The Future of Travel Demand

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Presentation for the PEEC Sustainable Mobility Seminar at Stanford University

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Soaring Global Demand for Vehicles

Source: Sperling and Gordon (2009), based on DOE, JAMA, other
Why worry about this?

Transportation accounts for $\frac{2}{3}$ of oil in US and $\frac{1}{2}$ in world

Transportation accounts for $\frac{1}{4}$ of CO$_2$ emissions in world

Source: EIA, 2006
Why worry about this?

Pollution

Congestion

Safety

Resiliency

Equity

Sprawl
What to do about it?
Reduce the impact of driving

Vehicle and fuel technology

Infrastructure design
What to do about it?
Reduce the amount of driving
SB375 Sustainable Communities Planning Act of 2008

Targets for per capita GHG emissions reduction from cars and trucks for metropolitan areas, by reducing vehicle-miles-traveled (VMT)

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<th>2020</th>
<th>2035</th>
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Annual VMT per Capita in U.S.
(VMT = vehicle miles traveled)

Have we reached peak driving?

Source: Bureau of Transportation Statistics, U.S. Census
It’s the economy, right?

VMT vs. GDP

- VMT per capita
- GDP per capita (2009$)
Or other trends?

- Income
- Fuel prices
- Traffic congestion
- Aging population
- Regional migration
- Back-to-the city
- Smartphones
- Others
Another way to look at it...

How do we as individuals and households make choices about travel?

How and why are these choices changing?
Nested choices

Long-term Choices
- Lifestyle
- Residential Location

Mid-term Choices
- Driver’s license
- Auto ownership

Short-term Choices
- Trip frequency
- Trip destination
- Mode choice
Choice process

- Set of choices available:
  - Drive alone
  - Shared ride
  - Bus
  - Rail
  - Bicycle
  - Walk
  - Skateboard

- Qualities of choices available:
  - Cost
  - Time
  - Comfort
  - Safety

- Value placed on different qualities:
  - Cost vs. Time
  - Time vs. Comfort
  - Comfort vs. Safety

Knowledge, perceptions

Needs, Constraints
Changes in all cells

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Expanding Traveler Choice
Bike sharing
50 operations in the U.S. since 2010

Transit complement or substitute?
Equity of access?
Micro-transit on demand
e.g Bridj, Chariot, Leap

Competing with public transit?
Getting people out of their cars?

http://www.bizjournals.com/sanfrancisco/blog/2015/03/leap-transit-commuter-bus-san-francisco-loup.html
Macro-transit on schedule
e.g. Google buses, Megabus

Competing with public transit?
Impacts on neighborhoods?
Car-Sharing

e.g. Zip-Car, Car 2 Go, etc.

Owners getting rid of cars?
Non-owners driving when they otherwise wouldn’t?
Ride-Sharing
e.g. Uber, Lyft, etc.

Reducing car ownership?
Competing with transit?
Single or shared rides?
Ride-Sharing – Shared Rides
e.g. Über Pool, Lyft Line, etc.

User willingness?
Feasibility in rural areas?
Individually owned cars?
Shared cars individually used?
Shared cars with shared rides?
Changes in all cells

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The table shows changes in all cells, with an emphasis on the long-term choices.
Are the “Millennials” different?

Example 1: Allison

Example 2: Hannah
Driver’s License Trends
Difference in licensing between 1995 and 2011 by age

Source: Steve Polzin, presentation for “Shifts in Travel Behavior: Where are We Going and How Do we Know? Tenth Annual Travel Data User Forum” Transportation Research Board, 2015.
Driver’s License by Generation
Got license within 1 year of eligible age

Source: Thigpen and Handy, Driver’s Licensing Delay: A Retrospective Study to Explain Intergenerational Differences, presented at the Annual Meeting of the Transportation Research Board, 2015.
Driving License: Role of Attitudes
“Driving was the coolest way to get to school”

Source: Thigpen and Handy, Driver’s Licensing Delay: A Retrospective Study to Explain Intergenerational Differences, presented at the Annual Meeting of the Transportation Research Board, 2015.
Driver’s License: Role of Parents
“My parents were happy to drive me places”

Source: Thigpen and Handy, Driver’s Licensing Delay: A Retrospective Study to Explain Intergenerational Differences, presented at the Annual Meeting of the Transportation Research Board, 2015.
Driver’s License Delay
Effect of age after controlling for other factors

Source: Thigpen and Handy, Driver’s Licensing Delay: A Retrospective Study to Explain Intergenerational Differences, submitted to the Transportation Research Board, 2015.
Driver’s License for HS students
Odds of getting license on time

Source: Brown and Handy, Factors Associated with High School Students’ Delayed Acquisition of Driver’s License: Insights from Three Northern California Schools, Transportation Research Record, forthcoming.
California Millennials Study
Led by Giovanni Circella
October 2015 Survey

- Individual Attitudes and Preferences
- Online Social Media and Adoption of Technology
- Residential Location and Living Arrangements
- Employment and Work/Study Activities
- Transportation Mode Perceptions
- Current Travel Behavior
- Shared Mobility Services
- Driver’s License and Vehicle Ownership
- Previous Travel Behavior and Residential Location
- Aspirations for/Opinions about Future Mobility
- Sociodemographic Traits
California Millennials Dataset

- Total sample of 2400: 1400 Gen Y (18-34) and 1000 Gen X (35-50).
- Quota sampling by region and neighborhood type.
- Weighted to correct for age, region and neighborhood type.
- Neighborhood type classified as urban, suburban or rural.
- Integrated with data from other sources, e.g. US Census, US EPA Smart Location Data, Walkscore.com, etc.
Weekly Vehicle Miles Traveled

- Suburban:
  - Generation X: 126
  - Millennials: 101

- Urban:
  - Generation X: 114
  - Millennials: 86

N=2082, weighted sample
Mode for most recent commute

Millenials
- Drive alone: 68.8%
- Carpool: 9.2%
- Motorcycle or motor-scooter: 0.4%
- Work-/School-provided shuttle: 1.0%
- Public Transit: 9.3%
- Uber/Lyft (on-demand ride services): 0.6%
- Bike or e-bike: 2.9%
- Walk or Skateboard: 6.0%
- Other: 2.0%

Gen X
- Drive alone: 74.5%
- Carpool: 7.2%
- Work-/School-provided shuttle: 0.4%
- Motorcycle or motor-scooter: 0.4%
- Public Transit: 8.4%
- Uber/Lyft (on-demand ride services): 0.4%
- Bike or e-bike: 1.5%
- Walk or Skateboard: 4.7%
- Other: 2.8%

N=1797, unweighted sample
Smartphones and travel

Flexibility in activities

Flexibility in travel

Productive travel time
Old fashioned modes
Bicycling culture

Riding away from a bar crawl

In Sickness and in Health, Long After the Bike Is Due Back
Percent Biking Last Week vs. “I like riding a bike”

Source: Xing, Buehler, and Handy, 2008; see other UC Davis bicycling studies
E-Bikes and Parents

“I love my bike. It’s my car!”

Skateboards and e-skateboards

https://www.youtube.com/watch?v=wiQE8QrQtd8

See dissertation by Kevin Fang
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Implications for VMT?
How do choices stack-up?
What substitutes for what?

Need a ride? Get a Lyft.
Will new options generate rather than substitute?
VMT in the future?

“The aggregate trends discussed do not allow us to forecast with any certainty the car use that we can expect in the future.”
– Goodwin and Van Dender, 2013
Things we can influence

Set of choices available + Qualities of choices available + Value placed on different qualities
“With walkers and in strollers, on hopalongs and (in the case of quite a few happily panting dogs) on leashes, Portlanders packed a series of previews Sunday of Tilikum Crossing, the first bridge in the United States to carry buses, bikes, trains, streetcars and people walking but no private cars.”
Turns onto Market Street by private cars barred starting Tuesday
8/10/15

“Anyone hoping to cruise San Francisco’s motley main drag of Market Street, whether driving through or simply gawking, will likely have to do it aboard Muni, in a taxi, on a bicycle or on foot.”
L.A. will add bike and bus lanes, cut car lanes in sweeping policy shift

8/11/15

“City leaders say the plan reflects a newfound view that simply widening streets is no longer feasible or, in many cases, desirable. They contend that if even a small share of motorists change their travel behavior, choosing alternatives to the car, the city can make a big dent in the overall number of miles traveled.”

Tipping the balance

If the options are good enough...
If driving is bad enough...
Challenge: US resistance to driving impediments

Pricing

Restrictions
Not all vehicle trips are “high value”!

The goal is accessibility!
What it will ultimately take
A Paradigm Shift in Transport Planning

**The Old Way:**
Make it easier to drive

**The New Way:**
Make it easier to NOT drive

Focus on “level of service”
Planning for mobility

Focus on “livability”
Planning for accessibility
Transforming Transportation

Hard

Harder

Hardest!

Hard enough

Harder

Hardest!
Thanks!

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