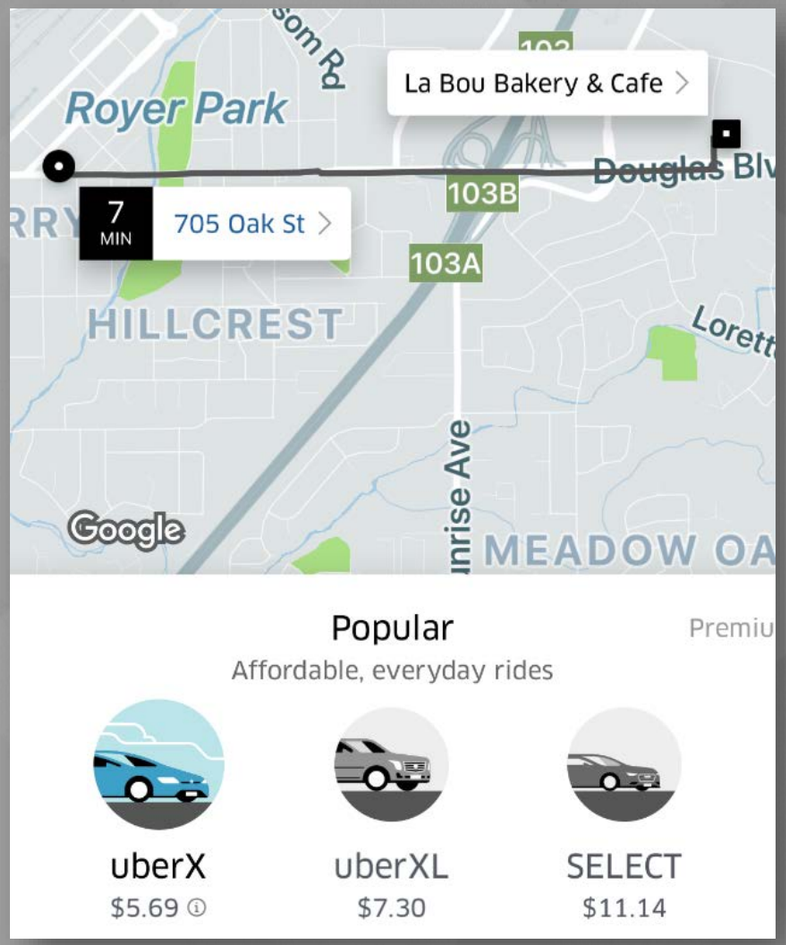
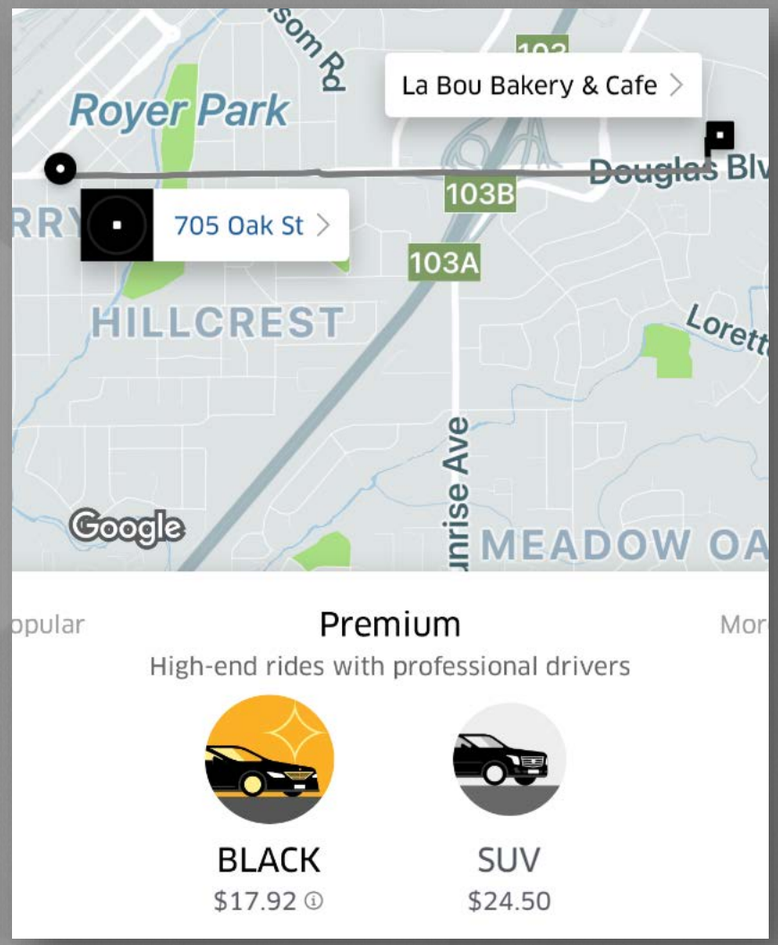
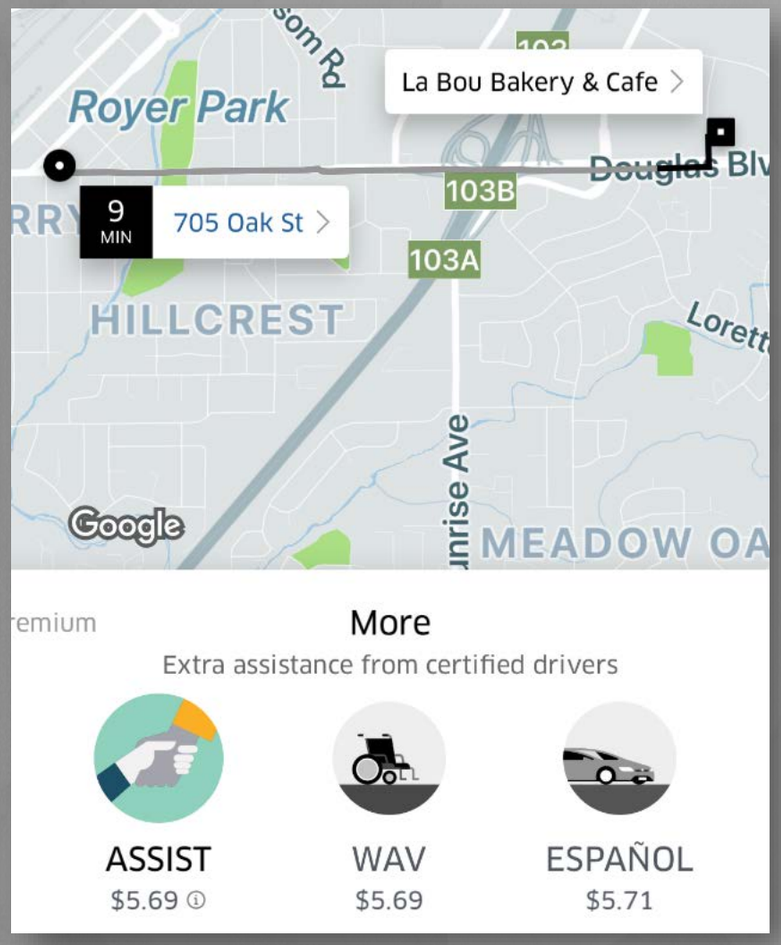
Policy Response

Private Sector Motivation = Revenue (Miles, Minutes, Demand Level, and Vehicle Choice)







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Policy Response

Transportation Network Space Allocation

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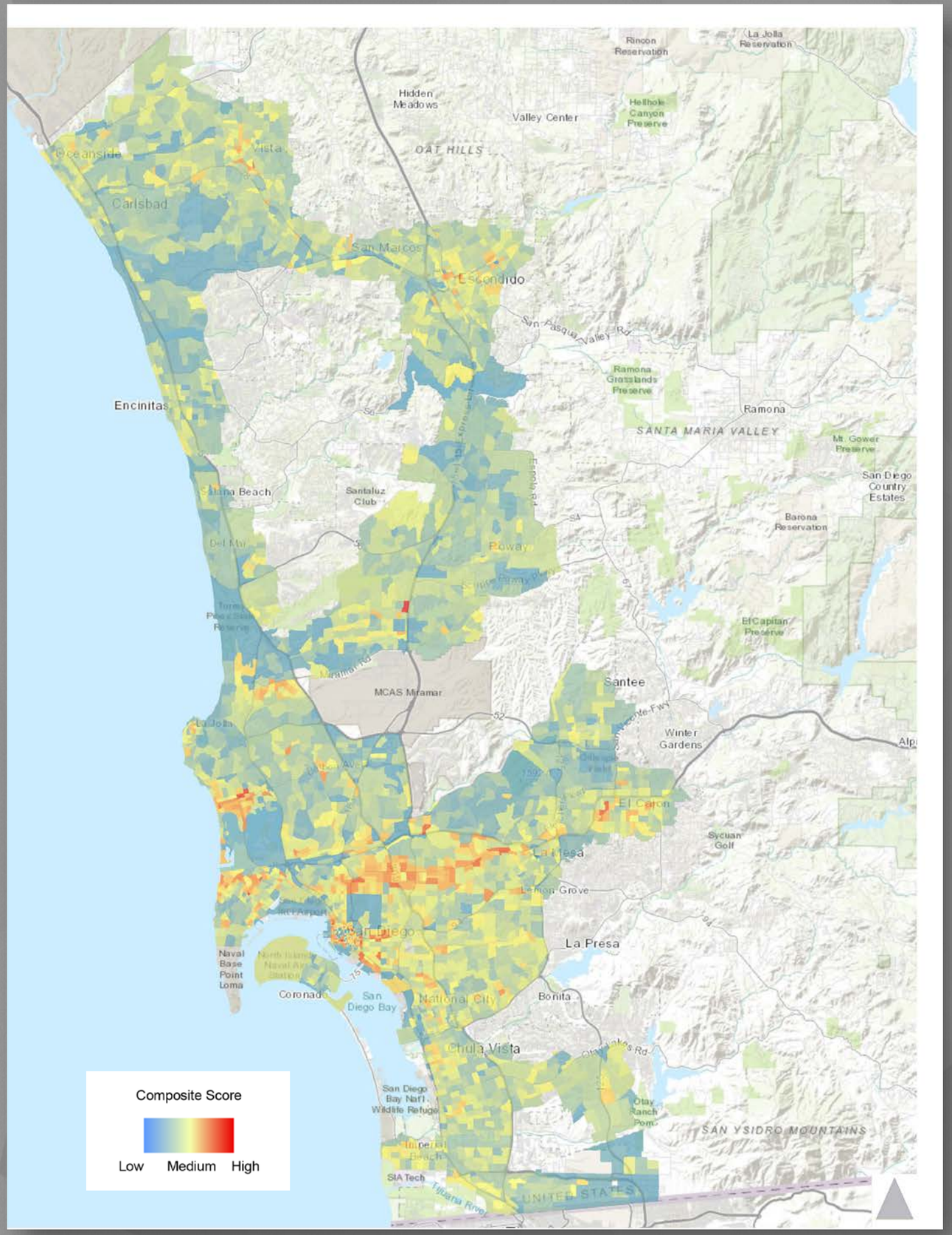
Policy Response

Market Assessment



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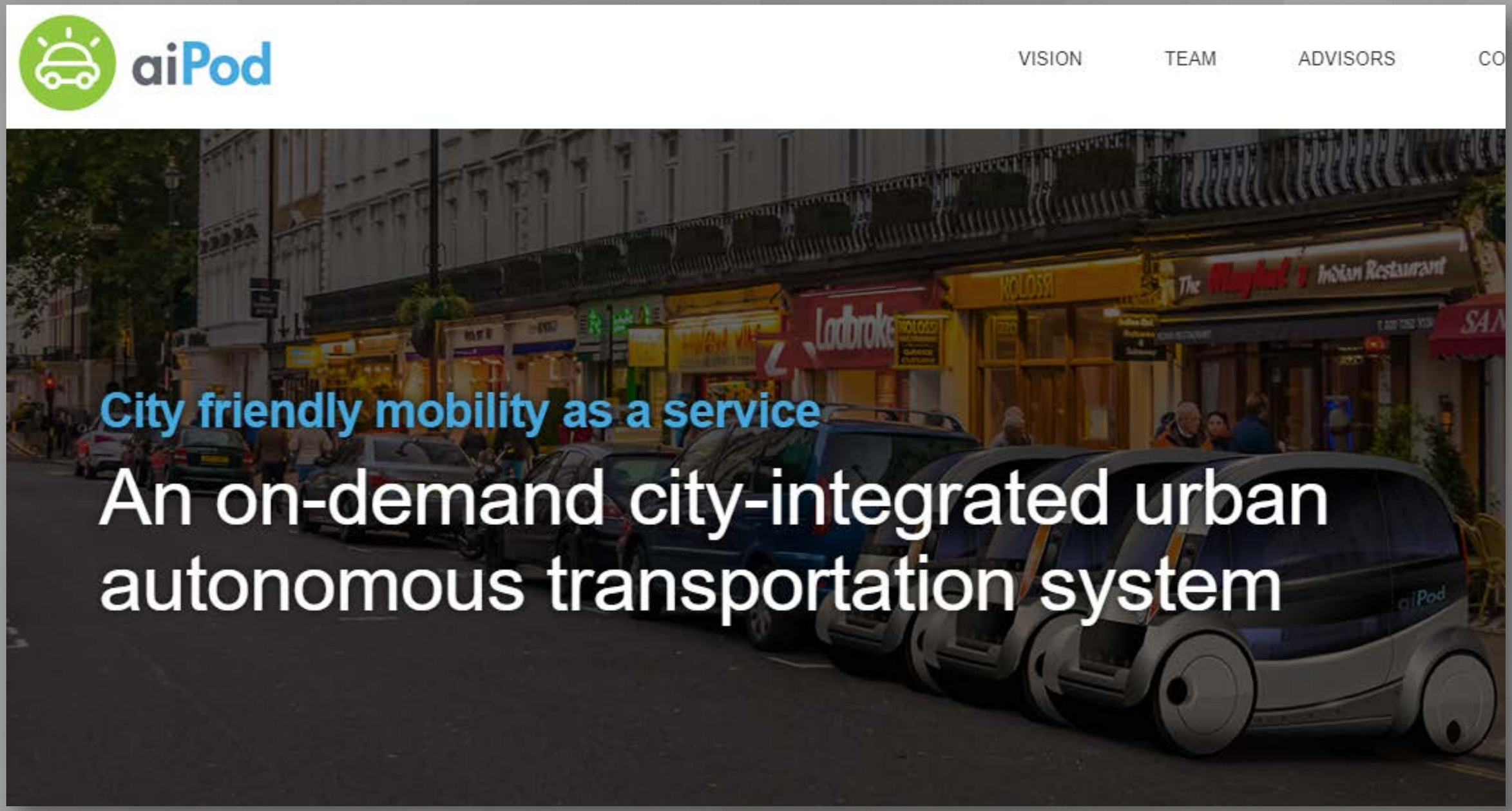
Policy Response

Microtransit



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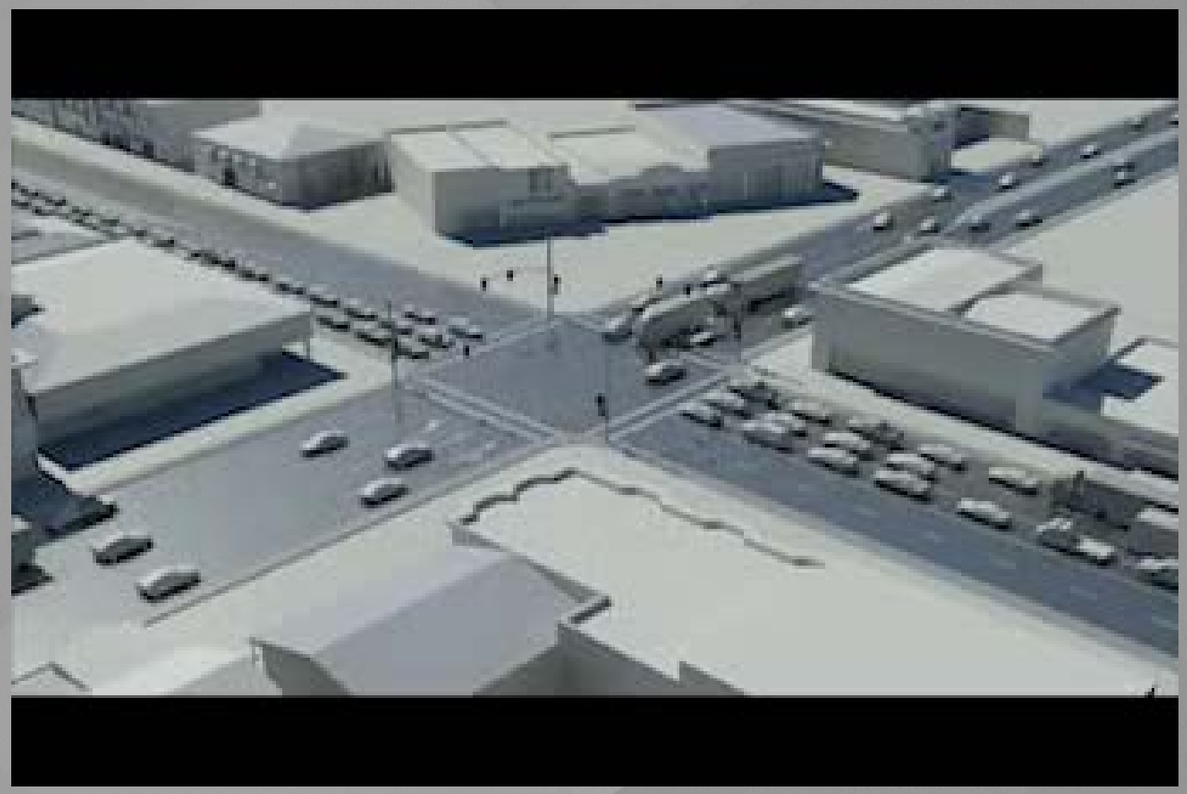
Policy Response

Micro-Transit or Micro-Vehicles



Performance	Traditional Vehicles	Micro Vehicles
Delay (seconds)	175	31
Fuel consumption (gallons)	422	187

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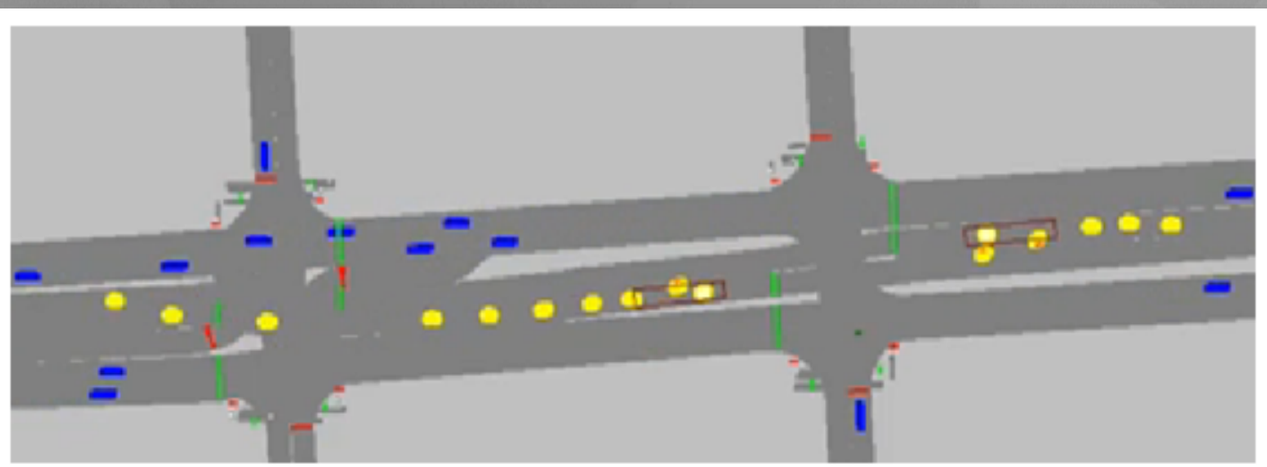
Policy Response

Autonomous Rapid Transit (ART)



Through TaxiBots (yellow) Passing Loading Bot at ART Station (red rectangles)

Performance	20-passenger vehicles	4-passenger vehicles
Reduced travel delay	46%	49%
Improvement in travel time advantage over cars	34%	36%
Improvement in travel time advantage over BRT	33%	35%

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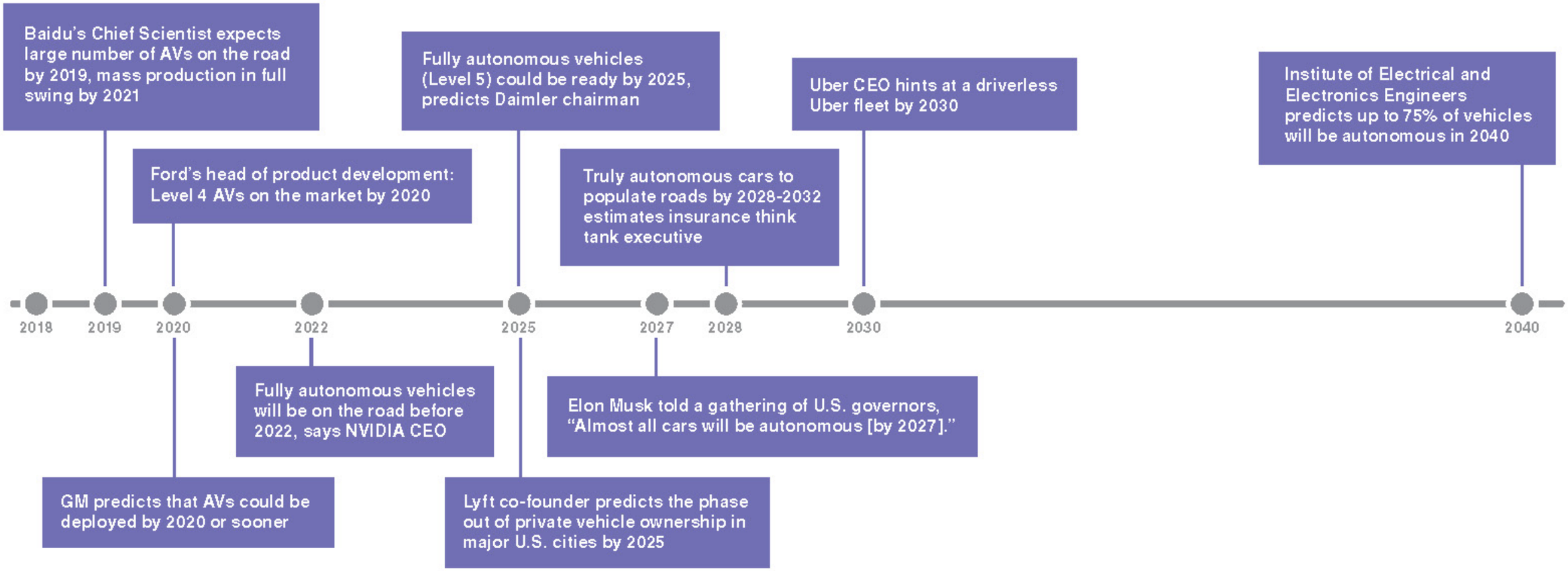
Trend Effects

AV Technology Timeline - Future Predictions



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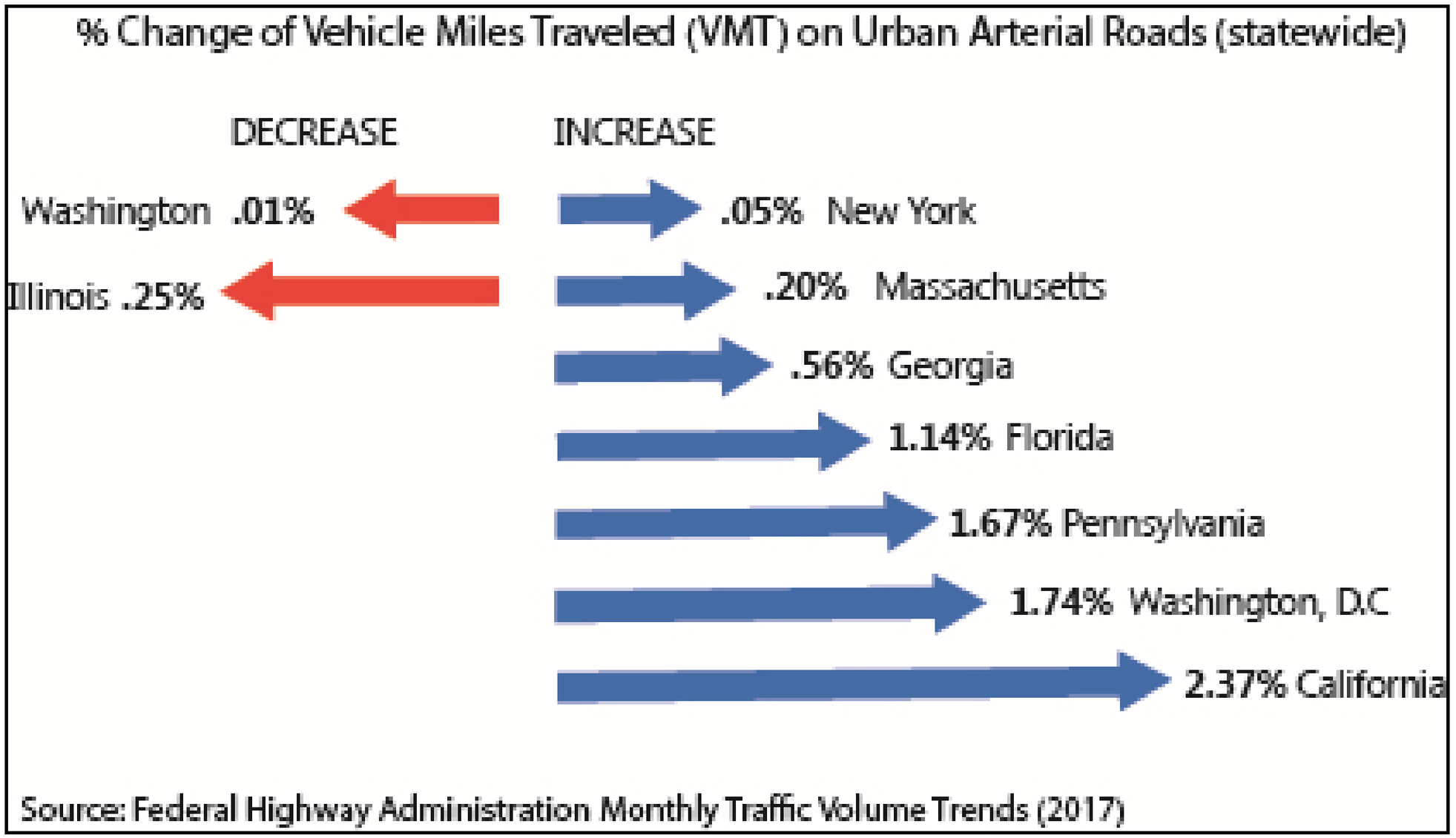
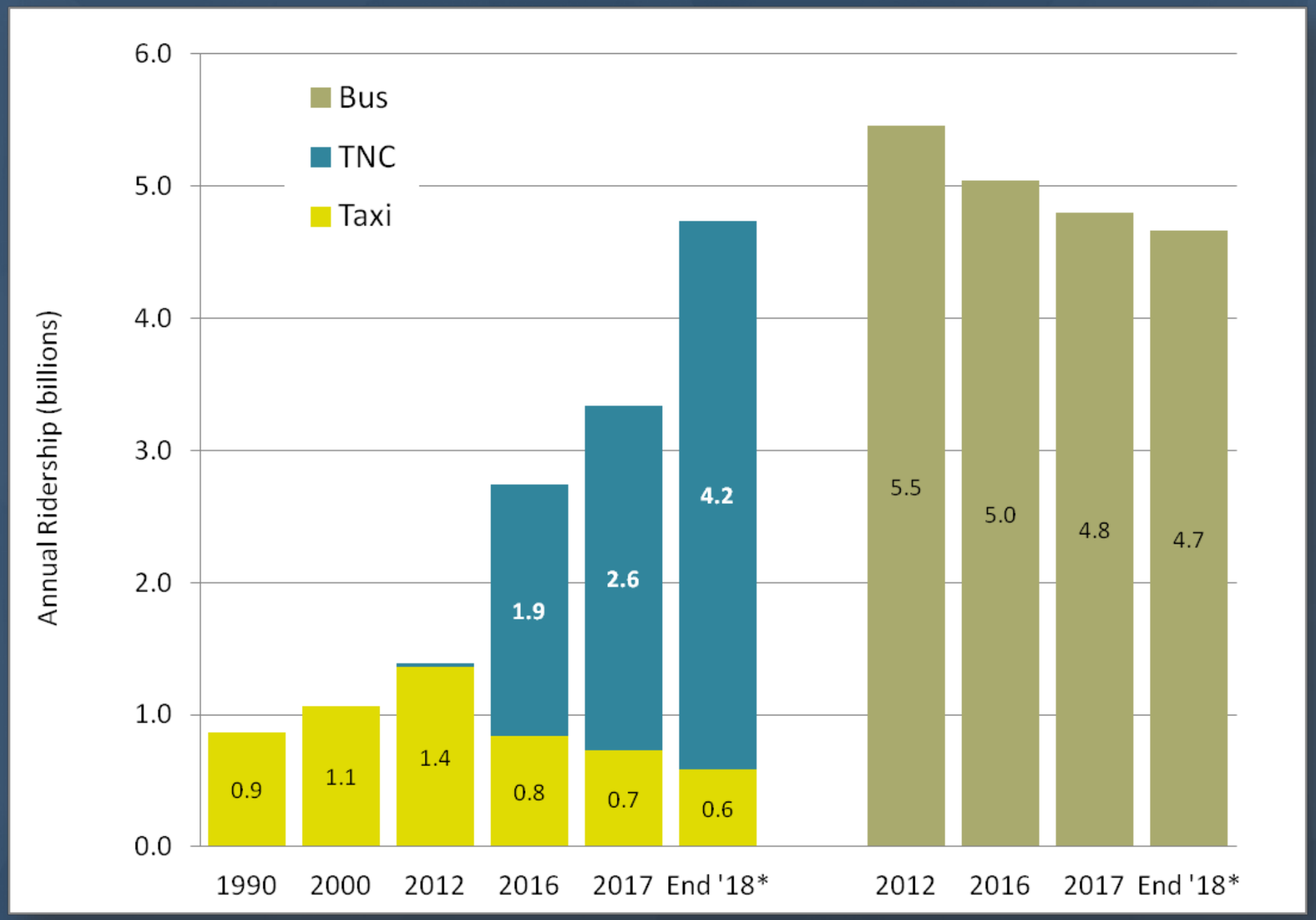
Trend Effects

Evidence



Trend Effects on Transit

Evidence



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Policy Response

Transportation Network Space Allocation

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Policy Response

Land Use