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The uneven effect of the COVID-19 pandemic on US fatal road accidents

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Abstract

One of the lesser-known categories of excess deaths of the COVID-19 pandemic in the US was that of fatal car crashes—road-death incidents went up despite the fact that driving decreased due to the lockdowns. Remarkably, then, while there was significantly less traffic in 2020 compared to 2019—the total miles traveled by car decreased by 11% in 2020—there was at the same time a 6.8% increase in fatal car crashes. This meant that the fatality rate per vehicle miles traveled increased by 21% from 2019 to 2020.

But the increase was not uniform: states that voted for Biden in 2020 had a much larger percentage increase in fatal car accidents per miles driven during the March to June 2020 period (the first four months of the pandemic) relative to the same period in 2019. In the case of states that voted for Biden, the average percentage increase in fatal car accidents per miles driven per state was 45 percent while the increase was just 22 percent in states that voted for Trump. During the next four months of the pandemic (July – October 2020), when COVID-19 was less prominent in the news and lockdowns had eased, the differences in the percentage increase in fatal car accidents per miles driven between Biden and Trump states was much smaller: 29% for Biden states versus 25% for states that voted for Trump.

Using regression analysis, we show that a higher percentage vote for Biden in 2020 is associated with a statistically significant increase in fatal accidents per vehicle miles travelled during the first four months (March – June 2020) of the pandemic relative to the same period in 2019. On the other hand, there is no statistical difference between the next four months of the pandemic (July-October 2020) relative to 2019.

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1 Introduction[i]

One of the lesser-known categories of excess deaths of the COVID-19 pandemic in the US was that of fatal car crashes—road-death incidents went up despite the fact that driving decreased due to the lockdowns.[ii] Remarkably, then, while there was significantly less traffic in 2020 compared to 2019—the total miles traveled by car decreased by 11% in 2020—there was at the same time a 6.8% increase in fatal car crashes. This meant that the fatality rate per vehicle miles traveled increased by 21% from 2019 to 2020.[iii]

Perhaps this is not too hard to understand. Increased stress or distress due to the pandemic can explain this significant rise in fatal car accidents despite the dramatic decline in total vehicle travel. No one is in doubt about the fact that the COVID-19 pandemic raised the level of stress or distress among the United States population (we will provide evidence-based studies below). But what is a good way to measure the stress or distress level of a population that doesn't immediately become too subjective? In fact, the decision here to look at fatal car crashes is a very considered choice. It is safe to say that, taken together, fatal car accidents are not simply chance events but typically involve a significant degree of recklessness. And that is true whether the driver gets into the car already impaired or not. We contend that the change in the rate of fatal car crashes in a short time period is a fairly reliable measure of change in population stress or distress.

Meanwhile, there is a curiosity about the fatal-crash data. Though the nation as a whole saw this rise in the rate of fatal car accidents per miles driven, the rise was by no means uniform across the country. Some states saw a much greater rise than others: for example, in the first four months of the pandemic, March-June 2020, the fatal traffic accidents rates per vehicle miles traveled in Vermont, Connecticut, and Rhode Island more than doubled (relative to the same period in 2019), while in Wyoming, Iowa, and Alaska the rates actually decreased. Can the variation among the states be explained?

Indeed, there is a pattern: in general, states that voted for Biden in 2020 had a much larger percentage increase in fatal car accidents per miles driven during the March to June 2020 period (the first four months of the pandemic) relative to the same period in 2019. In the case of states that voted for Biden, or Blue states, the average percentage increase in fatal car accidents per miles driven per state was 45 percent while the increase was just 22 percent in states that voted for Trump, or Red states. During the next four months of the pandemic, when COVID-19 was

less prominent in the news and lockdowns had eased, the differences in the percentage increase in fatal car accidents per miles driven (during the July-October 2020 period relative to the same period in 2019) between Biden and Trump states was much smaller: 29% for Biden states versus 25% for states that voted for Trump. (The formal statistical analysis we conduct confirms what the raw data show. We summarize our formal results in section 4.)

Further, for the eight northeastern states (New York, New Jersey, Maine, Vermont, New Hampshire, Massachusetts, Rhode Island and Connecticut), the differences between the two periods are even more dramatic. In the case of these eight states that voted overwhelmingly for Biden[iv], the average percentage increase in fatal car accidents per miles driven per state was 82 percent during the March-June 2020 period (relative to 2019) and just 27 percent during the July-October period, the next four months of the pandemic. (See Table 1b for the data state by state.)

Why was there this curious pattern? In this paper, we address this issue.

Covid-19

The World Health Organization (WHO) defines COVID-19 as an infectious disease caused by the SARS-CoV-2 virus. Most people infected with the virus will suffer from mild to moderate respiratory illness. It seems that older people or people dealing with medical conditions (such as diabetes and chronic respiratory diseases) have a higher chance of developing a severe illness. However, the World Health Organization claims that anyone of any age can become seriously ill and even die because of contracting this disease.[v]

On March 11, 2020, the director general of the World Health Organization declared the COVID-19 outbreak a global pandemic.[vi] In order to delay the spread of the pandemic, states in the US announced a stay-at-home order. California was the first state to announce this order in mid-March of that year, and quickly other states followed suit. However, although most states had instructions to stay at home in the first months of the pandemic, there was a difference between the type of instructions in the various states. In addition, a few states (Arkansas, Iowa, Nebraska, North Dakota, and South Dakota) did not issue stay-at-home orders of any kind. By June 2020, all states with lockdown instructions had begun to implement a reopening policy.[vii]

The COVID-19 pandemic was a stressful situation. The World Health Organization defines stress as a type of change that occurs due to physical, emotional, or psychological strain and affects both the mind and the body. WHO states that stress can be expressed as fear, worry,

inability to relax, difficulty concentrating, and worsening of existing health conditions.[viii] According to The World Health Organization, the social isolation of the lockdowns, which led to constraints on the ability to work, engage in the community, and seek support from others, was a significant factor in the increase of unprecedented stress among people during the COVID-19 pandemic. In addition to loneliness, financial worries and fear of infection, suffering, and death of oneself or others also contributed to the rise of stress at this time.[ix] The American Psychological Association published a report regarding this change in stress levels in the United States in 2020. The reported average stress level for adults due to COVID-19 was 5.9 (on a scale of 1 to 10). The reported average general stress level for adults in 2020 was 5.4, a number significantly higher than the general average in 2019, which was 4.9. This change marks the most significant increase in average reported stress since the start of the survey in 2007.[x]

Studies have shown that there is a positive association between stress and car accidents. Seltzer (1969) examined the relationship between stress and fatal traffic accidents by studying dead and surviving drivers whom the police determined to be responsible for fatal traffic accidents. He showed that social stress, such as a personal crisis or financial worry, increases the probability of being involved in a fatal traffic accident.[xi] Selzer and Winokur (1974) used questionnaires to measure stress among drivers (answering the questionnaire) and found a significant correlation between stress among drivers and traffic accidents.[xii] Magaña, Scherz, Seepold, Madrid, Paneda, and Garcia (2020) obtained similar results by experimenting on 50 drivers who drove for 25 minutes using a driving simulator. They checked the drivers' stress levels before driving, divided them into two groups, stressed and not stressed, and found that stressed drivers have a greater tendency to engage in a dangerous activity while driving. For example, stressed drivers accelerated and braked more frequently and with greater force. In addition, they saw that the stressed drivers tended to drive at high speed, to fail to stop at crosswalks, and to cross the center line to overtake other vehicles. They reasoned that those behaviors mean that other road users cannot predict these drivers' actions, which increases the probability of road accidents.[xiii]

It has been hypothesized that there is a positive association between the stress of the COVID-19 pandemic and more dangerous driving. Leonhardt (2020) claims that the most probable hypothesis for the increase in traffic deaths during the pandemic is mental health problems among the population caused by the isolations and disruptions of the COVID-19 pandemic and lockdowns. That is, many Americans felt frustrated or unhappy, and it affected their driving.[xiv]

According to Pappas (2022), Dr. Jing Feng, a cognitive psychologist who studies attention and driving, said that COVID-19 has made some normal activities more stressful. Hence, mental distractions among drivers may increase. In such a situation, a driver's reaction time slows down, resulting in unexpected driving predicaments that can quickly turn deadly[xv].

Stress and the COVID-19 pandemic

Although increased stress during the COVID-19 pandemic was a common phenomenon across the US, the increase differed between political groups.[xvi] Bock and Schnabel (2022) found a partisan distress gap, with Democrats reporting higher levels of distress than Republicans did.[xvii] Additionally, Calvillo, Ross, Garcia, Smelter, and Rutchick (2020) argued that there was a difference in the coverage of the pandemic between the media platforms of the different parties, with Democratic media emphasizing the severe risk of the pandemic, while Republican media were more sceptical of the risk. And they showed that these differences in coverage of the pandemic affected perceptions of the threat of the pandemic. The more news people received from a key Republican source (Fox News), the less vulnerable they felt, while the more they consumed a key Democratic media source (CNN), the more severe they felt the COVID-19 pandemic was.[xviii] In addition, people living in Democratic-controlled states faced longer and more severe lockdowns[xix], and this too contributed to perceptions of greater danger from COVID-19 as well as experiences of greater stress in such states. According to McCarthy (2020), Gallup's survey data likewise showed political differences in stress from the COVID-19 pandemic. A survey conducted between March 30 and April 2, 2020 found that while the pandemic stressed 84% of Democrats at this time, only 64% of Republicans were stressed.[xx]

2 Methodology

We first look at descriptive statistics. The formal methodology we employ is regression analysis. Initially, we employ simple linear regression models for each year separately. Later, we employ a Difference-in-Differences regression model with a Continuous Treatment in order to include both years of data in the same estimation equation. (We discuss this model below.) We now describe the data.

In this study, we use accident data taken from the Fatality Analysis Reporting System of the National Highway Traffic Safety Administration. This database contains information about all fatal traffic accidents in the US involving motor vehicles. We look at the monthly number of

fatal car crashes per state for 2018-2020 to compare the COVID-19 period and the preceding ones.

Figure 1 shows the percentage of change in miles traveled in 2020 by state (excluding the District of Columbia) relative to 2019 during the relevant months for our study. The figure shows that there was a decline in the miles traveled in 2020 compared to 2019. Overall, the statistics published by the United States Department of Transportation show that vehicle miles traveled was the lowest during the March-June 2020 period relative to 2019. See https://www.bts.gov/covid-19/daily-vehicle-travel.

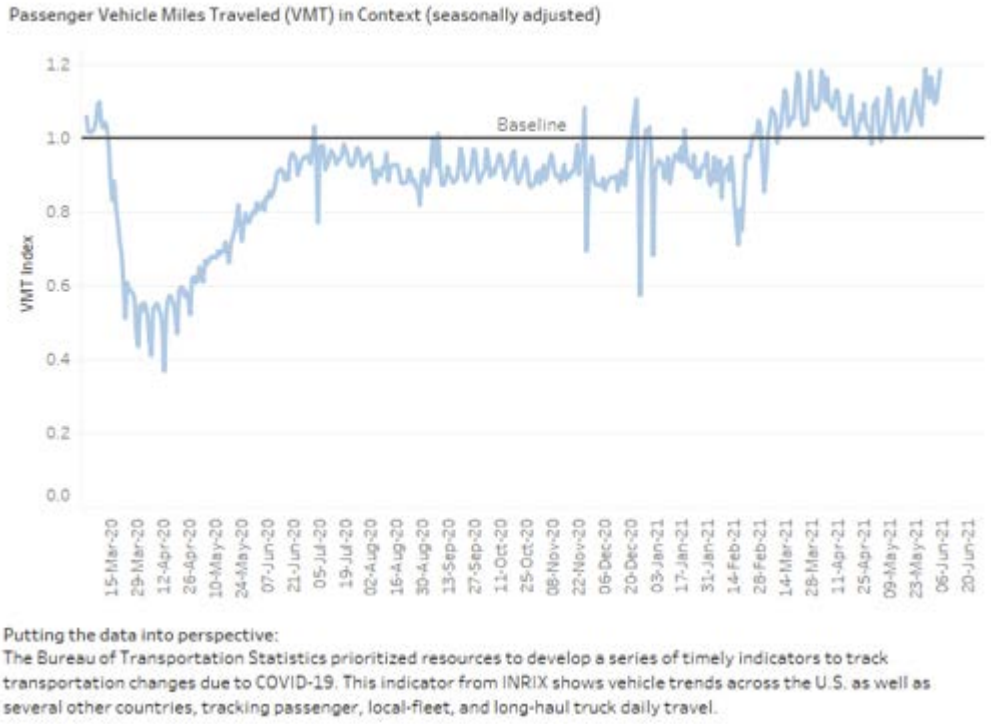


Figure 1: Daily Vehicle Travel during the COVID-19 Public Health Emergency

Table 1 shows the difference in the rate of change between the different months and the states. In all the states, there was a decrease in miles traveled from March to June in 2020 compared to 2019, and this decrease was more significant in the states Biden won than in the states Trump won. On average, there was a 28 percent decline in the states Biden won versus a 19 percent decline in states Trump won. From July to October, there was a less significant decrease overall in miles traveled relative to 2019, and the difference between Biden and Trump states was smaller (an average of 12 percent decline in Biden's states and 6 percent decline in Trump states).

Key Patterns in the changes in fatal accidents per miles traveled

Before we estimate the formal model, summary statistics compiled from Table 1b are consistent with the formal analysis we conduct later.

- In general, as already noted, states that voted for Biden in 2020 had a much larger percentage increase in fatal accidents per miles driven during the March to June 2020 period (relative to the same period in 2019). In the case of states that voted for Biden, the average percentage increase per state was 45 percent while the increase was just 22 percent in states that voted for Trump.
- As already noted, during the next four months of the pandemic, when COVID-19 was less prominent in the news and lockdowns had eased, the differences in the percentage increase in fatal accidents per miles driven between Biden and Trump states was much smaller: 29% for Biden states versus 25% for states that voted for Trump.
- There is a high positive correlation (47 percent) in the March-June period between (i) the percentage of change in fatal car accidents per miles traveled in 2020 relative to the 2019 period and (ii) the percentage of the vote that Biden received in 2020.
- This same correlation was much lower (17%) during the July-October period.

Table 1a: Percentage change in miles traveled between 2019-2020 and Biden % of vote

State name	March -June	July -October	Biden %
Wyoming	-17.54	-4.95	26.60
West Virginia	-26.22	-12.09	29.70
North Dakota	-22.10	-11.32	31.80
Oklahoma	-18.45	-7.96	32.30
Idaho	-12.02	1.23	33.10
Arkansas	-13.75	-3.01	34.80
South Dakota	-16.67	1.05	35.60
Kentucky	-21.56	-9.05	36.10
Alabama	-20.21	-6.79	36.60
Tennessee	-16.00	-3.47	37.40
Utah	-18.19	-3.32	37.60
Nebraska	-18.24	-5.03	39.20
Louisiana	-19.10	-6.95	39.90
Montana	-14.68	-0.45	40.50
Indiana	-22.75	-5.74	41.00
Mississippi	-18.42	-2.44	41.00
Missouri	-17.29	-1.54	41.40
Kansas	-21.51	-7.47	41.50
Alaska	-15.64	-2.95	42.80
South Carolina	-20.32	-5.48	43.40
Iowa	-20.02	-6.74	44.90
Ohio	-23.51	-8.72	45.20
Texas	-20.52	-10.65	46.50
Florida	-24.46	-8.07	47.90
North Carolina	-24.10	-8.87	48.60
Arizona	-13.60	2.39	49.40
Wisconsin	-23.36	-10.17	49.40
Georgia	-23.55	-10.06	49.50
Pennsylvania	-28.52	-14.29	50.00
Nevada	-24.57	-7.69	50.10
Michigan	-31.19	-10.94	50.60
Minnesota	-22.37	-11.87	52.40
New Hampshire	-27.63	-12.02	52.70
Maine	-26.03	-10.15	53.10
Virginia	-29.19	-12.72	54.10
New Mexico	-21.79	-11.32	54.30
Colorado	-23.41	-7.67	55.40
Oregon	-25.40	-10.23	56.50
New Jersey	-37.55	-15.52	57.10
Illinois	-26.85	-13.18	57.50
Washington	-28.24	-9.41	58.00
Delaware	-30.15	-15.27	58.70
Connecticut	-34.60	-8.47	59.30
Rhode Island	-25.61	-13.55	59.40
New York	-30.47	-11.42	60.90
California	-28.50	-14.89	63.50
Hawaii	-35.61	-32.15	63.70
Maryland	-30.83	-10.20	65.40
Massachusetts	-34.86	-18.62	65.60
Vermont	-32.96	-16.74	66.10

Table 1b: Percentage change in fatal car accidents per miles traveled between 2019-2020

State name	March -June	July -October	Biden %
Wyoming	-26.29	57.82	26.60
West Virginia	17.79	7.83	29.70
North Dakota	36.15	15.45	31.80
Oklahoma	16.11	24.62	32.30
Idaho	4.03	-11.20	33.10
Arkansas	34.80	47.10	34.80
South Dakota	45.01	62.58	35.60
Kentucky	20.15	24.81	36.10
Alabama	10.08	5.17	36.60
Tennessee	17.65	21.71	37.40
Utah	23.93	56.41	37.60
Nebraska	5.33	29.41	39.20
Louisiana	37.47	23.27	39.90
Montana	38.91	5.73	40.50
Indiana	42.73	25.48	41.00
Mississippi	29.86	41.82	41.00
Missouri	44.50	13.33	41.40
Kansas	24.35	9.70	41.50
Alaska	-12.66	23.65	42.80
South Carolina	30.86	18.74	43.40
Iowa	-11.23	30.85	44.90
Ohio	35.23	30.90	45.20
Texas	22.59	23.85	46.50
Florida	24.67	23.41	47.90
North Carolina	31.49	21.27	48.60
Arizona	0.31	16.62	49.40
Wisconsin	48.74	22.21	49.40
Georgia	18.13	47.13	49.50
Pennsylvania	30.54	35.63	50.00
Nevada	16.72	24.46	50.10
Michigan	52.10	34.68	50.60
Minnesota	30.09	36.01	52.40
New Hampshire	38.18	1.04	52.70
Maine	41.20	9.53	53.10
Virginia	34.31	25.99	54.10
New Mexico	22.70	6.60	54.30
Colorado	34.21	11.72	55.40
Oregon	5.07	30.60	56.50
New Jersey	51.97	20.03	57.10
Illinois	35.41	40.00	57.50
Washington	41.98	39.44	58.00
Delaware	6.35	-7.99	58.70
Connecticut	120.86	-8.46	59.30
Rhode Island	124.06	50.38	59.40
New York	36.62	30.00	60.90
California	29.13	36.61	63.50
Hawaii	6.50	75.46	63.70
Maryland	60.84	41.41	65.40
Massachusetts	62.30	31.65	65.60
Vermont	181.75	80.15	66.10

3 Results

Simple Linear Regression Model

We first conducted a simple analysis in which we regressed the percentage change in fatal traffic accidents per miles driven between 2019 and 2020 on the percent of the vote won by Biden and changes in other variables that might affect fatal accidents.

We want to examine the effect of voter turnout for Biden in the 2020 election on the rate of change in fatal traffic accidents per miles traveled between 2019 and 2020. In order to measure this effect, we run a regression of the rate of change in fatal car accidents per miles traveled on the voter turnout for Biden (denoted X) with changes in state-level control variables (denoted C). "s" refers to the state. The control variables are changes in the following variables: GDP per capita, median age, density per capita, and the number of vehicles per capita. We run this regression for the two periods: (i) March to June and (ii) July to October.

$$(1)\ \frac{\frac{cases_{2020}}{miles_{traveled_{s2020}}} - \frac{cases_{2019}}{miles_{traveled_{s2019}}}}{\frac{cases_{2019}}{miles_{traveled_{s2019}}}} = \beta_0 + \beta_1 X_s + \beta_2 \frac{C_{s2020} - C_{s2019}}{C_{s2019}} + u_s$$

Descriptive/summary statistics for these variables are in Table 2. The regression results appear in Table 3.

Table 2: Summary statistics for the variables by year

	2019			
	Mean	Std. dev	Min	Max
Fatal car accidents per 100 million miles traveled[xxi]	1.014155	0.2535558	0.4791831	1.588614
GDP per capita	61700.08	11593.33	38276.95	91336.45
Population density	201.3838	265.6543	1.291649	1207.303
Motor vehicles per capita	0.9431967	0.2080377	0.5819013	1.809173
Median age	38.478	2.361277	30.8	44.7
	2020			
Fatal car accidents per 100 million miles traveled[xxii]	1.228726	0.272951	0.6219923	1.831753
GDP per capita	60335.36	11115.53	38608.24	89204.11
Population density	202.1057	266.0155	1.291512	1208.243
Motor vehicles per capita	0.9387959	0.2120642	0.5803148	1.839073
Median age	38.648	2.331264	31.1	44.8

Table 3: Simple Regression Analysis: [xxiii]

Dependent variable: % change in fatal car accidents per miles driven in 2020, relative to 2019.

Independent Variables	March – June	July – October
Biden percentage of Vote	1.165*** (0.366)	0.344 (0.279)
Rate of change between 2019 and 2020:		
GDP per capita	0.292 (1.349)	-0.378 (1.030)
population density	-5.617 (6.309)	-3.723 (4.817)
Motor vehicles per capita	-0.457 (2.209)	2.206 (1.686)
Median age	-69.543*** (17.450)	-3.386 (13.322)
N	50	50
R-squared	0.49	0.10
Adjusted R-squared	0.43	0.00

*** significant at 99% level, ** significant at 95% level, * significant at 90% level

4. Discussion

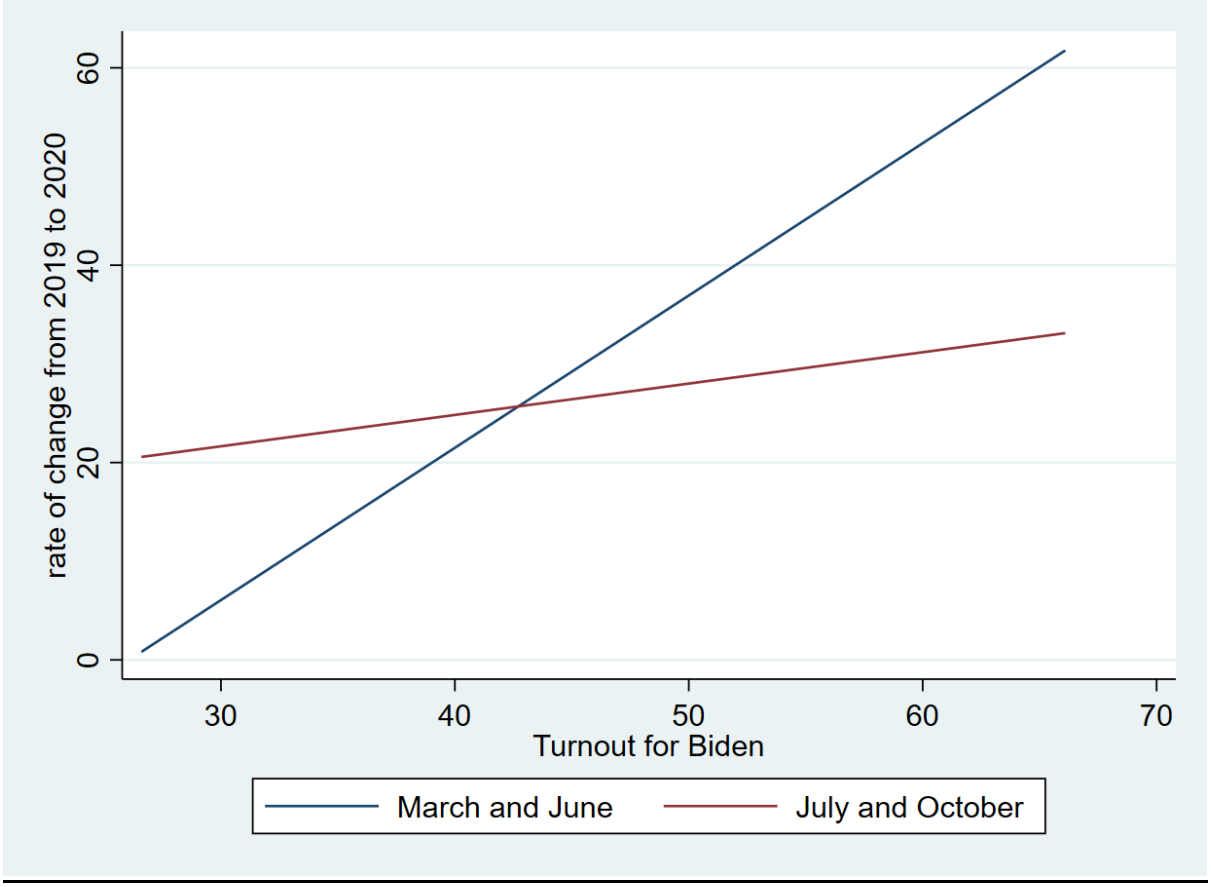
The regression results in Table 3 show that from March to June, a one percent increase in the percentage of votes for Biden resulted in a 1.17 increase in the rate of change in fatal traffic accidents per miles traveled between 2019 and 2020, and this effect was statistically significant. Meanwhile, between July and October, a one percent increase in the vote for Biden resulted in just a 0.344 increase in the rate of change in fatal traffic accidents per miles driven between 2019 and 2020, and this effect was not statistically significant.

Figure 2, based on the regression results of Table 3, shows the fitted regression lines of voter turnout for Biden on the rate of change in fatal car crashes per million miles traveled between 2019 and 2020 for two periods: March to June and July to October. Both regression lines show an upward trend. As the percentage of votes for Biden increases, so does the change in the rate of fatal traffic accidents per miles driven. However, the difference is dramatic: the March to June regression line is much steeper. Between March and June, Biden's turnout significantly affected the rate of change in fatal car crashes per miles traveled between 2019 and 2020. From July through October, the effect was negligible, and not statistically different from zero. That is, statistically there was no difference between "Biden" states and "Trump" states.

In summary, using regression analysis, we show that during the first few months of the epidemic when there were stay-at-home orders and more stress overall, the higher the proportion of votes received by Biden, the higher the rate of increase in fatal traffic accidents per miles traveled in 2020 relative to 2019. We interpret this to mean that, other things being equal, the higher stress level among Democrats during the first few months of the pandemic led to the statistically significant increase (in 2020 relative to 2019) in the rate of fatal car accidents per miles traveled.

Of course, this does not prove causality since there could be other factors as well that influenced this result. For example, perhaps the pandemic led to people doing less routine automobile maintenance, and thus their cars were in worse shape. This might have been more pronounced in Democratic states because these states had more lockdowns or more intense lockdowns. This still would be a COVID-19 effect, though unrelated or less clearly related to psychological stress. In addition, COVID-19 probably meant disruptions in the supply of spare parts. This issue might have been less sensitive to the particular state, but, still, the states with more intense lockdowns could have had more disruptions to the supply chain. We cannot rule out that these other factors mattered as well. Nevertheless, the huge difference between Biden and Trump states likely had a good deal to do with stress, especially given the fact that the difference between Biden and Trump states (in terms of changes in the fatal traffic accidents rate) went away following the period of lockdowns though supply-chain problems continued.

Figure 2: rate of change in fatal traffic accidents per miles traveled between 2019 and 2020.



Robustness Analysis and Additional Discussion

We now employ a Difference-in-Differences model with a Continuous Treatment. See Callaway et al. (2021) for details. The analysis using the formal model in this section confirms the results we saw in the descriptive statistics and the simple regressions we conducted.

Our formal model is as follows:

$$(2)\ cases/miles\_traveled_{sym} = \beta_0 + \beta_1 X_s + \beta_2 T_{2020} * X_s + \beta_3 C_{sy} + u_{sym}$$

Subscript s denotes the state, y denotes the year (2019 or 2020) and m denotes the month (March, April, May or June). The dependent variable, $cases/miles\_traveled_{sym}$ is the number of motor-vehicle accidents with fatalities per vehicle miles[xxiv] traveled in each state in a certain year and month. X_s is the percentage of voters for Biden in the 2020 presidential election in each state. We assume that the turnout for Biden proxies for the state's stress level. $T_{2020} * X_s$ is an interaction variable representing the difference in the effect of a one percent increase in turnout for Biden on fatal traffic accidents in 2020 (during the March –June and July – October periods) relative to 2019. The matrix C_{sy} contains a series of state and year-level control variables. We

include this matrix of other variables because these factors also impact fatal car accidents. We include characteristics of the state's population that affect the probability of fatal road accidents, median age from the Census Bureau, and GDP per capita, which we obtain from dividing the GDP data from the Bureau of Economic Analysis by the number of people from the Census Bureau. We also include factors that can affect the condition of the road, the population density per capita, and the number of motor vehicles per capita. To define the former variable, we use data on area and number of people from the Census Bureau and divide the number of people by the land area (in square meters). For the latter variable, we use data on the amount of all motorized vehicles from the Federal Highway Administration of the US Department of Transportation and divide it by the population data from the Census Bureau. As noted, summary statistics of the percentage change in fatal traffic accidents per miles traveled for 2020 versus 2019 at the state and time level are shown in Table 1b, along with the percentage of votes for Biden in the 2020 election for each state, while Table 2 presents summary statistics for the dependent variable, the rate of fatal car accidents per 100 million miles traveled, and the four control variables in the analysis by year.

By June, all the states had started to implement reopening policies. We want to check how this change affected the rate of fatal car accidents per miles traveled. Therefore, we repeat the analysis for the following four months (July - October) by running equation (2) over this period.

The voter turnout for Biden is not a binary variable but a continuous variable (each state has a different percentage vote for Biden); we thus run a difference-in-differences regression with a continuous treatment variable. We estimate the effect of a 1% change in voter turnout for Biden, on the rate of fatal traffic accidents in 2020 compared to 2019. In addition, we add a fixed effect at the state level and year and month level to control for any state specific and month specific effect that might affect fatal automobile accidents.

We also run similar regressions using data for 2018 and 2019 in order to see whether our results are different when there was no pandemic.

$$(3)\ \frac{cases}{miles\ travled_{sym}} = \beta_0 + \beta_1 X_s + \beta_2 T_{2019} * X_s + \beta_3 C_{sy} + u_{sym}$$

Equation (3) is like equation (2). However, it examines different years (y = 2018 or 2019) and a different interaction variable, $T_{2019} * X_s$, which represents the difference in the effect of a 1%

increase in voter turnout for Biden in 2020 on fatal traffic accidents in 2019 compared to 2018 in the examined months.

Table 4 shows the regression results of equation (2) for the years 2018-2019 from (a) March to June and from (b) July to October. We use this regression to test the parallel trends assumption of our difference-in-differences approach. We are interested in examining the coefficient of $T_{2019} * X_s$, the difference in the effect of a 1% increase in voter turnout for Biden on fatal traffic accidents in 2019 compared to 2018 in the examined periods.[xxv]

Table 4: Dependent Variable: Fatal car accidents per miles traveled.

	(a)	(b)
Biden percentage of vote x 2019	-0.002 (0.003)	0.002 (0.003)
Biden percentage of vote	-0.008*** (0.002)	-0.011*** (0.002)
GDP per capita	-0.0000095*** (0.0000017)	-0.0000067*** (0.0000017)
Population density	-0. 00015** (0.000072)	-0.00024*** (0.000072)
Motor vehicles registration per capita	-0.173** (0.087)	-0.061 (0.087)
Median age	-0.003 (0.008)	0.010 (0.008)
State and year and month fixed effects	Yes	Yes
Years included	2018-2019	2018-2019
Months examined	March - June	July - October
N	400	400
Overall R-squared	0.29	0.27

*** Significant at 99% level, ** significant at 95% level, * significant at 90% level

The negative (and significant) coefficient on Biden percentage of the vote is as expected. Unrelated to COVID-19, "FairWarning" published research showing that people in Republican states are more likely to die in car accidents than in Democratic states. They defined a state as Republican or Democratic according to which candidate they chose in the 2012 presidential election. They showed that the death rate per capita in Republican states is higher than that of Democratic states[xxvi]. According to Rainey (2012), this is probably because of higher speed limits, longer journeys, and greater distances to hospitals and emergency services than in Democratic states[xxvii]. Our data confirm the results of the study and show that this effect obtains even when normalizing by miles traveled. We also see that lower GDP per capita and less population density are associated with more fatal accidents per miles driven, other things being equal.

From the regression results from the formal model using 2018 and 2019, a 1% increase in the turnout for Biden had no significant effect on the rate of fatal traffic accidents per miles driven in the two periods examined. Table 5 shows the regression results of equation (2) for the two time periods: from March to June and from July to October using data for 2019 and 2020. The coefficient of interest is the one associated with the variable $T_{2020} * X_s$ (Biden percentage of vote x 2020), which measures the difference in the effect of a 1% increase in the turnout for Biden on fatal traffic accidents per miles driven in 2020 (COVID-19) compared to fatal traffic accidents per miles driven in 2019.

Table 5: Dependent Variable: Fatal car accidents per miles traveled.

	(a)	(b)
Biden percentage of vote x 2020	0.005* (0.003)	-0.002 (0.003)
Biden percentage of vote	-0.010*** (0.003)	-0.008*** (0.003)
GDP per capita	-0.000013*** (0.0000020)	-0.0000083*** (0.0000018)
Population density	-0.000010 (0.000083)	-0.00021*** (0.000075)
Motor vehicles per capita	-0.173* (0.099)	-0.012 (0.088)
Median age	0.001 (0.009)	0.008 (0.008)
State and year and month fixed effects	Yes	Yes
Years included	2019-2020	2019-2020
Month examined	March – June	July - October
N	400	400
Overall R-squared	0.32	0.19

*** Significant at 99% level, ** significant at 95% level, * significant at 90% level,

The results of the regression we run on the months from March to June appear in column 1 of Table 5. We find that a 1% increase in the percentage of the vote for Biden led to a 0.005 increase in the rate of fatal traffic accidents per miles driven, and the effect is statistically significant. Thus, at the beginning of the pandemic (when there were shutdowns in various states), the percent of the vote for Biden had a significant positive effect on the rate of fatal road accidents per miles traveled.

On the other hand, in July through October (column 2 of Table 5), a 1% increase in percentage of the vote for Biden resulted in a slight ***decrease*** (0.002) in the rate of fatal car accidents per miles traveled! Although this result is not statistically significant, it is striking.

For both periods, we see that a lower GDP per capita is associated with more fatal accidents per mile traveled, other things being equal. In addition, between July and October, a decrease in population density also leads to more fatal accidents per mile traveled, other things being equal.

Here, we run a separate regression for each of the years 2018, 2019, and 2020 for each period we examine, March through June and July through October.

$$(4)\ \frac{cases}{miles\ travled_{sm}} = \beta_0 + \beta_1 X_s + \beta_2 M_s + \beta_3 C_s + u_{sm}\ if\ year = 2018$$

$$(5)\ \frac{cases}{miles\ travled_{sm}} = \beta_0 + \beta_1 X_s + \beta_2 M_s + \beta_3 C_s + u_{sm}\ if\ year = 2019$$

$$(6)\ \frac{cases}{miles\ travled_{sm}} = \beta_0 + \beta_1 X_s + \beta_2 M_s + \beta_3 C_s + u_{sm}\ if\ year = 2020$$

We run these regressions without fixed effects but with M_s a dummy variable at the monthly level. The yearly regressions for 2018, 2019, and 2020 are shown for March to June in Table A1 in the Appendix, and for July to October in Table A2 in the Appendix.

Figure 3 shows the "estimated" relationship between the fatal car accidents rate per miles traveled and the percentage of votes for Biden using the regression results for the years 2018, 2019, and 2020, from the regression results (4), (5), and (6), respectively, for the period between March and June (M_s = March, April, May or June). The graph shows that the rate of fatal car accidents per miles driven was significantly higher for greater percentage votes for Biden in 2020 compared to 2018 and 2019. Figure 4 for the July-October period for 2018, 2019, and 2020 shows that there was no such effect, as the estimated slopes among the years are essentially parallel.

Figure 3: Yearly Regressions for 2018, 2019, and 2020 (March – June)

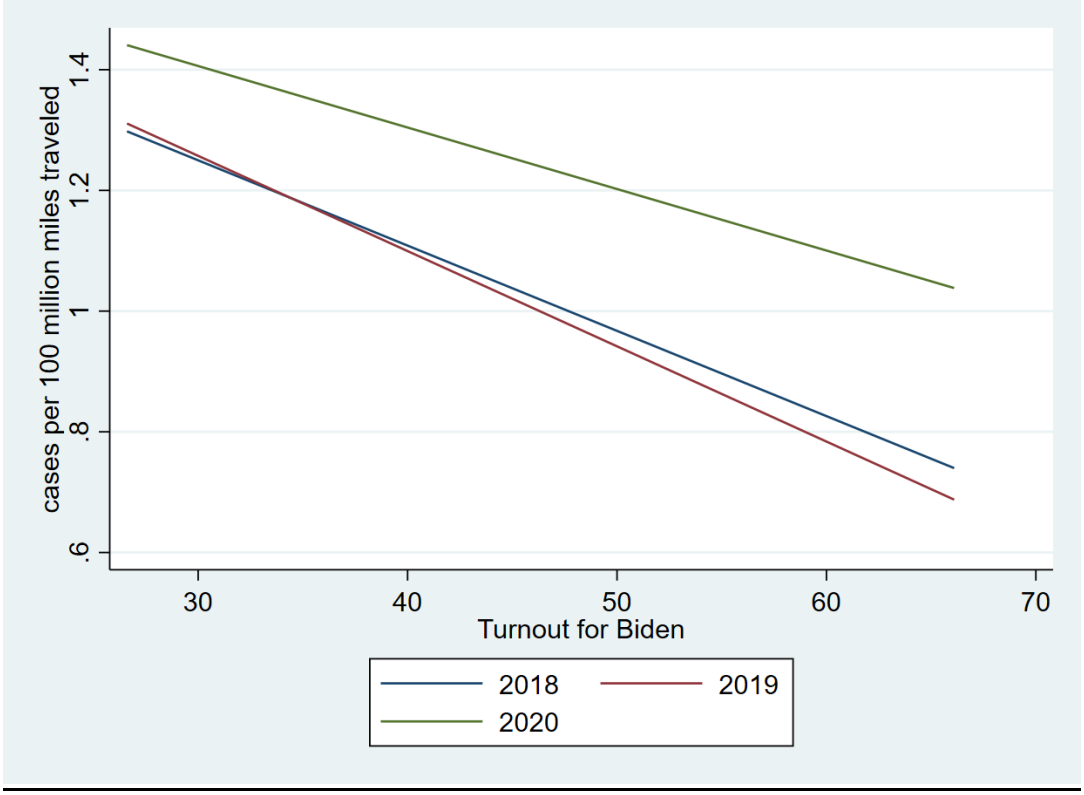
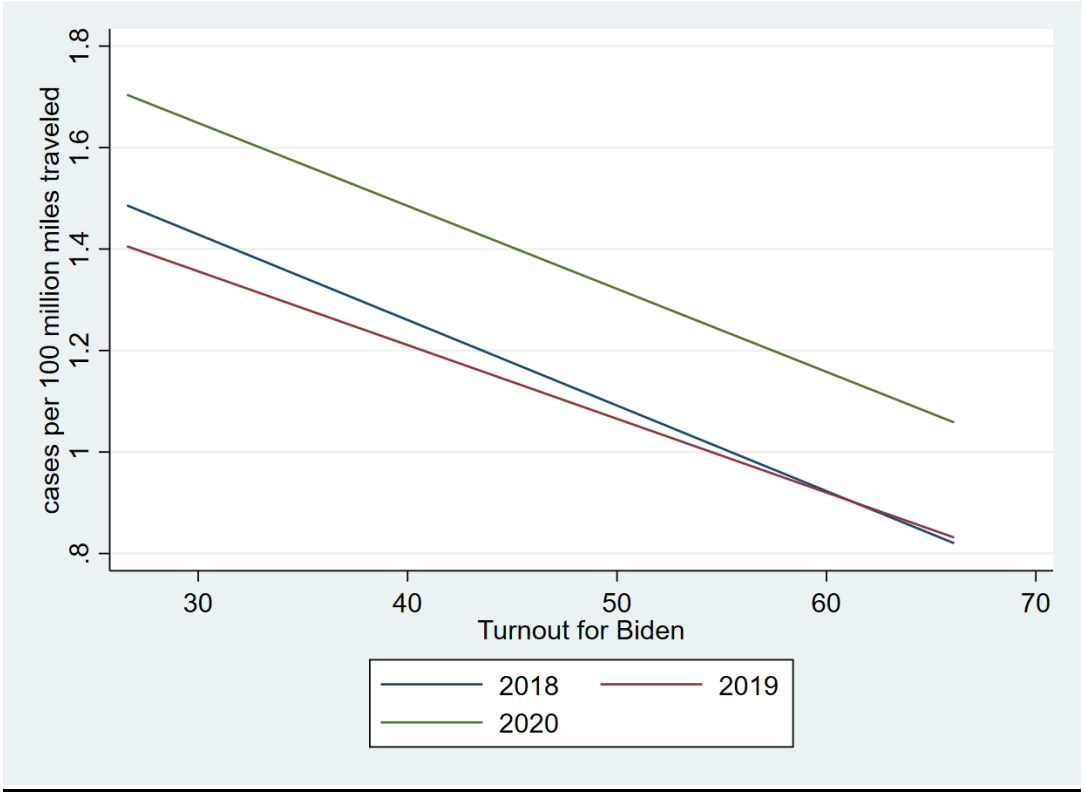


Figure 4: Yearly Regressions for 2018, 2019, and 2020 (July – October)



Overall, the results are essentially the same as in the formal difference in difference model (as well as the earlier simple analysis): Figure 3 shows that the gap between 2020 and the years before the COVID-19 pandemic was larger as the turnout for Biden increased. In the case of

March through June, the slope of the fitted line was 150% larger in 2019 (-0.1 versus -0.04) than in 2020 (2018 and 2019 had essentially had the same slope). Thus, the higher the percentage of the vote received by Biden, the higher the rate of fatal car accidents in 2020 compared to 2018 and 2019. The July to October regression results (Figure 4) show that the change in slope between 2020 and the years before the COVID-19 pandemic was smaller. In the case of July – October, the slope of the fitted line was only 43% larger in 2019 (again, 2018 and 2019 had essentially had the same slope.) Thus, again, the effect was more significant from March to June, at the beginning of the pandemic when there were also shutdowns, than from July to October, when the reopening policies were implemented.

5. Conclusion

In 2020, there was an increase in fatal road accidents in the United States, even though there was a significant decrease in miles traveled that year. One of the factors that can explain the phenomenon is an increase in stress among the US population because of the COVID-19 pandemic, as studies have shown a link between stress and fatal car accidents. However, the increase in stress was not uniform across the country. Our results show that at the beginning of the outbreak of the pandemic in the USA (March to June 2020), the percent increase in fatal car accidents per miles traveled (relative to 2019) was higher when the Biden vote in that state was higher. However, later (between July and October), there was no such effect.

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Appendix

Table A1: Yearly Regressions (March-June)

	2018	2019	2020
Biden percentage of vote	-0.008*** (0.003)	-0.010*** (0.003)	-0.004 (0.004)
GDP per capita	-0.000010*** (0.0000025)	-0.0000090*** (0.0000025)	-0.000018*** (0.0000032)
population density	-0.00016 (0.00010)	-0.00014 (0.00010)	0.00012 (0.00013)
Motor vehicles per capita	-0.207* (0.125)	-0.141 (0.123)	-0.205 (0.152)
Median age	-0.003 (0.011)	-0.003 (0.011)	0.005 (0.014)
April	0.024 (0.057)	-0.009 (0.058)	0.253*** (0.072)
May	0.146** (0.057)	0.126** (0.058)	0.328*** (0.072)
June	0.191*** (0.057)	0.165*** (0.058)	0.428*** (0.072)
N	200	200	200
Adjusted R-squared	0.317	0.327	0.331

Table A2: Yearly Regressions (July-October)

	2018	2019	2020
Biden percentage of vote	-0.010*** (0.003)	-0.010*** (0.003)	-0.007** (0.003)
GDP per capita	-0.000007*** (0.0000025)	-0.0000063** (0.0000024)	-0.000011*** (0.0000028)
population density	-0.00031*** (0.00010)	-0.00016 (0.00010)	-0.00026** (0.00011)
Motor vehicles per capita	-0.103 (0.126)	-0.022 (0.120)	0.001 (0.130)
Median age	0.002 (0.011)	0.017 (0.011)	-0.001 (0.012)
August	-0.055 (0.057)	0.031 (0.056)	0.078 (0.062)
September	0.088 (0.057)	0.093 (0.056)	0.034 (0.062)
October	0.013 (0.057)	-0.008 (0.056)	-0.095 (0.062)
N	200	200	200
Adjusted R-squared	0.332	0.278	0.319

[i] This paper is based on Maya Fuks' MA thesis.

[ii] See Stewart (2022).

[iii] In March 2022, the National Highway Traffic Safety Administration published the NHTSA Releases 2020 Traffic Crash Data report about the changes in traffic accidents and driving habits in the USA in 2020. It reported that the number of people who died in traffic accidents across the US in 2020 was 38,824, the highest number since 2007.

[iv] With the exception of New Hampshire and Maine (53% for Biden), Biden received more than 57 percent of the vote in these states.

[v] See https://www.who.int/health-topics/coronavirus#tab=tab_1

[vi] World Health Organization (2020).

[vii] See Zhang and Warner (2020).

[viii] See World Health Organization (2021).

[ix] See World Health Organization (2022).

[x] See American Psychological Association (2020).

[xi] See Selzer (1969).

[xii] See Selzer and Vinokur (1974).

[xiii] See Magaña, Scherz, Seepold, Madrid, Pañeda, and Garcia, R. (2020).

[xiv] See Leonhardt D. (2022).

[xv] See Pappas (2022).

[xvi] Newport (2007) reported that political identification affects mental health. According to a Gallup poll conducted four times between 2004 and 2007, Republicans report better mental health than Democrats. Newport, F. (2007). Republicans report much better mental health than others, Gallup Poll.

[xvii] See Bock and Schnabel (2022).

[xviii] See Calvillo, Ross, Garcia, Smelter, and Rutchick (2020).

[xix] See Kosnik and Bellas (2020).

[xx] See McCarthy (2020).

[xxi] The number of fatal accidents per 100 million miles driven between January and December 2019.

[xxii] The number of fatal accidents per 100 million miles driven between January and December 2020.

[xxiii] In all of our tables, we report the estimated coefficient with the standard error in parentheses.

[xxiv] For the graphs it is more convenient to use fatalities per 100 million vehicle miles traveled rather than fatalities per vehicle miles traveled, but this, of course, has no effect on our estimated coefficients.

[xxv] The variable Population Density is very skewed. When we put in the log rather than the level, the results are qualitatively unchanged.

[xxvi] See Hirsch (2012).

[xxvii] See Rainey (2012).