



Including the TNC Mode in Mode Choice Models Estimated Using Smartphone-Based Household Travel Survey Data

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Acknowledgements and presentation outline

Christopher Coy and Elizabeth Greene of RSG led the survey efforts.

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Outline

- Overview of the Sacramento and Bay Area surveys
- TNC mode share descriptive analysis
- Estimation results for two tour-level mode choice models
- Conclusions





Overview of the Sacramento and Bay Area Surveys

TNC use is growing rapidly, but there is limited data available to inform planning, modeling, and policy-making responses

These surveys both provide high quality data for analysis:

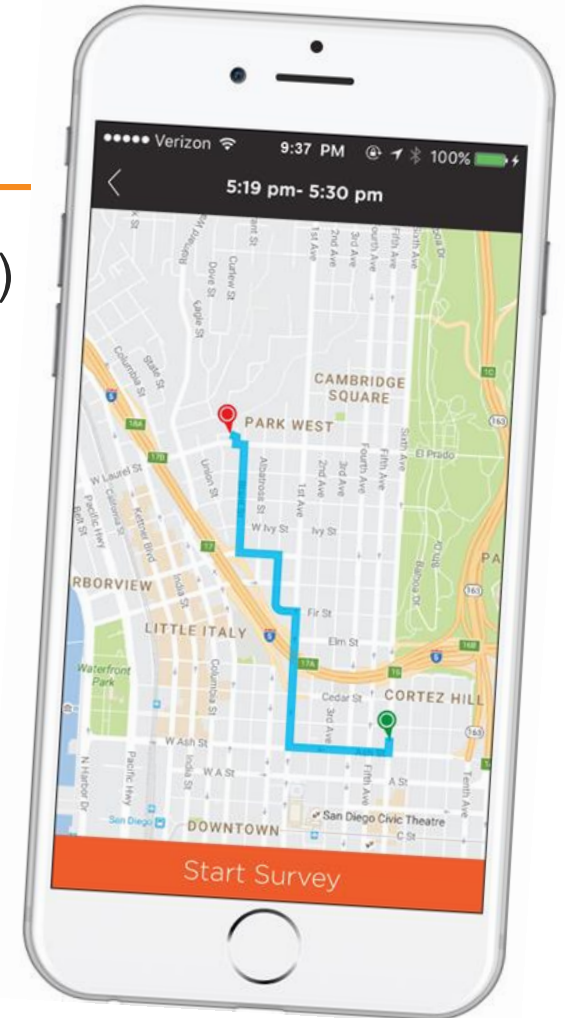
- Using **rigorous methods** (i.e., probability sampling)
- Using **innovative methods** (i.e., 7-day smartphone-based diary)
- Collecting a **sizable number of TNC trips** (geographic oversampling)
- Capturing **comprehensive travel behavior data** (person's entire travel)



The questionnaire captures comprehensive household, demographic, and travel data over the course of the week

Participants see 3 types of surveys in rMove

1. **Signup survey** upon activating the app (basic HH composition)
2. **Trip surveys** after each trip
e.g., “How did you travel to this destination?”
3. **Daily ‘end-of-day’ surveys**, covering a unique topic each day
Topics include: employment, school, typical travel, land use, personal vehicle, and more.



Summary Statistics from Surveys

STUDY AREA	SACRAMENTO (SAC0G) REGION	BAY AREA (MTC) REGION
Region size	6 counties, 2.3 M people	9 counties, 7.3 M people
Sample type	All household members	Adults w/ smartphones
Sample size	6,800 adults in 4,000 HH (75% used smartphone)	5,000 adults (100% used smartphone)
Travel days	35,000	33,000
Trip records	150,000 (96% from smartphone)	150,000 (100% from smartphone)
TNC trip records	900 (0.6% of trips, 0.4% when weighted)	5,000 (3.4% of trips, will be 1-2% weighted)





TNC Mode Share Descriptive Analysis

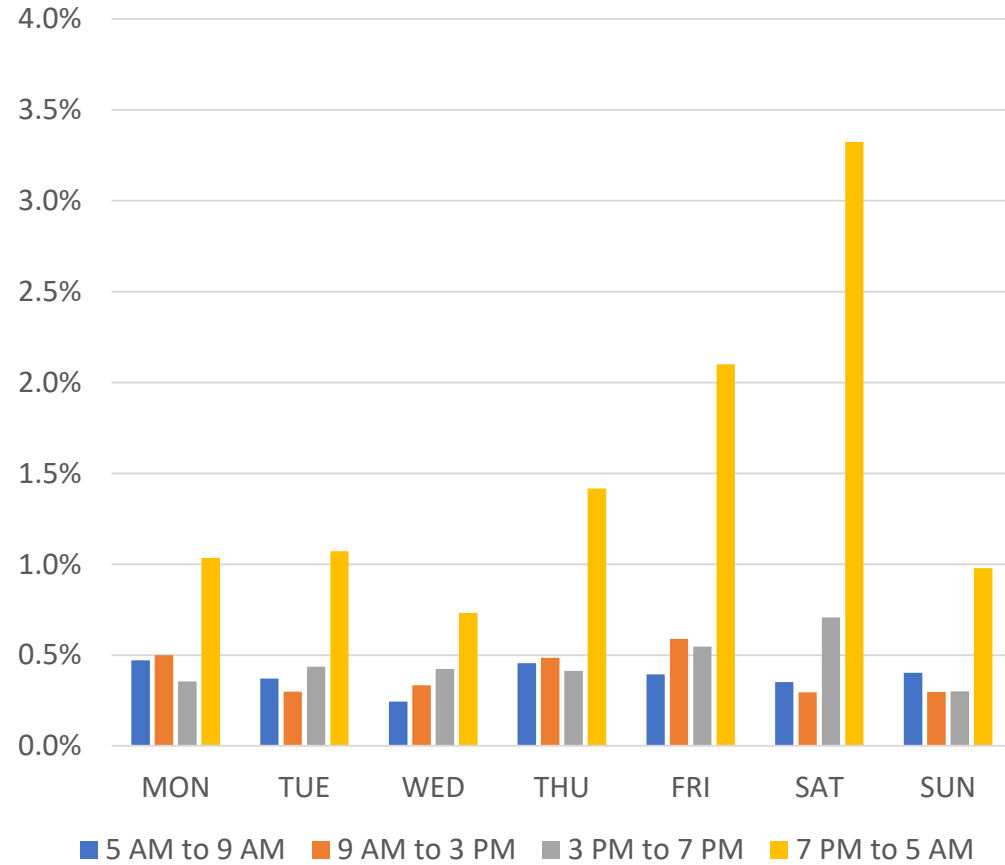
Sacramento and Bay Area TNC Mode Shares Along Various Dimensions

- This analysis only includes trips by smartphone-owning adults
- The Bay Area data is a partial sample, including about two-thirds of the final sample. (Data collection was just completed in late May.)
- Data is unweighted. (Final data sets have been/will be expanded and weighted to the full population.)

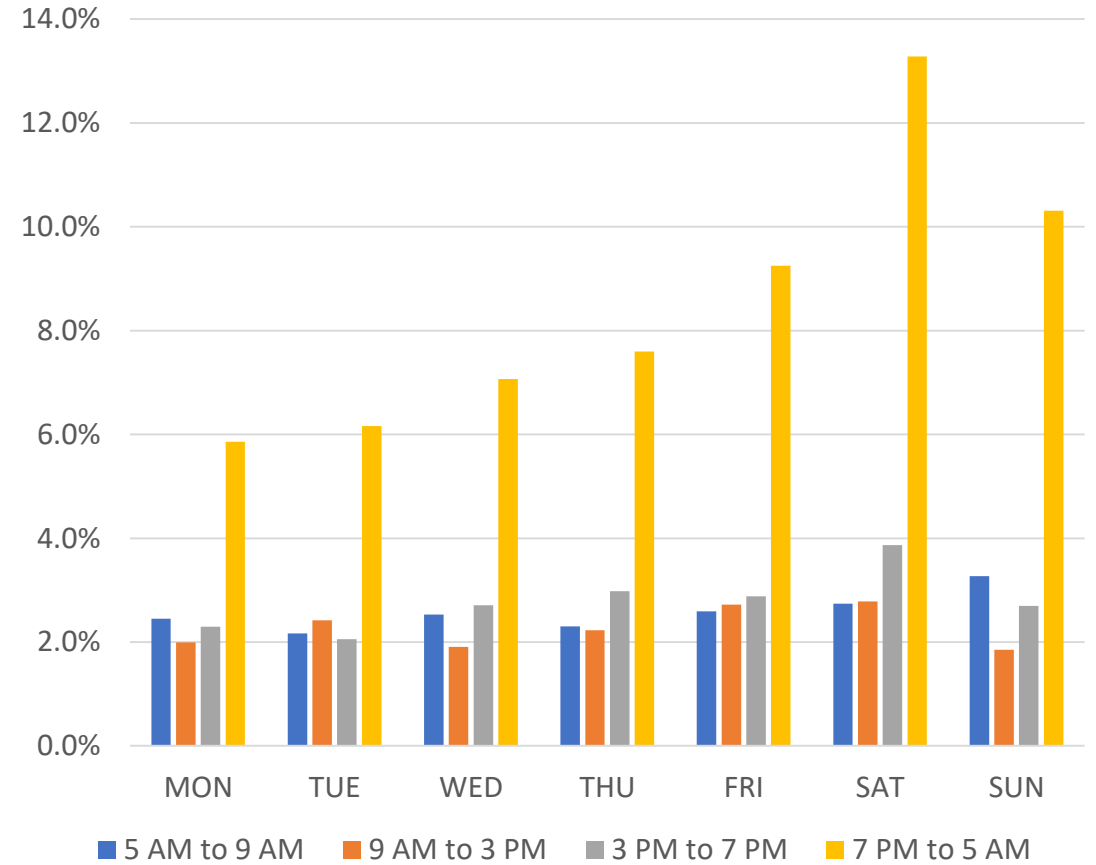


TNC mode share is highest in evenings and nights for all days of the week

SACRAMENTO

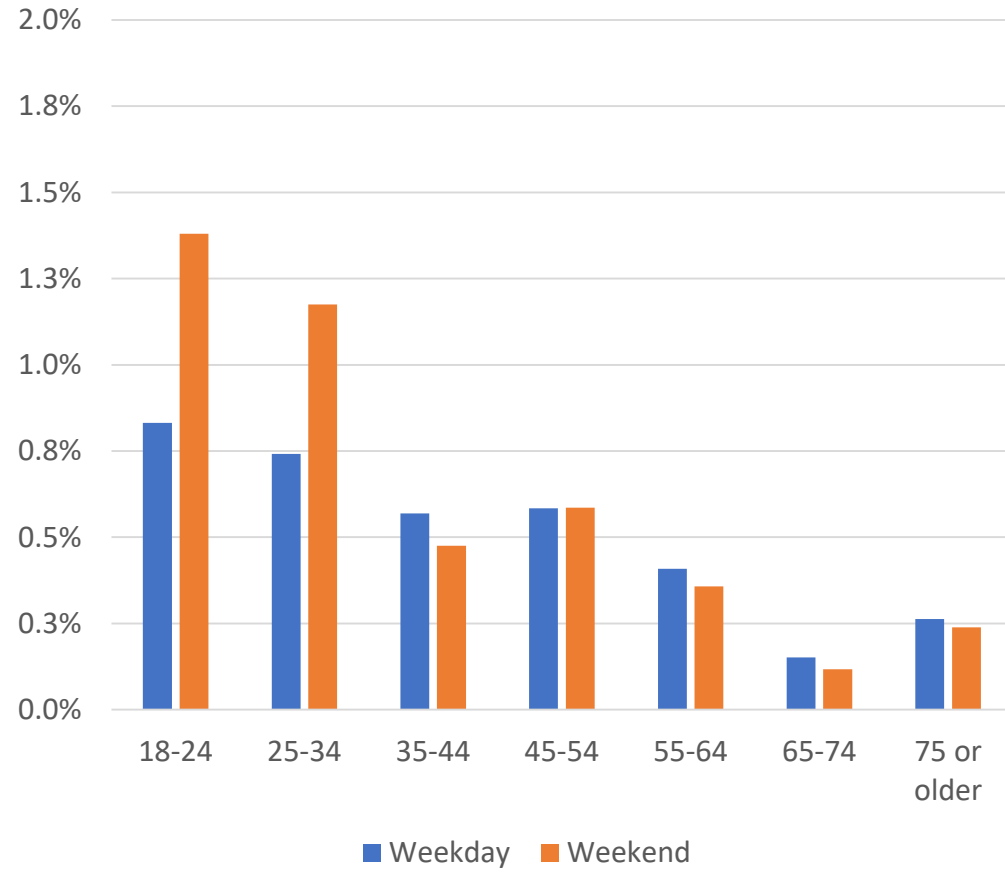


BAY AREA

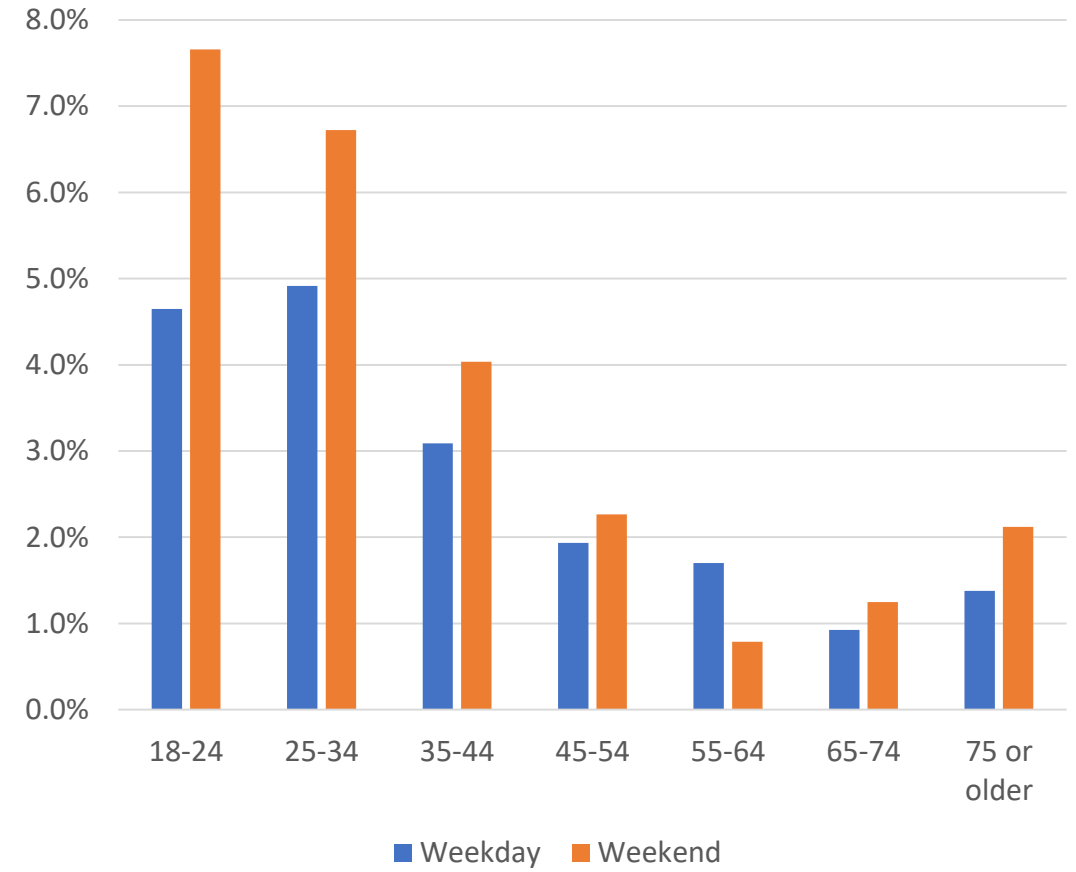


TNC mode share is highest among the younger age groups

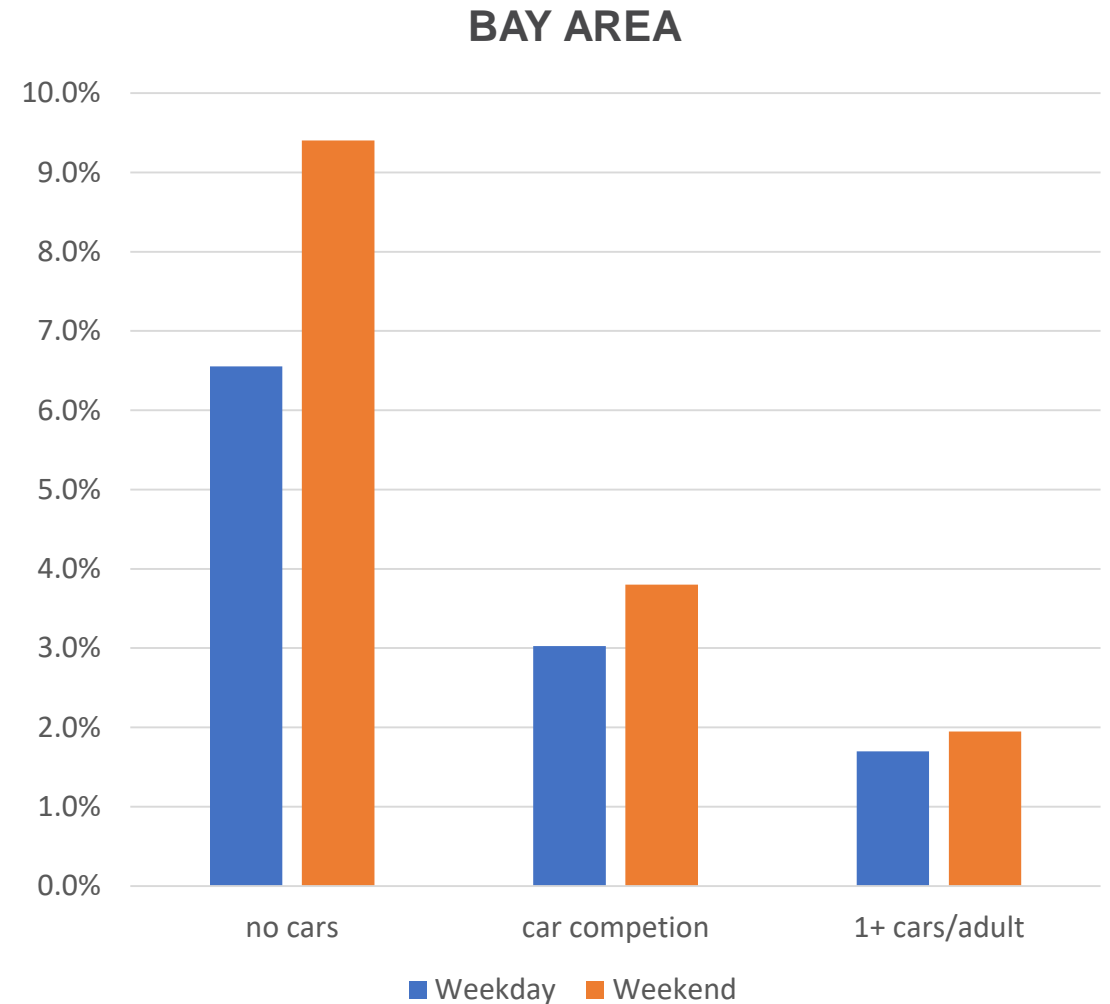
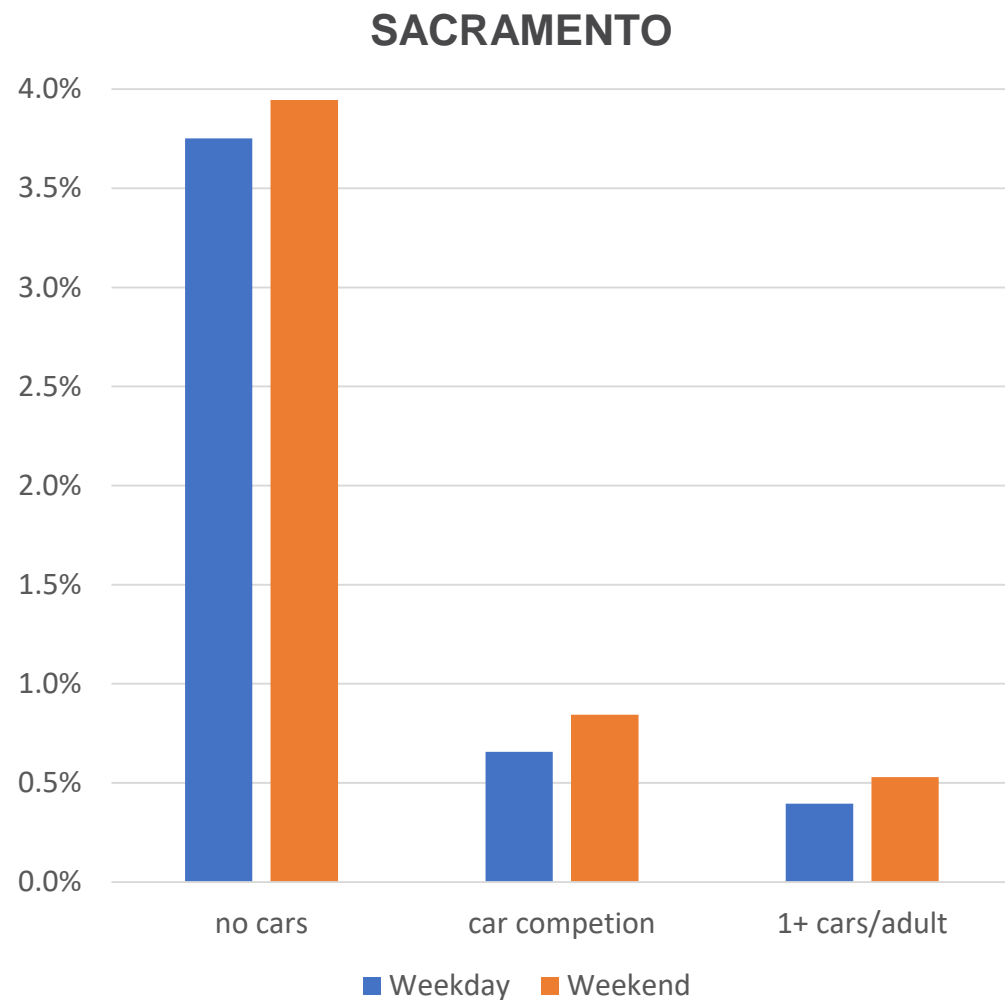
SACRAMENTO



BAY AREA

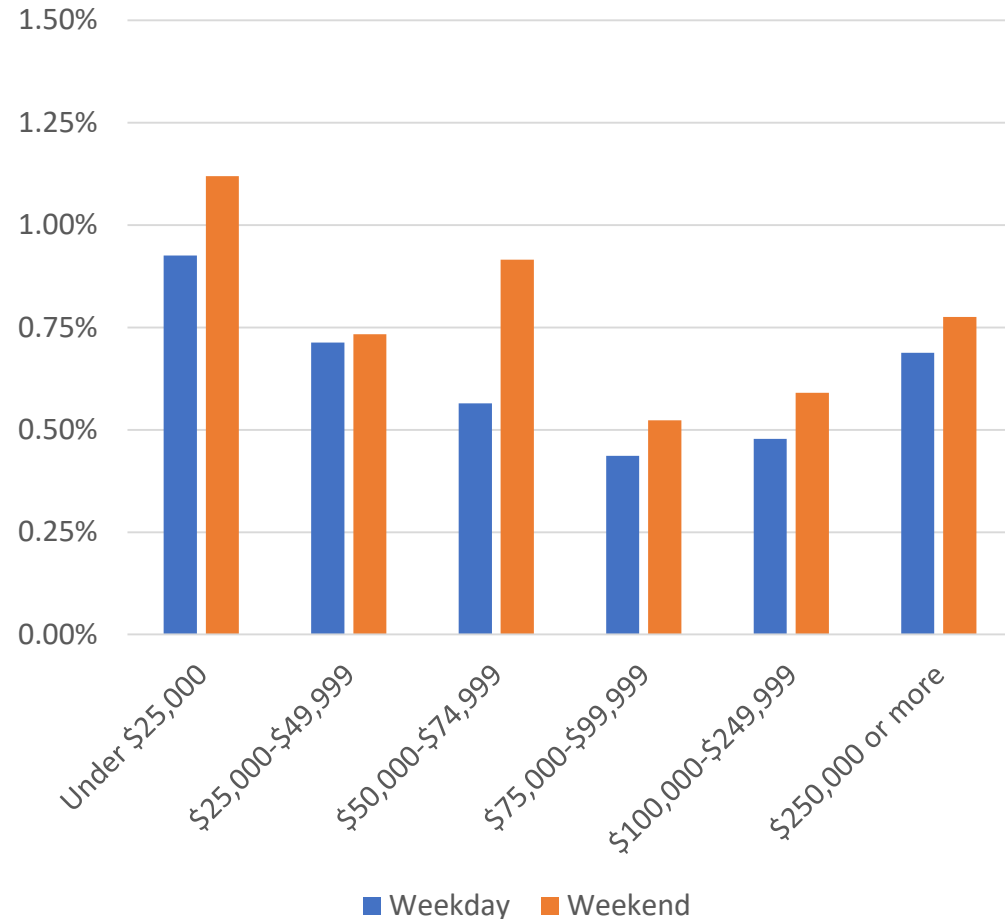


TNC mode share varies dramatically by car ownership level

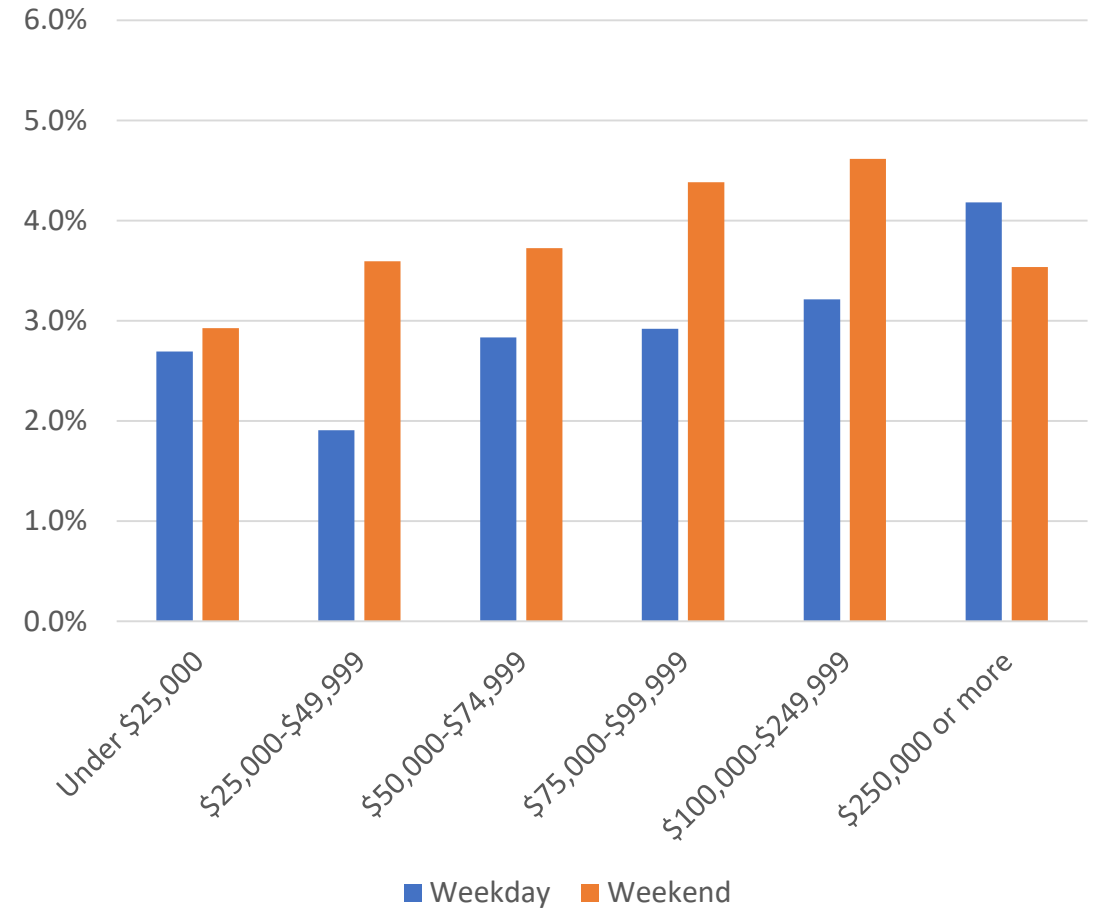


TNC mode share varies less by income than by age or car ownership, and in opposite directions in the two regions

SACRAMENTO

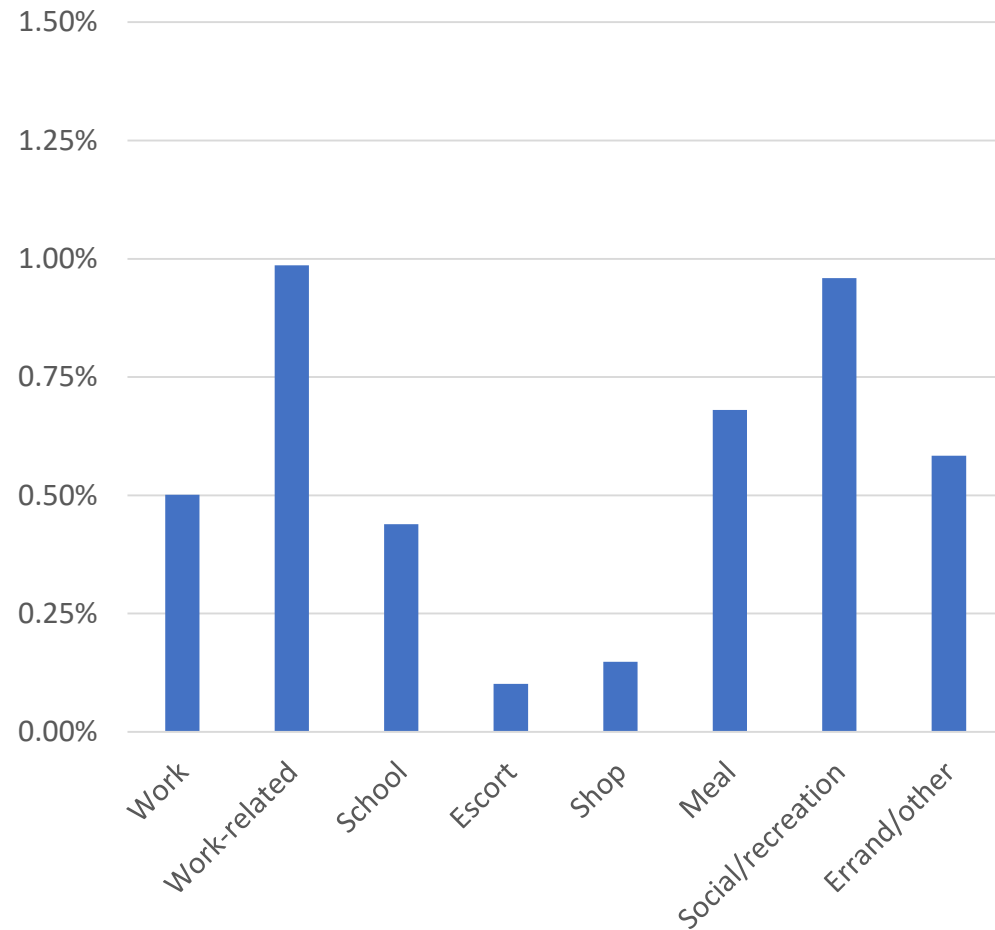


BAY AREA

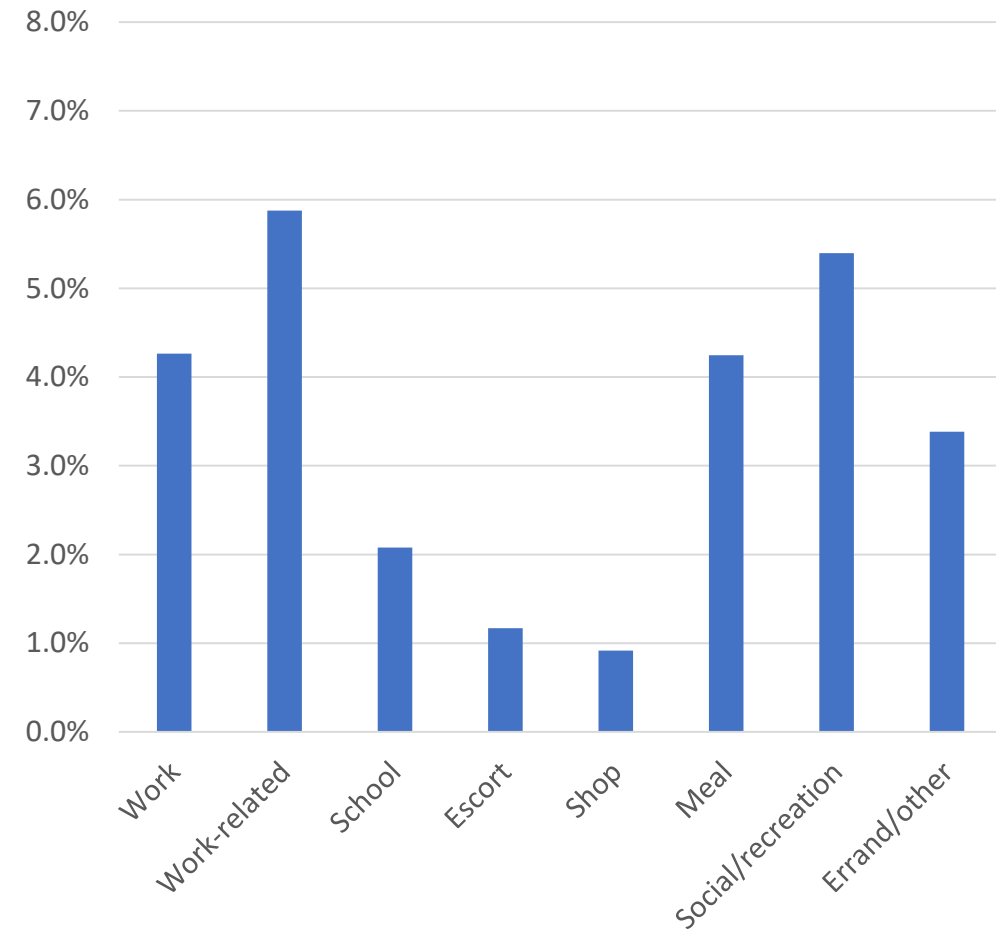


TNC mode share is highest for work-related, social/recreation and meal trips, and lowest for escorting and shopping trips

SACRAMENTO



BAY AREA





Tour Mode Choice Models Including TNC Mode

Modeling method

- Tour-level mode choice models estimated on the Sacramento data using the DaySim software and SACSIM inputs
- Data is for weekdays only (Mon-Fri)
- Separate models for home-based work tours and home-based non-work/school tours
- Data is unweighted. (Weighted data used later for model calibration.)



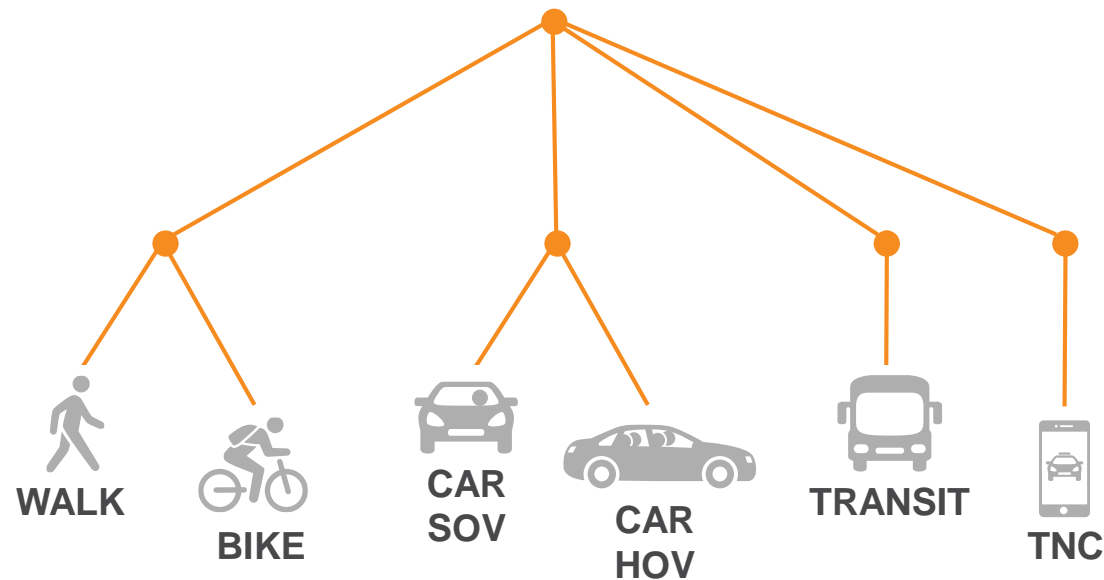
Direction and significance of TNC utility variables

VARIABLE	WORK TOURS	OTHER TOURS
No cars in HH	+++	++
Car competition in HH	+	
Income under \$25,000	++	+
Income over \$100,000		---
Tour main purpose is shopping		---
Transit stop density near home	--	
Land use density near home	+++	++
Land use density near destination	+++	+
Departure time is after 9 PM		++



Additional comments on model results

- Age variables were tested but were not significant in either model
- Mode nesting structures were tested nesting TNC with car, transit or walk/bike, but best results were obtained leaving TNC in a separate nest.





Conclusions

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- Even though the overall TNC mode shares in the two surveys are very different, the patterns in mode shares along key dimensions are very similar (except for income).
- Multi-day smartphone data collection and geographic oversampling allow collection of enough TNC trips to estimate several significant variables for TNC in mode choice models, even in a region where the actual TNC mode share is still quite low.
- The Bay Area data with about 5,000 TNC trips will provide rich data for mode choice model estimation.

