Do Millennials Value Travel Time Differently?

A Segmented Mode Choice Model Accounting for Travel-Based Multitasking

Aliaksandr Malokin,

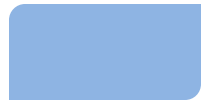Patricia L. Mokhtarian (patmokh@gatech.edu),
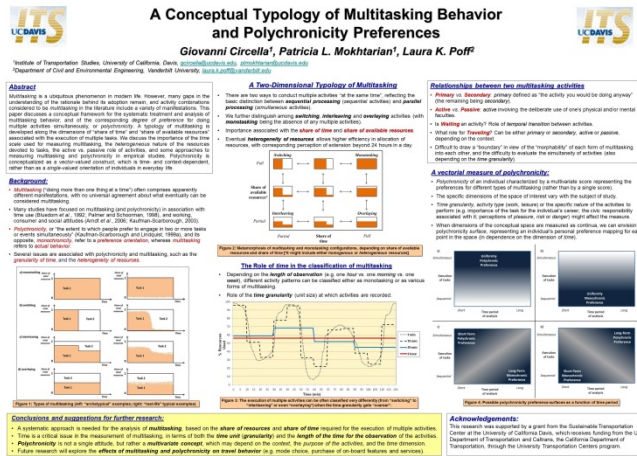Giovanni Circella

motivation

study design

model results

segmentation outcomes

takeaways

study context

A stream of our studies addressing the phenom-enon of **multitasking** (MTing) in **travel behavior**:

why does travel-based MTing matter?

A way to endure even **longer commutes**:

   sustainability effects: sprawl, resource consumption

   improved quality of life: increased job, housing choices

Competitive advantage to **public transportation**:

   preferring a longer transit commute to a shorter driving one, if they can use the time *productively*

Autonomous vehicles – a game changer:

   "I rode 500 miles in a self-driving car and saw the future. It's delightfully dull"

[*Wired*, 01/07/15]

this study

Dependent variable:

  commute mode choice (MNL model)

Key explanatory variable:

  propensity for travel-based multitasking behavior
  (i.e. to use laptop while commuting)

Heterogeneity:

  age-based segmentation (millennials, non)

Main interests:

  value of travel time savings
  willingness to pay for mode "multitaskability"

data collection

Mode-specific:
- *SacRT*
- *Capital Corridor (Amtrak)*
- *BART*
- *Yolobus*
- *UCD & Bay Area carpoolers*

Organization-specific:
- *Google*
- *Commuter Club*
- *UC Davis staff, students*

Email blast:
- *Infogroup*

Mail blast:
- *Random addresses along the Amtrak corridor*

Online panel:
- *Survey Analytics*

UC DAVIS

Travel Multi-Tasking Project
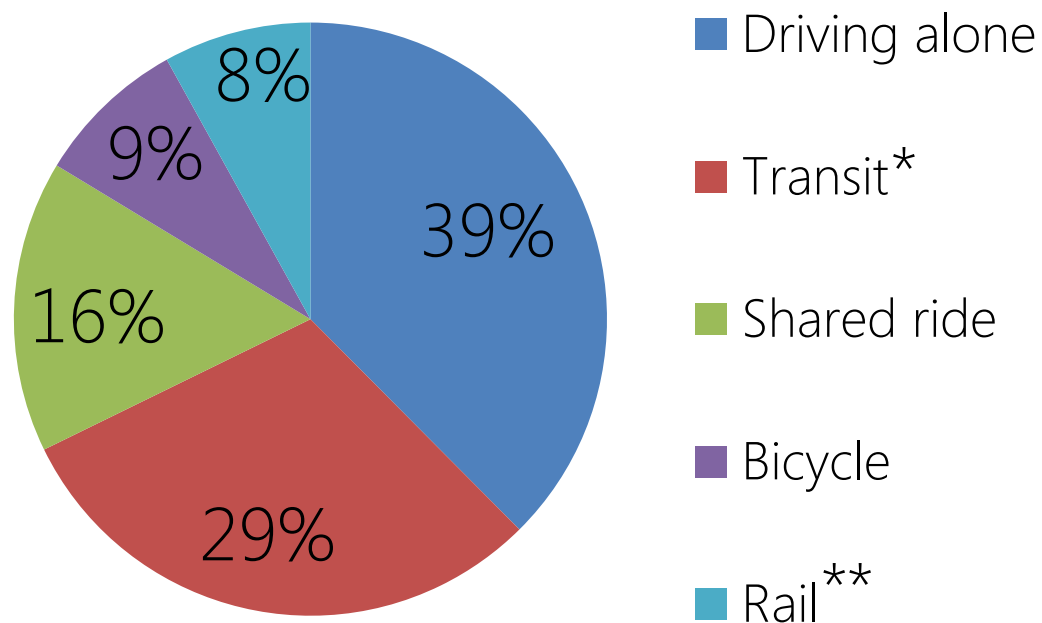
3 weeks of paper survey distribution (~3,000)

3 months of online surveys (~30 varieties)

sample description (N = 2216)

Paper surveys = 21%

Females = 61%

Average car ownership = 2.06

Average HH size = 2.68

Median income = $75,000-$100,000

Millennials (yob: 1980 or later) = 22%

Primary commute mode

Legend:
- Driving alone — 39%
- Transit* — 29%
- Shared ride — 16%
- Bicycle — 9%
- Rail** — 8%

*   Bus, light rail, and metro rail (BART)
** Commuter rail (Amtrak & Caltrain)

survey contents   (800 original variables)

A. Attitudes and personality

B. **Multitasking attitudes** *("polychronicity")*

C. Time use expectations and preferences

D. Attitudes toward waiting

E. **Perceptions of four commute modes** (plus externally-obtained objective characteristics)

F. A recent commute trip *(primary commute mode, and* **activities conducted during the commute***)*

G. "Internet access on-the-go"

H. Daily commute

I. Socioeconomic traits

Georgia Tech

mode-specific propensity to use laptop
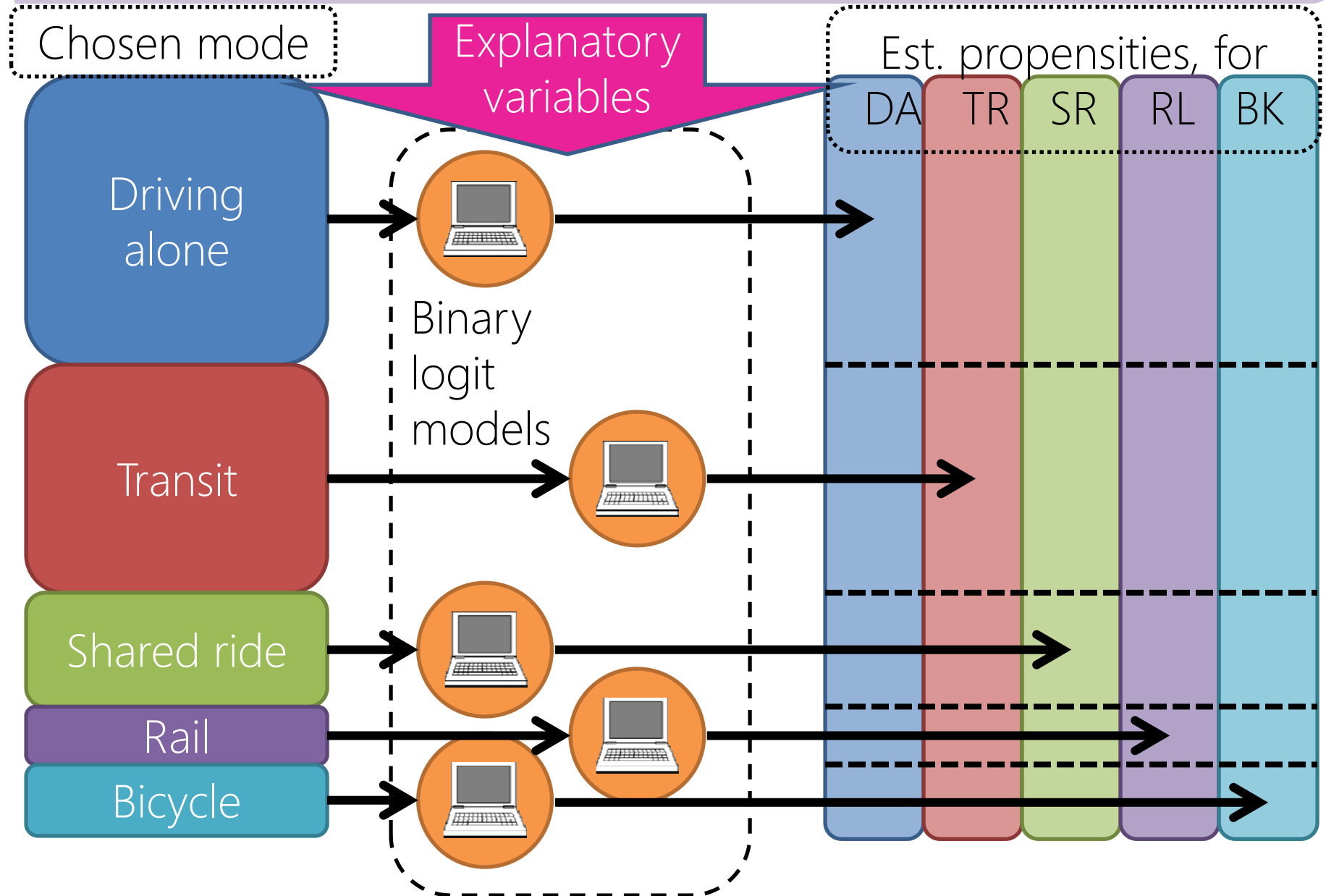
travel MT engagement

Laptop/tablet/netbook usage
by *primary commute mode* (N=2123)

Mode	N	Used laptop	% users
Bicycle	174	1	0.6
Rail	171	83	48.5
Transit	641	62	9.7
Shared ride	338	63	18.6
Driving alone	799	29	3.6

Binary logit models (by mode) of choice to use "laptop"

Socio-economic variables; general, time-use, multitasking, and waiting attitudes

travel MT propensity

Descriptive statistics of the variable
Propensity to Use Laptop/Tablet/Netbook

Mode	N*	Mean	SD
Bicycle	394	0.000	0.000
Rail	791	0.259	0.240
Transit	1992	0.101	0.099
Shared ride	2012	0.176	0.244
Driving alone	2073	0.047	0.105

* No. of respondents reporting perceptions for that mode, and, therefore, assumed to have it in their choice set.

base mode choice MNL model

N = 2216

$\mathcal{L}(\hat{\beta}) = -1156.654$

$\mathcal{L}(c) = -1587.107$

$\mathcal{L}(0) = -2641.483$

. . = 21

$-2[\mathcal{L}(0) - \mathcal{L}(\hat{\beta})]$

= 0.56

= 0.55

Significant variables:

Socio-economic characteristics

Objective mode attributes

General attitudes

Mode perceptions

Propensity to use laptop

Mode choice weighted MNL model, 5 alternatives, unequal choice sets

Variable	Bicycle	Rail	Transit	Shared ride	Driving alone
Headway, min			---		
Total travel time, min					
Monthly commuting cost, $			---		

Significance: --- < 1%

mode perceptions (generic variables)

Variable	Bicycle	Rail	Transit	Shared ride	Driving alone
Convenience			+ + +		
Benefit/cost			+ + +		
Comfort			+ + +		
Ability to multitask			+ + +		

Significance: + + + < 1%

socioeconomic characteristics

Variable	Bicycle	Rail	Transit	Shared ride	Driving alone
Driver's license			– –		
Female				+ + +	
Income, $	– –				

Significance: *** < 1%   ** < 5%

general attitudes

Variable	Bicycle	Rail	Transit	Shared ride	Driving alone
Pro-active modes	+++				
Necessity of travel			--		
Pro-transit		+++	+++		

Significance: *** < 1%   ** < 5%

ability to travel MT & constants

Variable	Bicycle	Rail	Transit	Shared ride	Driving alone
Propensity to be productive		+	- - -	+ + +	- - -
(Propensity to be productive)²				- - -	
Constant	- - -	- - -		- - -	base

Significance: *** < 1%   * < 10%

population heterogeneity

Does the propensity to use a laptop while commuting reduce the willingness to pay for shorter travel times?

Does this influence differ by population segment?

In particular, is it stronger for millennials?

segmentation: millennials (yob: 1980+)

	Millennials	Non-millennials	All
Sample size	496	1720	2216
	0.577	0.567	0.562
IVTT, min	-0.017*	-0.016	-0.026
OVTT, min	-0.052	-0.049	-0.046
Log of one way cost, $	-1.263	-1.170	-1.164
Propensity to use laptop	2.306	0.823**	1.150
Significance:	* < 10%	** < 5%	else <1%

value of travel time savings, $/hr

$$= \frac{\frac{\partial}{\partial}}{\frac{\partial}{\partial}} = \frac{\frac{\partial}{\partial}}{(\frac{\partial}{\partial})(\partial \quad \partial)} = (\underline{\quad} * \qquad) * 60\frac{}{h}$$
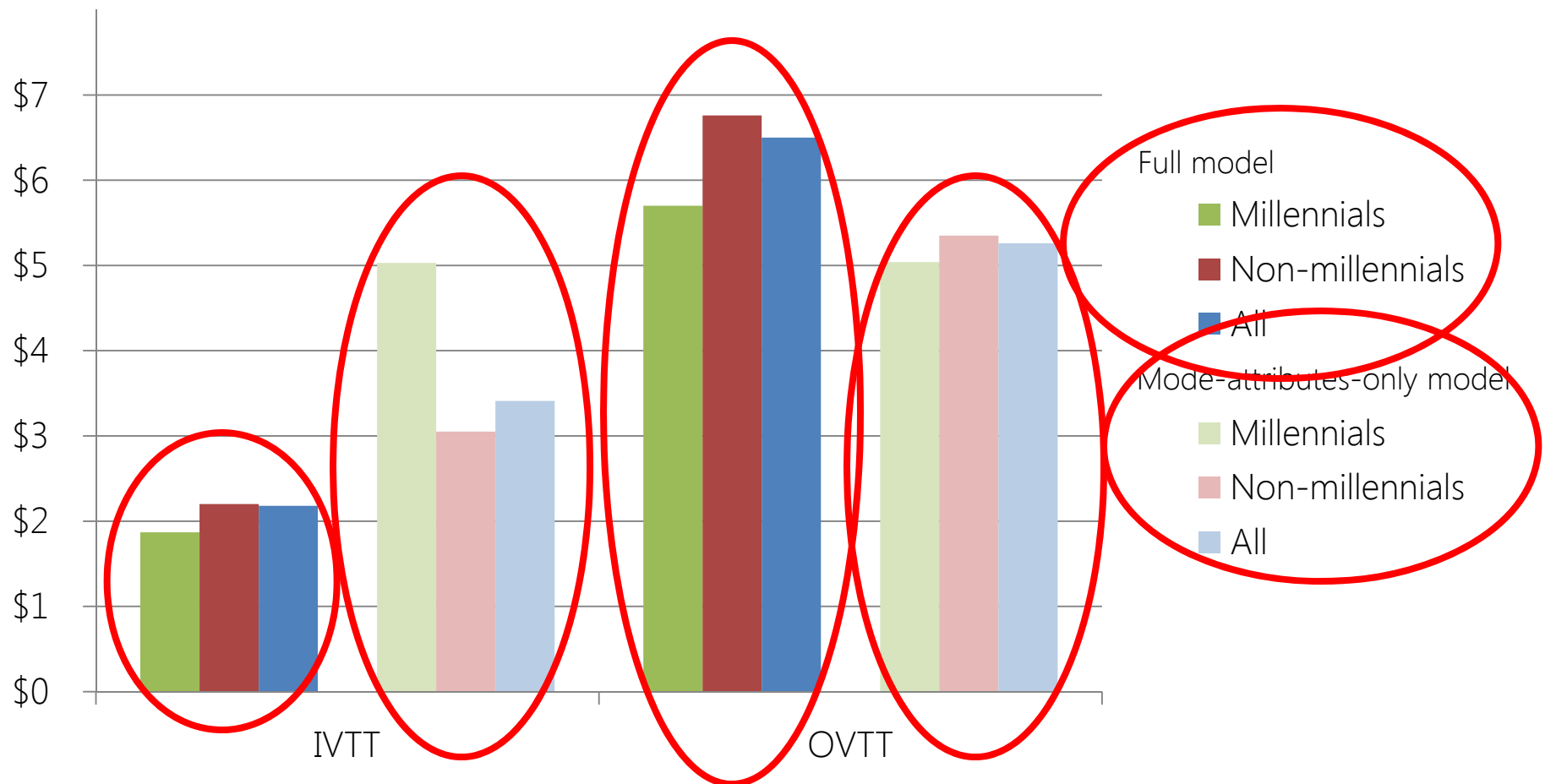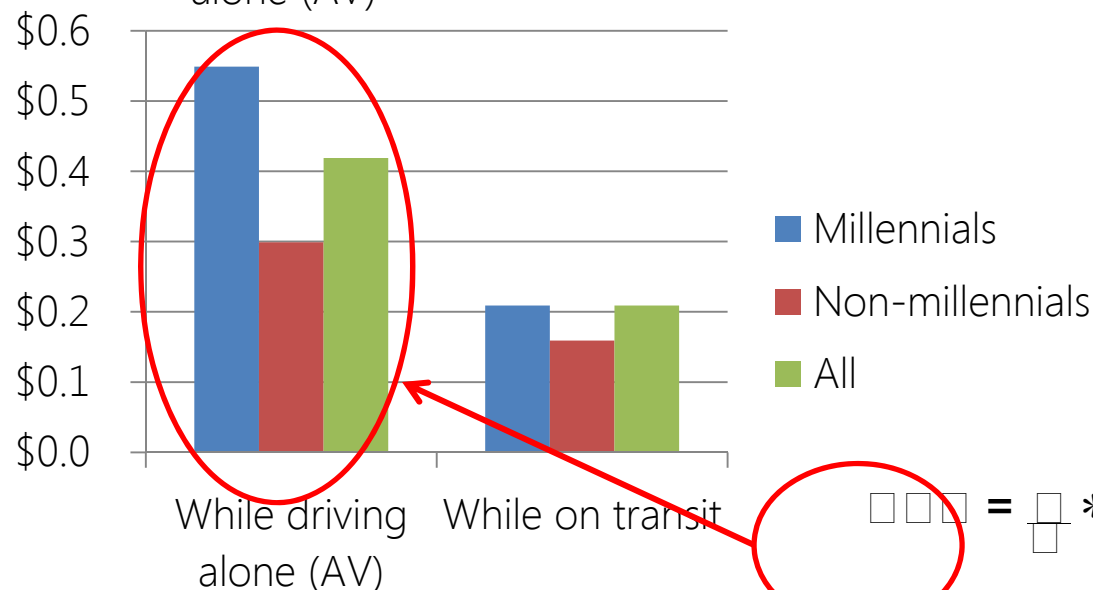
willingness to pay for desired "MTability"
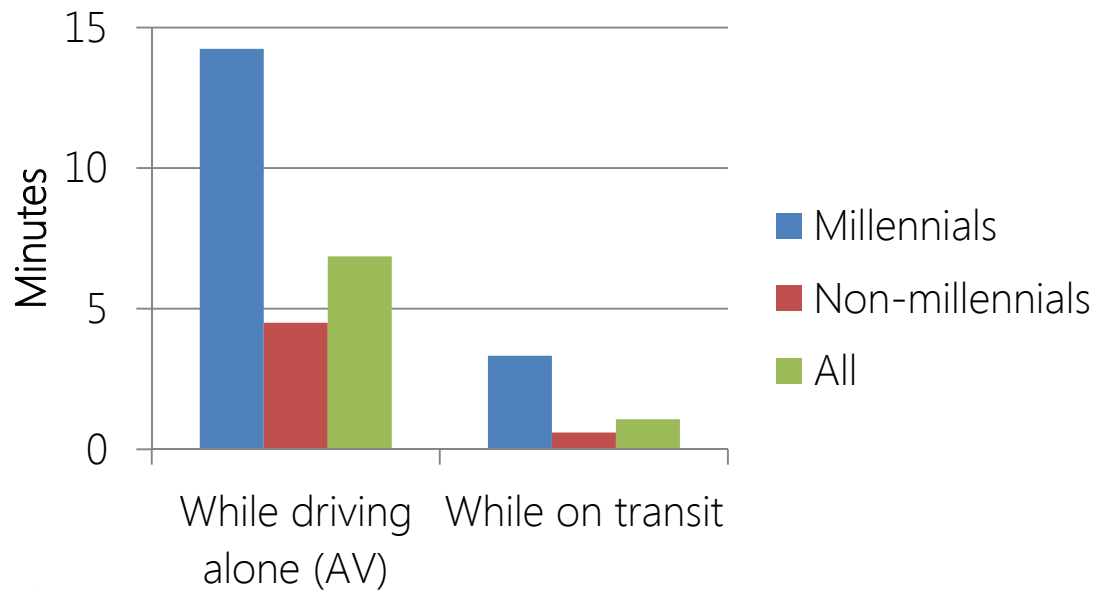
What are commuters willing to pay per trip to achieve commuter-rail levels of desired "MTability"?

Time

Cost

= __ *   * (−   )

multitasking & mode choice

Travel MT has a statistically *significant* and (in our view) *non-trivial* impact on mode choice.

- first time demonstrated with revealed preference data

Millennials are *more sensitive* to mode conduciveness towards travel MT: they value it more highly and are *willing to pay* more for it.

Millennials' value of time for OVTT is lower than non-millennials', probably due to their higher *proclivity for ICT devices* that makes OVTT less burdensome.

future research

Same data
- Identify and analyze groups of people with similar polychronicity profiles

- Further explore the role of population heterogeneity (with respect to multitasking propensity and behavior) in mode choice

- Develop structural equations models reflecting multiple directions of causality

New data
- Undertake international comparisons

Ultimately
- Use information from this dataset to inform scenario-testing at a regional scale, with demand forecasting models that are already in use

acknowledgements

selected references

Berliner, Rosaria M., Aliaksandr Malokin, Giovanni Circella, and Patricia L. Mokhtarian (2015) Travel-based multitasking: modeling the propensity to conduct activities while commuting. Presented at the 94th Transportation Research Board Meeting, Washington, DC.

Circella, Giovanni, Patricia L. Mokhtarian and Laura K. Poff (2012) A conceptual typology of multitasking behavior and polychronicity preferences. *electronic International Journal of Time Use Research* (*eIJTUR*) **9**(1), 59-107.

Ettema, Dick and Laura Verschuren (2007) The effect of multitasking on the value of travel time savings. *Transportation Research Record* **2010**, 19-25.

Lyons, Glenn and John Urry (2005) Travel time in the information age. *Transportation Research A* **39(2-3**), 257-276.

Malokin, A., G. Circella and P. L. Mokhtarian (2015). How do activities conducted while commuting influence mode choice? Testing transit-advantage and autonomous-vehicle scenarios. Presented at the 94th Transportation Research Board Meeting, Washington, D.C.

Ohmori, Nobuaki and Noboru Harata (2008) How different are activities while commuting by train? A case in Tokyo. *Tijdschrift voor Economische en Sociale Geografie* **99(5)**, 547–561.

Neufeld, Amanda J. and Patricia L. Mokhtarian (2012) A Survey of Multitasking by Northern California Commuters: Description of the Data Collection Process. Institute of Transportation Studies, University of California, Davis, Research Report UCD-ITS-RR-12-32. Available at http://www.its.ucdavis.edu/?page_id=10063&pub_id=1802, accessed January 10, 2015.

Zhang, Junyi and Harry Timmermans (2010) Scobit-based panel analysis of multitasking behavior of public transport users. *Transportation Research Record* **2157**, 46-53.