The impact of political affiliation on compliance with shelter-in-place orders: A difference-in-difference analysis with county and time fixed effects

Christina Chopra


Abstract

Background
In late March 2020, state and local governments across the country issued shelter-in-place directives to slow the spread of COVID-19. However, divergent messages from political parties on the severity of COVID-19 and differing levels of support of these social distancing measures have potentially prompted differential behaviors across political groups. This study examines state-level partisan differences in changes in human mobility during shelter-in-place orders.

Methods
Aggregated and de-identified large-scale human mobility data was collected from Cuebiq, a mobility insights platform, to measure the fraction of users that sheltered in place. A difference-in-difference analysis was performed to evaluate the changes in human mobility before and after shelter-in-place orders were implemented by state political afflictions.

Results
Before March 19th, 2020, there was a 0.82% difference (SE=0.003, p<0.001) between the percent of users sheltered in place in republican states versus democratic states. Difference-in-difference analysis revealed that on average, democratic states experienced a 4.11% (SE = 0.006, p<0.001) greater increase in the percent of users that sheltered in place compared to republican states pre-post the implementation of shelter-in-place orders. States that were not issued state-wide shelter-in-place orders were excluded from the study.

Conclusion
Evidence supports the differential changes in adherence to shelter-in-place orders by state political affiliation. These results suggest that political messaging may be a strong factor in influencing social distancing behaviors.

Introduction
In the United State alone, there have been over 5 million confirmed cases of the Coronavirus disease, and over 167 thousand deaths as of August 14th, 2020 (Google (https://docs.google.com/document/d/1ZCpCBxVKr7HN99l9n5I-notCjxrzwznTgwKwVNMIdQE/edit#heading=h.4d34og8)). In response to the pandemic, and in the absence of pharmaceutical measures, state and local governments have turned to social distancing measures as the primary mitigation strategy to curb transmission of the virus. Social distancing measures primarily took the form of shelter-in-place and stay-at-home orders where individuals were urged not to leave the house for anything other than essential purposes (The New York Times (https://docs.google.com/document/d/1ZCpCBxVKr7HN99l9n5I-notCjxrzwznTgwKwVNMIdQE/edit#heading=h.26in1rg)). However,
government-enforced social distancing policy is only as effective as the extent to which people adhere to it. As governments across the country continue to look towards directives to reduce the spread of the virus, understanding the factors that influence people’s compliance is crucial to ensuring that these policy measures remain as effective as possible.

A preliminary survey conducted by the Pew Research Center (Green (https://docs.google.com/document/d/1ZCpCBxVKr7HN99l9n5I-notCjxrzwnzTgwKvVNMIdQE/edit#heading-h.2s8ey0i)) found that public opinion on the coronavirus outbreak is divided along party lines, suggesting that political beliefs are a potential factor in influencing an individual’s social distancing behavior. Specifically, the study found that 83% of republicans support President Trump’s response to the coronavirus outbreak, compared to only 18% of democrats. However, it is unclear whether these differences in belief translated into actual differences in social distancing behavior. Previous studies have found significant associations between belief in science and party alignment with level of physical distancing (Brzezinski et al. (https://docs.google.com/document/d/1ZCpCBxVKr7HN99l9n5I-notCjxrzwnzTgwKvVNMIdQE/edit#heading-h.tyjcwt)).

In addition, survey results show significant gaps between republican and democratic individuals in belief about need to socially distance, disease risk and pandemic severity (Allcott et al. (https://docs.google.com/document/d/1ZCpCBxVKr7HN99l9n5I-notCjxrzwnzTgwKvVNMIdQE/edit#heading-h.32nysh7)). The present study aims to determine whether these partisan differences are also reflected in population mobility data in response to shelter-in-place orders.

Methods

Mobility Data

Human mobility data was obtained from Cuebiq’s mobility insights platform. (Cuebiq (https://docs.google.com/document/d/1ZCpCBxVKr7HN99l9n5I-notCjxrzwnzTgwKvVNMIdQE/edit#heading-h.3dy6vmk)) Cuebiq is a location intelligence and measurement platform and provides access to de-identified, large-scale human mobility data that is collected from over 15 million mobile devices. Users opt into providing their location data through a General Data Protection Regulation compliant framework. First-party data is collected through smartphone applications that are able to provide geographical coordinates using various location data sources such as GPS, Wifi, beacons or networks. Mobility was quantified using the aggregated movements of all the users in the county by taking the largest diagonal observed through all the user’s locations on each day. Users that are moving less than 330 feet (~100 m) are considered sheltered-in-place, and the total fraction of users sheltered-in-place in any given county comprises the shelter-in-place index. Data was collected from January 1st, 2019 to May 9th, 2020.

Empirical Approach

A Difference-in-difference model (DiD) was used to study the impact of political leaning on adherence to state-level shelter-in-place orders. In this design we used DiD to estimate the differences between republican and democratic affiliations by comparing the changes in the percent of the population sheltered in place over the time period surrounding the enactment of social distancing policy in the United States (“Difference-in-Difference Estimation” (https://docs.google.com/document/d/1ZCpCBxVKr7HN99l9n5I-notCjxrzwnzTgwKvVNMIdQE/edit#heading-h.30j0zll)).

Our study aimed to isolate the differential impact of shelter-in-place policy on two groups. Our approach follows the difference-in-difference model with varying treatment times proposed in Goodman-Bacon (2018) and applied in many similar studies related to social distancing behavior in response to Covid-19 (Brzezinski et al. (https://docs.google.com/document/d/1ZCpCBxVKr7HN99l9n5I-notCjxrzwnzTgwKvVNMIdQE/edit#heading-h.tyjcwt); Painter and Qiu (https://docs.google.com/document/d/1ZCpCBxVKr7HN99l9n5I-notCjxrzwnzTgwKvVNMIdQE/edit#heading-h.17dp8vu); Wright et al. (https://docs.google.com/document/d/1ZCpCBxVKr7HN99l9n5I-notCjxrzwnzTgwKvVNMIdQE/edit#heading-h.lnxb9j)). We obtain our main results by estimating the following equation [ SEQ Equation * ARABIC 1]:

\[ Y_{ct} = B_0 + B_1 P_{st} + B_2 G_t + B_3 P_{st} G_t + \text{FE} \]

where \( Y \) is the fraction of users sheltered in place in county \( c \) at time \( t \), \( P_s \) is the state policy, where \( P_{st} = 1 \) if at time \( t \), a shelter-in-place policy has gone into effect in state \( s \). \( G_t \) represents the political affiliation of the state, where \( G_s = 0 \) in republican states and \( G_s = 1 \) in democratic states. To account for the staggered shelter-in-place order time points for each state, we included county and time fixed effects. County fixed effects account for time-invariant factors that vary across counties and may be correlated with mobility patterns such as differences in population size, density, industries, income or geographic features. Time-fixed effects were also included to isolate the response to the state’s shelter-in-place order and account for the influence of rises in COVID-19 case counts, media reporting, and nationwide changes in mobility patterns.
Political Affiliation was defined at the state level using the results of the 2016 US Presidential election from the MIT Election Data and Science Lab (“Mit Election Data and Science Lab” (https://docs.google.com/document/d/1ZCpCBxVKr7HN99I9n5I-notCjxzwnzTgwKwVNMIdQE/edit#heading=h.1fob09e)). States were classified as democratic if the democratic vote share exceeded the republican vote share and republican if the republican vote share exceeded the democratic vote share.

**Timepoints of shelter-in-place**

The date on which shelter-in-place orders came into effect for each state was obtained from the New York Times (The New York Times (https://docs.google.com/document/d/1ZCpCBxVKr7HN99I9n5I-notCjxzwnzTgwKwVNMIdQE/edit#heading=h.26in1rg)). The dates of both state-level and county-level orders were taken into account. Overall, as shown in Figure 1, most democratic states implemented social distancing policy earlier than republican counterparts. Two states, Utah and Oklahoma, implemented shelter-in-place orders at a county-level and are not shown in the figure. Six states did not implement any state or county-wide shelter-in-place orders including Iowa, Nebraska, North Dakota, South Dakota, Wyoming, and Arkansas (all of which are republican).

Two separate Difference-in-difference Analyses were conducted. The first DiD measured the differential impact of shelter-in-place orders on democratic states versus republican states, excluding the six states that did not implement any shelter-in-place orders. In order to ensure robustness of these results and isolate the intervention effects, a second DiD analysis was conducted comparing republican states with shelter-in-place orders to the six republican states that did not implement any shelter-in-place policy.

**Results**

**Descriptive Analysis**

Figures 1 and 2 depict the average fraction of users sheltered in place in states with shelter-in-place orders between January 1st, 2020 and May 9th, 2020.

**Figure 1. Dates of state-wide shelter-in-place orders across 42 states. States are colored in accordance with political affiliation as determined by the results of the 2016 presidential election (republican states in red, democratic states in blue)**
Democratic states vs. republican states (excluding states with no shelter-in-place orders)

In Figure 1, the blue line represents the fraction of users sheltered in place averaged over all democratic states with shelter-in-place orders. The red line represents the fraction of users sheltered in place averaged over republican states with shelter-in-place orders. The frequent spikes visible in the data align with the expected weekly cycle in mobility where people tend to stay close to home on weekends and travel further on weekdays. Before the implementation of shelter-in-place orders, between January 1st, 2020 and March 19th, 2020, approximately 22% of users were sheltered in place. The difference between the fraction sheltered in place in republican states and democratic states is negligible during this time period. Beginning the 2nd week of March, the fraction of users sheltering in place rapidly increases. Shelter-in-place orders were officially implemented between March 19th and April 7th, 2020 (shaded in grey). Visually, the average percent of users sheltered in place in democratic states is much greater than the average percent of users sheltered in place in republican states after the intervention. This difference remains relatively constant until May 9th, 2020.

Republican states with shelter-in-Place vs. republican states without shelter-in-place

In Figure 2, the black line represents the fraction of users sheltered in place averaged over all republican states with no shelter-in-place orders. The red line represents the fraction of users sheltered in place averaged over republican states with shelter-in-place orders. Before the implementation of shelter-in-place orders, between Jan 1st, 2020 and March 19th, 2020, the fraction of users sheltered in place in republican states that would enact shelter-in-place orders is slightly greater than the fraction sheltered in place republican states that did not receive shelter-in-place orders. Beginning the 2nd week of March, the fraction of users sheltering in place increases among most republican states. In the time period following the implementation of these orders, visually the average percent of users sheltered in place in republican states with shelter-in-place orders is greater than the average percent of users sheltered in place in republican states with no shelter-in-place orders. This difference also remains relatively constant until May 9th, 2020. These differences are quantified in the following section.

Difference-In-Difference

Democratic states vs. republican states (excluding states with no shelter-in-place)

The difference-in-difference model was used to analyze partisan differences in the social distancing response. The results for the first DiD analysis comparing democratic and republican states that implemented shelter-in-place policies are shown in Table 1. Before the implementation of shelter-in-place orders, the baseline sheltered-in-place index in republican states was 0.2651 (p<0.001, SE=0.001) and in democratic states was 0.2732 (p<0.001, SE=0.001). The difference in baseline values was 0.0082 (p<0.001, SE=0.001). Post implementation of shelter-in-place orders, the segmented regression analysis reveals that this difference increased to 0.0411 (p<0.001, SE=0.001).
Republican states with shelter-in-place vs. republican states without shelter-in-place.

The results for the second DiD analysis comparing republican states that implemented shelter-in-place policies to republican states that did not implement shelter-in-place policies are shown in Table 2. Before mid-March, the baseline sheltered-in-place index in republican states that implemented shelter-in-place orders was 0.2651 (p<0.001, SE=0.001) and in republican states that did not implement shelter-in-place orders was 0.2521 (p<0.001, SE<0.001). The difference in baseline values was 0.013 (p<0.001, SE=0.001). Post implementation of shelter-in-place orders, the segmented regression analysis reveals that this difference increased to 0.0142 (p<0.001, SE=0.001).

Table 2. Difference-in-Difference Analysis of republican states with shelter-in-place policies and republican states with no shelter-in-place policies.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Coefficient</th>
<th>Standard Error</th>
<th>t Statistic</th>
<th>p-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Republican with shelter-in-place baseline before interruption</td>
<td>0.2651</td>
<td>0.000</td>
<td>707.674</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Republican without shelter-in-place baseline before interruption</td>
<td>0.2521</td>
<td>0.001</td>
<td>299.844</td>
<td>&lt; 0.001</td>
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<td>Republican with shelter-in-place trend</td>
<td>0.1078</td>
<td>0.001</td>
<td>196.628</td>
<td>&lt; 0.001</td>
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<td>Republican without shelter-in-place trend</td>
<td>0.0936</td>
<td>0.001</td>
<td>79.912</td>
<td>&lt; 0.001</td>
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<tr>
<td>Difference in republican with shelter-in-place level before interruption</td>
<td>0.0130</td>
<td>0.001</td>
<td>14.070</td>
<td>&lt; 0.001</td>
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<tr>
<td>Difference in republican with shelter-in-place level after interruption</td>
<td>0.0142</td>
<td>0.001</td>
<td>10.943</td>
<td>&lt; 0.001</td>
</tr>
</tbody>
</table>

Discussion
In this study, we analyzed the partisan differences in mobility response to shelter-in-place orders in the United States using aggregated cell-phone mobility data. Post-implementation of state-wide shelter-in-place orders, the percent sheltered in place in democratic states increased by 3.29% (p<0.001) more than the percent sheltered in place in republican states. Further, among republican states, the percent sheltered in place in those that implemented policy orders increased by 0.12% (p<0.001) more than in those that did not implement any policy orders.

We find a significantly larger decrease in mobility in democratic states compared to republican states. These results suggest that partisan differences may have had a stronger influence on stay-at-home behaviors than local shelter-in-place policies. These results are supported by Anderson, 2020 findings that changes in social distancing behavior are primarily voluntary, reflecting an individual’s belief about disease risk (Andersen https://docs.google.com/document/d/1ZcpCBxVKr7HN99I9n5I-notCjxrzwnzTgwKwVNMIdQE/edit#heading=h.2et92po)). In the early stages of the COVID-19 pandemic, President Trump suggested that the coronavirus was no worse than the flu, promised an early treatments and praised the United States testing capacity. (Qiu https://docs.google.com/document/d/1ZcpCBxVKr7HN99I9n5I-notCjxrzwnzTgwKwVNMIdQE/edit#heading=h.3rdcrjn)). Additionally, in a White House Briefing President Trump made statements “our country was not built to be shut down” and “We cannot let the cure be worse than the problem itself.” These statements by President Trump may have influenced republicans to be less inclined to social distance and follow shelter-in-place orders.

Further, Druckman et al. finds that polarized environments fundamentally change an individual’s decision making (Druckman et al. https://docs.google.com/document/d/1ZcpCBxVKr7HN99I9n5I-notCjxrzwnzTgwKwVNMIdQE/edit#heading=h.1t3h5sf)). Specifically, political polarization leads to a greater impact of party endorsement on individual opinion. As mentioned, the preliminary survey conducted by the Pew Research Center (Green https://docs.google.com/document/d/1ZcpCBxVKr7HN99I9n5I-notCjxrzwnzTgwKwVNMIdQE/edit#heading=h.2s8ey01)) found that 83% of republicans supported President Trump’s response to the coronavirus pandemic, compared to only 18% of democrats. The political polarization of the pandemic response perhaps resulted in greater alignment with party lines and a lower focus on scientific facts. In fact, Druckman also finds that such polarization stimulates greater than normal confidence in less substantive viewpoints. Therefore, these differences in shelter-in-place behaviors across states with opposing political affiliations may be attributed to the ongoing polarized political atmosphere where party endorsement outweighs evidence-based policy directives.

Conclusion

In conclusion, political affiliation may have an influence on level of adherence to social and economic policies related to the COVID-19 pandemic. Bipartisan support for effective evidence-based policies is necessary to ensure the nation-wide uptake of these measures, and ultimately reduce the transmission of COVID-19.

References


