

Adoption of Exclusive and Pooled TNC Services in Singapore and the U.S.

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Three questions:

1. Who uses TNC services (both exclusive and pooled)?
2. Among TNC users, who pools (more)?
3. What modes are TNC trips replacing?

Two countries:

1. Singapore
 - Using primary data collected via computer-based revealed preference survey ($N = 801$)
2. United States
 - Review of existing revealed preference survey studies in multiple metropolitan areas

1. Who uses TNC services (both exclusive and pooled)?

- The sociodemographic characteristics of TNC users in Singapore generally match those within dense U.S. metropolitan areas:
 - Younger, highly educated, and come from households with higher incomes
- The exception is car ownership:
 - In the U.S. TNC use is higher among zero-car households
 - Not a significant factor in Singapore (where car ownership is expensive and restricted)

2. Among TNC users, who pools (more)?

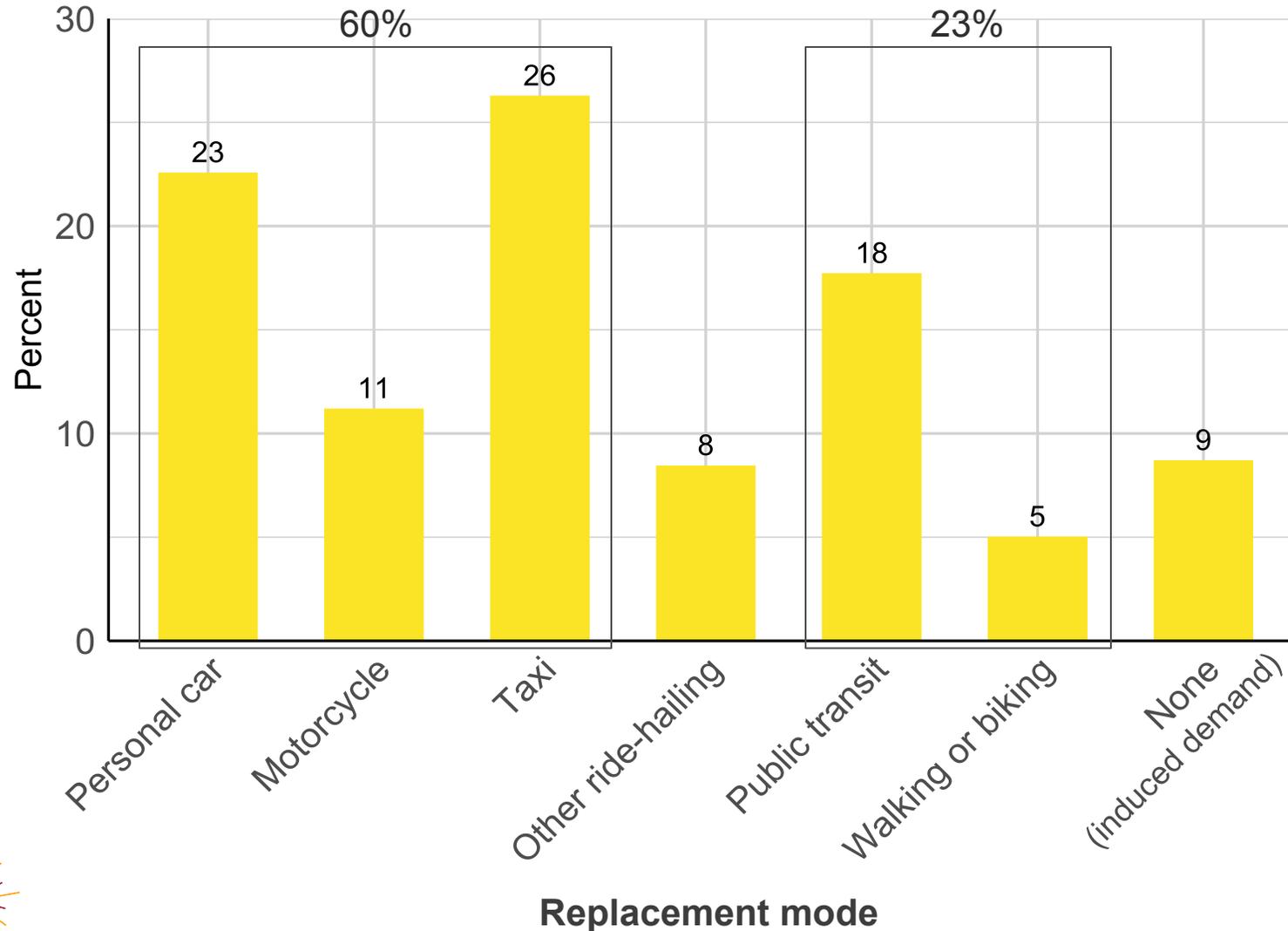
- There are fewer studies that look at the sociodemographic characteristics of users of pooled (rather than exclusive) TNC services
- Sociodemographics do not explain much of observed pooling behavior
 - In the U.S., younger individuals who are employed/non-students are more likely to have used shared services (0/1), but among users of pooled services students, respondents with graduate degrees, and those who are single report the greatest percentage of pooled trips
 - In Singapore, younger individuals who do not own a car and who have higher incomes are more likely to have used a pooled service (0/1)
 - Having a lower income predicts use of pooling at the highest rate among TNC trips

3. What modes are TNC trips replacing? United States

Location	Induced demand	Substitution of public transport and nonmotorized modes (walking and biking)	Substitution of car-based transport (personal car, taxi, or other car-based)	Source
San Francisco	8%	39%	52%	Rayle, et al. (2016)
7 U.S. metro areas	22%	39%	40%	Clewlow & Mishra (2017)
Boston metro area	5%	54%	41%	Gehrke, Felix, & Reardon (2018)
New York City*	3%	65%	55%	NYCDOT (2018)
Denver	12%	34%	54%	Henao (2017)
Dallas	6%	10%	85%	Lavieri & Bhat (2019)
U.S. national	1%	21%	79%	Bansal, et al. (2019)

* Percentages sum to over 100 because survey allowed multiple responses; for others errors are due to rounding

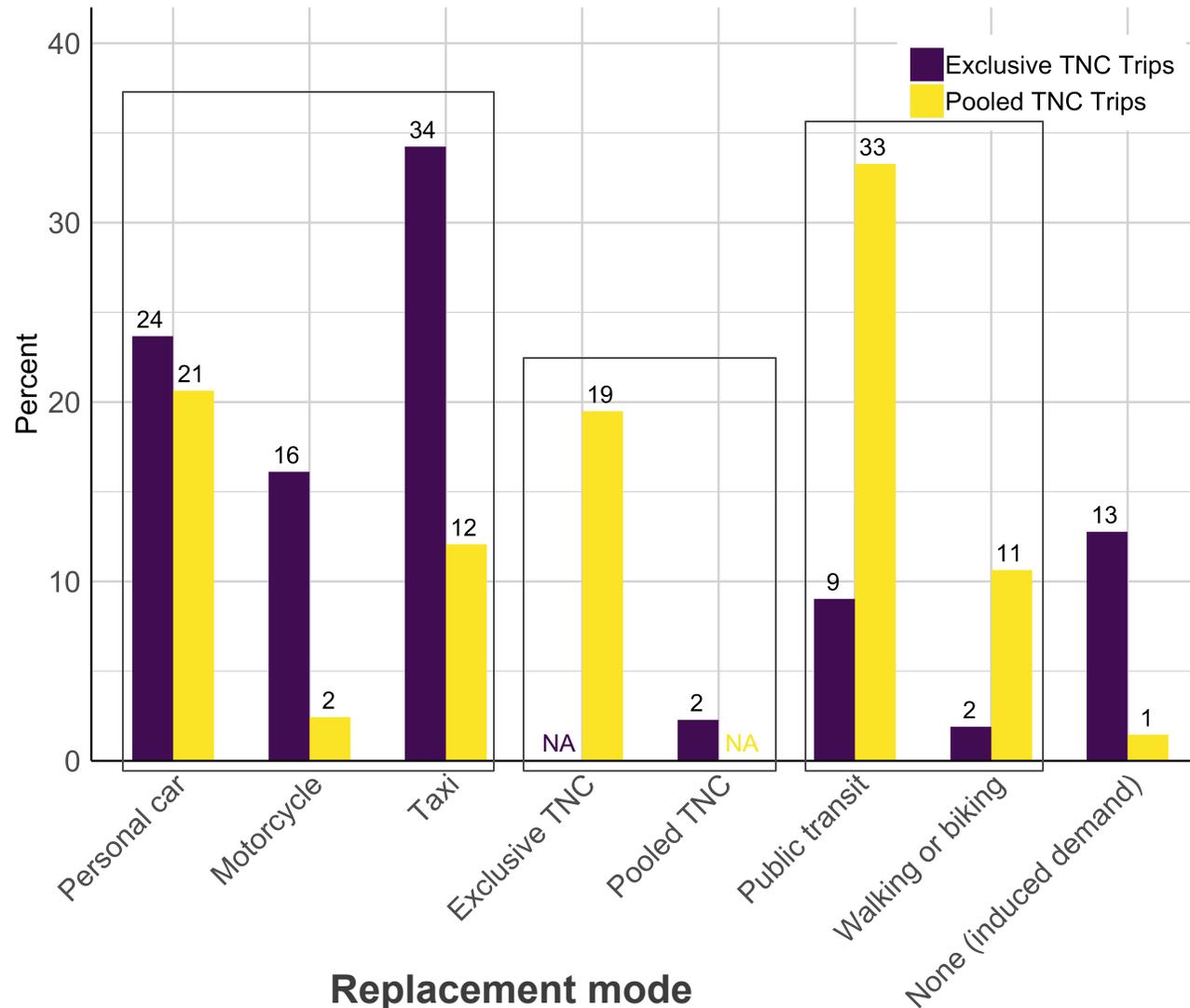
3. What modes are TNC trips replacing? Singapore (all trips)



“If the TNC service had not been available, what percentage of these TNC trips would you have made by the following modes instead?”

[weighted by frequency of each individual’s TNC use in the past month]

3. What modes are TNC trips replacing? Singapore (exclusive vs. pooled trips)



“If the TNC service had not been available, what percentage of these TNC trips would you have made by the following modes instead?”

[weighted by frequency of each individual’s reported exclusive or pooled TNC use in the past month]

3. What modes are TNC trips replacing?

- In Singapore, ridehailing is replacing more trips by private, motorized modes than in dense U.S. cities
- Considering mode substitution separately for exclusive and pooled TNC services, we find that:
 - Exclusive TNC services are much more likely to replace personal vehicle, motorcycle, and taxi trips and to induce demand
 - Pooled TNC services are much more likely to replace public transit, walking, and biking
- When it comes to mode substitution, people may view exclusive and pooled TNC services as distinct travel options that may be more closely related to other private or shared modes of travel than to each other

Conclusions and recommendations

- Research looking at use of TNCs should, by default, differentiate between exclusive and pooled services
- Policymakers encouraging pooling should balance its impacts on their own public transit system ridership with other potential efficiency benefits

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Appendix

United States: review of existing revealed preference survey studies in multiple metropolitan areas

Study	Location
Smith (2016)	U.S. (national)
Rayle, et al. (2016)	San Francisco Bay Area
Alemi, et al. (2017); Circella, et al. (2018)	California (state) - California Millennials Dataset
Dias, et al. (2017)	Seattle, WA - 2014–2015 Puget Sound Regional Travel Study
Sarriera, et al. (2017)	U.S. metropolitan areas where UberPOOL/LyftLine are available
Clelow & Mishra (2017)	7 U.S. metro areas: Boston, Chicago, Los Angeles, New York, San Francisco Bay Area, Seattle, and Washington, D.C.
Henao (2017)	Denver
Gehrke, Felix, & Reardon (2018)	Boston metropolitan region
NYCDOT (2018)	New York City (5 boroughs) – Citywide Mobility Survey
Schaller (2018); Batbold & Bin-Nun (2019)	U.S. (national) – NHTS 2017 data
Moody, Middleton, & Zhao (2019)	U.S. metropolitan areas where UberPOOL/LyftLine are available
Lavieri & Bhat (2019)	Dallas, TX
Bansal, et al. (2019)	U.S. (national)

Singapore data: online survey

- Primary data collected via computer-based survey on Qualtrics
- Data collected in Spring (Feb-April) 2019
- 801 respondents in final sample
- Quotas enforced to ensure representativeness of national population by age, income, and household car ownership

Who uses TNC services (both exclusive and pooled)?

United States

- Ridehailing use is highly concentrated in large, dense metropolitan areas
- All studies agree that use of ridehailing is higher among **younger** and **more educated** individuals
- Ridehailing users tend to underrepresent low-income and overrepresent **high-income** households, but results vary by study
- Gender differences are modest or not significant
- Significantly more ridehailing users come from **zero-car households**

Who uses TNC services (both exclusive and pooled)? Singapore

Individuals who are younger, highly educated, and come from households with higher incomes are significantly more likely to be TNC users in Singapore

	Has used TNC service (0/1)		Frequency of use (# of trips in the past month)
	b	e ^b	b
Intercept	3.851***		12.148***
Age (years)	-0.071***	0.931	-0.184***
Male (0/1)	-0.143	0.867	0.332
College degree (0/1)	0.448*	1.566	-0.078
Graduate degree (0/1)	0.756*	2.130	1.105
Full-time employed (0/1)	0.413	1.511	1.474*
Student (0/1)	-0.606	0.546	-0.949
Monthly household income (S\$1000)	0.071**	1.074	0.078
Household owns car (0/1)	0.342	1.409	-0.093
Number of people in household	-0.111	0.895	-0.138

p-value of two-tailed t-test against b = 0
significance key: * < 0.10, ** < 0.05, *** < 0.01

More frequent users of TNCs are younger and full-time employed

Among TNC users, who pools (more)?

United States

- Studies suggests users of TNC services who are **younger** and who are **employed/non-students** are more likely to have used sharing (0/1)
- For the subset of respondents who have used a dynamically pooled TNC services, this study also found that students, respondents with **graduate degrees**, and those who are **single** report the highest percentage of their TNC trips that are pooled (0-100%)
- Income was not a significant factor

Among TNC users, who pools (more)? Singapore

In Singapore individuals who are younger, and who come from household that do not own a car are significantly more likely to have used pooling

	Has used pooled service (0/1)		Percent of TNC trips that are pooled (in past month)
	b	e ^b	b
Intercept	2.253***		40.222***
Age (years)	-0.062***	0.940	0.030
Male (0/1)	0.153	1.165	-0.313
College degree (0/1)	0.036	1.037	-2.542
Graduate degree (0/1)	0.118	1.126	0.388
Full-time employed (0/1)	0.069	1.072	4.359
Student (0/1)	0.356	1.428	8.353
Monthly household income (S\$1000)	0.040*	1.041	-1.108**
Household owns car (0/1)	-0.403**	0.668	4.542
Number of people in household	0.029	1.029	0.079

p-value of two-tailed t-test against b = 0
significance key: * < 0.10, ** < 0.05, *** < 0.01

Those with lower incomes report a significantly greater share of TNC trips that are pooled

Caveats of comparative analysis

- Time discrepancy between the data collection efforts
- Actual providers of ridehailing services are different:
 - U.S. = Uber and Lyft
 - Singapore = Grab, Ryde, GoJek, etc.
- Survey questions are similar, but not identical