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TRANSPORT FINDINGS

Millennials and Reduced Car Ownership: Evidence from Recent Transport Surveys

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Transport Findings

This study examines the likelihood millennials are to own a car and the factors that have driven a reduction in car consumption. Based on a travel decision survey performed in 2015 in San Francisco, no significant evidence supports the claim that millennials are different from prior generations in terms of car ownership. Individuals with higher incomes and those that preferred more access and convenience were more likely to own a vehicle.

HYPOTHESES

Anecdotal reports continually indicate that millennials (born between 1983 and 2000) travel and behave differently than prior generations at similar stages in life. They generally avoid cars, delay when they get a driver's license, and favor multimodal transport, urban life, and emerging technologies (Delbosc and Ralph 2017; McDonald 2015; Circella et al. 2017). Their trips are often of shorter distance, and they use alternative modes of transport more frequently. However, these existing studies have been mostly descriptive, lacking statistical examination. Their conclusions were summarized based on data collected just after the economic recession. This information supports the narrative that millennials own cars less frequently due to the economic environment at the time.

Although car ownership decreased in the US for a period after the 2008 economic recession, as the economy gradually recovered, car ownership increased as well (Sivak 2018). An alternative hypothesis is that millennials still wanted to own cars, but were unable to afford them following the recession. In general, this examination of millennial consumption patterns requires evidence based on statistics.

Furthermore, most existing studies were implemented on a macro level by examining census groups and counties, while neglecting individuals themselves. Research conducted on an individual level can account for the self-selection effect of car ownership, and provide additional insight.

RESEARCH QUESTIONS

Therefore, this study seeks to answer the following questions:

- Are millennials significantly different from prior generations in terms of car reduction and car ownership?
- What attitudinal factors can explain a reduction in car ownership?

DATA

The study area was the San Francisco (SF) Bay Area, which is a large metropolitan region with a well-functioning multimodal transport system. This study employed a travel decision survey from 2015, which was collected by the SF Municipal Transportation Agency. This survey was conducted within the city and county of SF as well as the eight surrounding counties. They received a total of 762 responses.

METHODS

This study employed two models, a Heckman selection model and a binary logit model, to examine car reduction and car ownership. For car reduction, one statistical concern for sample selection arose due to the partial observability of the variable of interest. More specifically, only respondents who had stopped using cars during the past three years would report their reasons for car reduction. Heckman (1977; 1976) proposed a simple solution that treated the selection problem as an omitted variable problem, and this method was utilized to address this selection bias. An additional explanatory variable used to correct for self-selection in the Heckman selection model was trip frequency. In the binary logit model, the objective variable was car ownership, indicating if respondents had cars or not (Agresti 2003).

When processing the data, observations with missing values were dropped. The final sample had 325 observations, and only 63 stated reasons for car reduction. To adjust for the self-selection effect, this study included two groups of self-reported attitudinal factors. Individuals reduced car usage for various reasons, like, parking unavailability and costs, car ownership-related costs, infrequent use, physical constraints, life events, and car unavailability. Individuals ranked their driving priorities of improved mobility, easy access to multiple destinations, traveling with children or carrying something, and inexpensive or free parking.

FINDINGS

Table 1 shows a descriptive analysis of the selected variables. It is worth mentioning that about 81% of the respondents owned cars, and about 17% of the respondents reduced the number of cars they owned during the past three years.

Table 2 shows the modeling outcome for car reduction, in which only two variables were significant. Asians were unlikely to reduce the number of cars owned. People who cared about their speed, which is related to mobility and travel time, were unlikely to reduce the number of cars owned. Although people stated various reasons for car reduction, none of these attitudinal factors were significant. The multiple R^2 value was 0.05, indicating that the explanatory variables did not relate strongly to the variations in trip frequency. The p-value on the Inverse Mills Ratio was large. The null hypothesis that errors in the two-stages estimation are uncorrelated cannot be rejected.

Table 1: Variable Description and Data Summary

Continuous Variable	Description	Mean	S.D.	Min	Max	Percent	Sample Size
Trip Frequency	The number of trips during a day, in count	4.74	3.31	1.00	18.00		569
Income	Individual annual income, in K$	77.5	85.39	0.00	250.00		597
Discrete Variable							
Car Owned*	If the respondent owns a car 1; else 0					81.10%	762
Car Reduced*	If the respondent had a car reduced during the past three years 1; else 0					16.67%	762
Millennial*	If the respondent is aged 18 to 34, 1; else 0					26.96%	738
Gender	If the respondent is a male, 1; else 0					54.46%	762
White*	If the respondent's race is white, 1; else 0					52.65%	718
Asian*	If the respondent's race is Asian, 1; else 0					24.93%	718
In/Out SF*	If the respondent lives in San Francisco County, 1; other counties in SF Bay Area 0					50.13%	762
Speed*	If the respondent's stated reason for driving is faster access when compared with alternative modes, 1; else 0					77.28%	471
Trip Chain*	If the respondent's stated reason for driving is that he/she has multiple stops during a trip, 1; else 0					40.34%	471
Load*	If the respondent's stated reason for driving is that he/she carries something or travels with children, 1; else 0					63.38%	471
TNC Use	If the respondent does not use TNCs, 1;					59.19%	762
	If the respondent rarely uses TNCs, 2;					20.34%	762
	If the respondent uses TNCs monthly, 3;					8.53%	762
	If the respondent uses TNCs weekly, 4;					10.24%	762
	If the respondent uses TNCs daily, 5					1.71%	762
Sample Selection Variable (reasons for car reduction during the past three years)							
Parking Cost*	If the respondent reduced the number of cars because parking is insufficient or expensive, 1; else 0					13.39%	127
Car Cost*	If the respondent reduced the number of cars because car ownership is expensive, 1; else 0					18.90%	127
Life Event*	If the respondent reduced the number of cars because he/she moved or experienced other life events (marriage, school, divorce, etc.), 1; else 0					12.60%	127
Rare Use*	If the respondent reduced the number of cars because he/she rarely drives or he/she has physical constraints, 1; else 0					27.56%	127
Old & Broken Cars*	If the respondent reduced the number of cars because the car was old, broken, or stolen, 1; else 0					25.20%	127

* denotes binary variables; TNC: Tranportation Network Company.

Table 3 presents the modeling outcomes for car ownership, and only three variables were significant. Income was the core measurement for car ownership. High-income people were more likely to have cars. People stated various reasons for driving. Faster speeds and traveling with children or carrying stuff were strong incentives for owning cars. The McFadden R^2 value was 0.84, indicating that the model had the very good predictive ability.

Despite continual claims that millennials favor multimodal transport and new, technology-based transport options, in this study, no significant evidence was found that differentiated millennials from prior generations. From our

Table 2: Heckman Sample Selection Modeling Outcome for Car Reduction

Probit Selection Equation:		
	Estimate	**P-Value**
Intercept	-0.781	0.075
Millennials	0.166	0.448
Income	0.001	0.185
Gender	-0.207	0.219
White	-0.345	0.096
Asian	-0.731**	0.004
In/Out SF	0.094	0.588
Car Own	0.191	0.644
Speed	-0.470*	0.021
Trip Chain	0.326	0.077
Loading or Children	0.201	0.265
TNC Use	0.037	0.649
Outcome Equation (Trip Frequency):		
	Estimate	**P-Value**
Intercept	1.203*	0.042
Parking Cost	0.279	0.450
Car Cost	0.285	0.429
Life Event	-0.051	0.879
Rare Use	-0.208	0.495
Old or Broken Car	0.023	0.942
Multiple R^2: 0.05		
Error terms:		
	Estimate	**P-Value**
Inverse Mills Ratio	0.036	0.918
Sigma	0.786	NA
Rho	0.046	NA

Level of Significance: '***' 0.001, '**' 0.01 , '*' 0.05
2-step Heckman estimation
325 observations (262 censored and 63 observed)
21 free parameters (df = 305)

perspective, the observation that millennials favor multimodal transport systems is based on temporal characteristics due to the great recession. The nationwide patterns of car reduction from 2010 to 2016 can largely be explained by economic conditions, while millennials' preferences may have only played a minor role.

This study included various attitudinal factors on an individual level. However, no attitudinal factor was significant in explaining car reduction, indicating that incentives for car reduction are random and diverse. People that are more concerned with ease of access and use were generally more likely to own cars.

Table 3: Binary Logit Modeling Outcome on Car Ownership

Binomial Logit Estimation		
	Estimate	P-Value
Intercept	0.147	0.865
Millennials	0.488	0.521
Income	0.012*	0.024
Gender	0.749	0.212
White	1.051	0.121
Asian	0.933	0.219
In/Out SF	-1.013	0.105
Speed	1.844**	0.003
Trip Chain	0.675	0.361
Loading or Children	1.362*	0.047
TNC Use	-0.095	0.712

Level of Significance: '***' 0.001, '**' 0.01, '*' 0.05
Null deviance: 133.42 on 324 degrees of freedom
Residual deviance: 96.03 on 314 degrees of freedom
McFadden R^2: 0.84 (df=11)
AIC: 118.03

These findings are inconsistent with prior studies. This study agrees that car ownership decreased over the past years. It is possible that prior studies overstated the preferences of millennials and created the impression that prior generations have less of an impact on car reduction. Furthermore, SF residents have the highest per capita income among all US citizens, especially with a concentration of young IT engineers with Silicon Valley. Although driving is expensive, as long as their earnings can cover transport costs, people will continue to drive. Lastly, the data were sampled in 2015, when the economy had almost recovered. In other words, some millennials had the money to afford a car, and they wanted to save on travel time.

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