Discussing the “positive utilities” of autonomous vehicles:

Will travelers really use their time productively?

Patrick A. Singleton, Ph.D. – Utah State University
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Q: If someone from the 1950s suddenly appeared today, what would be the most difficult thing to explain to them about life today?

A: I possess a device [a smartphone], in my pocket, that is capable of accessing the entirety of information known to man.

I use it to look at pictures of cats and get in arguments with strangers.
Autonomous vehicles ➔ Travel behavior

Potential implications
- ↑ Highway capacity
- ↑ Intersection capacity
- ↑ Mobility
- ↑ Vehicle miles traveled
- ↓ Traffic crashes & injuries
- ↓ Vehicle ownership
- ↓ Parking demand
- ↓ Value of travel time

AVs $\rightarrow$ ↓ Value of time (VOT) $\rightarrow$ ↑ VMT

- Subjective value of travel time savings $\rightarrow$ value of (travel) time (VOT)
- Willingness to pay for marginal reduction in travel time ($/\text{min}$ or $$/\text{hr}$)
- Travel-based multitasking = engaging in other activities while traveling
### Simulation studies: some +50% ↓ VOT

<table>
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<tr>
<th>Study</th>
<th>Area</th>
<th>AV VOT Assumptions</th>
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<tr>
<td>Gucwa, 2014</td>
<td>San Francisco Bay Area, CA</td>
<td>100% of high-quality rail VOT; 50% of car driver VOT; zero</td>
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<td>Speiser et al., 2014</td>
<td>Singapore</td>
<td>30% of car driver VOT</td>
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<tr>
<td>Childress et al., 2015</td>
<td>Seattle, WA</td>
<td>65% of car driver VOT (for high-income travelers only)</td>
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<td>Davidson &amp; Spinoulas, 2015</td>
<td>Brisbane, Australia</td>
<td>95–75% of car driver VOT (for lower level AVs); 90–50% of car driver VOT (for higher level AVs)</td>
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<td>Kim et al., 2015</td>
<td>Atlanta, GA</td>
<td>50% of car driver VOT</td>
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<td>van den Berg &amp; Verhoef, 2015</td>
<td>United States, the Netherlands</td>
<td>100–61% of car driver VOT</td>
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<td>La Mondia et al., 2016</td>
<td>Michigan</td>
<td>75% of car driver VOT</td>
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<tr>
<td>Wadud et al., 2016</td>
<td>(none)</td>
<td>95% of car driver VOT (for lower level AVs); 50–20% of car driver VOT (for higher level AVs)</td>
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<td>Auld et al., 2017</td>
<td>Chicago, IL</td>
<td>100%, 75%, 50%, 25% of car driver VOT</td>
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<tr>
<td>Kockelman et al., 2017</td>
<td>Austin, TX</td>
<td>100% of transit VOT; 50% of car driver VOT; zero</td>
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What do travel behavior/modeling experts think?

★ Travel behavior/modeling “experts” are more skeptical than industry leaders.

Delphi poll of 45 travel modeling experts (Willumsen & Kohli, 2016)
- Average 10% ↓ VOT (but wide range of estimates)

Survey of 20 Netherlands transport experts (Milakis, Snelder, et al., 2017)
- Most aggressive AV scenario: 18% ↓ VOT (2030), 31% ↓ VOT (2050)
- More realistic AV scenarios: 3% ↓ VOT (2030), ~20% ↓ VOT (2050)

Poll of 109 travel survey researchers/practitioners (ISCTSC, 2017)
- Will commuters tolerate ↑ TT in AVs? 45% certain, 39% perhaps, 16% no

Sources:
How useful is travel-based multitasking?

★ Most multitasking isn’t productive/useful, except for long-distance train travel.

Review of travel-based multitasking (Keseru & Macharis, 2017)
- Train travelers more likely to read, write, rest, sleep, or do any other activities

Survey of ~700 commuters in Portland, OR (Singleton, 2017, 2018)
- Transit/auto passengers: most common activities not traditionally productive: thinking/daydreaming, viewing scenery or watching people, listening to music
- Most activity participation was not (or negatively) associated with mode choice
- Common travel-based multitasking may be less about productivity and more about passing the time or coping with burden/boredom of commuting.

Sources:
Singleton (2017) http://doi.org/10.15760/etd.3447
Singleton (2018) In press at Transportation Research Record.
What does the general public think?

General public may not perceive “productive time use” as a major AV benefit.

Survey of 1,000 Germans (Cyganski, Fraedrich, & Lenz, 2015)

- Biggest perceived advantages of AVs:
  - “Enjoy[ing] the trip and the landscape”
  - “Talk[ing] to companions or other passengers”
  - ~13% of respondents thought they would use an AV to “work during the trip”

Willingness-to-pay for AV features (Bansal et al., 2016; Daziano et al., 2017)

- ~$3,000 for partially-automated;
- ~$5,000–7,000 for fully-automated

Non-trivial share of respondents unwilling to pay anything for AV technologies

Sources:
Daziano, Sarrias, & Leard (2017) https://doi.org/10.1016/j.trc.2017.03.003
Will AVs feel more like trains or cars?

★ AV experience may be closer to a car passenger, with limited multitaskability.

★ Human comfort, performance, and multitasking
  ★ Limited ranges of acceleration/deceleration, lateral motion, and jerk

★ Microsimulation study of AV operations (Le Vine, Zolfaghari, & Polak, 2015)
  ★ Restricting AV accelerations/decelerations to light-rail transit levels
    → decreased intersection capacity, increased intersection delay

★ Carsickness (Diels & Bos, 2016; Nelson, 2017)
  ★ >2/3 of the population exhibits motion sickness while riding in a car

Sources:
What about private vs. shared AVs?

★ Time value efficiencies of AVs may be diminished for shared vehicles/trips.

★ Survey of 556 residents of Austin, TX (Zmud, Sener, & Wagner, 2016)
  ★ Most people would rather own an AV than use a shared AV or take a ride-share AV

★ Survey of 435 Australians (Krueger, Rashidi, & Rose, 2016)
  ★ VOT impacts: ↓ 45% for ride-alone shared AVs; ↓ 10% for shared-ride AVs

★ Stated preference experiment in Netherlands (Yap, Correia, & van Arem, 2016)
  ★ Egress trips from train: VOT for AV car-share > VOT for manual car-share

Sources:
Krueger, Rashidi, & Rose (2016) https://doi.org/10.1016/j.trc.2016.06.015
Summary

Emerging evidence contrary to popular narrative
- AVs → more productive uses of travel time (for working, reading, being entertained, sleeping, etc.) → reductions in VOT

Importance: VOT → travel demand → VMT → …

Echo others with similar arguments:
- Cyganski, Fraedrich, & Lenz, 2015
- Milakis, van Arem, & van Wee, 2017
- Sivak & Schoettle, 2016

References:
Questions?
Comments?

Patrick A. Singleton
Assistant Professor
Civil & Environmental Engineering
Utah State University
patrick.singleton@usu.edu
435-797-7109