Ride-Hailing, Ridesharing, and Transit Ridership: A National Study Using the 2017 National Household Travel Survey

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A Research Report from the Pacific Southwest Region University Transportation Center

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16. Abstract

Launched with the promise of "car-sharing" reducing the need for private vehicle ownership, ridehail/TNC services such as Uber and Lyft have been in competition with transit agencies for riders ever since their emergence - prompting the question whether ridehail is a complement to or a substitute for transit. This study uses person-level data from the 2017 National Household Travel Survey and from a SACOG travel model ("SACOG Replica") to evaluate the overlap between users of ridehailing (such as Uber and Lyft) and public transit riders, and whether the complementarity between modes varies across space.

While usage of both transit and ridehailing is greater within half a mile of frequent rail service than further from stations, it is inconclusive whether the complementarity between modes varies with distance to rail transit. A second specification testing the relationship between transit and the portion of ridehail usage unexplained by demographics and land uses suggests that this association could result from individual preferences rather than the modes themselves being complementary. Further, ridehail trips peak at different hours than transit trips even among users of both modes, suggesting that the two modes serve different types of trips rather than ridehailing solving the transit first/last-mile problem.

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About the Pacific Southwest Region University Transportation Center

The Pacific Southwest Region University Transportation Center (UTC) is the Region 9 University Transportation Center funded under the US Department of Transportation's University Transportation Centers Program. Established in 2016, the Pacific Southwest Region UTC (PSR) is led by the University of Southern California and includes seven partners: Long Beach State University; University of California, Davis; University of California, Irvine; University of California, Los Angeles; University of Hawaii; Northern Arizona University; Pima Community College.

The Pacific Southwest Region UTC conducts an integrated, multidisciplinary program of research, education and technology transfer aimed at *improving the mobility of people and goods throughout the region.* Our program is organized around four themes: 1) technology to address transportation problems and improve mobility; 2) improving mobility for vulnerable populations; 3) Improving resilience and protecting the environment; and 4) managing mobility in high growth areas.

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Disclosure

Marlon Boarnet and Clemens Pilgram conducted this research titled, "Ride-Hailing, Ridesharing, and Transit Ridership: A National Study Using the 2017 National Household Travel Survey" at the Department of Urban Planning and Spatial Analysis, Sol Price School of Public Policy, University of Southern California. The research took place from August 2019 to June 2021 and was funded by a grant from Caltrans in the amount of $100,000. The research was conducted as part of the Pacific Southwest Region University Transportation Center research program.

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Abstract

Launched with the promise of “car-sharing” reducing the need for private vehicle ownership, ridehail/TNC services such as Uber and Lyft have been in competition with transit agencies for riders ever since their emergence - prompting the question whether ridehail is a complement to or a substitute for transit. This study uses person-level data from the 2017 National Household Travel Survey and from a SACOG travel model (“SACOG Replica”) to evaluate the overlap between users of ridehailing (such as Uber and Lyft) and public transit riders, and whether the complementarity between modes varies across space.

While usage of both transit and ridehailing is greater within half a mile of frequent rail service than further from stations, it is inconclusive whether the complementarity between modes varies with distance to rail transit. A second specification testing the relationship between transit and the portion of ridehail usage unexplained by demographics and land uses suggests that this association could result from individual preferences rather than the modes themselves being complementary. Further, ridehail trips peak at different hours than transit trips even among users of both modes, suggesting that the two modes serve different types of trips rather than ridehailing solving the transit first/last-mile problem.

Ride-Hailing, Ridesharing, and Transit Ridership: A National Study Using the 2017 National Household Travel Survey

Executive Summary

While launched with the promise of “car-sharing” reducing the need for private vehicle ownership, ridehail/TNC services such as Uber and Lyft have been in competition with transit agencies for riders ever since their emergence - prompting the question whether ridehail is a complement to or a substitute for transit. This study uses person-level data containing travel behaviors and home locations from the 2017 National Household Travel Survey (“2017 NHTS”) and from a Sacramento Area Council of Governments travel model (“SACOG Replica”) to evaluate to what extent the ridership of ridehailing services (such as Uber and Lyft) overlaps with that of public transit, and whether the degree of complementarity between modes varies across space.

Previous research on the complementarity between ridehail services and transit focused either on aggregate ridership, on tours or on individual trips. So far, findings on complementarity have been mixed: Overall transit ridership did not decline following the TNCs market entry (Hall et al., 2018), and many tours involving ridehail also involve transit trips (Conway et al., 2018; King et al., 2020). At the same time, surveys suggest that at least some share of ridehail trips would have been transit trips, if not for the availability of ridehailing (Rayle et al., 2016). This study addresses two gaps in the literature: No prior studies focus on people as the level of observation, or evaluate what role the availability of rail transit near a person’s home location plays in determining whether or not somebody uses transit, ridehailing, both, or neither.

Using data from the 2017 National Household Travel Survey (NHTS), a regression model of trip counts at the person-level suggests that ridehailing and transit usage are complements, meaning that persons who use ridehailing more frequently also use transit more frequently, and vice versa. While usage of both transit and of ridehailing is far greater among people who live within half a mile of frequent rail service than among those living further from stations, it is inconclusive whether the degree of complementarity between modes varies with distance to rail transit. A second specification testing the relationship between transit and the portion of ridehail usage not explained by demographic and land use factors suggests that this complementarity could be the outcome of individual preferences and lifestyles, rather than the modes themselves being complementary travel options. Persons who prefer transit might also prefer ridehailing due to unobserved factors (preferences or lifestyles) rather than the modes complementing each other. Further, ridehail trips tend to occur later in the evening than most transit trips even among people who use both modes, suggesting person-level complementarity in the form of the two modes serving different types of trips as opposed to ridehailing serving as a solution to the transit first/last-mile problem.

Introduction

Since their market entry in the mid-2010s, ridehailing services such as Uber and Lyft offer point-to-point service. Ridehail operators tout it as a supplement to public transit services in cities, potentially reducing the need for private vehicle ownership (as reported in, e.g., Etherington, 2018). At the same time, critics fear that they peel riders away from transit. As an example, Clewlow and Mishra (2017) found in a survey of ridehail users that they reported an average 6 percent reduction in transit use after adopting ridehailing. In this project, we rely on travel diary data from the 2017 National Household Travel Survey ("2017 NHTS") and related datasets to evaluate to what extent ridehailing services (such as those provided by operators Uber and Lyft) are complements or substitutes for public transit – and whether the relationship varies between households with different levels of transit availability based on their home locations.

Literature Review

Ridehailing is new enough that there have been few studies on the topic. Within that still young literature, the question of whether ride-hailing is a substitute or complement for public transit has already garnered attention. Hall, Palsson, and Price (2018) conducted possibly the most well-known study on the topic. They used National Transit Database (NTD) data from 2004 to 2015 to estimate the effect of Uber's entry into metropolitan areas on transit ridership. Using a differences-in-differences (DID) design (made possible by the staggered roll-out of Uber into markets during their study period), Hall, Palsson, and Price (2018) estimate that Uber's entry is associated with a five-percentage point increase in transit ridership after two years of Uber's first entry into the market. They find heterogeneity in those results, with the complementary effect of Uber on transit ridership larger in more populous cities and for smaller metro systems – a combination that is complex, because the largest metro systems are often found in the largest metropolitan areas (Hall et al., 2018). Doppelt (2018), in a masters thesis at Georgetown University, also used a DID design and found a positive association between Uber entry and rail transit ridership but a negative association between Uber entry and bus transit ridership (Doppelt, 2018). Sadowsky and Nelson studied the entry of both Uber and Lyft into U.S. markets, finding that when Uber entered a metropolitan area, transit ridership increased, but the entry of Lyft, which almost always followed Uber into metropolitan area markets, was associated with a decrease in transit ridership, at times below the pre-Uber levels (Nelson & Sadowsky, 2019; Sadowsky & Nelson, 2017).

Most existing studies rely on aggregate data, typically ridership from the National Transit Database (NTD). By using Automated Passenger Count data on transit use and data scraped from Application Programming Interfaces of Uber and Lyft, Erhardt et al. (2021) estimated fixed-effects panel data model and time-series model to evaluate whether transportation network companies (TNCs) are responsible for any changes in transit ridership. For both models, TNCs were considered responsible for decreases in net bus ridership of 8.6% to 10.8%, which supports that ride-hailing services work as a substitute for public transit. However, the study has not found any statistically significant association between TNCs and light rail ridership (Erhardt et al., 2021). Ngo, Gotschi, and Clark (2021) examined the effects of ride-hailing on bus ridership in a medium-sized urban area considering the fact that public transit service in medium-sized urban areas is different from that of metropolitan areas. The research found that Uber accounts for a decrease in bus ridership relative to comparable cities without Uber. The impact of Uber varied across the timing of the day, with highest reduction in bus ridership during the nighttime (after 6 pm) when the public transit service is less available. Ngo et al (2021) also suspected a greater incentive of TNC riders in smaller cities to simply substitute their transit usage due to more limited transit access. The decline in bus ridership persisted even after the exit of Uber suggesting possible long-term effect of ride-hailing service on public transit ridership (Ngo et al., 2021).

A number of studies make use of disaggregate rider-or trip-level data such as in-person surveys, trip data from TNCs, or on travel diary surveys such as the National Household Travel Survey ("NHTS"). However, these studies largely focus on describing who these services' users are in terms of demographics or socioeconomic characteristics, with a secondary emphasis on what alternative modes they may consider and to what extent their trips may be multimodal. In describing socioeconomic characteristics of ride-hailing users, studies reliant on different types of data sources largely agree that ride-hailing users tend to be younger, better educated, earn higher incomes than the general population, are more likely to be childless, and tend to live in dense urban areas (Conway et al., 2018; Dias et al., 2017; Grahn et al., 2019). Conway et al. (2018) further note that growth in for-hire vehicle travel such as ride-hail services and taxicabs across different waves of the NHTS between 1995 and 2017 is greatest among younger, higher income populations, though low-income populations continue to form a large user base for these services (Conway et al., 2018). Alemi et al. (2019) on the other hand find that while socioeconomic characteristics may explain adoption of ride-hail services, they are less predictive of frequency than behavioral factors such as degree of smartphone usage, and willingness to pay for reductions in travel time (Alemi et al., 2019). By using survey data from Toronto, Young and Farber (2019) evaluated the user characteristics and trip characteristics of ride-hailing service and examined the impact of ride-hailing services on other transit mode usage (Young & Farber, 2019).

Similar to other studies, Young and Farber (2019) found that ride-hailing tend to be a wealthy younger generation phenomenon as more than 70% of ride-hailing users are aged between 20-39 and more than 50% of them having income level above $100,000. Bansal, Sinha, Dua, and Daziano (2019) evaluated a proprietary survey of 11,902 Americans living in areas served by TNCs to investigate the association between various socio-demographic factors and preferences of TNC users. The survey sample is limited due to over- or under- representation of some demographic groups, and the study tried to address the issue by estimating person-level weights using an iterative proportional fitting technique. Similar to previous studies, they found that younger individuals from more affluent families with higher education levels living in metropolitan area are more likely to be the users of TNC services, and age has shown downward parabolic association with TNC usage. Further, the study also found that TNC users located in suburbs and those owning private vehicles are less likely to pool rides (Bansal et al., 2020). Lastly and consistent with findings of other studies, Dias, Lavieri, Garikapati, Astroza, Pendyala, and Bhat (2017) show the users of ride-sourcing and car-sharing services in the 2014-2015 Puget Sound Regional Travel Study are more likely to be younger, well-educated, wealthier, and live in denser areas (Dias et al., 2017).

The literature is less convergent when it comes to the degree to which ride-hailing services and public transit are complements or substitutes. Using a survey of 380 respondents conducted in San Francisco, Rayle et al. (2016) find that approximately half of ride-hail trips replaced a mode other than taxicabs, with public transit and driving making up smaller shares of alternate modes among ride-hail users surveyed (Rayle et al., 2016). Observing public transit ridership in major North American cities from 2002 to 2018, Graehler, Mucci and Erhardt (2019) estimate that the entry of TNCs decreased heavy rail ridership by 1.3% and bus ridership by 1.7%. However, the study did not find any statistically significant association between the entry of TNCs and light rail ridership (Graehler et al., 2019). Conway et al. (2018) evaluate ride-hail and taxicab users in the 2017 NHTS, finding that approximately 75% of tours including ride-hail services or taxicab recorded in the 2017 NHTS also included another mode of travel in the same tour – while the same is only true for 8% of auto trips. Relying on the same 2017 NHTS data, Grahn et al. (2019) note that 60% of users rely on those services for special occasions only, using them no more than three times in the month prior to the survey (Grahn et al., 2019). King, Conway, and Salon (2020) on the other hand use the 2017 NHTS to look at specifically the use of for-hire vehicles as a first/last mile mode to access transit. They found three quarters of for-hire vehicle tours (trips with at least one intermediate stop) include another mode of travel and 27% of for-hire tours include transit. Using the same geoinformation detailed data from California as we do in this study, they found 11% of for-hire tours include first mile/last mile transit access. They also examined the distributions of non-auto trips and for-hire vehicle trips by time of day and found for-hire trips exceeds other non-auto trips in evenings when transit services are limited and non-motorized modes are deemed to be dangerous. While the research could not separate for-hire use to ride-hailing services and taxi trips, the authors ultimately concluded that for-hire vehicles can act as complements to public transit (King et al., 2020). Young and Farber (2019) find that about half of ride-hailing users own a monthly pass for public transit in Toronto, posing a possible complementary effect between ride-hailing service and transit usage. Two papers by Brown (2019) and by Lavieri et al. (2018) evaluating trip-level data from TNCs find that a large volume of trips occur in areas with access to public transit, or even that trips conducted via ride-hailing more closely resemble transit trips than they do private car trips (Brown, 2019; Lavieri et al., 2018).

One shortcoming common to all rider-level studies we identified that evaluate the effect of ride-hailing services on urban transportation is the population of analysis: To the extent questions about mode splitting and complementarity with public transit networks are raised, the focus is on ride-hail users, rather than on comparing transit users with ridehail users. For that reason we have little information on individual or household travel behavior and how that is associated with ride-hailing, in particular when it comes to choices between transit and ride-hailing. This study will fill that gap. We use the 2017 National Household Travel Survey (NHTS) to study the relationship between transit ridership (specifically rail transit) and ride-hailing use. This will allow studies of behavioral factors, rather than aggregate data, in ways that have not previously been possible.

Methods

Throughout this study and for all data sources employed, we classify survey respondents into four "types of riders": a) People who use neither public transit nor ridehailing services, b) people who use ridehailing services but not transit, c) people who use transit but not ridehailing, and d) people who use both ridehailing and transit.

This study is structured as follows:

- **Descriptive statistics:** First, we review descriptive statistics of for each of the four rider types listed above – to determine whether these groups differ from one another in observable ways in terms of demographics or home surroundings. We also estimate multinomial logit (MNL) regressions to predict which of the four "type of rider" categories a respondent will be in as a function of sociodemographic characteristics and land uses near the survey respondent's home, and those results are in an appendix. That MNL model is simply associational, given that the independence of irrelevant alternatives (IIA) assumption is not likely to be satisfied in this case.

- **Complementarity Regressions**: We model transit usage at the person level as a function of the same demographic and land use information used in the "type of rider" classification models, as well as their ridehailing usage. This modeling is performed using a series of linear probability models.[1]
- **Residual Regressions:** In a second specification, we model ridehail usage at the person-level as a function of demographic and land use information, and then test whether the portion of ridehail usage unexplained by this specification explains transit usage at the person level, controlling for the same demographic and land use variables.
- **Intraday Distributions of Trips:** Finally, we evaluate when during the day riders of both modes use either mode to determine whether ridehailing and public transit are likely used for the same purposes, and compare distributions against transit use by exclusive transit users and ridehail use by exclusive ridehail users.[2]

Data Sources

In our study, we employ data from the 2017 National Household Travel Survey ("2017 NHTS") – a nationally representative travel diary survey that attempts to capture broad nationwide trends in transportation. We employ a second dataset, Replica – a modeled travel diary of all trips in a typical week in the Sacramento Metropolitan area conducted by a synthetic population – as a test for the validity of our findings outside the 2017 NHTS.

2017 NHTS (Nationwide)

The 2017 NHTS is the most recent iteration of the National Household Travel Survey, a federally funded travel survey regularly conducted once or twice every decade (Westat, 2019). This survey is conducted to describe households' travel behavior and identify trends over time, and is used in a wide range of modeling and planning applications. Funded by the Federal Highway Administration with the intent of creating a nationally representative travel diary study, it allowed state and local agencies such as Metropolitan Planning Organizations ("MPOs") or state departments of transportation to pay for additional respondents in their jurisdictions or to add additional questions, allowing for more granular study within those areas.[3]

For our analyses, we rely on two version of the 2017 NHTS: We conduct nationwide analyses that do not rely on household location information data using the publicly available release (Westat Center for Transportation, Technology & Safety Research, 2016/2021), and then test whether the same

[1] Linear probability models refers to models with a binary outcome variable estimated using Ordinary Least Squares regression.
[2] This method expands upon the analyses of intraday distribution of trips presented by King et al., disaggregating by type of rider (King et al., 2020).
[3] The California Department of Transportation was one of the state agencies that purchased a larger sample of respondents within their jurisdiction.

specifications provide different results using just the subset of NHTS respondents located in California, for whom we have additional location information (National Renewable Energy Laboratory, 2019).

The 2017 NHTS contains five tables: *Persons*, *Households*, *Vehicles*, *Locations*, and *Trips*. *Persons* contains person-level information about respondents to the survey such as individual demographics or travel habits, with each observation representing one survey respondent. [4] *Households* contains household-level information such as households' locations or income levels, with each observation representing one household, which in return contains one or more people as members. [5] *Vehicles* records personal motor vehicles owned by households, with each observation representing a vehicle.[6] *Locations* contains coordinates of locations visited by survey respondents, including their home locations.[7] Lastly, *Trips* records all trips conducted by survey respondents on their assigned travel day for which they are recording information, with each observation representing one trip taken by a person.

The *Persons* table contains two questions regarding respondents' travel habits that are central to this study, asking respondents a) on how many of the past 30 days they used public transit, and b) how many times they purchased a ride using a smartphone rideshare app such as Uber or Lyft in the past 30 days. Responses to these questions form the basis of the dependent variables employed in this project.[8]

2017 NHTS (California)

The National Renewable Energy Laboratory (NREL)'s Transportation Secure Data Center provides the California subsample of the 2017 NHTS along with detailed geographic information about households' locations, as well as the origin and destination locations of each trip recorded in the trip diary (National Renewable Energy Laboratory, 2019). Those data are available via secure access in a computing environment that does not allow any release of information that could identify individual survey respondents. Its table structure is identical to those in the nationwide 2017 NHTS, and its 55,793 respondents across 26,095 households form a perfect subset of the 264,234 Nationwide 2017 NHTS respondents across 129,696 households.

SACOG Replica

In addition to the 2017 NHTS, we rely upon data from a synthetically generated proprietary travel simulation dataset provided by the Sacramento Area Council of Governments that attempts to model all trips undertaken on each day of a typical week in the Fall of 2019 ("SACOG Replica"). This dataset simulates an artificial population based on information from the census, calibrated to resemble the

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[4] Specifically, we rely upon each respondent's sex, age, race, ethnicity, education level, driver status, and travel habits from the *person*s table.

[5] Specifically, we rely upon each respondent's household's income, MSA size, and urban status, from the *households* table.

[6] We rely on *vehicles* to determine whether each respondent has at least one motor vehicle in their household as a proxy for access to motor vehicles.

[7] We rely on *locations* for respondents' home locations, but only have this information for the California subsample of NHTS respondents.

[8] Responses to the questions about travel habits align closely but not perfectly with observed travel behavior on respondents' assigned travel days: Out of 223,948 people who stated that they had used neither transit nor ridehailing in the past 30 days, only 358 (0.16%) recorded one or more ridehailing or taxi trips on their assigned travel day and 166 recorded at least one transit trip on their assigned travel day.

entire population residing in the SACOG area (Sacramento Area Council of Governments, 2021). Agents from this population then conduct trips on the basis of cell phone movement data. As such, the SACOG data contains two tables: *population* contains individual-and household-level demographic and location information such as an individual's age, sex, race and ethnicity, education level, household income, and household location for all 2,239,019 simulated individuals, while *trips* contains information on each trip taken by this population.[9]

Locations of Rail Transit Stations

To calculate the distance from each household's location to the nearest rail station for each household in the California 2017 NHTS subsample and in the SACOG Replica model, we rely on a shapefile containing the locations of all rail stations in California.[10]

We classify rail stations into two types: Frequent rail, and infrequent rail. Frequent rail refers to rail transit services such as Los Angeles Metro, Bay Area Rapid Transit (BART) or San Francisco's MUNI, while infrequent rail refers to commuter rail services such as Caltrain, Metrolink, the Altamont Corridor Express, or Amtrak.

Data Processing

2017 NHTS (Nationwide)

To create a person-level regression dataset from the 2017 NHTS, we combine information from the *persons*, *households*, and *vehicles* tables: From the *households* table, we take each person's household's income, their urban status, metropolitan area size, and census division, and combine them with a person's age, gender, race, ethnicity, education level, driver status, annual miles driven, and habits regarding ridehail and transit usage from the *persons* table.[11] Lastly, we record whether or not any given person's household has at least one vehicle listed in *vehicles* to determine whether a person may have access to an automobile. The resulting dataset combines individual and household-level characteristics such that each observation in the data represents a person.[12]

2017 NHTS (California)

The data processing applied to the California sample of the 2017 NHTS is identical to that applied to the Nationwide 2017 NHTS data, with the exception of an additional steps of determining the spatial relationship between each household's home location and rail transit as a proxy for transit availability: Using the locations of stations from this data source and this classification, we calculate the distance between the home of each household in the California 2017 NHTS subsample and in the SACOG replica

[9] A third table in the SACOG data, *previous_activities*, includes the activity preceding any given trip; however, we do not rely on data from this table in this project.

[10] We thank Seva Rodnyansky for generously providing us with the shapefile used the Boarnet et al. study of whether high income households reduce their driving when living near rail transit (Boarnet et al., 2020).

[11] Note that we do not use all variables listed here in our regression specification; annual miles driven and census division appear only in the Descriptive Statistics section of this report.

[12] If multiple people are recorded for one household, all people within the same household share the same information for household-level variables.

model and its respective nearest station of each type,[13] and create four dummy variables, indicating 1) whether a given respondent lives within half a mile of a station served by *frequent* rail, 2) whether a given respondent lives within half a mile of a station served by *infrequent* rail, 3) whether a respondent lives between half a mile and three miles from a station served by *frequent* rail, and 4) whether a respondent lives between half a mile and three miles from a station served by *infrequent* rail.[14]

SACOG Replica

Since the SACOG Replica model data does not report information on individuals' habits analogous to the 2017 NHTS's questions about travel in the past 30 days, we sort individuals into the four groups listed in the Methods section above based on their observed travel behavior during the typical week recorded in *trips*: For each individual described in *population*, we count the number of trips they conducted via ridehailing or public transit, respectively, and create dummy variables indicating whether an individual used each of modes at least one time.

To identify individuals living within half a mile or a 0.5-3 mile band of frequent and infrequent rail service in the SACOG Replica data, we perform the same distance calculations as described above for the California subsample of the 2017 NHTS.

[13] In doing so, we implicitly assume that the respective closest stations to any given household for either frequent or infrequent types of rail service are relevant for determining whether or not a household has access to rail service.

[14] Dummy variables take the value of 1 if a household meets the specified criterion, and a value of 0 if it does not. Note that being located close to *frequent* rail and to *infrequent* rail are not mutually exclusive – for households located near stations with both types of service, both dummy variables are set equal to 1.

Descriptive Statistics

2017 NHTS (Nationwide)

Table 1. Characteristics of Transit and Ridehail Users, Nationwide 2017 NHTS[15]

[15] For a version of this table weighted by the person expansion weights in the NHTS, see **Appendix A.**

Table 2. Characteristics of Transit and Ridehail Users, Nationwide 2017 NHTS (continued)

Characteristics of Transit and Ridehail Users per 2017 NHTS

(Nationwide, unweighted)

	Transit: No, Ridehail: No		Transit: Yes, Ridehail: No		Transit: No, Ridehail: Yes		Transit: Yes, Ridehail: Yes	
Person: Education Level	**Count**	**Share**	**Count**	**Share**	**Count**	**Share**	**Count**	**Share**
I don't know	121	0.1%	18	0.1%	3	0.0%	1	0.0%
I prefer not to answer	69	0.0%	6	0.0%	0	0.0%	0	0.0%
Less than a high school graduate	12,276	6.1%	1,839	10.1%	192	1.7%	152	2.4%
High school graduate or GED	43,453	21.7%	3,021	16.6%	665	6.0%	343	5.4%
Some college or associates degree	61,763	30.8%	4,113	22.7%	2,239	20.2%	1,045	16.3%
Bachelor's degree	44,766	22.4%	4,290	23.6%	4,258	38.5%	2,318	36.2%
Graduate degree or professional degree	37,831	18.9%	4,858	26.8%	3,703	33.5%	2,540	39.7%

Person: Hispanic or Latino	**Count**	**Share**	**Count**	**Share**	**Count**	**Share**	**Count**	**Share**
I don't know	19	0.0%	1	0.0%	0	0.0%	2	0.0%
Refused	279	0.1%	29	0.2%	8	0.1%	7	0.1%
Hispanic or Latino: Yes	15,717	7.8%	2,023	11.1%	1,091	9.9%	632	9.9%
Hispanic or Latino: No	184,264	92.0%	16,092	88.7%	9,961	90.1%	5,758	90.0%

Person: Race	**Count**	**Share**	**Count**	**Share**	**Count**	**Share**	**Count**	**Share**
I don't know	170	0.1%	27	0.1%	11	0.1%	6	0.1%
Refused	829	0.4%	114	0.6%	52	0.5%	39	0.6%
White	167,237	83.5%	12,626	69.6%	8,925	80.7%	4,788	74.8%
Black or African American	13,320	6.7%	2,492	13.7%	590	5.3%	502	7.8%
Asian	7,806	3.9%	1,358	7.5%	772	7.0%	581	9.1%
American Indian or Alaska Native	1,268	0.6%	142	0.8%	43	0.4%	30	0.5%
Native Hawaiian or other Pacific Islander	457	0.2%	49	0.3%	35	0.3%	27	0.4%
Multiple responses selected	4,989	2.5%	657	3.6%	369	3.3%	256	4.0%
Some other race	4,203	2.1%	680	3.7%	263	2.4%	170	2.7%

Person: Sex	**Count**	**Share**	**Count**	**Share**	**Count**	**Share**	**Count**	**Share**
I don't know	18	0.0%	3	0.0%	3	0.0%	0	0.0%
I prefer not to answer	122	0.1%	13	0.1%	7	0.1%	10	0.2%
Male	92,863	46.4%	8,524	47.0%	5,648	51.1%	3,208	50.1%
Female	107,276	53.6%	9,605	52.9%	5,402	48.8%	3,181	49.7%

Person: Age	**Value**	**Value**	**Value**	**Value**
1st Percentile	16	16	18	17
5th Percentile	21	18	22	21
25th Percentile	41	36	30	29
50th Percentile	57	54	39	37
75th Percentile	68	64	53	52
95th Percentile	82	77	68	68
99th Percentile	92	86	79	78

Person: Annual Miles Driven Personally	**Value**	**Value**	**Value**	**Value**
1st Percentile	1	0	156	0
5th Percentile	500	10	2,000	250
25th Percentile	5,000	3,000	8,000	4,000
50th Percentile	10,000	8,000	12,000	10,000
75th Percentile	15,000	13,000	16,000	15,000
95th Percentile	30,000	25,000	30,000	28,000
99th Percentile	50,000	45,000	50,000	50,000

Person: Monthly Days of Transit Use	**Value**	**Value**	**Value**	**Value**
1st Percentile	0	1	0	1
5th Percentile	0	1	0	1
25th Percentile	0	2	0	2
50th Percentile	0	4	0	4
75th Percentile	0	12	0	14
95th Percentile	0	26	0	28
99th Percentile	0	40	0	45

Person: Monthly Uses of Ridehailing services	**Value**	**Value**	**Value**	**Value**
1st Percentile	0	0	1	1
5th Percentile	0	0	1	1
25th Percentile	0	0	1	2
50th Percentile	0	0	2	3
75th Percentile	0	0	4	5
95th Percentile	0	0	10	15
99th Percentile	0	0	20	30

2017 NHTS (California)

Table 2. Characteristics of Transit and Ridehail Users in the California 2017 NHTS[16]

[16] For a version of this table weighted by the person expansion weights in the NHTS, see **Appendix B.**

Table 2. Characteristics of Transit and Ridehail Users in the California 2017 NHTS (continued)

Characteristics of Transit and Ridehail Users per 2017 NHTS
(California, unweighted)

	Transit: No, Ridehail: No		Transit: Yes, Ridehail: No		Transit: No, Ridehail: Yes		Transit: Yes, Ridehail: Yes	
Person: Race	**Count**	**Share**	**Count**	**Share**	**Count**	**Share**	**Count**	**Share**
I don't know	35	0.1%	7	0.2%	7	0.3%	4	0.3%
Refused	176	0.7%	31	1.0%	23	0.9%	15	1.0%
White	20,323	77.7%	2,175	68.8%	1,965	76.3%	1,065	71.8%
Black or African American	696	2.7%	192	6.1%	74	2.9%	60	4.0%
Asian	2,357	9.0%	375	11.9%	250	9.7%	173	11.7%
American Indian or Alaska Native	203	0.8%	19	0.6%	15	0.6%	9	0.6%
Native Hawaiian or other Pacific Islander	175	0.7%	16	0.5%	16	0.6%	9	0.6%
Multiple responses selected	1,062	4.1%	169	5.3%	115	4.5%	83	5.6%
Some other race	1,114	4.3%	179	5.7%	110	4.3%	66	4.4%
Person: Sex	**Count**	**Share**	**Count**	**Share**	**Count**	**Share**	**Count**	**Share**
I don't know	1	0.0%	2	0.1%	2	0.1%	0	0.0%
I prefer not to answer	13	0.0%	4	0.1%	1	0.0%	2	0.1%
Male	12,155	46.5%	1,539	48.7%	1,253	48.7%	765	51.5%
Female	13,972	53.4%	1,618	51.2%	1,319	51.2%	717	48.3%
Person: Age	**Value**		**Value**		**Value**		**Value**	
1st Percentile	16		16		17		18	
5th Percentile	21		19		21		22	
25th Percentile	42		39		31		30	
50th Percentile	58		56		41		38	
75th Percentile	69		66		54		52	
95th Percentile	83		78		69		69	
99th Percentile	90		87		79		79	
Person: Annual Miles Driven Personally	**Value**		**Value**		**Value**		**Value**	
1st Percentile	10		0		100		0	
5th Percentile	500		80		1,400		400	
25th Percentile	4,000		3,000		7,000		4,500	
50th Percentile	8,500		8,000		10,500		9,100	
75th Percentile	13,000		12,000		15,000		13,000	
95th Percentile	25,000		23,000		30,000		25,000	
99th Percentile	50,000		35,000		45,000		40,000	
Person: Monthly Days of Transit Use	**Value**		**Value**		**Value**		**Value**	
1st Percentile	0		1		0		1	
5th Percentile	0		1		0		1	
25th Percentile	0		1		0		2	
50th Percentile	0		3		0		4	
75th Percentile	0		10		0		12	
95th Percentile	0		25		0		25	
99th Percentile	0		36		0		30	
Person: Monthly Uses of Ridehailing services	**Value**		**Value**		**Value**		**Value**	
1st Percentile	0		0		1		1	
5th Percentile	0		0		1		1	
25th Percentile	0		0		1		2	
50th Percentile	0		0		2		3	
75th Percentile	0		0		4		6	
95th Percentile	0		0		10		16	
99th Percentile	0		0		20		30	

Tables 1 and 2 present descriptive statistics of the four types of riders for 2017 NHTS respondents nationwide and in California, respectively. All four rider types overlap substantially in terms of the distributions of every single variable: There is no variable on which all of the outliers fall into any one of the four groups. The inability to distinguish between types of riders based on variables included in the 2017 NHTS is confirmed by a multinomial logistic regression model;[17] while it is capable of explaining approximately 17% of variation in rider types and all three other types of rider differ markedly from the baseline of riding neither transit nor ridehail, there is no demographic variable based on which exclusive

[17] See **Appendix C** for outputs from this Multinomial Logistic Regression model.

ridehail users, exclusive transit users, and habitual users of both modes differ markedly from one another. See Appendix C for the multinominal regression results.

Transit riders, ridehail users, and users of both modes all tend to live in large MSAs, especially compared to NHTS respondents who used neither mode. In terms of age, income, education, and possession of driver's licenses, it is evident that users of both ridehail and transit closely resemble ridehail users who do not use public transit – much more so than they do users of public transit who do not ride public transit. At 41 and 38 respectively, the median ages of exclusive ridehail users and of ridehail-and-transit users are considerably lower than those of exclusive transit users (56), and of users of neither mode (58). At the same time, only 89.8% of California NHTS respondents who use both modes live in households with at least one motor vehicle – compared to 98.7% of respondents who use ridehail but not transit, 84.9% of respondents who use transit but not ridehail, and 98.6% of respondents who use neither mode. Further, respondents using both modes use transit on more days per month than exclusive transit users, and also use ridehail more frequently than exclusive ridehail users, while driving approximately the same amount of miles as users of neither mode or as exclusive ridehail users.

A more detailed look at where each type of rider tends to live – presented in **Tables 3 and 4** - suggests that both ridehail users and transit users tend to live in areas close to rail stations compared to those who do not use either mode – but that 30.8% of exclusive transit users and 34.9% of exclusive ridehail users live more than three miles from any kind of rail service. The same is true for only 17.7% of habitual users of both modes. Similarly, 7.8% of exclusive ridehail users and 12.9% of exclusive transit users live within half a mile of frequent rail service – compared to 22.8% of users of both modes.

Similarly, when looking at the distribution of rider types within different areas segmented by their distance to rail services, it is evident that where a household lives in relation to rail transit stations matters for their travel behavior: 85.6% of the 18 million Californians living more than three miles away from any kind of rail service do not use transit or ridehail at all, while the same is only true for 26.5% of the approximately 130,000 Californians who have both frequent rail and commuter rail services within half a mile of their homes. Users of neither ridehail nor transit form a majority in all types of locations with no rail services within half a mile, as well as in areas close to infrequent rail with no nearby stations offering frequent rail services. Ridehail users do not form a majority of the local population in any location, while over 60% of the approximately 128,000 Californians living within half a mile of both frequent and infrequent rail service use transit, either exclusively or in combination with ridehail services.

Table 3. California 2017 NHTS population by Rider Type and proximity to Stations

Distance from Home to Rail by Rider Type	Count		Share within group	
	Unweighted	Weighted	Unweighted	Weighted
Neither Ridehail nor transit				
No frequent nor infrequent rail within 3 miles	21,888	15,720,099	69.5%	52.1%
Frequent rail > 3 miles, infrequent rail 0.5 - 3 miles	3,713	5,984,526	11.8%	19.8%
Infrequent rail > 3 miles, frequent rail 0.5 - 3 miles	3,826	5,060,292	12.1%	16.8%
Both frequent and infrequent rail 0.5 - 3 miles	1,059	1,783,894	3.4%	5.9%
Frequent rail > 3 miles, infrequent rail < 0.5 miles	177	311,663	0.6%	1.0%
Frequent rail 0.5 - 3 miles, infrequent rail < 0.5 miles	42	103,035	0.1%	0.3%
Frequent rail < 0.5 miles, infrequent rail > 3 miles	464	724,482	1.5%	2.4%
Frequent rail < 0.5 miles, Infrequent rail 0.5 - 3 miles	302	477,805	1.0%	1.6%
Both frequent and infrequent rail <0.5 miles	24	33,838	0.1%	0.1%
Ridehail, no transit				
No frequent nor infrequent rail within 3 miles	1,214	974,994	47.1%	34.9%
Frequent rail > 3 miles, infrequent rail 0.5 - 3 miles	376	500,964	14.6%	17.9%
Infrequent rail > 3 miles, frequent rail 0.5 - 3 miles	549	771,763	21.3%	27.6%
Both frequent and infrequent rail 0.5 - 3 miles	222	271,140	8.6%	9.7%
Frequent rail > 3 miles, infrequent rail < 0.5 miles	24	32,915	0.9%	1.2%
Frequent rail 0.5 - 3 miles, infrequent rail < 0.5 miles	10	26,239	0.4%	0.9%
Frequent rail < 0.5 miles, infrequent rail > 3 miles	75	93,048	2.9%	3.3%
Frequent rail < 0.5 miles, Infrequent rail 0.5 - 3 miles	93	111,074	3.6%	4.0%
Both frequent and infrequent rail <0.5 miles	12	12,511	0.5%	0.4%
Transit, no Ridehail				
No frequent nor infrequent rail within 3 miles	1,488	1,232,273	47.0%	30.8%
Frequent rail > 3 miles, infrequent rail 0.5 - 3 miles	390	702,840	12.3%	17.6%
Infrequent rail > 3 miles, frequent rail 0.5 - 3 miles	640	1,024,572	20.2%	25.6%
Both frequent and infrequent rail 0.5 - 3 miles	305	469,723	9.6%	11.8%
Frequent rail > 3 miles, infrequent rail < 0.5 miles	23	34,246	0.7%	0.9%
Frequent rail 0.5 - 3 miles, infrequent rail < 0.5 miles	11	16,029	0.3%	0.4%
Frequent rail < 0.5 miles, infrequent rail > 3 miles	122	175,732	3.9%	4.4%
Frequent rail < 0.5 miles, Infrequent rail 0.5 - 3 miles	169	308,486	5.3%	7.7%
Both frequent and infrequent rail <0.5 miles	15	31,647	0.5%	0.8%
Both Transit and Ridehail				
No frequent nor infrequent rail within 3 miles	419	381,442	28.2%	17.7%
Frequent rail > 3 miles, infrequent rail 0.5 - 3 miles	170	301,207	11.5%	14.0%
Infrequent rail > 3 miles, frequent rail 0.5 - 3 miles	314	528,459	21.2%	24.5%
Both frequent and infrequent rail 0.5 - 3 miles	257	408,961	17.3%	19.0%
Frequent rail > 3 miles, infrequent rail < 0.5 miles	19	24,730	1.3%	1.1%
Frequent rail 0.5 - 3 miles, infrequent rail < 0.5 miles	12	19,054	0.8%	0.9%
Frequent rail < 0.5 miles, infrequent rail > 3 miles	92	194,640	6.2%	9.0%
Frequent rail < 0.5 miles, Infrequent rail 0.5 - 3 miles	167	246,757	11.3%	11.5%
Both frequent and infrequent rail <0.5 miles	34	49,734	2.3%	2.3%

Note: Distances to rail service are straight-line distances from a household's residential location.

Table 4. California 2017 NHTS population by Rider Type and proximity to Stations

Shares of the population that use ridehailing or transit by proximity to station areas

(2017 NHTS, California Sample)

	Count		Share within group	
Rider Types by Habitual Use	Unweighted	Weighted	Unweighted	Weighted
No frequent nor infrequent rail within 3 miles				
Neither Ridehail nor Transit	21,888	15,720,099	87.5%	85.9%
Ridehail, no transit	1,214	974,994	4.9%	5.3%
Transit, no Ridehail	1,488	1,232,273	5.9%	6.7%
Both Transit and Ridehail	419	381,442	1.7%	2.1%
No frequent rail within 3 miles, within 0.5 - 3 miles of infrequent rail				
Neither Ridehail nor Transit	3,713	5,984,526	79.9%	79.9%
Ridehail, no transit	376	500,964	8.1%	6.7%
Transit, no Ridehail	390	702,840	8.4%	9.4%
Both Transit and Ridehail	170	301,207	3.7%	4.0%
No infrequent rail within 3 miles, within 0.5 - 3 miles of frequent rail				
Neither Ridehail nor Transit	3,826	5,060,292	71.8%	68.5%
Ridehail, no transit	549	771,763	10.3%	10.5%
Transit, no Ridehail	640	1,024,572	12.0%	13.9%
Both Transit and Ridehail	314	528,459	5.9%	7.2%
Within 0.5 - 3 miles of both frequent and infrequent rail				
Neither Ridehail nor Transit	1,059	1,783,894	57.5%	60.8%
Ridehail, no transit	222	271,140	12.0%	9.2%
Transit, no Ridehail	305	469,723	16.5%	16.0%
Both Transit and Ridehail	257	408,961	13.9%	13.9%
No frequent rail within 3 miles, within 0.5 miles of infrequent rail				
Neither Ridehail nor Transit	177	311,663	72.8%	77.2%
Ridehail, no transit	24	32,915	9.9%	8.2%
Transit, no Ridehail	23	34,246	9.5%	8.5%
Both Transit and Ridehail	19	24,730	7.8%	6.1%
Frequent rail within 0.5 - 3 miles, infrequent rail within 0.5 miles				
Neither Ridehail nor Transit	42	103,035	56.0%	62.7%
Ridehail, no transit	10	26,239	13.3%	16.0%
Transit, no Ridehail	11	16,029	14.7%	9.8%
Both Transit and Ridehail	12	19,054	16.0%	11.6%
Within 0.5 miles of frequent rail, no infrequent rail 3 miles				
Neither Ridehail nor Transit	464	724,482	61.6%	61.0%
Ridehail, no transit	75	93,048	10.0%	7.8%
Transit, no Ridehail	122	175,732	16.2%	14.8%
Both Transit and Ridehail	92	194,640	12.2%	16.4%
Within 0.5 miles of frequent rail, infrequent rail within 0.5 - 3 miles				
Neither Ridehail nor Transit	302	477,805	41.3%	41.8%
Ridehail, no transit	93	111,074	12.7%	9.7%
Transit, no Ridehail	169	308,486	23.1%	27.0%
Both Transit and Ridehail	167	246,757	22.8%	21.6%
Within 0.5 miles of both frequent and infrequent rail services				
Neither Ridehail nor Transit	24	33,838	28.2%	26.5%
Ridehail, no transit	12	12,511	14.1%	9.8%
Transit, no Ridehail	15	31,647	17.6%	24.8%
Both Transit and Ridehail	34	49,734	40.0%	38.9%

Note: Distances to rail service are straight-line distances from a household's residential location.

SACOG Replica

Descriptive statistics for the SACOG Replica data are presented in **Table** 5. As is the case in the 2017 NHTS, the population of "individuals" in the SACOG Replica model who use both ridehail and transit more closely resemble exclusive transit users than they do exclusive ridehail users or users of neither mode – and use transit more than do the exclusive transit users. Unlike in the NHTS, the users of both ridehail and transit appear to be poorer than other rider types, and do not skew toward being more educated or more likely to be male.

Table 5. Characteristics of Transit and Ridehail Users in SACOG Replica

	Transit: No, Ridehail: No		Transit: Yes, Ridehail: No		Transit: No, Ridehail: Yes		Transit: Yes, Ridehail: Yes	
Sex	**Count**	**Share**	**Count**	**Share**	**Count**	**Share**	**Count**	**Share**
Male	961,454	49.1%	83,142	46.8%	35,203	47.0%	12,037	44.1%
Female	997,752	50.9%	94,529	53.2%	39,640	53.0%	15,262	55.9%
Race	**Count**	**Share**	**Count**	**Share**	**Count**	**Share**	**Count**	**Share**
White	1,318,163	67.3%	101,399	57.1%	50,023	66.8%	15,785	57.8%
Black or African American	122,556	6.3%	19,109	10.8%	5,089	6.8%	3,952	14.5%
Asian	248,568	12.7%	30,489	17.2%	9,686	12.9%	3,768	13.8%
American Indian or Alaska Native	13,776	0.7%	1,475	0.8%	719	1.0%	367	1.3%
Native Hawaiian or Pacific Islander	16,212	0.8%	1,643	0.9%	476	0.6%	149	0.5%
Some other race	121,659	6.2%	13,810	7.8%	4,228	5.6%	1,898	7.0%
More than one race	118,272	6.0%	9,746	5.5%	4,622	6.2%	1,380	5.1%
Ethnicity	**Count**	**Share**	**Count**	**Share**	**Count**	**Share**	**Count**	**Share**
Not Latino or Hispanic	1,537,165	78.5%	138,297	77.8%	58,905	78.7%	21,413	78.4%
Latino or Hispanic	422,041	21.5%	39,374	22.2%	15,938	21.3%	5,886	21.6%
Education	**Count**	**Share**	**Count**	**Share**	**Count**	**Share**	**Count**	**Share**
No School	217,658	11.1%	23,592	13.3%	10,445	14.0%	3,985	14.6%
K-12 but less than High School	504,007	25.7%	29,152	16.4%	22,077	29.5%	5,664	20.7%
High School Diploma	364,682	18.6%	38,503	21.7%	13,191	17.6%	6,317	23.1%
Some College	572,273	29.2%	58,642	33.0%	19,144	25.6%	7,909	29.0%
Bachelors Degree or higher	300,586	15.3%	27,782	15.6%	9,986	13.3%	3,424	12.5%
Household Income (in Dollars)	**Value**		**Value**		**Value**		**Value**	
1st Percentile	0		0		4,052		2,531	
5th Percentile	10,130		0		11,144		8,030	
25th Percentile	41,433		21,508		29,988		16,412	
50th Percentile	80,300		52,681		67,877		32,976	
75th Percentile	133,834		101,309		126,521		75,616	
95th Percentile	255,678		205,396		267,668		192,461	
99th Percentile	543,814		356,800		562,460		339,754	
Age	**Value**		**Value**		**Value**		**Value**	
1st Percentile	5		4		3		3	
5th Percentile	8		16		4		15	
25th Percentile	22		25		19		32	
50th Percentile	39		43		39		52	
75th Percentile	57		61		62		70	
95th Percentile	78		82		85		89	
99th Percentile	88		94		94		94	
Weekly Transit Trips	**Value**		**Value**		**Value**		**Value**	
1st Percentile	0		1		0		1	
5th Percentile	0		1		0		1	
25th Percentile	0		1		0		1	
50th Percentile	0		1		0		2	
75th Percentile	0		3		0		5	
95th Percentile	0		9		0		11	
99th Percentile	0		14		0		15	
Weekly Ridehail Trips	**Value**		**Value**		**Value**		**Value**	
1st Percentile	0		0		1		1	
5th Percentile	0		0		1		1	
25th Percentile	0		0		1		1	
50th Percentile	0		0		1		1	
75th Percentile	0		0		2		2	
95th Percentile	0		0		4		4	
99th Percentile	0		0		6		6	

Complementarity Regressions

Having found hints of differences in demographics between the four types of riders, we move on to the next question: After accounting for differences in transit usage based on demographic and location information, how much of cross-sectional variation in transit ridership can be explained using information on respondents' use of ridehailing? We estimate models using Ordinary Least Squares ("OLS") regression, doing so separately for the large sample size of the Nationwide 2017 NHTS and the detailed location information available for the smaller California sample. While the dependent variables are count data (number of days) or binary (any use) we use OLS because the coefficients allow easy interpretations of magnitudes, which we discuss later. The standard errors for OLS will be biased and so the hypothesis tests should be interpreted with that caution. Lastly, we test whether patterns emerging from the NHTS are also present in the SACGOG Replica travel simulation.

2017 NHTS (Nationwide)

The table below lists coefficients for our complementarity regressions based on the nationwide NHTS sample, weighted using the NHTS's person expansion weights.[18]

Table 6. Complementarity Regressions on Nationwide NHTS data

Dependent Variable:	Transit # of Days in Past 30 Days	Transit Any Use in Past 30 Days	Rideshare # of Trips in Past 30 Days	Rideshare Any Use in Past 30
MSA Size (versus not in an MSA)				
In an MSA of Less than 250,000	0.0214	0.00501	-0.192***	-0.0
	(0.0837)	(0.00569)	(0.0182)	
In an MSA of 250,000 - 499,999	0.0631	0.0134**	-0.130***	
	(0.0845)	(0.00648)	(0.0225)	
In an MSA of 500,000 - 999,999	-0.0511	-0.00188	-0.116***	
	(0.0797)	(0.00558)	(0.0227)	
In an MSA or CMSA of 1,000,000 - 2,999,999	-0.00226	0.0166***	-0.00082	
	(0.0767)	(0.00559)	(0.0	
In an MSA or CMSA of 3 million or more	1.479***	0.108***		
	(0.0839)	(0.00559)		
Urban Status (versus not in an urban area)				
In an urban area	0.435***	0.0443***		
	(0.0479)	(0.00389)		
In an Urban cluster	-0.216***	-0.0003		
	(0.0674)	(0.0		
In an area surrounded by urban areas	-0.0768			
	(0.790)			
Annual Household Income (versus <$10,000)				
$10,000 to $14,999	0.229			
	(0.264)			
$15,000 to $24,999	0.492*			
	(0.			
$25,000 to $25,999				
$35,000 to $49,999				
$50,000 to $74,999				
$75,000 to $99,999				
$100,000 to $124,999				
$125,000 to $149				
$150,000				
$2				

[18] For results of the same regression specification on unweighted data, see **Appendix D**.

Table 6. Complementarity Regressions on Nationwide NHTS data (continued)

Dependent Variable:	Transit # of Days in Past 30 Days	Transit Any Use in Past 30 Days	Rideshare # of Trips in Past 30 Days	Rideshare Any Use in Past 30 D
Age in years	-0.0228***	-0.00110***	-0.0128***	-0.00241*
	(0.00157)	(9.11e-05)	(0.000511)	(7.32e
Race (versus White)				
Black or African American	0.825***	0.0441***	-0.0980***	
	(0.131)	(0.00676)	(0.0359)	
Asian	0.447**	0.0193**	-0.130**	
	(0.180)	(0.00845)	(0.0524)	
American Indian or Alaska Native	0.390	0.0276	-0.0413	
	(0.276)	(0.0184)	(0.181)	
Native Hawaiian or other Pacific Islander	0.776	-0.00568	-0.07	
	(0.523)	(0.0167)	(0	
More than one race	0.0220	0.0284***		
	(0.146)	(0.00945)		
Some other race	0.131	0.0355***		
	(0.170)	(0.0106)		
Hispanic or Latino	0.0387	-0.00913		
	(0.105)	(0.00583)		
Sex: Female	-0.236***	-0.0089		
	(0.0581)	(0.0		
Education (versus "less than high school")				
High school graduate or GED	0.397***			
	(0.136)			
Some college or associates degree	0.670***			
	(0.134)			
Bachelor's degree	1.143***			
	(0.135			
Graduate degree or professional degree	1.54			
Driver: No				
Access to a motor vehicle				
Rideshare (# of trips in past 30 days)				
Rideshare (dummy for any usage i				
Transit (# of days out of pas				
Transit (dummy for a				
Constant Term				
Observa				
R-sq				
R				

Controlling for the size of the metropolitan area a respondent lives in, whether or not their location is urban, their age, household income, race, education, gender, ethnicity, driver status, and access to vehicles within their household, we find evidence for complementarity between the two modes: Respondents who reported at least one ridehailing trip in the past 30 days are 24.2 percentage points more likely to also have reported using public transit on at least one of the past 30 days. Similarly, respondents who reported using transit in the past 30 days are 17.8 percentage points more likely to have also reported using ridehail services during the same period, all else held equal. The same relationships hold when using continuous rather than binary measures for usage of each mode: Each additional ridehailing trip in the 30 days prior is associated with 0.39 additional days of transit usage, while each additional day of using transit is associated with 0.05 additional ridehailing trips during the same period.[19]

2017 NHTS (California)

Our previous specification of the complementarity regression allows us only to estimate a single coefficient for the relationship between individuals' ridehailing usage and public transit usage. The inclusion of detailed geoinformation on household locations in the California subsample of the 2017 NHTS allows us to evaluate the degree of complementarity between ridehailing and transit depending on where in relation to transit service a survey respondent lives. We do so by interacting the variable of interest – in this case, a respondent's ridehailing usage – and a set of dummy variables capturing different types of proximity between individuals' home locations and rail stations. In this case, we use the distance dummy variables described in the Data Processing section above. This allows for separate coefficients to capture both a) the complementarity between ridehailing and transit usage that exists regardless of a household's relation to rail (the "main effect", analogous to the complementarities estimated using the Nationwide 2017 NHTS) and b) the additional complementarities that exists for individuals living within half a mile of frequent rail, within half a mile of infrequent rail service, between half a mile and three miles from frequent rail service, and between half a mile and three miles from infrequent rail service.[20] Coefficients for both the effect of proximity to stations on transit (or ridehail) usage and for the complementarity between ridehailing and transit usage are presented on the next pages in **Tables 7 and 8**.

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[19] Coefficients presented in this paragraph are based on the five-day person expansion weights and robust standard errors. Estimating the same regression models without any weighting scheme returns results that are marginally smaller in magnitude, but identical in signs and significance levels – see Appendix.

[20] Note that there are some overlaps between spatial regimes in these specifications, as households can be both within half a mile (or within the band between half a mile and three miles) of one type of transit and within a certain radius of the other type.

Table 7. Complementarity Regressions, California NHTS, Transit Dependent Variables[21]

Dependent Variable: Independent Variable:	Transit Continuous (No Interaction Terms) Ridehail Continuous	Transit Continuous (With Interaction Terms) Ridehail Continuous	Transit Dummy (No Interaction Terms) Ridehail Dummy	Transit Dummy (With Interactio Rideha
Proximity to Rail Transit Service				
<0.5 Miles to Frequent Rail		3.384***		
		(0.432)		
0.5 - 3 Miles to Frequent Rail		1.283***		
		(0.148)		
<0.5 Miles to Infrequent Rail		1.358***		
		(0.514)		
0.5 - 3 Miles to Infrequent Rail		0.757***		
		(0.137)		
Rideshare (# of trips in past 30 days or Dummy)				
Main Effect	0.312***	0		
	(0.0523)			
Interaction: <0.5 Miles to Frequent Rail				
Interaction: 0.5 - 3 Miles to Frequent Rail				
Interaction: <0.5 Miles to Infrequent Rail				
Interaction: 0.5 - 3 Miles to Infrequent Rail				
Constant Term				
Control Variables				
Observation				
R-squar				
Ro				

[21] All regressions in this table use person expansion weights from the NHTS. For a full table of coefficients including all control variables, see **Appendix E.**

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Table 8. Complementarity Regressions on California NHTS, Ridehail Dependent Variables[22]

Similar magnitudes of complementarity to those observed in the nationwide NHTS data emerge when estimating a model with the same specification using the California subsample of the 2017 NHTS, as is presented in **Tables 7 and 8**: All else held equal, respondents who reported taking at least one ridehail trip in the past 30 days are 24.2 percentage points more likely to have also reported at least one day of transit usage during the same time frame, and each ridehail trip taken in the past 30 days is associated with an additional 0.31 days of using public transit.

Our model suggests that NHTS survey respondents living near rail stations are far more likely to use transit and also far more likely to use ridehail than those who do not live near any kind of rail. It is less conclusive on whether the degree of complementarity between transit and ridehail varies depending spatial relationship between an individual's home location and the nearest station: Controlling for proximity to rail does not eliminate the statistically significant positive association between transit usage and ridehail usage. At the same time, only few of the interaction terms are statistically significant, implying that unlike usage, the degree of complementarity between modes does not vary a whole lot across space.

SACOG Replica

We perform the similar specifications as for the California 2017 NHTS subsample using the SACOG Replica data, modeling transit usage as a function of a person's age, sex, race and ethnicity, education level, household income, and whether they use ridehailing services – the outputs of which are presented

[22] All regressions in this table use person expansion weights from the NHTS. For a full table of coefficients including all control variables, see **Appendix F.**

in **Table 9**. The same picture emerges for both dummy variables indicating whether an individual ever uses transit or ever uses ridehail service and for continuous measurements counting the number of times an individual uses either mode: Controlling for all other factors available in the SACOG replica data, use of ridehail services is associated with a 17.7 percentage point increase in the likelihood of using public transit, and each ridehailing trip is associated with 0.304 additional trips conducted by public transit.

Allowing for different relationships between ridehail usage and transit usage depending on individuals' home locations and additionally controls for individuals' locations, we find far stronger complementarity between ridehailing and transit in locations close to rail than in locations further away from rail service. Further, we find that proximity to frequent rail is associated with greater complementarity between modes than is proximity to infrequent rail. While the baseline degree of complementarity – observed across the entire population regardless of home location - drops from a 17.1 to a 11.1 percentage point increase of likelihood of transit usage associated with ridehail usage, any use of ridehail services is associated with an additional 11.9 percentage points in the likelihood of using transit among individuals who live within half a mile of frequent rail service.

Table 9. Complementarity Regressions on SACOG Replica Data

Dependent Variable: **Ridehail Variable:**	Weekly Transit Trips Weekly Ridehail Trips	Weekly Transit Trips Weekly Ridehail Trips	Dummy for Any Transit Dummy for Any Ridehail	Dummy for Any Transit Dummy for Any Ridehail
Age in years	0.002	0.002	0.001	0.001
	(0.00004)	(0.00004)	(0.00001)	(0.00001)
Female	0.011	0.012	0.005	0.005
	(0.002)	(0.002)	(0.0004)	(0.0004)
Race (versus White)				
American Indian or Alaska Native	0.046	0.030	0.019	0.013
	(0.009)	(0.009)	(0.002)	(0.002)
Asian	0.170	0.146	0.045	0.035
	(0.002)	(0.002)	(0.001)	(0.001)
Black or African American	0.318	0.243	0.069	0.040
	(0.003)	(0.003)	(0.001)	(0.001)
Native Hawaiian or other Pacific Islander	0.023	-0.032	0.024	-0.0001
	(0.009)	(0.009)	(0.002)	(0.002)
Some other Race	0.092	0.044	0.026	0.008
	(0.004)	(0.004)	(0.001)	(0.001)
More than One Race	0.052	0.034	0.016	0.008
	(0.003)	(0.003)	(0.001)	(0.001)
Hispanic or Latino	0.019	0.007	0.012	0.007
	(0.002)	(0.002)	(0.001)	(0.001)
Household Income (in $)	-0.00000	-0.00000	-0.00000	-0.00000
	(0.000)	(0.000)	(0.000)	(0.000)
Education (versus "no school")				
Bachelors Degree or higher	-0.027	-0.021	-0.011	-0.009
	(0.003)	(0.003)	(0.001)	(0.001)
High School Diploma	-0.053	-0.012	-0.014	-0.002
	(0.003)	(0.003)	(0.001)	(0.001)
K-12	-0.151	-0.092	-0.044	-0.027
	(0.003)	(0.003)	(0.001)	(0.001)
Some College	-0.036	-0.005	-0.012	-0.002
	(0.003)	(0.003)	(0.001)	(0.001)
Proximity to Rail Transit Service				
<0.5 Miles to Frequent Rail		0.813		0.275
		(0.003)		(0.001)
<0.5 Miles to Infrequent Rail		0.519		0.133
		(0.009)		(0.002)
0.5 - 3 Miles to Frequent Rail		0.123		0.053
		(0.002)		(0.0004)
0.5 - 3 Miles to Infrequent Rail		0.305		0.073
		(0.002)		(0.001)
Rideshare (Weekly # of trips or Dummy)				
Main Effect	0.304	0.115	0.177	0.111
	(0.002)	(0.003)	(0.001)	(0.001)
Interaction: <0.5 Miles to Frequent Rail		0.742		0.119
		(0.007)		(0.003)
Interaction: <0.5 Miles to Infrequent Rail		-0.018		0.039
		(0.015)		(0.008)
Interaction: 0.5 - 3 Miles to Frequent Rail		0.329		0.090
		(0.004)		(0.002)
Interaction: 0.5 - 3 Miles to Infrequent Rail		0.051		0.012
		(0.005)		(0.002)
Constant Term	0.260	0.055	0.085	0.021
	(0.004)	(0.004)	(0.001)	(0.001)
Observations	2,239,019	2,239,019	2,239,019	2,239,019
R-squared	0.027	0.077	0.037	0.106

(Standard Errors in Parentheses)

Residual Complementarity Models

While the complementarity models document statistically significant associations between ridehail usage and transit usage at the person-level, they do not provide information on whether this observed complementarity is due to anything about the modes themselves, or due to unobserved preferences among individuals For example, persons might have preferences toward an urban or car-free lifestyle which would create an association between ride-hailing and transit use at the individual level, even if the two modes did not complement each other in any way.

To test for the role of unobserved preferences, we take a two-stage approach: In the first stage, we model ridehailing behavior as a function of all variables included in the complementarity regressions, and then in the second stage we model transit use as a function of 1) all variables included in the complementarity regressions, 2) predicted ridehail usage,[23] and 3) residual ridehail usage. In doing so, we understand residual ridehail usage – that is, ridehail usage (or non-usage) that cannot be explained by the land use, demographic, and location information included as independent variables in the first stage – to reflect individuals' preferences. Assuming this attribution is correct, a statistically significant positive association between residual ridehail usage and transit usage would suggest that the same preferences motivating ridehail usage also motivate riding public transit.

Table 10 displays the coefficients for the first and second stages of the residual regression described respectively, using both the Nationwide and California samples of the 2017 NHTS. Due to the California sample including detailed information on respondents' home locations, we are able to additionally include information on proximity to frequent and infrequent rail service (as defined in the Data Processing section above) in both the first and second stages of the model. Regardless of whether or not we control for proximity to rail service, we find strong statistically positive associations between residual ridehail usage and transit usage.

Table 10. Residual Regressions on Nationwide and California 2017 NHTS Data

Scope:	Nationwide NHTS		California NHTS		California NHTS	
Transit Proximity Controls:	No		No		Yes	
Dependent Variable:	Ridehail Dummy	Transit Dummy	Ridehail Dummy	Transit Dummy	Ridehail Dummy	Transit Dummy
Stage:	**1**	**2**	**1**	**2**	**1**	**2**
MSA Size (versus not in an MSA)						
In an MSA of Less than 250,000	-0.0372***	-0.00400	-0.000577	-0.00267	0.00580*	0.0127
	(0.00375)	(0.00569)	(0.00341)	(0.0127)	(0.00335)	(0.0127)
In an MSA of 250,000 - 499,999	-0.0185***	0.00888	-0.00837***	0.0153	-0.00288	0.0263**
	(0.00453)	(0.00648)	(0.00235)	(0.0105)	(0.00222)	(0.0104)
In an MSA of 500,000 - 999,999	-0.0236***	-0.00759	-0.00513**	-0.0172**	0.00155	-0.00271
	(0.00413)	(0.00558)	(0.00258)	(0.00816)	(0.00248)	(0.00800)
In an MSA or CMSA of 1,000,000 - 2,999,999	0.0104**	0.0191***	-0.00392	0.00432	-0.0206***	-0.0308***
	(0.00416)	(0.00559)	(0.00297)	(0.00865)	(0.00357)	(0.00894)
In an MSA or CMSA of 3 million or more	0.0572***	0.122***	0.0185***	0.0357***	0.00644**	0.00891
	(0.00407)	(0.00557)	(0.00262)	(0.00820)	(0.00261)	(0.00794)
Urban Status (versus not in an urban area)						
In an urban area	0.0554***	0.0577***	0.00621**	0.0175*	-0.00246	-0.00367
	(0.00285)	(0.00389)	(0.00252)	(0.00918)	(0.00260)	(0.00922)
In an Urban cluster	-0.00348	-0.00121	-0.000890	-0.0154*	-0.000734	-0.0153*
	(0.00292)	(0.00499)	(0.00237)	(0.00910)	(0.00222)	(0.00895)
In an area surrounded by urban areas	-0.0396	-0.0399	-0.00399	-0.0175	0.00136	-0.0164
	(0.0412)	(0.0404)	(0.0146)	(0.0181)	(0.0172)	(0.0216)

[23] If performed correctly, the estimation procedure should drop predicted ridehailing out of the model out due to multicollinearity, since it is a perfect linear combination of the independent variables included in the first stage.

Table 10. Residual Regressions on Nationwide and California 2017 NHTS Data (continued)

Scope:	Nationwide NHTS		California NHTS		California NHTS	
Transit Proximity Controls:	No		No		Yes	
Dependent Variable:	Ridehail Dummy	Transit Dummy	Ridehail Dummy	Transit Dummy	Ridehail Dummy	Transit Dummy
Stage:	**1**	**2**	**1**	**2**	**1**	**2**
Annual Household Income (versus <$10,000)						
$10,000 to $14,999	0.0115	-0.0116	-0.00425	-0.0411*	-0.00558	-0.0435*
	(0.00816)	(0.0130)	(0.00676)	(0.0236)	(0.00651)	(0.0231)
$15,000 to $24,999	0.0219***	-0.0191*	0.00875	-0.0472**	0.0102	-0.0436**
	(0.00769)	(0.0115)	(0.00726)	(0.0189)	(0.00685)	(0.0186)
$25,000 to $25,999	0.0134*	-0.0308***	0.00773	-0.0310	0.00614	-0.0339*
	(0.00774)	(0.0110)	(0.00726)	(0.0189)	(0.00694)	(0.0186)
$35,000 to $49,999	0.0233***	-0.0390***	0.0135*	-0.0471***	0.0129*	-0.0492***
	(0.00762)	(0.0106)	(0.00716)	(0.0172)	(0.00683)	(0.0170)
$50,000 to $74,999	0.0193***	-0.0423***	0.0200***	-0.0426**	0.0187**	-0.0462***
	(0.00745)	(0.0103)	(0.00762)	(0.0170)	(0.00728)	(0.0168)
$75,000 to $99,999	0.0188**	-0.0464***	0.0241***	-0.0486***	0.0250***	-0.0480***
	(0.00771)	(0.0104)	(0.00806)	(0.0172)	(0.00770)	(0.0170)
$100,000 to $124,999	0.0124	-0.0474***	0.0153*	-0.0418**	0.0152*	-0.0430**
	(0.00794)	(0.0109)	(0.00824)	(0.0178)	(0.00787)	(0.0175)
$125,000 to $149,999	0.0477***	-0.0310***	0.0229**	-0.0485***	0.0243***	-0.0471***
	(0.00954)	(0.0116)	(0.00957)	(0.0182)	(0.00921)	(0.0179)
$150,000 to $199,999	0.0660***	-0.00348	0.0298***	-0.0435**	0.0323***	-0.0389**
	(0.00999)	(0.0120)	(0.00960)	(0.0176)	(0.00919)	(0.0174)
$200,000 or more	0.146***	0.0232*	0.0592***	-0.00937	0.0579***	-0.0117
	(0.0102)	(0.0121)	(0.0103)	(0.0183)	(0.00988)	(0.0180)
Age in years	-0.00273***	-0.00176***	-0.000949***	-0.00101***	-0.000889***	-0.000908***
	(7.59e-05)	(9.09e-05)	(8.18e-05)	(0.000133)	(7.87e-05)	(0.000131)
Race (versus White)						
Black or African American	-0.0159***	0.0402***	-0.00910	0.0176	-0.0111	0.0145
	(0.00523)	(0.00675)	(0.00761)	(0.0126)	(0.00745)	(0.0126)
Asian	-0.0239***	0.0135	-0.0163***	-0.00282	-0.0194***	-0.00833
	(0.00725)	(0.00845)	(0.00433)	(0.00760)	(0.00426)	(0.00741)
American Indian or Alaska Native	-0.0263*	0.0212	-0.00874*	-0.0148	-0.00784	-0.0108
	(0.0151)	(0.0184)	(0.00470)	(0.0202)	(0.00545)	(0.0205)
Native Hawaiian or other Pacific Islander	0.0125	-0.00265	-0.0224***	0.0133	-0.0179***	0.0259
	(0.0194)	(0.0167)	(0.00396)	(0.0273)	(0.00441)	(0.0274)
More than one race	-0.00247	0.0278***	-0.00126	0.0136	-0.00203	0.0120
	(0.00778)	(0.00945)	(0.00808)	(0.0123)	(0.00785)	(0.0121)
Some other race	-0.0103	0.0330***	-0.00222	-0.00798	-0.00294	-0.00892
	(0.00903)	(0.0106)	(0.00581)	(0.00955)	(0.00583)	(0.00959)
Hispanic or Latino	0.00650	-0.00756	-0.000663	-0.00103	-0.00141	-0.00331
	(0.00554)	(0.00584)	(0.00460)	(0.00648)	(0.00452)	(0.00639)
Sex: Female	-0.00921***	-0.0112***	-0.000927	-0.0117**	-0.000740	-0.0114**
	(0.00284)	(0.00328)	(0.00297)	(0.00484)	(0.00294)	(0.00478)
Education (versus "less than high school")						
High school graduate or GED	0.0429***	0.0166**	0.0119***	0.0270**	0.0122***	0.0279**
	(0.00443)	(0.00763)	(0.00417)	(0.0111)	(0.00423)	(0.0110)
Some college or associates degree	0.0653***	0.0385***	0.0203***	0.0323***	0.0213***	0.0342***
	(0.00476)	(0.00745)	(0.00509)	(0.0105)	(0.00509)	(0.0103)
Bachelor's degree	0.137***	0.0915***	0.0372***	0.0563***	0.0343***	0.0513***
	(0.00563)	(0.00772)	(0.00561)	(0.0108)	(0.00550)	(0.0107)
Graduate degree or professional degree	0.149***	0.135***	0.0506***	0.0829***	0.0448***	0.0719***
	(0.00606)	(0.00818)	(0.00699)	(0.0118)	(0.00676)	(0.0115)
Driver: No	-0.00444	0.139***	0.0216***	0.101***	0.0194***	0.0967***
	(0.00581)	(0.00801)	(0.00636)	(0.0117)	(0.00626)	(0.0114)
Access to a motor vehicle	-0.125***	-0.434***	-0.0754***	-0.315***	-0.0591***	-0.287***
	(0.00946)	(0.0115)	(0.0142)	(0.0247)	(0.0133)	(0.0242)

Table 10. Residual Regressions on Nationwide and California 2017 NHTS Data (continued)

Scope:	Nationwide NHTS		California NHTS		California NHTS
Transit Proximity Controls:	No		No		Yes
Dependent Variable:	Ridehail Dummy	Transit Dummy	Ridehail Dummy	Transit Dummy	Ridehail Dummy
Stage:	**1**	**2**	**1**	**2**	**1**
Proximity to Rail Transit Service					
<0.5 Miles to Frequent Rail					
0.5 - 3 Miles to Frequent Rail					
<0.5 Miles to Infrequent Rail					
0.5 - 3 Miles to Infrequent Rail					
Residual Ridehail Usage from Stage 1					
Constant Term					
Observations					
R-squared					
Rob					

Applying the same two-stage approach to the SACOG Replica data, we find the same statistical relationships and magnitudes – presented in **Table 11**: As was the case in the NHTS data, ridehail usage by any given individual that cannot be explained by their residential location or their demographic information is associated with more transit usage, suggesting that both are explained by preferences not measured in either data source.

Table 11. Residual Ridehail Regressions on SACOG Replica Data

Stage:	1	2	1	2
Dependent Variable:	Ridehail Dummy	Transit Dummy	Ridehail Dummy	Transit Dummy
Controls for Transit Proximity:	No	No	Yes	Yes
Age in years	0.0004	0.001	0.0005	0.001
	(0.00001)	(0.00001)	(0.00001)	(0.00001)
Female	0.004	0.005	0.004	0.006
	(0.0003)	(0.0004)	(0.0003)	(0.0004)
Race (versus White)				
American Indian or Alaska Native	0.018	0.022	0.017	0.015
	(0.002)	(0.002)	(0.002)	(0.002)
Asian	0.003	0.046	0.002	0.035
	(0.0004)	(0.001)	(0.0004)	(0.001)
Black or African American	0.015	0.071	0.011	0.043
	(0.001)	(0.001)	(0.001)	(0.001)
Native Hawaiian or other Pacific Islander	-0.010	0.023	-0.013	-0.003
	(0.002)	(0.002)	(0.002)	(0.002)
Some other Race	-0.003	0.025	-0.005	0.007
	(0.001)	(0.001)	(0.001)	(0.001)
More than One Race	0.003	0.016	0.002	0.008
	(0.001)	(0.001)	(0.001)	(0.001)
Hispanic or Latino	0.001	0.012	0.0001	0.007
	(0.0004)	(0.001)	(0.0004)	(0.001)
Household Income (in $)	-0.00000	-0.00000	-0.00000	-0.00000
	(0.000)	(0.000)	(0.000)	(0.000)
Education (versus "no school")				
Bachelors Degree or higher	-0.017	-0.014	-0.017	-0.012
	(0.001)	(0.001)	(0.001)	(0.001)
High School Diploma	-0.013	-0.016	-0.011	-0.003
	(0.001)	(0.001)	(0.001)	(0.001)
K-12	0.001	-0.044	0.004	-0.026
	(0.001)	(0.001)	(0.001)	(0.001)
Some College	-0.017	-0.015	-0.016	-0.005
	(0.0005)	(0.001)	(0.0005)	(0.001)
Proximity to Rail Transit Service				
<0.5 Miles to Frequent Rail			0.030	0.287
			(0.001)	(0.001)
<0.5 Miles to Infrequent Rail			0.035	0.144
			(0.002)	(0.002)
0.5 - 3 Miles to Frequent Rail			0.010	0.059
			(0.0003)	(0.0004)
0.5 - 3 Miles to Infrequent Rail			0.015	0.077
			(0.0004)	(0.001)
Residual Ridehail Usage		0.177		0.160
		(0.001)		(0.001)
Constant Term	0.040	0.092	0.029	0.023
	(0.001)	(0.001)	(0.001)	(0.001)
Observations	2,239,019	2,239,019	2,239,019	2,239,019
R-squared	0.004	0.037	0.006	0.105

Note: Standard Errors in parentheses.

Intraday Distribution of Trips

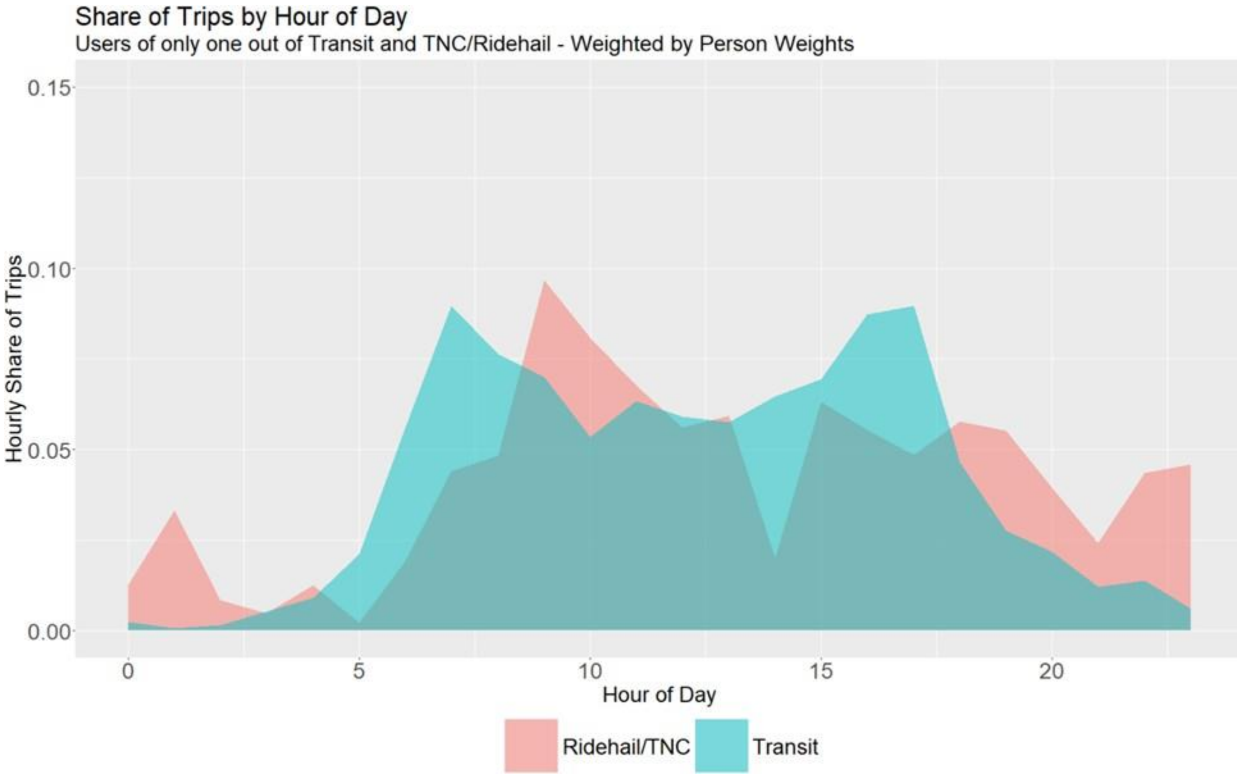
The regression models described in the preceding sections all indicate complementarity between ridehail services and transit at the person-level, with strong hints that the complementarity (or association) is due to unobserved preferences for both modes. In all specifications, usage of either mode is measured across a longer time – the previous 30 days for the NHTS, or over the course of a typical week in the SACOG Replica data. It is entirely possible for the modes to be complements when looking at all trips conducted by any given person on this longer time scale, yet still be competitors for any given trip – or that the two modes serve entirely different purposes within the same population of users altogether.

Expanding upon the analysis presented by King et al., looking at when during the day transit trips and ridehailing trips occur (King et al., 2020), we evaluate the intraday distributions of trips for both transit and ridehailing services at the hourly level, plotting them separately for users of both transit and ridehail services and for exclusive users of either mode.[24]

Figure 1. Share of Trips by Hour of Day, 2017 NHTS, Habitual users of both Transit and TNC/Ridehail

[24] In either plot, the area under the curve sums to 100% of trips conducted using that mode by the specific groups of users. Habitual users of both modes recorded a total of 2,601 transit trips and 918 transit trips, while habitual users of only one mode logged a total of 8,175 transit trips and 1,257 TNC trips in the 2017 NHTS. To account for differences in the probability of individual respondents being sampled, we multiply each trip by the expansion weight of the person taking the trip.

Figure 2. Share of Trips by Hour of Day, 2017 NHTS, Habitual users either Transit or TNC/Ridehail



As is displayed in **Figure 1**, we find that for habitual users of both modes, ridehail trips tend to occur later in the day, and that ridehailing trips do not have the same morning and evening peak patterns of usage across time that are visible in the distributions of public transit trips. This suggests that for habitual users of both modes, ridehailing may serve a set of mobility needs unmet by public transit: A substantial share of all ridehail trips occur in the evening or late at night – times of day at which transit schedules may be less frequent or pose safety concerns.

By contrast, the ridehailing and transit usage patterns of habitual users of only transit or only ridehail are somewhat more similar to each other visually **(Figure 2)**, though the same large share of evening and late night ridehail usage remains absent in transit usage. Comparing the ridehail usage of exclusive ridehail users to that of habitual users of both ridehail and transit, we see that habitual users of both modes do not exhibit the morning peak in TNC usage, further suggesting that they may be using ridehail services for different purposes than exclusive users of ridehail services.

Figure 3. Share of Trips by Hour of Day, SACOG Replica, Habitual users of both Transit and TNC

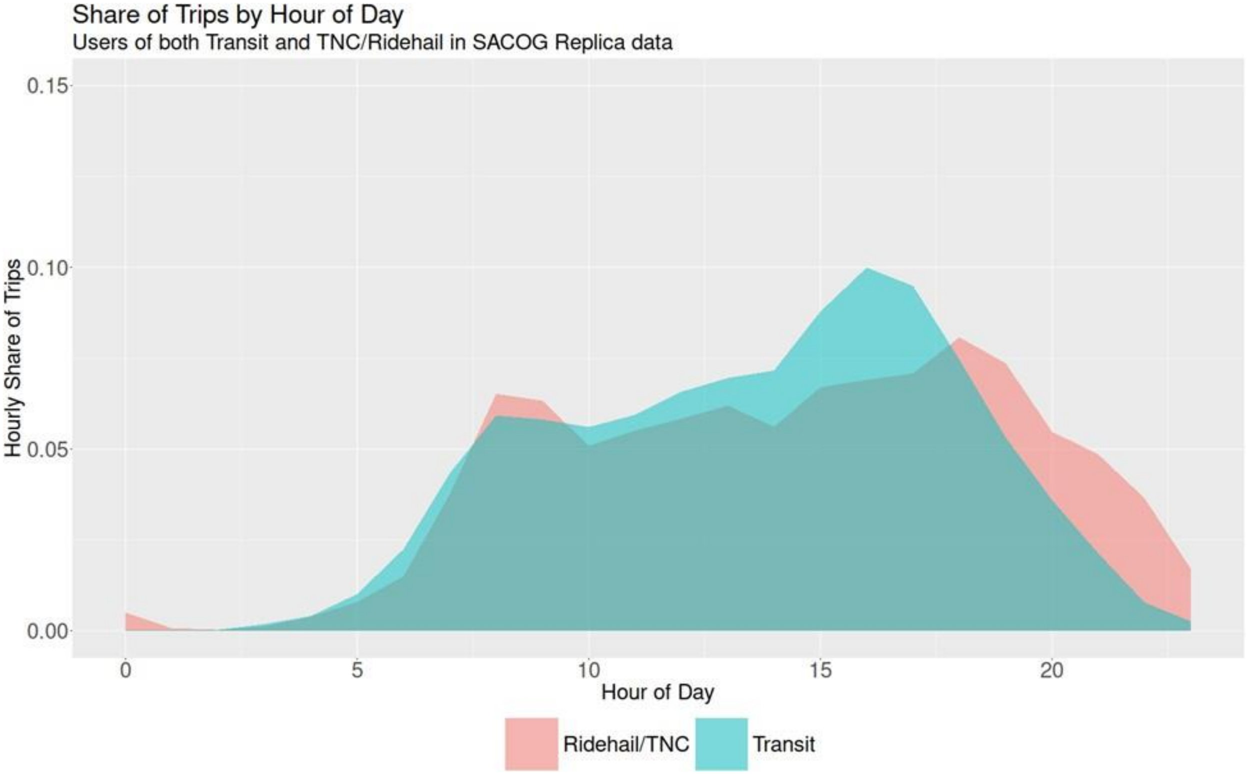
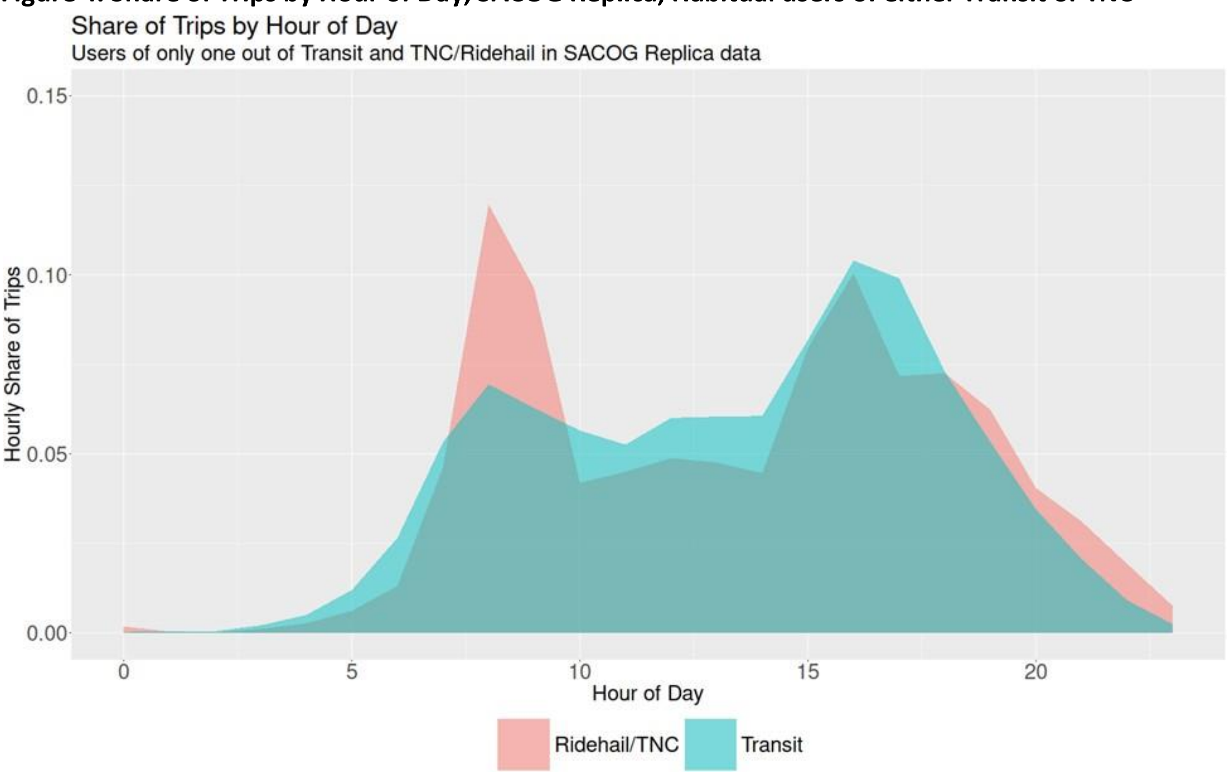


Figure 4. Share of Trips by Hour of Day, SACOG Replica, Habitual users of either Transit or TNC



Similar intraday patterns, while less pronounced, are also visible in the data from the SACOG Replica travel simulation of all trips in the Greater Sacramento Area, where once again TNC trips tend to occur later in the day than transit trips (see **Figures 3 and 4**).

Discussion and Conclusion

Our goal with this report was to evaluate at the person-level whether there appears to be a complementarity between TNC/Ridehailing services such as Uber and Lyft and public transit usage using travel diary data, and to investigate the nature of competition or complementarity between modes. The descriptive statistics of different types of rider – exclusive transit users, exclusive ridehail users, and habitual users of both modes – suggest that at least as of 2017, the two modes catered to overlapping yet distinctly different groups of people.

Ultimately, every specification of our regression analyses testing whether the use of one mode explain usage of the other returned statistically significant positive associations between ridehail usage and transit usage at the person level; no specification results in associations that are negative or statistically indistinguishable from zero. Further, we find hints that unobserved preferences toward using ridehail services may be strongly associated with using public transit, in that ridehail usage in excess of what is explained by demographic and land use factors is positively associated with transit usage. This suggests that usage of both services may be the result of the same preferences toward a car-free lifestyle.

As is noted by King et al. and confirmed in our own analysis of intraday trip distributions, it appears that any complementarity may take the form of the two modes jointly meeting riders' mobility needs at different times of day, rather than any within-trip complementarity: Ridehail trips are often part of the same tour as transit trips, do not act as first/last mile access to transit for a particularly large share of transit trips (King et al., 2020).[25]

Jointly, our findings suggest that while ridehail services may well compete with transit at the trip level – leading to the declines in transit usage observed by other researchers - they appear to be complements at the person level: Ridehailing users are more likely to also be transit users than people who do not use ridehailing services. That "within-person" complementarity is likely due to preferences for non-car modes, rather than ridehailing use that supplements transit trips (i.e. first-last mile transit access.)

One planning implication of these findings is that associations between ridehailing and transit travel might not be evidence that ridehailing is an effective transit first-last mile solution. While the nature of the NHTS and CHTS data did not allow us to directly test whether ridehail is used as part of transit tours, the evidence that ridehail and transit users have common preferences raises the possibility that the two modes are used by similar persons, rather than the two modes functioning together. We suggest that, going forward, planners be alert to this possibility, and that ridehail and transit trip-making can be associated without ridehail working as a transit first-last mile solution for transit.

Our study is not without limitations: It is important to note that the measures of land use and transit availability used in this report are simplifications, and that they may proxy the effects of other land uses that accompany stations rather than capturing any effects solely attributable to transit itself. Future

[25] In our own analysis of whether ridehailing trips in the NHTS appear to start or end close to stations, we identified merely 34 such trips (4.3% of all taxi/ridehail trips in the California 2017 NHTS sample) where a ridehail trip started or ended within 100 meters of a station with frequent or infrequent rail service.

work may use such innovations as GTFS transit schedules and accessibility modeling to determine the quality of transit services available to any given NHTS household. Additionally, there may be an opportunity to rely on sources such as OpenStreetMap to generate control variables that could capture the effects of other land uses on travel behavior. Finally, it is important to note that all our analyses undertaken in this project are cross-sectional in nature. None of the analyses involve data predating the market entry of ridehail services; prohibiting any observation of whether ridehail services such as Uber or Lyft capture riders who would otherwise have used public transit.

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Data Management Plan

Products of Research

Our research involved data from three main sources, all described in the "Data Sources" section above: The 2017 National Household Travel Survey's Nationwide public release, its California subset of respondents along with detailed geoinformation regarding household locations and trip destinations, and a proprietary trip simulation ("Replica") from the Sacramento Area Council of Governments. Further, we rely on a shapefile from Boarnet et al. (2020) to calculate the distance between California NHTS households and their respective stations.

Data Format and Content

Regression datasets and trip data are provided in Excel compatible comma separated (CSV) format. Station locations from Boarnet et al. (2020) are provided in ESRI shapefile format.

Data Access and Sharing

Data from the Nationwide 2017 NHTS are publicly available via the *summarizeNHTS* R package.[26] For reader convenience, we deposited the regression dataset and trip dataset used in this report's analyses in the public data repository. All data from the California 2017 NHTS Add-On that can be publicly released were deposited in the public data repository, as has been the shapefile from Boarnet et al. (2020). All data in the public data repository are described in greater detail in "Data description.xlsx".

SACOG Replica data were obtained via an agreement with SACOG, and therefore cannot be deposited in the public data repository.

Reuse and Redistribution

With the exception of the California 2017 NHTS's geoinformation, all data from the 2017 NHTS used in this report are available through the public data repository. Please cite this report when reusing.

Data Sources

2017 National Household Travel Survey, Nationwide Release. Retrieved via https://github.com/Westat-Transportation/summarizeNHTS.

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[26] See, https://github.com/Westat-Transportation/summarizeNHTS.

Appendix A: Descriptive Statistics for Nationwide 2017 NHTS, weighted by Person Expansion Weights

Characteristics of Transit and Ridehail Users per 2017 NHTS

(Nationwide, weighted)

	Transit: No, Ridehail: No		Transit: Yes, Ridehail: No		Transit: No, Ridehail: Yes		Transit: Yes, Ridehail: Yes	
Census Division	**Count**	**Share**	**Count**	**Share**	**Count**	**Share**	**Count**	**Share**
New England	8,715,553	4.3%	1,908,991	6.4%	499,896	3.8%	904,450	7.7%
Middle Atlantic	21,250,082	10.6%	8,263,395	27.8%	977,267	7.4%	3,221,048	27.3%
East North Central	30,761,466	15.3%	3,623,582	12.2%	1,707,447	12.9%	1,386,422	11.7%
West North Central	14,599,387	7.3%	1,223,105	4.1%	592,404	4.5%	237,640	2.0%
South Atlantic	41,227,346	20.5%	4,255,707	14.3%	3,268,580	24.7%	2,037,858	17.3%
East South Central	13,474,740	6.7%	761,783	2.6%	477,568	3.6%	162,538	1.4%
West South Central	25,837,284	12.9%	2,026,840	6.8%	1,630,099	12.3%	602,297	5.1%
Mountain	14,944,599	7.4%	1,899,864	6.4%	913,486	6.9%	638,888	5.4%
Pacific	30,063,798	15.0%	5,735,769	19.3%	3,192,712	24.1%	2,617,430	22.2%
Household Vehicle Access	**Count**	**Share**	**Count**	**Share**	**Count**	**Share**	**Count**	**Share**
Household: Does not have vehicle(s)	5,216,200	2.6%	8,615,751	29.0%	427,102	3.2%	2,660,505	22.5%
Household: Has Vehicle(s)	195,658,055	97.4%	21,083,285	71.0%	12,832,357	96.8%	9,148,065	77.5%
Household Income	**Count**	**Share**	**Count**	**Share**	**Count**	**Share**	**Count**	**Share**
Not Ascertained	24,956	0.0%	1,562	0.0%	271	0.0%	66	0.0%
I don't know	1,083,613	0.5%	384,307	1.3%	28,694	0.2%	15,056	0.1%
I prefer not to answer	4,618,959	2.3%	498,964	1.7%	172,578	1.3%	153,409	1.3%
Less than $10,000	9,755,197	4.9%	4,680,669	15.8%	503,775	3.8%	555,487	4.7%
$10,000 to $14,999	9,140,492	4.6%	2,374,014	8.0%	202,308	1.5%	421,112	3.6%
$15,000 to $24,999	17,028,026	8.5%	2,806,266	9.4%	465,128	3.5%	710,430	6.0%
$25,000 to $34,999	19,016,138	9.5%	2,538,316	8.5%	652,083	4.9%	535,363	4.5%
$35,000 to $49,999	24,837,796	12.4%	2,547,271	8.6%	1,212,736	9.1%	799,095	6.8%
$50,000 to $74,999	34,760,390	17.3%	3,469,272	11.7%	1,752,489	13.2%	1,593,976	13.5%
$75,000 to $99,999	26,963,144	13.4%	2,763,234	9.3%	1,794,689	13.5%	1,344,132	11.4%
$100,000 to $124,999	21,161,592	10.5%	2,421,362	8.2%	1,612,020	12.2%	1,151,264	9.7%
$125,000 to $149,999	11,803,357	5.9%	1,452,038	4.9%	1,231,258	9.3%	1,111,913	9.4%
$150,000 to $199,999	10,808,984	5.4%	1,835,832	6.2%	1,391,088	10.5%	1,329,041	11.3%
$200,000 or more	9,871,611	4.9%	1,925,928	6.5%	2,240,343	16.9%	2,088,226	17.7%
MSA Size	**Count**	**Share**	**Count**	**Share**	**Count**	**Share**	**Count**	**Share**
In an MSA of Less than 250,000	20,442,431	10.2%	1,832,713	6.2%	477,940	3.6%	276,675	2.3%
In an MSA of 250,000 - 499,999	19,496,279	9.7%	1,878,113	6.3%	816,911	6.2%	437,127	3.7%
In an MSA of 500,000 - 999,999	26,010,256	12.9%	2,600,999	8.8%	1,276,505	9.6%	517,637	4.4%
In an MSA or CMSA of 1,000,000 - 2,999,999	41,034,321	20.4%	5,236,558	17.6%	3,486,374	26.3%	1,812,086	15.3%
In an MSA or CMSA of 3 million or more	59,232,530	29.5%	16,680,439	56.2%	6,793,769	51.2%	8,590,039	72.7%
Not in MSA or CMSA	34,658,439	17.3%	1,470,215	5.0%	407,960	3.1%	175,006	1.5%
Urban Status	**Count**	**Share**	**Count**	**Share**	**Count**	**Share**	**Count**	**Share**
In an urban area	136,147,147	67.8%	26,690,493	89.9%	12,335,659	93.0%	11,431,150	96.8%
In an Urban cluster	21,631,918	10.8%	1,378,894	4.6%	284,317	2.1%	135,547	1.1%
In an area surrounded by urban areas	121,837	0.1%	4,314	0.0%	980	0.0%	6,864	0.1%
Not in urban area	42,973,354	21.4%	1,625,335	5.5%	638,503	4.8%	235,010	2.0%
Person: Driver Status	**Count**	**Share**	**Count**	**Share**	**Count**	**Share**	**Count**	**Share**
Driver: Yes	181,806,298	90.5%	18,629,839	62.7%	12,492,921	94.2%	9,463,164	80.1%
Driver: No	19,067,957	9.5%	11,069,197	37.3%	766,538	5.8%	2,345,406	19.9%
Person: Education Level	**Count**	**Share**	**Count**	**Share**	**Count**	**Share**	**Count**	**Share**
I don't know	120,339	0.1%	28,850	0.1%	3,075	0.0%	20,544	0.2%
I prefer not to answer	70,483	0.0%	9,265	0.0%	0	0.0%	0	0.0%
Less than a high school graduate	18,265,270	9.1%	4,235,835	14.3%	342,754	2.6%	355,319	3.0%
High school graduate or GED	48,289,097	24.0%	6,397,226	21.5%	1,324,691	10.0%	743,536	6.3%
Some college or associates degree	63,080,652	31.4%	7,108,972	23.9%	3,040,992	22.9%	2,107,342	17.8%
Bachelor's degree	40,485,599	20.2%	5,891,465	19.8%	4,806,061	36.2%	4,299,523	36.4%
Graduate degree or professional degree	30,562,815	15.2%	6,027,422	20.3%	3,741,886	28.2%	4,282,306	36.3%
Person: Hispanic or Latino	**Count**	**Share**	**Count**	**Share**	**Count**	**Share**	**Count**	**Share**
I don't know	9,080	0.0%	6,224	0.0%	0	0.0%	1,691	0.0%
Refused	175,871	0.1%	42,708	0.1%	6,257	0.0%	18,951	0.2%
Hispanic or Latino: Yes	30,655,372	15.3%	6,018,555	20.3%	2,713,423	20.5%	1,857,441	15.7%
Hispanic or Latino: No	170,033,933	84.6%	23,631,550	79.6%	10,539,778	79.5%	9,930,488	84.1%
Person: Race	**Count**	**Share**	**Count**	**Share**	**Count**	**Share**	**Count**	**Share**
I don't know	434,002	0.2%	104,180	0.4%	18,333	0.1%	12,843	0.1%
Refused	947,928	0.5%	194,920	0.7%	91,809	0.7%	80,736	0.7%
White	151,783,851	75.6%	16,525,276	55.6%	9,885,516	74.6%	7,973,319	67.5%
Black or African American	22,187,840	11.0%	6,960,630	23.4%	1,276,952	9.6%	1,450,279	12.3%
Asian	9,262,240	4.6%	2,417,840	8.1%	892,774	6.7%	1,184,228	10.0%
American Indian or Alaska Native	1,710,193	0.9%	290,138	1.0%	40,664	0.3%	95,607	0.8%
Native Hawaiian or other Pacific Islander	593,341	0.3%	67,869	0.2%	46,330	0.3%	43,007	0.4%
Multiple responses selected	6,065,079	3.0%	1,141,123	3.8%	454,910	3.4%	476,875	4.0%
Some other race	7,889,782	3.9%	1,997,060	6.7%	552,171	4.2%	491,678	4.2%

Characteristics of Transit and Ridehail Users per 2017 NHTS

(Nationwide, weighted)

Person: Sex	Transit: No, Ridehail: No Count	Transit: No, Ridehail: No Share	Transit: Yes, Ridehail: No Count	Transit: Yes, Ridehail: No Share	Transit: No, Ridehail: Yes Count	Transit: No, Ridehail: Yes Share	Transit: Yes, Count
I don't know	25,458	0.0%	1,289	0.0%	7,788	0.1%	
I prefer not to answer	147,646	0.1%	39,927	0.1%	8,804	0.1%	
Male	97,314,282	48.4%	14,100,647	47.5%	7,099,216	53.5%	
Female	103,386,869	51.5%	15,557,173	52.4%	6,143,651	46.3%	

Person: Age	Value	Value	Value
1st Percentile	16	16	17
5th Percentile	18	17	
25th Percentile	32	30	
50th Percentile	48	46	
75th Percentile	62	60	
95th Percentile	78	74	
99th Percentile	88	85	

Person: Annual Miles Driven Personally	Value	Value
1st Percentile	0	0
5th Percentile	500	
25th Percentile	5,000	
50th Percentile	10,000	
75th Percentile	15,000	
95th Percentile	30,000	
99th Percentile	60,000	

Person: Monthly Days of Transit Use	Value
1st Percentile	0
5th Percentile	
25th Percentile	
50th Percentile	
75th Percentile	
95th Percentile	
99th Percentile	

Person: Monthly Uses of Ridehai
1st Percentile
5th Percentile
25th Percentile
50th Percen
75th Pe
95t

Appendix B: Descriptive Statistics for California 2017 NHTS, weighted by Person Expansion Weights

Characteristics of Transit and Ridehail Users per 2017 NHTS
(California, weighted)

	Transit: No, Ridehail: No		Transit: Yes, Ridehail: No		Transit: No, Ridehail: Yes		Transit: Yes, Ridehail: Yes	
Census Division	Count	Share	Count	Share	Count	Share	Count	Share
Pacific	22,033,696	100.0%	3,995,548	100.0%	2,794,649	100.0%	2,154,984	100.0%
Household Vehicle Access	Count	Share	Count	Share	Count	Share	Count	Share
Household: Has Vehicle(s)	21,611,755	98.1%	3,212,063	80.4%	2,753,220	98.5%	1,884,555	87.5%
Household: Does not have Vehicle(s)	421,941	1.9%	783,486	19.6%	41,430	1.5%	270,429	12.5%
Household Income	Count	Share	Count	Share	Count	Share	Count	Share
Not Ascertained	2,467	0.0%	352	0.0%	0	0.0%	0	0.0%
I don't know	172,407	0.8%	57,911	1.4%	9,745	0.3%	1,658	0.1%
I prefer not to answer	365,210	1.7%	63,133	1.6%	25,526	0.9%	9,420	0.4%
Less than $10,000	1,009,433	4.6%	582,631	14.6%	94,876	3.4%	92,805	4.3%
$10,000 to $14,999	879,100	4.0%	317,578	7.9%	32,666	1.2%	61,153	2.8%
$15,000 to $24,999	1,874,015	8.5%	421,881	10.6%	107,128	3.8%	119,510	5.5%
$25,000 to $34,999	2,127,896	9.7%	403,715	10.1%	109,206	3.9%	113,569	5.3%
$35,000 to $49,999	2,507,753	11.4%	260,897	6.5%	185,320	6.6%	121,604	5.6%
$50,000 to $74,999	3,448,832	15.7%	465,006	11.6%	356,683	12.8%	232,470	10.8%
$75,000 to $99,999	2,945,175	13.4%	370,301	9.3%	388,544	13.9%	290,990	13.5%
$100,000 to $124,999	2,314,357	10.5%	321,125	8.0%	320,936	11.5%	260,834	12.1%
$125,000 to $149,999	1,341,268	6.1%	183,824	4.6%	270,313	9.7%	205,852	9.6%
$150,000 to $199,999	1,547,604	7.0%	256,008	6.4%	348,804	12.5%	247,687	11.5%
$200,000 or more	1,498,180	6.8%	291,187	7.3%	544,902	19.5%	397,430	18.4%
MSA Size	Count	Share	Count	Share	Count	Share	Count	Share
In an MSA of Less than 250,000	683,246	3.1%	65,306	1.6%	44,468	1.6%	26,282	1.2%
In an MSA of 250,000 - 499,999	2,011,049	9.1%	301,267	7.5%	98,616	3.5%	54,912	2.5%
In an MSA of 500,000 - 999,999	2,554,824	11.6%	291,482	7.3%	95,989	3.4%	46,421	2.2%
In an MSA or CMSA of 1,000,000 - 2,999,999	2,708,489	12.3%	366,884	9.2%	369,382	13.2%	170,525	7.9%
In an MSA or CMSA of 3 million or more	13,482,983	61.2%	2,924,290	73.2%	2,177,239	77.9%	1,848,016	85.8%
Not in MSA or CMSA	593,105	2.7%	46,320	1.2%	8,954	0.3%	8,829	0.4%
Urban Status	Count	Share	Count	Share	Count	Share	Count	Share
In an urban area	19,633,562	89.1%	3,814,516	95.5%	2,731,333	97.7%	2,120,168	98.4%
In an Urban cluster	1,329,325	6.0%	121,324	3.0%	33,258	1.2%	15,550	0.7%
In an area surrounded by urban areas	4,785	0.0%	2,247	0.1%	81	0.0%	2,388	0.1%
Not in urban area	1,066,024	4.8%	57,461	1.4%	29,977	1.1%	16,879	0.8%
Person: Driver Status	Count	Share	Count	Share	Count	Share	Count	Share
Driver: Yes	19,473,120	88.4%	2,522,112	63.1%	2,630,307	94.1%	1,761,727	81.8%
Driver: No	2,560,576	11.6%	1,473,437	36.9%	164,342	5.9%	393,258	18.2%
Person: Education Level	Count	Share	Count	Share	Count	Share	Count	Share
I don't know	22,915	0.1%	21,923	0.5%	727	0.0%	0	0.0%
I prefer not to answer	15,427	0.1%	2,886	0.1%	0	0.0%	0	0.0%
Less than a high school graduate	2,397,985	10.9%	653,594	16.4%	88,572	3.2%	52,734	2.4%
High school graduate or GED	4,876,667	22.1%	803,911	20.1%	266,682	9.5%	120,790	5.6%
Some college or associates degree	7,262,654	33.0%	1,043,633	26.1%	778,769	27.9%	451,866	21.0%
Bachelor's degree	4,247,821	19.3%	776,000	19.4%	947,928	33.9%	746,598	34.6%
Graduate degree or professional degree	3,210,228	14.6%	693,602	17.4%	711,971	25.5%	782,996	36.3%
Person: Hispanic or Latino	Count	Share	Count	Share	Count	Share	Count	Share
I don't know	2,454	0.0%	0	0.0%	0	0.0%	0	0.0%
Refused	35,906	0.2%	15,470	0.4%	4,606	0.2%	0	0.0%
Hispanic or Latino: Yes	8,233,356	37.4%	1,508,141	37.7%	818,494	29.3%	624,859	29.0%
Hispanic or Latino: No	13,761,981	62.5%	2,471,938	61.9%	1,971,549	70.5%	1,530,125	71.0%
Person: Race	Count	Share	Count	Share	Count	Share	Count	Share
I don't know	119,236	0.5%	21,879	0.5%	8,084	0.3%	13,004	0.6%
Refused	169,340	0.8%	73,641	1.8%	44,309	1.6%	45,464	2.1%
White	13,474,775	61.2%	2,169,674	54.3%	1,834,520	65.6%	1,349,793	62.6%
Black or African American	1,150,893	5.2%	402,642	10.1%	136,494	4.9%	112,801	5.2%
Asian	3,055,728	13.9%	554,573	13.9%	361,030	12.9%	288,818	13.4%
American Indian or Alaska Native	237,708	1.1%	30,396	0.8%	19,397	0.7%	15,667	0.7%
Native Hawaiian or other Pacific Islander	199,364	0.9%	23,861	0.6%	20,455	0.7%	13,735	0.6%
Multiple responses selected	1,080,745	4.9%	233,873	5.9%	132,048	4.7%	152,502	7.1%
Some other race	2,545,907	11.6%	485,009	12.1%	238,312	8.5%	163,199	7.6%

Characteristics of Transit and Ridehail Users per 2017 NHTS
(California, weighted)

	Transit: No, Ridehail: No		Transit: Yes, Ridehail: No		Transit: No, Ridehail: Yes		Transit: Yes, Ridehail: Yes	
Person: Sex	**Count**	**Share**	**Count**	**Share**	**Count**	**Share**	**Count**	**Share**
I don't know	1,470	0.0%	1,617	0.0%	11,368	0.4%	0	0.0%
I prefer not to answer	20,177	0.1%	4,681	0.1%	3,262	0.1%	5,386	0.2%
Male	10,857,946	49.3%	1,860,922	46.6%	1,440,556	51.5%	1,090,064	50.6%
Female	11,154,104	50.6%	2,128,329	53.3%	1,339,463	47.9%	1,059,534	49.2%
Person: Age	**Value**		**Value**		**Value**		**Value**	
1st Percentile	16		16		17		17	
5th Percentile	18		18		19		20	
25th Percentile	31		32		28		28	
50th Percentile	46		48		36		34	
75th Percentile	61		62		46		43	
95th Percentile	78		77		63		64	
99th Percentile	89		85		75		74	
Person: Annual Miles Driven Personally	**Value**		**Value**		**Value**		**Value**	
1st Percentile	0		0		100		0	
5th Percentile	400		0		1,100		300	
25th Percentile	4,200		1,500		7,000		3,000	
50th Percentile	9,600		6,000		10,000		8,000	
75th Percentile	14,000		12,000		15,000		12,000	
95th Percentile	30,000		20,000		25,000		23,000	
99th Percentile	55,000		44,200		45,000		40,000	
Person: Monthly Days of Transit Use	**Value**		**Value**		**Value**		**Value**	
1st Percentile	0		1		0		1	
5th Percentile	0		1		0		1	
25th Percentile	0		2		0		2	
50th Percentile	0		4		0		5	
75th Percentile	0		15		0		15	
95th Percentile	0		30		0		26	
99th Percentile	0		40		0		32	
Person: Monthly Uses of Ridehailing services	**Value**		**Value**		**Value**		**Value**	
1st Percentile	0		0		1		1	
5th Percentile	0		0		1		1	
25th Percentile	0		0		1		2	
50th Percentile	0		0		2		3	
75th Percentile	0		0		5		7	
95th Percentile	0		0		10		20	
99th Percentile	0		0		20		30	

Appendix C: Multinomial Logistic Type-of-Rider Classification Model (2017 NHTS Nationwide)

Multinomial Logistic Regression: Type-of-rider Classification Model
(Nationwide 2017 NHTS, versus baseline of "Neither Transit nor Ridehail")

Rider Type:	Transit: Yes, Ridehail: No	Transit: No, Ridehail: Yes	Transit: Yes, Ridehail: Yes
MSA Size (versus not in an MSA)			
In an MSA of Less than 250,000	0.678***	0.842*	1.108*
	(0.074)	(0.063)	(0.048)
In an MSA of 250,000 - 499,999	0.959	1.660***	1.105*
	(0.107)	(0.121)	(0.052)
In an MSA of 500,000 - 999,999	0.794*	1.442***	1.005
	(0.086)	(0.103)	(0.046)
In an MSA or CMSA of 1,000,000 - 2,999,999	1.605***	2.163***	1.411***
	(0.166)	(0.151)	(0.063)
In an MSA or CMSA of 3 million or more	3.228***	2.537***	2.383***
	(0.325)	(0.174)	(0.099)
Urban Status (versus not in an urban area)			
In an urban area	2.862***	2.697***	1.752***
	(0.187)	(0.115)	(0.052)
In an Urban cluster	0.937	1.143*	1.186***
	(0.097)	(0.077)	(0.047)
In an area surrounded by urban areas	1.545	1.679	0.656
	(1.131)	(0.800)	(0.389)
Annual Household Income (versus <$10,000)			
$10,000 to $14,999	1.007	0.650***	0.915
	(0.111)	(0.072)	(0.043)
$15,000 to $24,999	0.940	0.710***	0.676***
	(0.093)	(0.063)	(0.030)
$25,000 to $25,999	0.931	0.714***	0.619***
	(0.092)	(0.061)	(0.029)
$35,000 to $49,999	0.872	0.803**	0.550***
	(0.083)	(0.063)	(0.025)
$50,000 to $74,999	0.951	0.836*	0.552***
	(0.083)	(0.062)	(0.023)
$75,000 to $99,999	1.056	0.962	0.593***
	(0.093)	(0.072)	(0.026)
$100,000 to $124,999	1.130	1.100	0.608***
	(0.101)	(0.082)	(0.027)
$125,000 to $149,999	1.648***	1.300***	0.689***
	(0.151)	(0.100)	(0.034)
$150,000 to $199,999	1.984***	1.613***	0.791***
	(0.178)	(0.123)	(0.038)
$200,000 or more	3.335***	2.852***	0.904*
	(0.292)	(0.212)	(0.043)
Age in years	0.947***	0.954***	0.987***
	(0.001)	(0.001)	(0.000)

Multinomial Logistic Regression: Type-of-rider Classification Model
(Nationwide 2017 NHTS, versus baseline of "Neither Transit nor Ridehail")

Rider Type:	Transit: Yes, Ridehail: No	Transit: No, Ridehail: Yes	Transit: Yes, Ridehail: Yes
Race (versus White)			
Black or African American	1.063	0.870**	1.399***
	(0.056)	(0.040)	(0.040)
Asian	0.769***	0.760***	1.156***
	(0.039)	(0.032)	(0.039)
American Indian or Alaska Native	1.162	0.934	1.231*
	(0.233)	(0.154)	(0.124)
Native Hawaiian or other Pacific Islander	1.665*	1.168	1.142
	(0.365)	(0.217)	(0.186)
More than one race	1.197*	1.000	1.298***
	(0.086)	(0.059)	(0.060)
Some other race	1.114	1.067	1.264***
	(0.103)	(0.078)	(0.068)
Hispanic or Latino	0.962	1.019	1.087**
	(0.049)	(0.039)	(0.035)
Sex: Female	0.821***	0.817***	0.884***
	(0.023)	(0.017)	(0.015)
Education (versus "less than high school")			
High school graduate or GED	2.197***	2.770***	0.904**
	(0.228)	(0.242)	(0.034)
Some college or associates degree	5.496***	5.758***	1.133***
	(0.522)	(0.471)	(0.042)
Bachelor's degree	13.956***	11.384***	1.690***
	(1.306)	(0.921)	(0.064)
Graduate degree or professional degree	20.242***	12.487***	2.356***
	(1.914)	(1.022)	(0.090)
Driver: No	2.072***	0.888	2.697***
	(0.115)	(0.054)	(0.075)
Access to a motor vehicle	0.060***	0.394***	0.120***
	(0.004)	(0.035)	(0.004)
Constant Term	0.135***	0.046***	0.529***
	(0.021)	(0.007)	(0.035)

ll:	-1.09e+05	Observations:	226,799
chi2:	45074.831	Pseudo R-squared:	0.1711

Note: Standard Errors in parentheses below coefficient estimates. * p<0.05, ** p<0.01, *** p<0.001

Appendix D: Complementarity Regressions (2017 NHTS Nationwide), unweighted

Dependent Variable:	Transit # of Days in Past 30 Days	Transit Any Use in Past 30 Days	Rideshare # of Trips in Past 30 Days	Rideshare Any Use in Past 30 Days
MSA Size (versus not in an MSA)				
In an MSA of Less than 250,000	-0.0517***	-0.000762	-0.112***	-0.0214***
	(0.0194)	(0.00175)	(0.00630)	(0.00122)
In an MSA of 250,000 - 499,999	-0.0816***	-0.00569***	-0.0526***	-0.00281*
	(0.0241)	(0.00206)	(0.00823)	(0.00168)
In an MSA of 500,000 - 999,999	-0.109***	-0.0114***	-0.0663***	-0.00756***
	(0.0231)	(0.00190)	(0.00801)	(0.00150)
In an MSA or CMSA of 1,000,000 - 2,999,999	0.0246	0.00930***	0.0540***	0.0166***
	(0.0243)	(0.00209)	(0.0103)	(0.00175)
In an MSA or CMSA of 3 million or more	0.743***	0.0655***	0.214***	0.0356***
	(0.0250)	(0.00204)	(0.00961)	(0.00159)
Urban Status (versus not in an urban area)				
In an urban area	0.233***	0.0256***	0.137***	0.0334***
	(0.0151)	(0.00138)	(0.00547)	(0.00109)
In an Urban cluster	-0.147***	-0.000131	-0.0242***	-0.00201*
	(0.0178)	(0.00168)	(0.00544)	(0.00115)
In an area surrounded by urban areas	-0.0404	-0.0252	-0.163***	0.00541
	(0.300)	(0.0226)	(0.0513)	(0.0252)
Annual Household Income (versus <$10,000)				
$10,000 to $14,999	0.149	-0.00676	0.0739***	0.00464
	(0.0952)	(0.00510)	(0.0254)	(0.00301)
$15,000 to $24,999	0.220**	-0.0266***	0.108***	0.0142***
	(0.0862)	(0.00437)	(0.0237)	(0.00281)
$25,000 to $25,999	0.268***	-0.0297***	0.113***	0.0118***
	(0.0817)	(0.00423)	(0.0245)	(0.00281)
$35,000 to $49,999	0.173**	-0.0370***	0.0815***	0.00926***
	(0.0780)	(0.00412)	(0.0226)	(0.00279)
$50,000 to $74,999	0.169**	-0.0380***	0.0810***	0.00646**
	(0.0771)	(0.00405)	(0.0228)	(0.00275)
$75,000 to $99,999	0.132*	-0.0365***	0.0633***	0.00818***
	(0.0774)	(0.00414)	(0.0229)	(0.00289)
$100,000 to $124,999	0.0822	-0.0374***	0.0756***	0.0134***
	(0.0774)	(0.00426)	(0.0237)	(0.00306)
$125,000 to $149,999	0.129	-0.0252***	0.158***	0.0294***
	(0.0806)	(0.00464)	(0.0275)	(0.00357)
$150,000 to $199,999	0.195**	-0.0149***	0.216***	0.0482***
	(0.0811)	(0.00477)	(0.0272)	(0.00377)
$200,000 or more	0.397***	-0.00402	0.662***	0.118***
	(0.0832)	(0.00489)	(0.0326)	(0.00409)
Age in years	-0.0157***	-0.000898***	-0.0109***	-0.00221***
	(0.000514)	(3.41e-05)	(0.000227)	(3.03e-05)
Race (versus White)				
Black or African American	0.455***	0.0279***	-0.0770***	-0.0193***
	(0.0510)	(0.00271)	(0.0172)	(0.00200)
Asian	0.341***	0.0188***	-0.0849***	-0.0148***
	(0.0593)	(0.00370)	(0.0233)	(0.00327)
American Indian or Alaska Native	0.0453	0.0117	-0.0327	-0.00835
	(0.105)	(0.00768)	(0.0418)	(0.00548)
Native Hawaiian or other Pacific Islander	0.265	0.0149	-0.0208	0.0160
	(0.214)	(0.0126)	(0.0577)	(0.0121)
More than one race	0.229***	0.0216***	-0.0301	0.000154
	(0.0681)	(0.00412)	(0.0222)	(0.00363)
Some other race	0.135*	0.0194***	-0.00588	-0.00418
	(0.0770)	(0.00500)	(0.0279)	(0.00417)

Dependent Variable:	Transit # of Days in Past 30 Days	Transit Any Use in Past 30 Days	Rideshare # of Trips in Past 30 Days	Rideshare Any Use in Past 30 Days
Hispanic or Latino	0.0861**	0.00320	-0.0322**	-0.00427*
	(0.0418)	(0.00263)	(0.0162)	(0.00237)
Sex: Female	-0.152***	-0.00807***	-0.0435***	-0.00770***
	(0.0170)	(0.00118)	(0.00710)	(0.00104)
Education (versus "less than high school")				
High school graduate or GED	0.0881*	-0.00161	0.237***	0.0403***
	(0.0526)	(0.00296)	(0.0115)	(0.00171)
Some college or associates degree	0.226***	0.00926***	0.283***	0.0526***
	(0.0514)	(0.00292)	(0.0128)	(0.00180)
Bachelor's degree	0.418***	0.0330***	0.466***	0.0938***
	(0.0517)	(0.00307)	(0.0149)	(0.00210)
Graduate degree or professional degree	0.655***	0.0642***	0.476***	0.0968***
	(0.0533)	(0.00321)	(0.0152)	(0.00224)
Driver: No	1.309***	0.0949***	-0.00455	-0.0197***
	(0.0620)	(0.00326)	(0.0218)	(0.00202)
Access to a motor vehicle	-6.280***	-0.388***	-0.452***	-0.0252***
	(0.156)	(0.00603)	(0.0539)	(0.00430)
Rideshare (# of trips in past 30 days)	0.280***			
	(0.0147)			
Rideshare (dummy for any usage in past 30 days		0.216***		
		(0.00370)		
Transit (# of days out of past 30)			0.0492***	
			(0.00294)	
Transit (dummy for any usage in past 30 days)				0.166***
				(0.00291)
Constant Term	6.796***	0.473***	0.711***	0.0917***
	(0.160)	(0.00738)	(0.0524)	(0.00490)
Observations	226,799	226,799	226,799	226,799
R-squared	0.138	0.167	0.069	0.136

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Appendix E: California NHTS: Full Complementarity Regressions with Transit Dependent Variables

Dependent Variable:	Transit Continuous (No Transit Proximity Controls)	Transit Continuous (With Transit Proximity Controls)	Transit Dummy (No Transit Proximity Controls)	Transit Dummy (With Transit Proximity Controls)
MSA Size (versus not in an MSA)				
In an MSA of Less than 250,000	-0.0529	0.279	-0.0162	0.0107
	(0.282)	(0.280)	(0.0196)	(0.0199)
In an MSA of 250,000 - 499,999	0.263	0.508**	0.00522	0.0257*
	(0.236)	(0.233)	(0.0153)	(0.0153)
In an MSA of 500,000 - 999,999	-0.364*	-0.0664	-0.0322**	-0.00860
	(0.188)	(0.184)	(0.0132)	(0.0131)
In an MSA or CMSA of 1,000,000 - 2,999,999	0.0758	-0.677***	-0.0113	-0.0727***
	(0.199)	(0.207)	(0.0140)	(0.0145)
In an MSA or CMSA of 3 million or more	0.735***	0.214	0.0457***	0.00449
	(0.193)	(0.184)	(0.0131)	(0.0131)
Urban Status (versus not in an urban area)				
In an urban area	0.271	-0.136	0.0534***	0.0224
	(0.215)	(0.217)	(0.0134)	(0.0137)
In an Urban cluster	-0.317	-0.320	0.00128	0.00163
	(0.213)	(0.210)	(0.0143)	(0.0143)
In an area surrounded by urban areas	-0.105	-0.0455	0.344	0.359*
	(0.514)	(0.436)	(0.228)	(0.212)
Annual Household Income (versus <$10,000)				
$10,000 to $14,999	-0.610	-0.632	-0.0383	-0.0459
	(0.502)	(0.491)	(0.0284)	(0.0281)
$15,000 to $24,999	-0.915**	-0.834**	-0.0613**	-0.0607***
	(0.398)	(0.391)	(0.0240)	(0.0235)
$25,000 to $25,999	-0.640	-0.662*	-0.0558**	-0.0650***
	(0.392)	(0.387)	(0.0235)	(0.0232)
$35,000 to $49,999	-0.932**	-0.936**	-0.109***	-0.115***
	(0.379)	(0.374)	(0.0220)	(0.0215)
$50,000 to $74,999	-0.968***	-1.000***	-0.0928***	-0.0999***
	(0.350)	(0.348)	(0.0215)	(0.0211)
$75,000 to $99,999	-1.086***	-1.018***	-0.100***	-0.101***
	(0.351)	(0.350)	(0.0219)	(0.0215)
$100,000 to $124,999	-1.021***	-1.036***	-0.0983***	-0.101***
	(0.363)	(0.358)	(0.0221)	(0.0216)
$125,000 to $149,999	-1.183***	-1.126***	-0.0959***	-0.0937***
	(0.366)	(0.363)	(0.0235)	(0.0229)
$150,000 to $199,999	-1.097***	-0.954***	-0.0812***	-0.0737***
	(0.358)	(0.355)	(0.0234)	(0.0228)
$200,000 or more	-0.572	-0.556	-0.0792***	-0.0800***
	(0.386)	(0.381)	(0.0231)	(0.0226)
Age in years	-0.0170***	-0.0164***	-0.000612***	-0.000588***
	(0.00278)	(0.00264)	(0.000199)	(0.000195)
Race (versus White)				
Black or African American	0.576**	0.502*	0.0596***	0.0475***
	(0.290)	(0.284)	(0.0182)	(0.0184)
Asian	0.100	-0.0550	-0.0178*	-0.0305***
	(0.168)	(0.164)	(0.0104)	(0.0101)
American Indian or Alaska Native	-0.215	-0.122	-0.0175	-0.0134
	(0.443)	(0.464)	(0.0339)	(0.0356)
Native Hawaiian or other Pacific Islander	-0.0808	0.119	-0.0160	0.00313
	(0.419)	(0.419)	(0.0339)	(0.0348)
More than one race	0.427	0.439	0.0409**	0.0378**
	(0.271)	(0.268)	(0.0180)	(0.0176)
Some other race	-0.226	-0.263	-0.0118	-0.0125
	(0.202)	(0.201)	(0.0147)	(0.0146)
Hispanic or Latino	0.00175	-0.0570	0.00532	0.000832
	(0.142)	(0.139)	(0.00971)	(0.00949)
Sex: Female	-0.204*	-0.218**	-0.00390	-0.00360
	(0.106)	(0.104)	(0.00712)	(0.00700)

Dependent Variable:	Transit Continuous (No Transit Proximity Controls)	Transit Continuous (With Transit Proximity Controls)	Transit Dummy (No Transit Proximity Controls)	Transit Dummy (With Transit Proximity Controls)
Education (versus "less than high school")				
High school graduate or GED	0.509*	0.523**	0.00682	0.0106
	(0.262)	(0.255)	(0.0160)	(0.0157)
Some college or associates degree	0.633***	0.696***	0.0256*	0.0317**
	(0.235)	(0.231)	(0.0154)	(0.0152)
Bachelor's degree	1.100***	1.028***	0.0777***	0.0749***
	(0.244)	(0.238)	(0.0162)	(0.0159)
Graduate degree or professional degree	1.659***	1.489***	0.126***	0.113***
	(0.271)	(0.264)	(0.0171)	(0.0168)
Driver: No	2.383***	2.287***	0.191***	0.185***
	(0.280)	(0.269)	(0.0151)	(0.0147)
Access to a motor vehicle	-6.789***	-6.271***	-0.371***	-0.326***
	(0.573)	(0.557)	(0.0242)	(0.0240)
Proximity to Rail Transit Service				
<0.5 Miles to Frequent Rail		3.384***		0.220***
		(0.432)		(0.0213)
0.5 - 3 Miles to Frequent Rail		1.283***		0.119***
		(0.148)		(0.0106)
<0.5 Miles to Infrequent Rail		1.358***		0.0689*
		(0.514)		(0.0356)
0.5 - 3 Miles to Infrequent Rail		0.757***		0.0538***
		(0.137)		(0.00901)
Rideshare (# of trips in past 30 days or Dummy)				
Main Effect	0.312***	0.116**	0.242***	0.172***
	(0.0523)	(0.0561)	(0.0126)	(0.0184)
Interaction: <0.5 Miles to Frequent Rail		-0.155*		0.0666*
		(0.0812)		(0.0391)
Interaction: 0.5 - 3 Miles to Frequent Rail		0.0696		0.0262
		(0.0796)		(0.0260)
Interaction: <0.5 Miles to Infrequent Rail		0.295**		0.0104
		(0.140)		(0.0698)
Interaction: 0.5 - 3 Miles to Infrequent Rail		0.274***		0.0496**
		(0.0843)		(0.0251)
Constant Term	7.801***	7.324***	0.468***	0.430***
	(0.723)	(0.704)	(0.0347)	(0.0341)
Observations	32,091	32,091	32,091	32,091
R-squared	0.167	0.198	0.187	0.220

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Note: All regressions in the above table use person expansion weights from the NHTS.

Appendix F: California NHTS: Full Complementarity Regressions with Ridehail Dependent Variables

Dependent Variable:	(10) Ridehail Continuous (No Transit Proximity Controls)	(12) Ridehail Continuous (With Transit Proximity Controls)	(14) Ridehail Dummy (No Transit Proximity Controls)	(16) Ridehail Dummy (With Transit Proximity Controls)
MSA Size (versus not in an MSA)				
In an MSA of Less than 250,000	0.0217	0.138**	0.0270	0.0394**
	(0.0656)	(0.0628)	(0.0171)	(0.0172)
In an MSA of 250,000 - 499,999	-0.176***	-0.0550	-0.0199*	-0.00744
	(0.0484)	(0.0447)	(0.0106)	(0.0106)
In an MSA of 500,000 - 999,999	-0.119***	-0.00806	-0.0174*	-0.00458
	(0.0458)	(0.0442)	(0.01000)	(0.0100)
In an MSA or CMSA of 1,000,000 - 2,999,999	0.0180	-0.302***	0.0359***	-0.00135
	(0.0547)	(0.0627)	(0.0116)	(0.0121)
In an MSA or CMSA of 3 million or more	0.431***	0.204***	0.0730***	0.0494***
	(0.0529)	(0.0512)	(0.0108)	(0.0110)
Urban Status (versus not in an urban area)				
In an urban area	0.188***	0.0519	0.0421***	0.0276***
	(0.0542)	(0.0533)	(0.00899)	(0.00900)
In an Urban cluster	0.0351	0.0300	0.00839	0.00905
	(0.0514)	(0.0480)	(0.0107)	(0.0106)
In an area surrounded by urban areas	0.0763	0.197	0.0978	0.120
	(0.280)	(0.300)	(0.176)	(0.176)
Annual Household Income (versus <$10,000)				
$10,000 to $14,999	-0.0514	-0.0545	-0.00295	-0.00772
	(0.146)	(0.141)	(0.0196)	(0.0196)
$15,000 to $24,999	0.184	0.203	0.0300*	0.0293*
	(0.150)	(0.143)	(0.0175)	(0.0172)
$25,000 to $25,999	0.150	0.122	0.00521	0.00149
	(0.170)	(0.167)	(0.0171)	(0.0169)
$35,000 to $49,999	0.257*	0.231	0.0414**	0.0366**
	(0.149)	(0.142)	(0.0172)	(0.0171)
$50,000 to $74,999	0.345**	0.319**	0.0447***	0.0408**
	(0.146)	(0.141)	(0.0169)	(0.0168)
$75,000 to $99,999	0.423***	0.434***	0.0587***	0.0585***
	(0.159)	(0.155)	(0.0176)	(0.0173)
$100,000 to $124,999	0.302**	0.288**	0.0483***	0.0471***
	(0.151)	(0.146)	(0.0181)	(0.0179)
$125,000 to $149,999	0.437**	0.451***	0.0864***	0.0883***
	(0.178)	(0.170)	(0.0211)	(0.0208)
$150,000 to $199,999	0.472***	0.504***	0.0929***	0.0968***
	(0.158)	(0.151)	(0.0202)	(0.0198)
$200,000 or more	1.094***	1.073***	0.171***	0.168***
	(0.181)	(0.175)	(0.0200)	(0.0198)
Age in years	-0.0230***	-0.0223***	-0.00393***	-0.00387***
	(0.00151)	(0.00147)	(0.000168)	(0.000166)
Race (versus White)				
Black or African American	-0.261*	-0.296**	-0.0511***	-0.0582***
	(0.143)	(0.144)	(0.0157)	(0.0157)
Asian	-0.439***	-0.496***	-0.0702***	-0.0770***
	(0.0835)	(0.0802)	(0.00986)	(0.00982)
American Indian or Alaska Native	0.129	0.133	0.0353	0.0379
	(0.147)	(0.128)	(0.0289)	(0.0277)
Native Hawaiian or other Pacific Islander	-0.285**	-0.179	-0.0201	-0.0106
	(0.134)	(0.139)	(0.0315)	(0.0313)
More than one race	-0.201	-0.205*	-0.0232	-0.0241
	(0.122)	(0.120)	(0.0159)	(0.0159)
Some other race	0.0140	-0.00320	0.00483	0.00412
	(0.105)	(0.103)	(0.0125)	(0.0124)
Hispanic or Latino	-0.110	-0.110	-0.0251***	-0.0259***
	(0.0740)	(0.0736)	(0.00922)	(0.00913)
Sex: Female	-0.0407	-0.0422	-0.000607	-0.000460
	(0.0570)	(0.0558)	(0.00653)	(0.00648)

Dependent Variable:	(10) Ridehail Continuous (No Transit Proximity Controls)	(12) Ridehail Continuous (With Transit Proximity Controls)	(14) Ridehail Dummy (No Transit Proximity Controls)	(16) Ridehail Dummy (With Transit Proximity Controls)
Education (versus "less than high school")				
High school graduate or GED	0.219***	0.244***	0.0236**	0.0260**
	(0.0829)	(0.0835)	(0.0103)	(0.0103)
Some college or associates degree	0.478***	0.515***	0.0735***	0.0765***
	(0.102)	(0.102)	(0.0110)	(0.0109)
Bachelor's degree	0.999***	0.982***	0.160***	0.158***
	(0.135)	(0.134)	(0.0127)	(0.0125)
Graduate degree or professional degree	1.074***	1.007***	0.166***	0.160***
	(0.121)	(0.118)	(0.0135)	(0.0133)
Driver: No	0.294**	0.302**	-0.0229**	-0.0226**
	(0.150)	(0.149)	(0.0108)	(0.0108)
Access to a motor vehicle	-0.699***	-0.559**	-0.0617***	-0.0454**
	(0.267)	(0.244)	(0.0191)	(0.0188)
Proximity to Rail Transit Service				
<0.5 Miles to Frequent Rail		1.462***		0.107***
		(0.183)		(0.0204)
0.5 - 3 Miles to Frequent Rail		0.553***		0.0821***
		(0.0786)		(0.00992)
<0.5 Miles to Infrequent Rail		0.693**		0.0814**
		(0.327)		(0.0347)
0.5 - 3 Miles to Infrequent Rail		0.122**		0.00682
		(0.0613)		(0.00817)
Transit (# of days out of past 30 or dummy)				
Main Effect	0.0880***	0.0210	0.207***	0.161***
	(0.0132)	(0.0163)	(0.0109)	(0.0159)
Interaction: <0.5 Miles to Frequent Rail		-0.00347		0.0367
		(0.0318)		(0.0349)
Interaction: 0.5 - 3 Miles to Frequent Rail		0.0453*		0.0101
		(0.0273)		(0.0227)
Interaction: <0.5 Miles to Infrequent Rail		0.127*		0.0478
		(0.0756)		(0.0627)
Interaction: 0.5 - 3 Miles to Infrequent Rail		0.0554**		0.0342
		(0.0277)		(0.0218)
Constant Term	1.016***	0.892***	0.146***	0.133***
	(0.305)	(0.273)	(0.0268)	(0.0265)
Observations	32,091	32,091	32,091	32,091
R-squared	0.103	0.127	0.183	0.196

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Note: All regressions in the above table use person expansion weights from the NHTS.