

Economic, Environmental, and Energy Assessment of Emerging Mobility Systems

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Transportation Network Companies (TNCs) move people differently

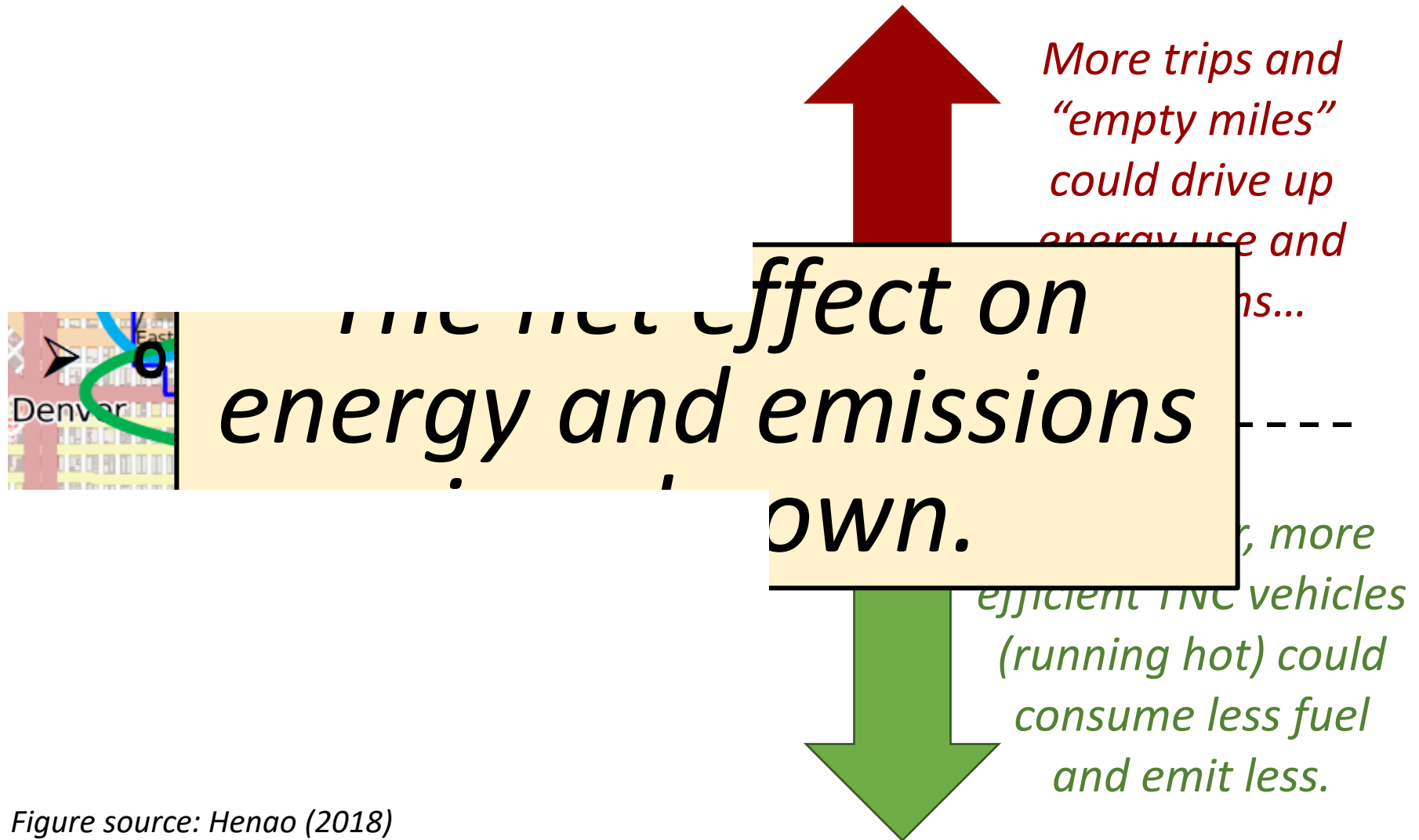
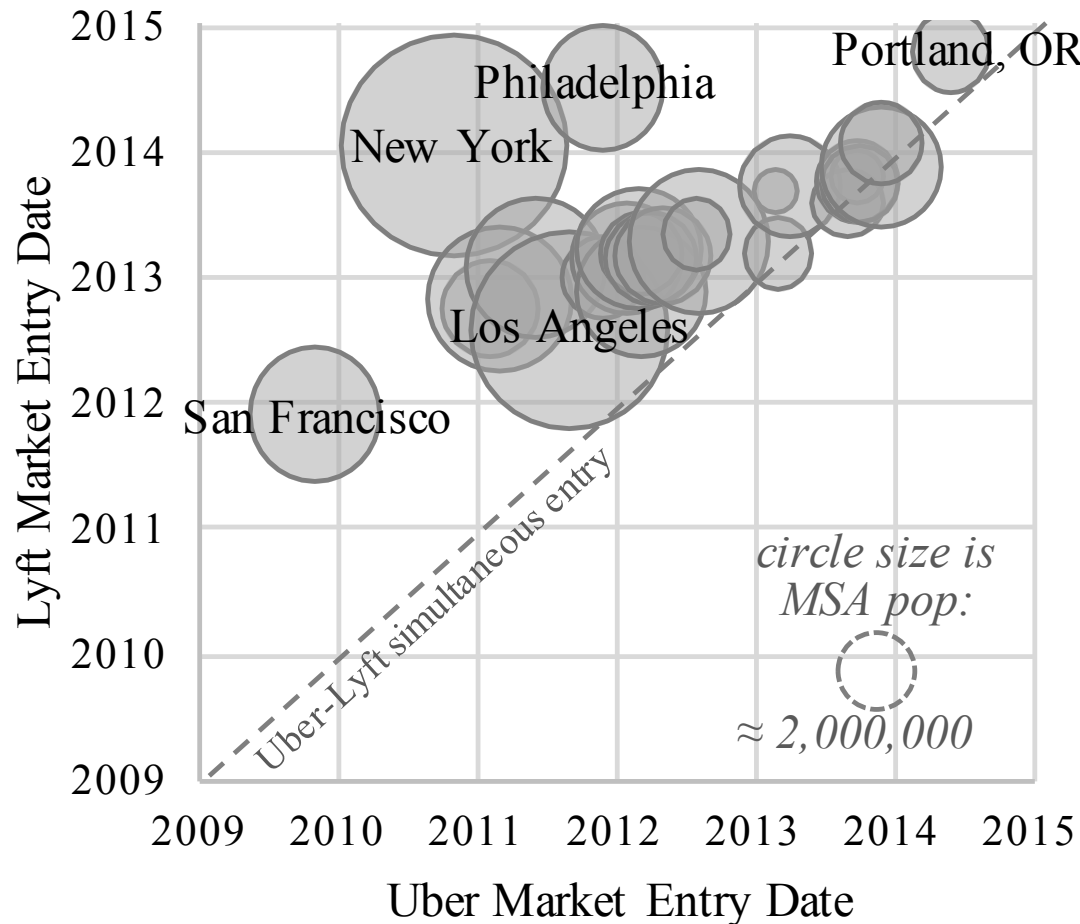


Figure source: Henao (2018)

TNCs Uber and Lyft have grown quickly, in number of markets and share of rides



- Uber and Lyft launched in March 2010 and June 2012, respectively.
- TNCs accounted for 15% of intra-San Francisco trips in 2016¹.
- In 2018, Uber and Lyft announced the completion of 10 billion and 1 billion total trips^{2,3}.

Original figure from published data: Bi (2014), Li (2016), Brazil and Kirk (2016), and Lyft (2016)

¹<https://www.sfcta.org/tncstoday>; ²<https://www.uber.com/newsroom/10-billion/>; ³<https://blog.lyft.com/posts/one-billion-rides>

TNCs likely affect several energy and environmental outcomes

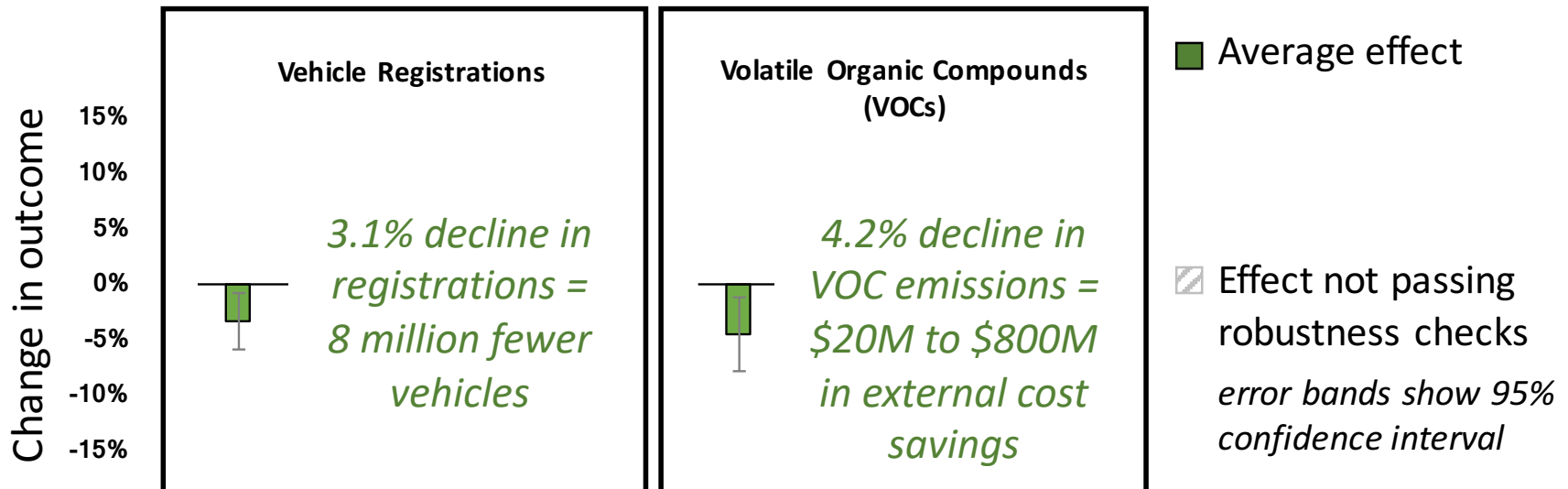
Outcomes	Potential mechanism(s) to explain an increase	Potential mechanism(s) to explain a decrease
Vehicle Registrations	<ul style="list-style-type: none"> Novel employment opportunity motivates TNC drivers to purchase new vehicles 	<ul style="list-style-type: none"> New travel mode frees TNC passengers from personal vehicle dependence
Vehicle Miles Traveled (VMT)	<ul style="list-style-type: none"> Empty miles Induced travel (including from other modes) 	<ul style="list-style-type: none"> Higher perceived marginal cost of a trip (vs. personal vehicle)
Gasoline Consumption	<ul style="list-style-type: none"> Increased VMT Idling between trips 	<ul style="list-style-type: none"> Trips shifted to vehicles with superior fuel economy Eco-driving
Air Pollutant Emissions	<ul style="list-style-type: none"> Increased VMT Idling between trips 	<ul style="list-style-type: none"> Trips shifted to vehicles with superior emissions controls Fewer cold starts

Not much peer-reviewed literature; white papers observe a variety of trends:

Study	Method	Data	Finding			
Vehicle Registrations						
Rayle et al (2016)	Survey	San Francisco “hotspots”	0%			
Hampshire et al (2017)	Regression	Survey in Austin, TX	↓ 9%			
Gong et al (2017)	Regression	New vehicle sales in China	↑ 8%			
Clelow & Mishra (2018)	Survey	Survey in 7 U.S. metro areas	↓ 9%			
Schaller (2018)	Trends	U.S. Census (ACS) in 20 cities	↑			
Vehicle Miles Traveled (VMT)						
			VMT	Conges- tion	# of Trips	Transit Riders
Rayle et al (2016)	Survey	San Francisco “hotspots”	↑ 33%			
Li et al (2017)	Regression	TTI’s Urban Mobility Report		↓		
Hampshire et al (2017)	Regression	Survey in Austin, TX			↓ 23%	
Clelow & Mishra (2018)	Survey	Survey in 7 U.S. metro areas	↑ 49– 61%			
Hall et al (2018)	Regression	National Transit Database		↓		↑
Schaller (2018)	Trends	U.S. Census (ACS) in 20 cities	↑ 60%			
Henao & Marshall (2018)	Survey	Author-collected data in Denver, CO	↑ 85%			

We find that TNCs reduce vehicle ownership and VOC emissions:

- We seek a causal relationship using real-world data at the U.S. state level in a propensity score-weighted difference-in-difference model:



Better data can better inform our collective understanding

Topic	Data Opportunity	Policy Relevance
How TNC vehicles travel	<ul style="list-style-type: none">• Active versus empty miles• Roads used	VMT dynamics and whether current DOT estimation methods count TNC vehicles correctly
TNC vehicle descriptive statistics	<ul style="list-style-type: none">• Make and model• Model year	More accurate assessments of gasoline consumption and air pollutant emission effects
Trip volume descriptive statistics	<ul style="list-style-type: none">• Number of drivers• Number of passengers• Number of trips	Relevant for various energy and environmental outcomes of interest
Service territory	<ul style="list-style-type: none">• Localities (ZIPs? municipalities?) served over time	Where should we be looking for TNC effects?
Driver shifts	<ul style="list-style-type: none">• Sign-in, sign-out times	Cold start ramifications