COVID-19'S LONG-DISTANCE TRAVEL IMPACT ACROSS THE UNITED STATES

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ABSTRACT

Using over a thousand Americans' population-weighted responses to a long-distance travel survey, this paper examines reductions in trips over 75-miles (one-way) in 2020, during the pandemic, versus behaviors in 2019. Negative binomial models of trip counts suggest that people age 25 to 64 took 0.2 fewer annual long-distance business trips during the pandemic, but people age 65 and older took 0.4 fewer business and 0.6 fewer non-business long-distance trips, on average. Household income has less impact on non-business long-distance trip-making during pandemic compared to pre-pandemic, but their trip-making for business purposes is robust or stable to income.

KEYWORDS: COVID-19 pandemic, long-distance travel, travel behavior, travel survey

QUESTIONS

COVID-19 has greatly impacted travel around the globe. Passenger-trips by air fell 50% compared to 2019 flights (OAG Aviation Worldwide, 2021). Public transit was extensively affected (Beck and Hensher, 2020) since people hesitated to use shared modes (Dean and Zuniga-Garcia, 2022). Although the pandemic's

impacts on daily travel behavior have been extensively explored (Abdullah et al., 2020; De Vos, 2020; Habib et al., 2021), studies about the related impacts on long-distance (LD) travel are lacking. To explore such impact on Americans' LD travel, a survey was conducted in March 2021, asking over 1,000 Americans about their business and non-business trip counts in 2019 and 2020.

METHODS

The web-based survey, using Qualtrics software, had a three-week collection process. After data cleaning, the final response pool includes 451 (45%) Texans and 553 (55%) non-Texan Americans. A population-weighting procedure matched the demographic distributions of age, region, and gender based on the last 5 years American Community Survey data (US Census Bureau, 2021), leveraging the iterative proportional fitting method (Roth et al., 2017).

To capture the factors that impact LD trip-making frequency during the pandemic, this paper first presents the shares of LD trip-making occurrence in 2019 and 2020. The year 2019 is considered to have no pandemic impacts, which is contrary to the year 2020. A negative binomial model was conducted to predict the average number of LD business and non-business trips in 2019 and 2020, followed by a sensitivity analysis on all independent variables.

FINDINGS

Demographic distributions of LD non-business and business trip occurrences during 2019 and 2020 are shown in Table 1. The effect of COVID-19 on LD trips was felt equally across non-business and business trips in general. Business trips accounted for about one-third of the total LD trips in 2019 and 2020. For non-business trips, females and males made about the same number of LD trips , but males had more business trips, about twice of the amount made by females before the pandemic. People aged 25 to 34 years contributed the most to LD trip-making, with over a quarter for non-business purposes and over half for business purposes. While early-career individuals have a larger share of LD business trips, the share of LD non-business trips by age group is nearly uniform, perhaps because all age groups travel for vacations and to see family during holidays. People aged 25 to 54 made 81% of the business LD trips prior to the pandemic, and the number climbed up to 88% during the pandemic, which could be the possible delegation of work to the lower-risk employees. In terms of travelers living in different census regions, the Western population made more business LD trips, on average, compared to other regions before pandemic, while Northeastern people made more non-business trips. The split remained similar during pandemic in 2020, but the LD trip makers in the Southern US were less impacted by COVID-19 compared to the other three census regions, possibly due to the looser mask-wearing restrictions.

Table 1. Demographic distribution of long-distance trip occurrence in 2019 and 2020 in the US

Calendar year	**2019**		**2020**	
Trip purpose	**Non-Business**	**Business**	**Non-Business**	**Business**
	66%	34%	67%	33%
Gender				
Female	52%	34%	51%	38%
Male	48%	66%	49%	62%
Age				
18 to 24 years	5%	5%	6%	7%

25 to 34 years		26%	52%	27%	55%
35 to 44 years		15%	12%	17%	13%
45 to 54 years		15%	19%	18%	20%
55 to 64 years		19%	9%	20%	4%
65 or more years		20%	3%	11%	1%
Region	***2019 Population (%)**				
Northeast	17%	28%	14%	26%	15%
Midwest	21%	12%	5%	11%	4%
South	38%	31%	35%	34%	41%
West	24%	30%	47%	29%	41%

Note: 2019 population statistics were obtained from US Census Bureau (2021)

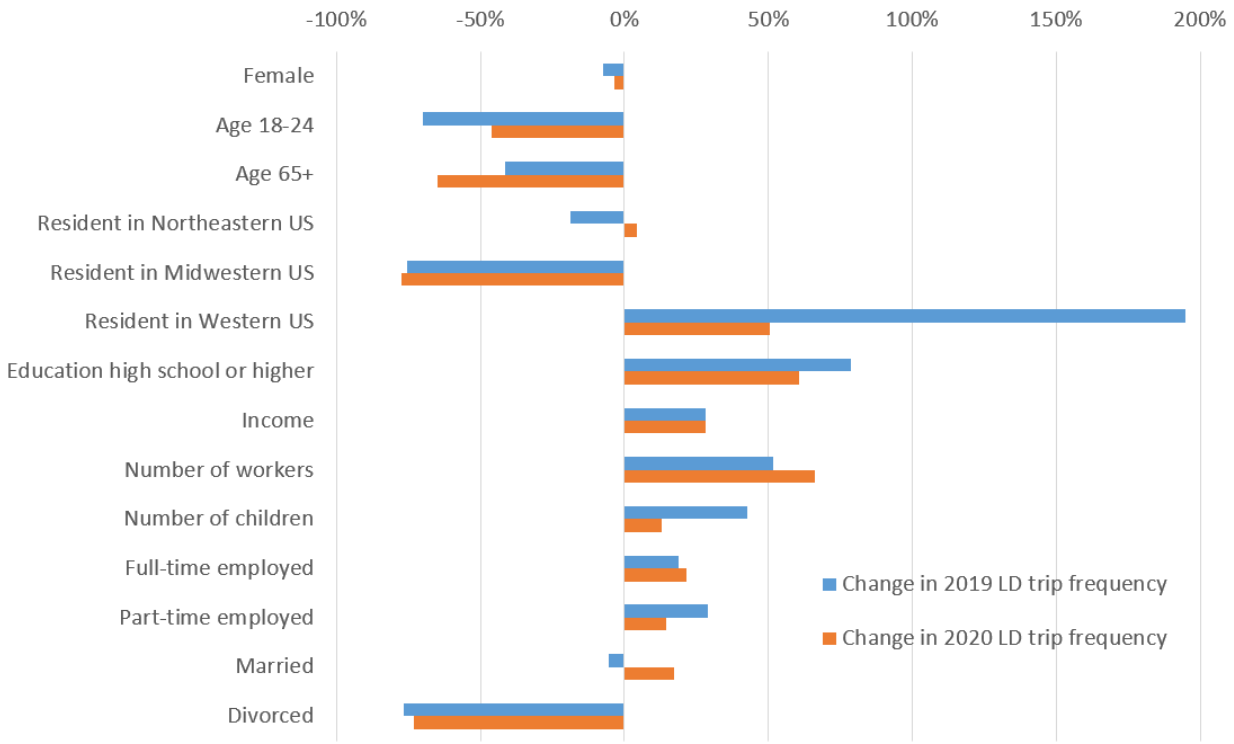
A negative binomial (NB) regression model was conducted to estimate Americans' LD business and non-business trip-making frequency in 2019 and 2020 (Table 2).. Practical significance of the NB model estimates is further shown in Figure 1, obtained through a sensitivity analysis. The practical significance is calculated as the average change (in percentage) in the estimated predictor through increasing the continuous variables by one standard deviation or shifting categorical variables from 0 to 1.The business trip frequency model results show that more workers in the household and higher employment status (full-time employment versus part-time or unemployed) led to more LD business trips in 2019 and 2020. When unaffected by COVID-19, people age 25 to 64 living in the Western US with higher annual income were predicted to make more LD business trips. People with more children were predicted to make more LD business trips, to pursue higher household income, although taking care of children may often make one forsake business travel plans. The pandemic model (year 2020) shows fewer LD business trips made in general (as seen from the drop in the intercept), but females, people age 64 or younger, and those married people were less impacted. The most practically significant variable in the pre-pandemic model was the residence in the Western US, but it became less practically significant during pandemic as people worked from home. Most of the variables were less practically significant in the pandemic model; however, the variable of people age 65 or older was more significant, because they were more vulnerable to COVID-19, leading to much fewer LD business trips.

Table 2. Parameter estimates in annual business and non-business trip counts prediction in 2019 and 2020 (using population-weighted negative binomial count model)

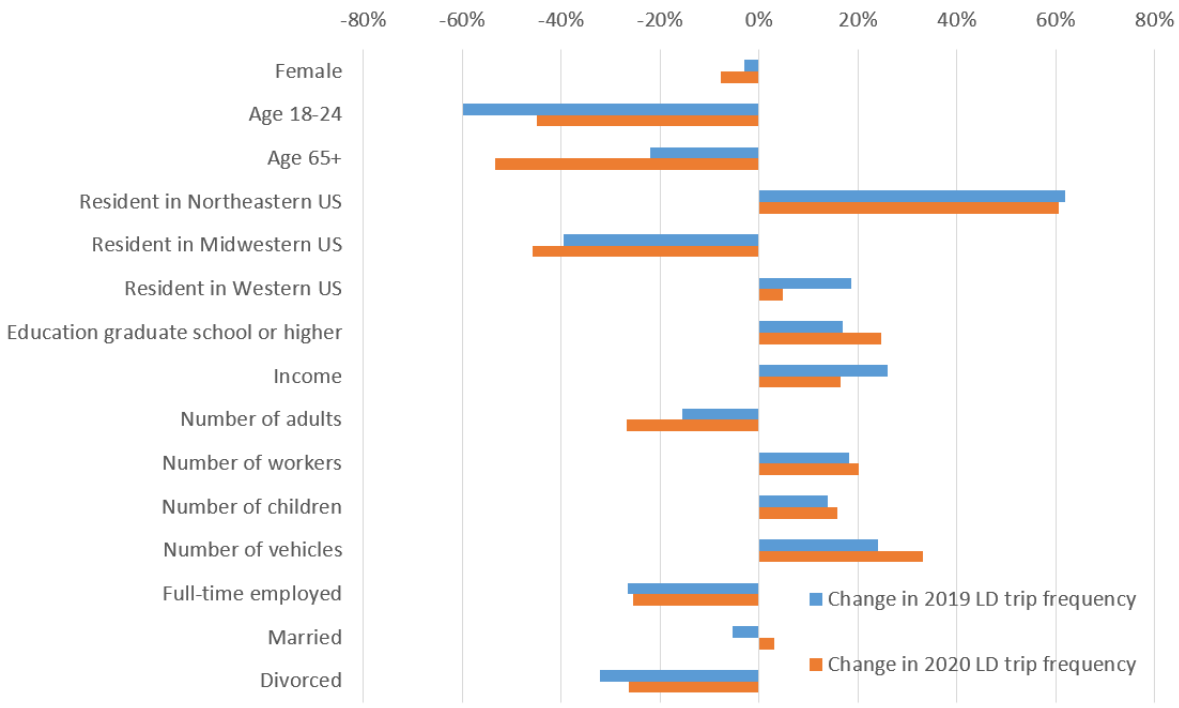
	Business trip frequency in 2019			**Business trip frequency in 2020**		
	Estimate	Std. Error	P-value	Estimate	Std. Error	P-value
(Intercept)	-1.528	0.327	0.000	-2.385	0.444	0.000
Female	-0.147	0.194	0.449	-0.067	0.261	0.796
Age 18-24	-1.373	0.317	0.000	-0.722	0.411	0.079
Age 65+	-0.702	0.335	0.036	-1.150	0.459	0.012
Resident in Northeastern US	-0.025	0.268	0.927	-0.021	0.352	0.952
Resident in Midwestern US	-1.228	0.279	0.000	-1.553	0.372	0.000
Resident in Western US	1.264	0.234	0.000	0.347	0.319	0.276
Education high school or higher	0.660	0.265	0.013	0.533	0.355	0.134
Income (in $10k)	0.461	0.207	0.026	0.462	0.277	0.095
Number of workers	0.375	0.094	0.000	0.458	0.126	0.000
Number of children	0.369	0.109	0.001	0.126	0.146	0.390
Full-time employed	1.367	0.271	0.000	1.655	0.360	0.000
Part-time employed	1.448	0.334	0.000	1.596	0.447	0.000
Married	-0.460	0.233	0.048	0.398	0.317	0.210

Divorced	-1.863	0.408	0.000	-1.078	0.530	0.042
No. of observations	**1,004**			**1,004**		
Dispersion Parameter (ρ):	0.159			0.087		
McFadden's R2:	0.332			0.304		
Likelihood ratio test (χ2)	212			128		
Prob > χ2	0.000			0.000		
2 x log-likelihood	-2,261			-1,608		
	Non-business trip frequency in 2019			**Non-business trip frequency in 2020**		
	Estimate	Std. Error	P-value	Estimate	Std. Error	P-value
(Intercept)	1.094	0.155	0.000	0.992	0.217	0.000
Female	-0.069	0.089	0.442	-0.181	0.125	0.147
Age 18-24	-1.062	0.153	0.000	-0.801	0.206	0.000
Age 65+	-0.399	0.127	0.002	-0.967	0.181	0.000
Resident in Northeastern US	0.563	0.121	0.000	0.501	0.170	0.003
Resident in Midwestern US	-0.422	0.120	0.000	-0.584	0.167	0.000
Resident in Western US	0.252	0.112	0.024	0.074	0.157	0.634
Education graduate school or higher	0.240	0.096	0.013	0.344	0.135	0.011
Income (in $10k)	0.000	0.000	0.000	0.000	0.000	0.036
Number of adults	-0.129	0.056	0.021	-0.238	0.078	0.002
Number of workers	0.152	0.052	0.003	0.165	0.073	0.023
Number of children	0.136	0.069	0.048	0.154	0.096	0.111
Number of vehicles	0.234	0.052	0.000	0.308	0.073	0.000
Full-time employed	-0.614	0.107	0.000	-0.606	0.149	0.000
Married	-0.274	0.108	0.011	0.001	0.152	0.996
Divorced	-0.608	0.159	0.000	-0.334	0.220	0.129
No. of observations	**1,004**			**1,004**		
Dispersion Parameter (ρ):	0.693			0.335		
McFadden's R2:	0.198			0.114		
Likelihood ratio test (χ2)	231			110		
Prob > χ2	0.000			0.000		
2 x log-likelihood	-4,635			-3,719		

For the non-business model, people aged 25 to 64 years made more non-business LD trips in 2020 compared to other age groups, which is because they have more needs in LD trip-making for non-business purposes, such as visiting family and friends and for recreation. A higher education level, more vehicles owned, and higher household income also led to more LD non-business trip-making. According to the practical significance in the non-business model (Figure 1b), the variable of age 65 or older were less significant in LD non-business trip-making compared to business purposes, because these people still need to engage in recreation activities or visiting family even if their travel was greatly impacted by the pandemic. An increase by one standard deviation ($51k) of household income led to a 26% increase in pre-pandemic LD non-business trip counts, but only led to a 16% increase during 2020, likely because of people's unwillingness to make LD non-business trips when exposed to health risks. Interestingly, being full-time employed had a positive impact on LD trip frequency for business purposes, while it had the opposite impact on LD trip-making for non-business purposes.



a) Business trip frequency model



b) Non-business trip frequency model

Figure 1. The practical significance of variables in the trip frequency model

Results from this survey have shown that COVID-19 has greatly impacted LD travel behavior, for both business and non-business purposes. The pandemic raises the need to gather global LD trip patterns, while policies regarding vaccine and travel restrictions across different states and nations are also fundamental to capture future LD travel patterns.

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