Trusted Institutions and Mobility Restriction: Evidence from the COVID-19 Pandemic in Korea*

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Abstract

This study examines the role of trusted institutions and political orientation in people's tendency to comply with COVID-19 preventive measures. Using data on public transportation mobility and political orientation in the Seoul metropolitan area, we show that political messages on quarantine success downplayed the severity of the virus and thus citizens' social distancing compliance during the major waves of COVID-19 in 2020-2021. Individuals supporting the government align their mobility behaviors with the government messages, feeling safe and engaging more in social activities. Additional channels come from the area's occupation and industry classifications, mainly through remote work availability.

Keywords: political orientation; political message; mobility; social distancing; policy compliance; COVID-19

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1. Introduction

Since the original outbreak of COVID-19 in early 2020, multiple health policies on social distancing and mobility restrictions have been implemented to effectively reduce mortality and its load on the healthcare system across the world. While the effectiveness of such restrictive measures depends on the collective compliance of individuals, abidance to containment measures requires heavy personal social responsibility. Persistent and common actions through shared beliefs are key to overcoming pandemics and preventing the free-rider problem. Previous studies on major pandemics (SARS, MERS, H1N1 influenza, and COVID-19) have suggested that diverse factors including education level (Taylor et al., 2009), gender (Galasso et al., 2020), income level (Chiou and Tucker, 2020; Coven and Gupta 2020; Bodas and Peleg, 2020), civil capital (Barrios et al., 2021), and political partisanship (Barrios et al., 2020) heavily influence one's level of compliance. Among multiple channels, the role of governments in providing reliable information on virus specificity and containment has been found to be crucial (Van Der Weerd et al., 2011). Previous research has suggested that people tend to depend heavily on instructions and preventive policies from authorities when facing widespread uncertainty in a pandemic situation (Vaughan and Tinker, 2009; Marien and Hooghe, 2011; Briscese et al., 2020). Thus, effective public communication should be provided at the right time and place in accordance with the pandemic situation to achieve positive public health outcomes (Quinn et al., 2013).

However, containment measures have not always been in accordance with political messages. Governments in advanced countries have continuously advertised their success in containing the pandemic and how safe it was for citizens to maintain essential economic and consumption activities (Garrett, 2020). The positive signals provided by the government were often mismatched with the pandemic situation and existing containment policies, where COVID-19 infection rates soared shortly after the government released messages of quarantine success to the public. A natural question is whether individuals trusted the institution and valued its public messages when deciding whether to abide by containment measures. Whether to believe the public message (and prolong one's essential activities) or perceive the message as misleading information could directly influence one's decision to comply with public policies.

In this study, we study the impacts of political orientation towards the government on the level of compliance with public health policies. We take advantage of the fact that the enforcement of public health policies which were rapidly implemented shortly after the unexpected widespread of COVID-19. The study exploits the regional variations in political orientation using the 2017 presidential election and 2020 congressional election results from Seoul Metropolitan City in South Korea. The political orientations of each area are measured using the election results (votes cast for the winning candidate) and mobility is calculated from 11,004 bus stops in Seoul, which accounts for all the bus stations up to 2019. By combining these, variations within the city's smallest regional classifications in terms of political orientation and mobility were able to be examined. This allows us to implement a difference-in-differences approach to estimate the role of political orientation on abidance to social distancing and mobility reduction using daily mobility data from 11,004 bus stations in Seoul spanning from 2020 to 2021.

The key findings of this paper are as follows. The decline in weekend public transportation mobility around the three major waves of COVID-19 in 2020 and 2021 is significantly stronger in areas where there were fewer votes cast for the president and the ruling party. The results are statistically significant for all waves and both the 2017 presidential election and 2020 legislative election results. Groups casting more votes for the president and his party before the crisis seemed to show stronger belief in the government's messages about successful quarantining and stimulus spending, which might have led to less compliance with social distancing and higher mobility levels. An investigation of heterogeneous behaviors divided by occupation and industry classification provides that areas with a high proportion of service workers, elementary workers, warehouses, and transportation businesses had less influence from political orientation in reducing mobility levels. A possible explanation could be that these workers had less access to remote work and had to work weekends. Robustness checks disclose that the effect remains consistent when using car traffic mobility data instead of public transportation mobility data.

Our study contributes to the literature on the impact of political alignment and trust in the government on public health policy compliance during the pandemic. While previous literature has commonly discussed the effect of political alignment on compliance with COVID-19 mitigation policies, the relationship between political messages and public health policies differs by nation. For instance, a study of political trust in the European Union nations (Bargain and Aminjonov, 2020) shows that in situations where the government promotes the severity of the COVID-19 pandemic and encourages its citizens to avoid the virus, higher levels of political trust were aligned with better abidance with health policies and showed a larger effect of policy stringency. Alternatively, in the case of the United States where President

Donald Trump and the Republican Party presented statements downplaying the severity of COVID-19, states more favorable to Republicans engaged in less social distancing and wore fewer face masks (Allcott et al., 2020). A study in Italy (Barbieri and Bonini, 2021) examines the role of trust towards the ruling political party and finds that provinces in favor of the right-wing parties showed lower rates of compliance with social distancing orders. To the best of our knowledge, this study is the first to utilize both public transportation data and road traffic data to measure the level of compliance with social distancing. Apart from previous studies mainly using surveys from sampled populations and mobility from smartphone location data, this study's research design uses the election results measured from 425 electoral wards and mobility data calculated from 11,004 bus stops in Seoul. Additionally, this study observes all periods of major COVID-19 outbreaks during the years of 2020-2021, contrasting with majority of previous research solely focusing on a single widespread period.

The remainder of the paper is structured as follows. Section 2 reviews the background on the pandemic situation in Korea. Sections 3 and 4 present the data and the empirical methodology. Section 5 describes the main results of the study, after which section 6 describes the possible mechanisms. Section 7 concludes the paper with policy implications.

2. Background

2.1. The Status of COVID-19 in Korea

A brief overview of the status of COVID-19 in South Korea during the years of 2020-2021 is as follows[1]. The first known imported case of COVID-19 occurred on January 20, 2020 from a 35-year-old Korean woman traveling abroad. Following, the first wave of the COVID-19 pandemic started on February 18, 2020 in the city of Daegu, about 150 miles southeast of Seoul. An explosive outbreak began among members of a religious group called Shincheonji, mostly affecting the country's southern regions (84% of the confirmed cases were from Daegu and Gyeongsangbuk-do). Alert levels were raised from orange to red on February 23, 2020 and the start of the 2020 public school academic year was delayed by more than a week by the Ministry of Education. Approximately 11,000 people were infected. The first super spreading wave ended around April 2020.

After several months of a well-controlled pandemic situation, South Korea faced a second wave of COVID-19 super spread beginning on August 3, 2020. The epicenter of the

[1] For detailed description on South Korea's COVID-19 status, please visit http://ncov.mohw.go.kr/en/.

spread was Seoul, the capital city of South Korea. A massive outbreak started at a church named Sarang-Jaeil Church and soon spread nationwide in two weeks. The reason for such a rapid spread was due to negligence of socially distancing and disobedience to public health policies. The areas most affected by the pandemic were Seoul and Gyeonggi-do, the city's larger metropolitan area, where approximately 13,000 people were infected. The second wave ceased in September 2020.

Beginning November 13, 2020, Korea experienced a third wave of COVID-19 super spread. The spread was on a nationwide scale, infecting approximately 45,000 people until it diminished around January 20, 2021. This widespread outbreak was not attributed to a particular group like the first and the second waves but was spread through an unspecified group of people, going undetected. Experts stated that the cause of the third widespread of COVID-19 was due to a premature easing of the social distancing measures after the end of the second COVID-19 wave (Seong et al., 2021). Opposed to the advice from pandemic professionals, the government had reduced the social distancing level to its lowest even though the pre-stated government standards for doing so were not met.

The fourth pandemic wave outburst began on July 8, 2021, after a public announcement from the Korean Disease Control and Prevention Agency. While the government provided a public statement that COVID-19 mitigation policies would be relaxed due to a well-controlled quarantine, the COVID-19 delta variant led to more than 180,000 infection cases occurring nationwide. The fourth wave ceased in September 2021, but the rate has not fallen below 1,000 confirmed cases per day since then. For convenience, a graphical overview of the COVID-19 trends is provided in Appendix Graph 1.

2.2. The Government's Political Messages and Spending Revitalization Plans

As South Korea was going through the cyclical turbulence of multiple COVID-19 waves, a common criticism the government faced was that its messages were not in accordance with the real COVID-19 situation. The government and the administration provided multiple public messages and implemented consumption boosting policies during the COVID-19 pandemic period[2]. Government-issued messages ranged from celebrating quarantine success to public assurance on returning to school and enjoying safe holidays. Table 1 summarizes the

[2] For a full timeline of the announced government messages, please visit https://www.korea.net/Government/Briefing-Room/Presidential-Speeches.

political messages and spending revitalization plans announced by the government, which were followed by subsequent rises in virus cases.

[Table 1]

Before the occurrence of the Shincheonji mass infection incident which led to the first wave of COVID-19 on February 18, 2020, the president announced a special message for the people on February 10, 2020. The message emphasized that the Coronavirus is not a serious disease to the nation so far, and people should feel at ease given that the fatality rate is not high (Korea.Net, 2020a). On March 30, 2020, the government praised its quarantine measure policies, saying that Korea was nearing victory against COVID-19 and would be recognized internationally as the golden standard of quarantine and pandemic mitigation (Korea.Net, 2020b). However, the Itaewon COVID-19 mass outbreak occurred soon after. On May 11, 2020, before the second wave of COVID-19, stimulus payment program providing up to KRW 1,000,000 (USD 766.49 as of July 6) were provided per household to encourage consumption spending and drive recovery in sales losses. Furthermore, a presidential message on the Korean New Deal Initiative (July 14, 2020) explained how "Korea is overcoming the COVID-19 crisis in an exemplary manner, managing to keep the daily infection levels low (Korea.Net, 2020c)." Unfortunately, a massive spread of the virus followed two weeks after.

Before the third wave of the pandemic was widespread, the government publicly announced that they were preparing for coexistence with the virus by reorganizing the social distancing system (Korea.Net, 2020d). This was followed by the resumption of the 76.2 million dollars domestic spending revitalization plan, providing vouchers to citizens to encourage economic activity (October 18, 2020). As a result of the wide spread of the virus following the message, the government issued an official apology for the inadequate containment. However, political messages downplaying the COVID-19 situation did not end there. After revising the rules on public holidays to allow for longer summer vacations, the president ensured safe summer holidays and a return to in-person classes in the second semester at a meeting on epidemic prevention and control on June 7, 2021 (Korea.Net, 2021a; Korea.Net, 2021b). Shortly after, a contrasting situation materialized as the fourth wide spread of the pandemic attacked the nation. As a result, new social distancing measures, including the prohibition of gatherings of more than two people, were instead heavily enforced.

Cases of government messages misrepresenting the COVID-19 situation have been frequently observed worldwide. Garrett (2020) well summarizes such cases in his study. When the pandemic first emerged in China, the Chinese government and local officials released statements that downsized the severity of the virus potential. In Japan, the government hesitated to fully disclose the mass infection that happened onboard the Princess Diamond cruise ship, attempting to assure citizens of a well-controlled pandemic situation. In Iran, the deputy health minister and the ruling council attempted to persuade the nation that the pandemic was almost stabilized, and no imminent danger of disease spread existed. This resulted in a devastating spread of disease in Iran. The Saudi Arabian government, through social media censorship and imprisonment, sought to silence communications on the danger of COVID-19 spreading inside the nation. In the case of the United States, the Trump administration declared the pandemic to be a hoax, claiming the severity of the disease to be exaggerated by the opposing Democratic Party.

3. Data

This study uses two main sources of data for analysis - public transportation mobility data measured per bus station from 2017 to 2021 from the Seoul Open Data Service, and the election results at the electoral ward level from the 2017 presidential and 2020 congressional elections from the Republic of Korea National Election Commission. The region of observation is restricted to Seoul Metropolitan City, where 20% of the total population of South Korea lives. The advantage of observing the effects in Seoul was the availability of rich traffic data and demographic information for all 425 wards (the smallest geographical unit of governmental statistical measurement). The unit of observation is the 425 electoral wards of Seoul, which were established based on being the appropriate size and population for residential convenience and administrative efficiency.[3]

3.1. Public Transportation Mobility

To create an index calculating the mobility changes in a certain area, we use public transportation mobility data between January 2017 and December 2021. The data contain the daily number of boarding and deboarding passengers using the bus, obtained from public transportation card information. The justification for using bus data to represent public

[3] They are the smallest unit of measure dividing Seoul (Region (Si) > District (Gu) > Ward (Dong)).

transportation mobility is as follows. The buses account for 36.59% of total public transportation usage in 2020.[4] In Seoul, a total of 598 bus lines serve 11,004 bus stations (Seoul Metropolitan Government, 2022). Bus transport data are favored over the subway data for our research due to Seoul's relatively small number of metro lines and stations (9 metro lines visiting 320 metro stations). Alternatively, Seoul's bus routes are classified into 5 types (trunk bus, branch bus, circulation bus, rapid bus, and local bus) to connect suburbs, the city center, and subcenters ubiquitously. By utilizing bus transportation data to measure the mobility of citizens, we take advantage of the abundant and even distribution of bus stations in the Seoul region. All of the 11,004 bus stations (every bus station in Seoul up to 2019) are matched to the 425 electoral wards using the coordinates from the Open Source Geographic Information System. The daily number of onboard passengers was collected per bus station, which was aggregated by ward to represent the daily mobility information for the 425 electoral wards. To control for time-series trends as well as seasonal and monthly characteristics, we use the differenced mobility levels between the years 2020-2021 and 2019-2020. Thus, the main outcome variable is the mobility reduction rate for the 425 wards before and after the emergence of COVID-19:

$$Mobility\ Reduction_t = \frac{Mobility_t - Mobility_{t-1}}{Mobility_{t-1}} \times 100. \tag{1}$$

Finally, weekends are chosen as the time unit for the analysis to eliminate the effect of weekday commuting and capture mobility mostly representing leisure and recreation.

3.2. Political Orientation (Election Results)

As a proxy for political orientation, election results from before or early stages of the COVID-19 pandemic are used.[5] The 19th presidential election held in May 2017 is used to represent the citizens' political alignment. In order to capture political orientation towards the ruling political party, the 21st congressional election results from April 2020 are also used. Votes earned by the president (Moon Jae In) and the ruling party (the Democratic Party) are

[4] Cars, bus, and metro each consist of 24.5%, 24%, and 41.6% of the overall 32,162,000 daily traffic volume (Seoul Metropolitan City Report, 2022).

[5] The 21st congressional election was held in April 15, 2020 shortly after the initial outbreak of COVID-19. However, the number of infections were very low in the initial stage of the pandemic, and less relevant with our region of observation, Seoul.

used as the main treatment intensity for the difference-in-differences setting. The distribution and mapping of political orientation from the election results are shown in figure 1. In both elections, most of the wards supported the president and the ruling party, even though there were variations by ward.

[Figure 1]

4. Empirical Strategy

To estimate the effect of political orientation on an individual's compliance with social distancing, we implement the difference-in-differences (DID) regression framework. It compares the mobility reduction rates for groups with different levels of political orientation before and after the enforcement of social distancing policies. The treatment and reference periods are set as one month before and after the implementation of mobility restriction measures. The empirical strategy relies on the variation in votes earned as political orientation among the electoral wards. For the analysis, three waves of COVID-19 outbreak in Seoul Metropolitan City between 2020 and 2021 are used. The first wave of COVID-19 is dropped as it was mainly centered in Daegu and Gyunsangbuk-do, which are not closely related to Seoul. The reference periods are the weekends before the enforcement of the social distancing policies, while the treatment periods are weekends after the strengthened public health policies were implemented. The regression equation has the form as follows:

$$Y_{ist} = \beta_0 + \beta_1 D_{is} + \beta_2 Post_t + \beta_3 (D_{is} \times Post_t) + \gamma Covid_{st-1} + X'_{ist}\delta + \theta_t + \eta_s + \varepsilon_{ist}, \quad (2)$$

where Y_{ist} is the mobility reduction rate (%) per ward i in district s, on day t. D_{is} is the percentage of votes the presidential candidate and the ruling party earned in ward i. A binary specification for D_{is} was also introduced to indicate whether the candidate received votes at more than the median level. This allows for comparison between the wards that were more favorable to the president and his party and the wards that were less supportive. $Post_t$ is the post reference period dummy separating the periods before the enforcement of social distancing policies and after the strengthened mobility restriction measures. Specifically, the length of each timeframe is two months: a month of the pre-period and another for the post-period. Appendix Table 1 summarizes the reference periods and the treatment periods for the three major waves of COVID-19 in Seoul.

$D_{is} \times Post_t$ is the interaction term, providing the main coefficient of interest. If political orientation has a negative effect on mobility reduction, the coefficient for the interaction term, β_3, is expected to show a positive sign. $Covid_{st-1}$ is the number of Covid-19 infections in the district on day $t-1$. By including the number of COVID-19 confirmed cases in the previous day as a control, we intend to control for both the direct and indirect effects of the local pandemic outbreak. First, one may perceive large infection numbers as a higher chance of encountering those who are infected and reduce mobility. Additionally, this information reflects the amount of exposure to emergency messages and the exigency to comply with government policies. The emergency alert text messages received when an infection case has happened in nearby location may act as a warning sign to disseminate information and encourage preventive behaviors (Lee and You, 2021). The vector X_{ist} is a set of time-invariant covariates which could potentially affect the outcome variable even without public policy intervention. It controls for the regional characteristics, including population density, elderly population proportion, land price, industry characteristics, and resident job proportion. Fixed effects are also added for days and districts. There are 25 districts in Seoul at the time of this study. Standard errors are clustered by electoral ward. Summary statistics on the major variables are provided in Table 2.

[Table 2]

5. Results

5.1. Visual Evidence: Common time trends

Since this study is based on DID estimators, the parallel trend assumption that differences in mobility are constant over time for the wards in the reference periods should be held. To observe parallel trends and the effect of regional variations in political orientation, visual evidence is provided in figure 2.[6]

[Figure 2]

Figure 2 exhibits time trends for the wards that casted large numbers of votes for the president or the congressional ruling party (red dashed line) and the wards with fewer votes

[6] In Figure 2, we show only Sunday as Saturday and Sunday have different mobility patterns. Presenting only Saturday has a similar reduction in mobility. The graphs are available on request.

(blue straight line). The vertical dotted line separates the periods before and after the social distancing policies were implemented. The graph results indicate that the common time trend is a reasonable assumption. Before the implementation of the enhanced social distancing policies, the curves are quite close and show parallel trends with overlapping confidence intervals. However, after the strict public health policies hit, the groups diverge significantly with a sharp reduction in mobility. This fall is more pronounced in the groups of wards with a lower level of political trust. In conclusion, there is less evidence of blatant violations of the common time trend in the data, and the social distancing policy appears to have a diverging impact on mobility reduction for the groups with different levels of trust in the government.

5.2. Effects on Public Transportation Mobility

Table 3 shows the estimation results on mobility reduction. Panels A and B represent the two types of election results used for the regression. The independent variable of interest is the interaction term between votes cast (political orientation) and the post-reference period dummy, specified in the first rows of each panel. The estimates capture the effect of political orientation towards the government and the ruling party on the mobility reduction level, controlling for the difference in mobility trends by region through the district fixed effect. The columns represent the three major waves of pandemic outbreaks. The results indicate that the wards that cast fewer votes for the president or the ruling party decreased their mobility more than their counterparts. A 10% decrease in the proportion of votes of support in the presidential election resulted in a 1.75-3.15% higher reduction in mobility across waves. In the case of the congressional election, a 10% decrease in the proportion of votes for the ruling party led to a 1.12-1.81% additional reduction in mobility.

[Table 3]

Table 4 shows the estimation results using a binary measure of political orientation comparing the areas which casted a large proportion of votes in support of the president (or the ruling party) to areas with lower support.[7] The effects remain significant and consistent with those in Table 3. Wards more favorable to the president show 0.77-1.56% more mobility and regions casting higher levels of votes to the ruling party tend to move 0.91-1.31% more. This

[7] The binary specification separates the 425 wards into two regions, a high approval and a low approval region, using the median of votes earned by candidates.

suggests that political orientation has a significant effect on compliance with social distancing policies. The results are statistically significant at a 1% level and are consistent for all three periods of major widespread outbreaks, for election results and both continuous and binary specifications.

[Table 4]

5.3. Effects on Overall Car Traffic Mobility

A possible concern could be that the reduction in public transportation usage may not fully reflect the mobility patterns of residents. This could be the case if people substituted public transit with transportation by car. To debunk such a concern, we additionally test for mobility changes using overall car traffic as the dependent variable. Data from the Seoul Open Data Portal provide the daily number of vehicles passing through a certain point on major roads. A total of 139 traffic beacons[8] installed on major roads by the Seoul Transport Operation and Information System (TOPIS) are matched with the electoral wards to measure the regional road traffic congestion per day. The beacons counted the daily number of automobiles on the road, and thus gave the researchers the ability to capture mobility by vehicles other than buses. However, a limitation existed in the relatively small number of beacons. As result, only the mobility of approximately 250 wards (58.96%) was included in the sample. The estimation results using car traffic mobility are provided in Table 5.

[Table 5]

The results provide a consistent story with the public transportation mobility. The positive and significant coefficients for road traffic mobility reduction suggest that the decrease in bus mobility is not the result of an increase in car traffic mobility.[9] The evidence strengthens the effect of political orientation, where people in favor of the government and the ruling party show less mobility reduction in both public transportation and car usage.

[8] Although there are 139 beacons installed, road traffic is measured for both directions. This allows us to calculate the overall car traffic mobility for approximately 250 wards.

[9] Although the coefficients are not significant for the first wave, the sign and magnitude are similar to the results in Table 3.

5.4. Eliminating Outlying Districts

Another concern is whether the effect of political orientation comes from outlying areas. Three districts in Seoul, Gangnam-gu, Seocho-gu, and Songpa-gu, have historically tended to provide election results strongly in favor of the conservative party in most elections. It is a common phenomenon to call these three conservative districts the *Gangnam 3-gu* in Korea. For instance, the proportion of votes earned by the former liberal president in the 2017 presidential election were 34.3%, 34.9%, and 39.1%, respectively, far lower than the city's pooled mean of 41.2%. In the case of the 2020 congressional election, the percentage of votes earned by the liberal party were 38.7%, 39.5%, and 47.9% each, which was lower than the city's pooled mean of 52.7% (Republic of Korea National Election Commission, 2021). Thus, to test whether these outlier districts distorted the true effect of political orientation, we run the regression without these three districts. The results are summarized in Table 6. The results are consistent before and after the elimination of the outlier districts, suggesting that the estimated effects are not the outcome of distortion from outliers.

[Table 6]

5.5. False Specification Testing

Although we have graphically interpreted the common time trend assumption before the treatment period in Figure 2, a placebo regression is implemented in order to further validate that the mobility reduction difference after public health policy enforcement was indeed from the political orientation effect. We assume that the COVID-19 public health policies and mobility restraints were implemented between the years 2018-2019 instead of 2020-2021. The weekends and months are identical to the main specification. Table 7 shows the results. In comparison to the main specification results, all coefficients in the placebo test lose their significance with coefficients near zero. Thus, we do not reject the null hypothesis of parallel trends.

[Table 7]

6. Discussion on Possible Mechanisms

6.1. Public Messages about Quarantine Success and Spending Revitalization

From the empirical findings, we suggest an important mechanism to explain the disparities in mobility responses. Repeated messages from the president on the successful mitigation of COVID-19 and the government's encouragement for resuming essential economic activities were embraced differently by people according to their political alignments. Individuals adjusted their social behaviors and civic capital in deciding their own level of policy compliance through the channels of trust and belief based on their political orientation (Bargain and Aminjonov, 2020; Bartscher et al., 2021). Revisiting Table 1, the phenomenon is clearly visible. The president and his administration confidently believed in the safety of the nation and celebrated their quarantine success. Before the major widespread of COVID-19 outbursts were words of the government to assure the public to believe that the pandemic will soon be over. In May and October 2020, the government announced domestic spending revitalization plans to promote consumption and economic activities, which were soon postponed due to subsequent COVID-19 case growth (Jung et al., 2021).

These messages opposing the severe, widespread of pandemic may have downplayed the actual severity of the crisis. Individuals with more support for the government made their decision to comply with social distancing based on these messages of successful quarantine handling. When the government encouraged consumption and outdoor activities by providing consumption vouchers and longer alternative holidays, those fond of the government were convinced by the political stance of a well-controlled pandemic situation. Thus, they did not reduce their movements and engaged more in social activities after feeling safe from the government's signals. Several studies provide consistent evidence for this possible mechanism (Dirks and Ferrin, 2001; Bonell et al., 2020; Bavel et al., 2020; Bartscher et al., 2021; Corbu et al., 2021), suggesting a positive relationship between trust in an institution and adherence behaviors.

The empirical findings of this study are in line with recent literature on the role of trust and belief in compliance with social distancing and quarantine. Allcott et al. (2020) observe the effect of partisan differences for the Trump administration in the United States, where states with higher support for Trump's public messages on safety, the ineffectiveness of face masks and quarantine tend to have citizens who move more and ignore quarantine measures. Republicans, following President Trump's messages about the low threat of COVID-19, showed less concern over virus spread, did not avoid public places, and engaged in more social activities (Piacenza, 2020; Marist, 2020; Saad, 2020). In contrast, Bargain and Aminjonov (2020) reveal how higher trust in the government led to better compliance with social distancing for 17 European nations where the government consistently provided messages supporting the social distancing measures. Another study in Romania suggests that individual compliance with restrictive measures is shaped by trust in institutions or belief in conspiracy theories surrounding the COVID-19 outbreak (Corbu et al., 2021). We suggest that South Korea's situation aligns with that of the United States, where the conflict between the government's political messages and social distancing policies induced different responses to policy compliance.

6.2. Effects of Industry and Occupation Classification

Another possible channel of the effect is occupation and industry characteristics. In response to the pandemic, companies actively adjusted working conditions and environment according to each industrial and occupational characteristic (Kim, 2020). Multiple companies moved to remote work, and delivery services and the logistics industry expanded their business in response to the soaring demands (Statistics Korea, 2020). However, regional differences in industry and job characteristics may have evoked a differential response to the containment measures regardless of political orientation. As certain industries could not flexibly adjust their face-to-face work in response to surging demand (Park et al., 2021), workers may have had no other choice but to commute to work even on the weekend. Concerns about job loss and loss of income may also have influenced the decision to continue to work despite one's political orientation and the risk of infection. Existing literature supports such possibilities by suggesting concerns about unemployment and wage loss as an important component of compliance with health policies (Lau et al., 2007; Bodas and Peleg, 2020). If workers prioritized financial stability during the pandemic situation, there could be a possibility that they chose to continue working regardless of one's political orientation and the risk of infection. To investigate such heterogeneous effects, we extract the industrial and occupational characteristics of the 425 wards from the Seoul city demographic information data (Seoul Open Data Service).

First, we observe the effect of industry classification in two specifications: logistics and transport business. An indicator variable on whether there is a logistics and warehouse facility in the region is used to separate the wards by the presence or absence of an active logistics industry. Additionally, we observe the effect of the transport industry by using a binary specification to indicate whether the share of transport business in the region is above the average level of 14.88%. Table 8 shows the results divided by industry classification. Unlike the pooled results, areas with warehouses and logistics industry workplaces were less influenced by the political alignment of the residents in their mobility levels. Also, areas with large transport businesses showed no differences in mobility reduction according to their voting results.

If these wards behaved accordingly to their government approval ratings, their mobility levels should have been higher than their counterparts. However, in contrast to our pooled estimation results, higher support for the government had less influence in areas with logistics and transport businesses. Smaller and insignificant coefficients imply that channels other than political orientation induced such heterogeneity. We suggest the availability of remote work as the primary cause. The report on the transportation survey announced by Statistics Korea provides that warehouses and logistics workers increased by 46,000 people, followed by sales increasing by approximately one trillion KRW (USD 764,890,000 as of July 6) in 2020. These industries require face to face operations, from product packaging to delivery. Thus, the aggregate mobility reduction could have been offset by an increase in commuting workers in the logistics and transport industries.

[Table 8]

Next, we investigate the effect of two occupations: service and elementary jobs. A binary variable whether the proportion of service and elementary workers is larger than the mean level (36.02% and 8.62% each) separates the wards into high and low proportion regions. Table 9 shows that compliance with mobility restrictions is less pronounced for areas with a high proportion of service and elementary workers. Even if these wards showed higher support for the president and the ruling party, the workers' political orientation was less considered in deciding whether to decrease mobility. On the other hand, the channel of political approval remains strong and prominent for areas with less service and elementary occupations.

Consistent to the previous literature suggesting income level as a factor influencing compliance to social distancing policy (Chiou and Tucker, 2020; Coven and Gupta, 2020), workers in low paying occupations have shown less variation in their mobility mainly from their concern for job stability and income loss. Unlike other jobs, workers in the service or elementary job sectors usually work even on the weekends (Job Korea, 2018). Workers in these occupations get paid less on average, earning about 1.6 to 1.8 million KRW (USD 1378.39 as of July 6) less per month than workers overall (Employment and Labor Statistics Korea, 2020). Even if one perceived the pandemic situation to be dangerous due to a disbelief in the political messages, the worker still had to commute to one's workplace. By simple calculation, the workers may be risking higher chance of infection and forgoing on political orientation to earn approximately KRW 64,000-73,000 (USD 49.01-55.90) a day by commuting to work on weekends.[10]

[Table 9]

7. Conclusion

This paper examines the role of institutional trust by analyzing the effect of political orientation on compliance with social distancing policies. We observe 425 electoral wards in Seoul Metropolitan City to examine if citizens' abidance by public health policies mainly comes from their political stance before the COVID-19 pandemic. Estimation results suggest that political alignment significantly influences the decision to reduce mobility when social distancing policies were enforced by the government. The decline in weekend mobility is significantly stronger in areas where the citizens' voting results showed less support for the president and the ruling party. The effect is consistent throughout all periods of major nationwide COVID-19 spread, and consistent for political orientation in both the presidential and congressional elections. The main channel of the effect comes from the role of the government's public message on successful pandemic intervention. Other channels include occupation and industry types, accessibility to remote work, and concern on income loss.

While quarantine measures are most effective when all people make a uniform effort based on mutual understanding on the importance of health policies, political orientation results in different responses towards social distancing and abiding by public health policies when combined with political messages of quarantine success. Thus, room for improvement is clear. The government's public messages should not downplay the severity of the pandemic but instead align with public health policies for mitigation measures to gain maximum strength.

[10] Counter to expectation, Appendix Table 5 shows that the area's student population or the availability of local private education institutions did not influence mobility reduction through the channels of political orientation.

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Table 1: Timeline on Government Messages, Spending Revitalization Plans, and the subsequent COVID-19 outbursts

Government Messages on COVID-19 Spending Revitalization Plans	Subsequent COVID-19 Outbreak
・“Novel Coronavirus is not a serious disease in our country” ・“People should be able to feel at ease, given that fatality rate is low” (Senior Secretaries Meeting, 10 Feb, 2020)	・First wave of COVID-19 outburst (Feb 18, 2020) ・Alert levels were raised to red (Feb 23, 2020)
・“Korea is near victory against COVID-19. Korea’s pandemic mitigation will be recognized as the golden standard internationally” (Emergency Economic Council Meeting, 30 Mar, 2020)	・Itaewon COVID-19 mass outbreak (May 5, 2020)
・Emergency relief funds (1,000$) to all Koreans (11 May, 2020) ・“Korea is overcoming the COVID-19 crisis in an exemplary manner. We successfully managed to keep our daily infections low, without stopping the economy” (Korean New Deal Initiative, 14 Jul, 2020)	・Second wave of COVID-19 outburst (Aug 3, 2020)
・Resume on the domestic spending revitalization plan ($76.2 million), providing consumption vouchers (18 Oct, 2020) ・“Government should prepare for coexistence with the virus, by reorganizing the social distancing system. Also, efforts to boost economic vitality should be redoubled” (Senior Secretaries Meeting, 2 Nov, 2020)	・Third wave of COVID-19 outburst (Nov 13, 2020)
・“In-person classes will be able to resume smoothly in the second semester” ・“The government will do our utmost to ensure that people are fully able to take a vacation.” (Meeting to Check Epidemic Prevention and Control, 7 Jun, 2021) ・Extended summer holiday period by revising [Rules on Public Holidays] for longer alternative holidays (7 July 2021)	・Fourth wave of COVID-19 outburst (July 8, 2021)

Note: Sources for the presidential speeches is Korea.net, the official governmental site providing an English translation of all major public messages provided by the 19th president of the Republic of Korea

Table 2: Summary Statistics

Variables	Second Wave (Aug.2020 – Sept. 2020)			Third Wave (Nov. 2020 – Jan. 2021)			Fourth Wave (Jul.2021 – Aug. 2021)		
	Obs.	Mean	SD	Obs.	Mean	SD	Obs.	Mean	SD
Panel A: Traffic Mobility									
Mobility reduction (%) (Public Transportation)	6784	-30.53	16.70	6784	-36.91	15.87	6784	-30.53	9.14
Mobility reduction (%) (Car Traffic)	1996	-9.94	16.36	1935	-14.25	13.97	1985	-12.88	11.76
Passengers per bus station (24h)	6784	5475	4255	6784	5433	4451	6784	5808	4362
Car traffic per beacon (24h)	2110	28203	16407	2020	28797	17245	2087	28917	17283
Panel B: Election Results									
Votes Earned by President (%)	6784	41.15	3.95	6784	41.15	3.95	6784	41.15	3.95
Votes Earned by Ruling party (%)	6768	52.66	7.48	6768	52.66	7.48	6768	52.66	7.48
Panel C: Ward and District Characteristics									
Covid incident (t-1)	6784	2.07	3.07	6784	7.19	8.49	6784	15.36	10.55
Population density	6784	23869	11768	6784	23733	11665	6784	23446	11515
Elder ratio (%)	6784	16.02	3.40	6784	16.27	3.45	6784	16.48	3.39
Land price ($10{,}000\ won/1m^2$)	6784	437.74	538.37	6784	439.26	515.53	6784	449.87	331.75
Number of students	6784	35678	15092	6784	35678	15092	6784	35678	15092
Number of private institutes	6784	614.71	499.14	6784	614.71	499.14	6784	614.71	499.14
Worker population (%)	6784	74.67	221.82	6784	74.67	221.82	6784	74.67	221.82
Service worker (%)	6784	36.02	13.28	6784	36.02	13.28	6784	36.02	13.28
Production worker (%)	6784	5.62	6.38	6784	5.62	6.38	6784	5.62	6.38
Sales worker (%)	6784	16.46	7.90	6784	16.46	7.90	6784	16.46	7.90
Elementary worker (%)	6784	8.43	1.80	6784	8.43	1.80	6784	8.43	1.80
Logistics and warehouse	6784	4.48	20.69	6784	4.48	20.69	6784	4.48	20.69
Transport business	6784	7.48	8.19	6784	7.48	8.19	6784	7.48	8.19

Table 3: Effect of Political Orientation on Mobility Reduction

Variables	(1) Second Wave (Aug.2020 – Sept. 2020)	(2) Third Wave (Nov. 2020 – Jan. 2021)	(3) Fourth Wave (Jul.2021 – Aug. 2021)
	Panel A: Presidential Election Results (May 2017)		
Votes received × Post	0.306***	0.315***	0.175***
	(0.062)	(0.051)	(0.034)
Votes received (%)	0.043	0.047	0.067
	(0.112)	(0.089)	(0.137)
Post	-35.78***	-39.63***	-22.11***
	(2.648)	(2.126)	(1.486)
Mean of dep. variable	-30.53	-36.91	-30.53
Observations	6,784	6,784	6,784
R-squared	0.832	0.888	0.486
	Panel B: Congressional Election Results (April 2020)		
Votes received × Post	0.132***	0.181***	0.112***
	(0.031)	(0.025)	(0.017)
Votes received (%)	0.084	0.025	-0.039
	(0.053)	(0.042)	(0.067)
Post	-30.11***	-36.14***	-20.85***
	(1.754)	(1.338)	(0.994)
Mean of dep. variable	-30.50	-36.87	-30.48
Observations	6,768	6,748	6,768
R-squared	0.835	0.890	0.487

Note: Each row represents the waves of COVID-19 outburst during the years 2020-2021. The dependent variable of interest is the mobility reduction rate for each corresponding periods. Standard errors are clustered by ward and are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Level of regional fixed effect is determined by 25 districts. Note that the first wave is excluded from analysis, since the widespread had less effect on our region of interest.

Table 4: Effect of Political Orientation on Mobility Reduction (Binary Approval Ratings)

Variables	(1) Second Wave (Aug.2020 – Sept. 2020)	(2) Third Wave (Nov. 2020 – Jan. 2021)	(3) Fourth Wave (Jul.2021 – Aug. 2021)
	Panel A: Presidential Election Results (May 2017)		
High Approval Rating × Post	1.562***	1.244***	0.774***
	(0.429)	(0.401)	(0.258)
High Approval Rating [0-1]	-0.304	-0.180	0.105
	(0.564)	(0.555)	(0.707)
Post	-23.95***	-27.33***	-15.32***
	(0.446)	(0.342)	(0.340)
Mean of dep. variable	-30.53	-36.91	-30.53
Observations	6,784	6,784	6,784
R-squared	0.831	0.886	0.484
	Panel B: Congressional Election Results (April 2020)		
High Approval Rating × Post	1.310***	1.149***	0.906***
	(0.433)	(0.400)	(0.257)
High Approval Rating [0-1]	0.675	0.994**	0.273
	(0.497)	(0.504)	(0.635)
Post	-23.80***	-27.25***	-15.36***
	(0.451)	(0.344)	(0.341)
Mean of dep. variable	-30.50	-36.87	-30.48
Observations	6,768	6,768	6,768
R-squared	0.834	0.889	0.486

Note: Table 4 is the estimation results using a binary specification for the main regressor 'votes received'. Regions are separated into high approval and low approval groups using the median level of votes received by the president and the ruling party. Each row represents the waves of COVID-19 outburst during the years 2020-2021. The Standard errors are clustered by ward and are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Level of regional fixed effect is determined by 25 districts. Note that the first wave is excluded from analysis, since the widespread had less effect on our region of interest.

Table 5: Effect of Political Orientation on Mobility Reduction (Car Traffic Mobility)

Variables	(1) Second Wave (Aug.2020 – Sept. 2020)	(2) Third Wave (Nov. 2020 – Jan. 2021)	(3) Fourth Wave (Jul.2021 – Aug. 2021)
	Panel A: Presidential Election Results (May 2017)		
Votes received × Post	0.246	0.273***	0.214**
	(0.204)	(0.087)	(0.086)
Votes received (%)	0.063	-0.235	0.044
	(0.256)	(0.159)	(0.170)
Post	-17.01**	-34.99***	-18.03***
	(8.487)	(3.444)	(3.502)
Mean of dep. variable	-9.939	-14.25	-12.88
Observations	1,996	1,935	1,985
R-squared	0.568	0.708	0.358
	Panel B: Congressional Election Results (April 2020)		
Votes received × Post	0.134	0.131***	0.094**
	(0.114)	(0.044)	(0.040)
Votes received (%)	0.066	-0.126	0.064
	(0.168)	(0.079)	(0.100)
Post	-13.87**	-30.59***	-14.21***
	(6.099)	(2.272)	(2.224)
Mean of dep. variable	-9.939	-14.25	-12.88
Observations	1,996	1,935	1,985
R-squared	0.568	0.707	0.358

Note: Table 5 is the estimation results for mobility captured from overall road traffic instead of bus transportation usage. Each row represents the waves of COVID-19 outburst during the years 2020-2021. The dependent variable of interest is the mobility reduction rate for each corresponding periods. Standard errors are clustered by ward and are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Level of regional fixed effect is determined by 25 districts. Note that the first wave is excluded from analysis, since the widespread had less effect on our region of interest.

Table 6: Effect of Political Orientation on Mobility Reduction (Eliminating Outlier Districts)

Variables	(1) Second Wave (Aug.2020 – Sept. 2020)	(2) Third Wave (Nov. 2020 – Jan. 2021)	(3) Fourth Wave (Jul.2021 – Aug. 2021)
	Panel A: Presidential Election Results (May 2017)		
Votes received × Post	0.359***	0.207***	0.161**
	(0.090)	(0.082)	(0.068)
Votes received (%)	-0.011	0.083	0.134
	(0.162)	(0.129)	(0.156)
Post	-37.86***	-35.09***	-21.59***
	(3.848)	(3.465)	(2.946)
Mean of dep. variable	-30.23	-36.67	-30.31
Observations	5,712	5,712	5,712
R-squared	0.838	0.885	0.497
	Panel B: Congressional Election Results (April 2020)		
Votes received × Post	0.127**	0.111***	0.128***
	(0.054)	(0.042)	(0.034)
Votes received (%)	0.057	0.054	-0.069
	(0.080)	(0.066)	(0.080)
Post	-29.66***	-32.38***	-21.79***
	(3.012)	(2.328)	(1.981)
Mean of dep. variable	-30.18	-36.62	-30.26
Observations	5,696	5,696	5,696
R-squared	0.840	0.888	0.497

Note: Each row represents the waves of COVID-19 outburst during the years 2020-2021. The dependent variable of interest is the mobility reduction rate for each corresponding periods. Standard errors are clustered by ward and are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Level of regional fixed effect is determined by 25 districts. Note that the first wave is excluded from analysis, since the widespread had less effect on our region of interest.

Table 7: False Specification Test

Variables	(1) Counterfactual 2nd Wave (Aug.2018 – Sept. 2018)	(2) Counterfactual 3rd Wave (Nov. 2018 – Jan. 2019)	(3) Counterfactual 4th Wave (Jul.2019 – Aug. 2019)
	Panel A: Presidential Election Results (May 2017)		
Votes received × Post	-0.061	0.151	0.080
	(0.057)	(0.097)	(0.052)
Votes received (%)	-0.357	-0.282	-0.496
	(0.276)	(0.242)	(0.346)
Post	3.209	-3.206	-3.285
	(2.325)	(4.195)	(2.253)
Mean of dep. variable	0.268	-0.040	1.665
Observations	5,922	6,768	5,922
R-squared	0.224	0.228	0.283
	Panel B: Congressional Election Results (April 2020)		
Votes received × Post	0.025	0.046	0.025
	(0.024)	(0.057)	(0.028)
Votes received (%)	-0.025	0.103	-0.028
	(0.150)	(0.140)	(0.186)
Post	-0.632	0.513	-1.341
	(1.255)	(2.840)	(1.558)
Mean of dep. variable	0.324	-0.006	1.750
Observations	5,908	6,752	5,908
R-squared	0.220	0.228	0.279

Note: Standard errors are clustered by ward and are reported in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$. Level of regional fixed effect is determined by 25 districts. Note that the first wave is excluded from analysis, since the widespread had less effect on our region of interest.

Table 8: Effect of Political Orientation on Mobility Reduction by Industrial Classification

	Logistics and Warehouse				Transport Business			
	Presidential Election (May 2017)		Legislative Election (April 2020)		Presidential Election (May 2017)		Legislative Election (April 2020)	
Variables	(1) Low freq. wards	(2) High freq. wards	(3) Low freq. wards	(4) High freq. wards	(5) Low freq. wards	(6) High freq. wards	(7) Low freq. wards	(8) High freq. wards
Panel A: Second COVID-19 Widespread (Aug 2020 ~ Sept 2020)								
Votes Earned × Post	0.302***	0.311*	0.129***	0.268*	0.336***	0.132	0.159***	0.047
	(0.064)	(0.179)	(0.032)	(0.146)	(0.067)	(0.164)	(0.035)	(0.080)
Mean of dep. variable	-30.58	-29.41	-30.55	-29.41	-31.35	-29.32	-31.30	-29.32
Approval Rating (%)	41.07	42.83	52.59	54.02	40.69	41.82	50.90	55.25
Observations	6,480	304	6,464	304	4,048	2,736	4.032	2.736
R-squared	0.831	0.922	0.833	0.922	0.824	0.866	0.827	0.867
Panel B: Third COVID-19 Widespread (Dec 2020 ~ Jan 2021)								
Votes Earned × Post	0.315***	0.233	0.181***	0.031	0.341***	0.014	0.186***	0.052
	(0.052)	(0.259)	(0.025)	(0.166)	(0.056)	(0.124)	(0.030)	(0.059)
Mean of dep. variable	-36.94	-36.18	-36.90	-36.18	-37.95	-35.38	-37.88	-35.38
Approval Rating (%)	41.07	42.83	52.59	54.02	40.69	41.82	50.90	55.25
Observations	6,480	304	6,464	304	4,048	2,736	4,032	2,736
R-squared	0.888	0.939	0.891	0.939	0.885	0.904	0.887	0.905
Panel C: Fourth COVID-19 Widespread (July 2021 ~ Aug 2021)								
Votes Earned × Post	0.182***	0.099	0.114***	0.036	0.201***	-0.020	0.129***	0.026
	(0.035)	(0.133)	(0.017)	(0.119)	(0.036)	(0.103)	(0.019)	(0.043)
Mean of dep. variable	-30.55	-30.10	-30.50	-30.10	-31.67	-28.83	-31.61	-28.83
Approval Rating (%)	41.07	42.83	52.59	54.02	40.69	41.82	50.90	55.25
Observations	6,480	304	6,464	304	4,048	2,736	4,032	2,736
R-squared	0.487	0.812	0.487	0.811	0.560	0.560	0.560	0.516

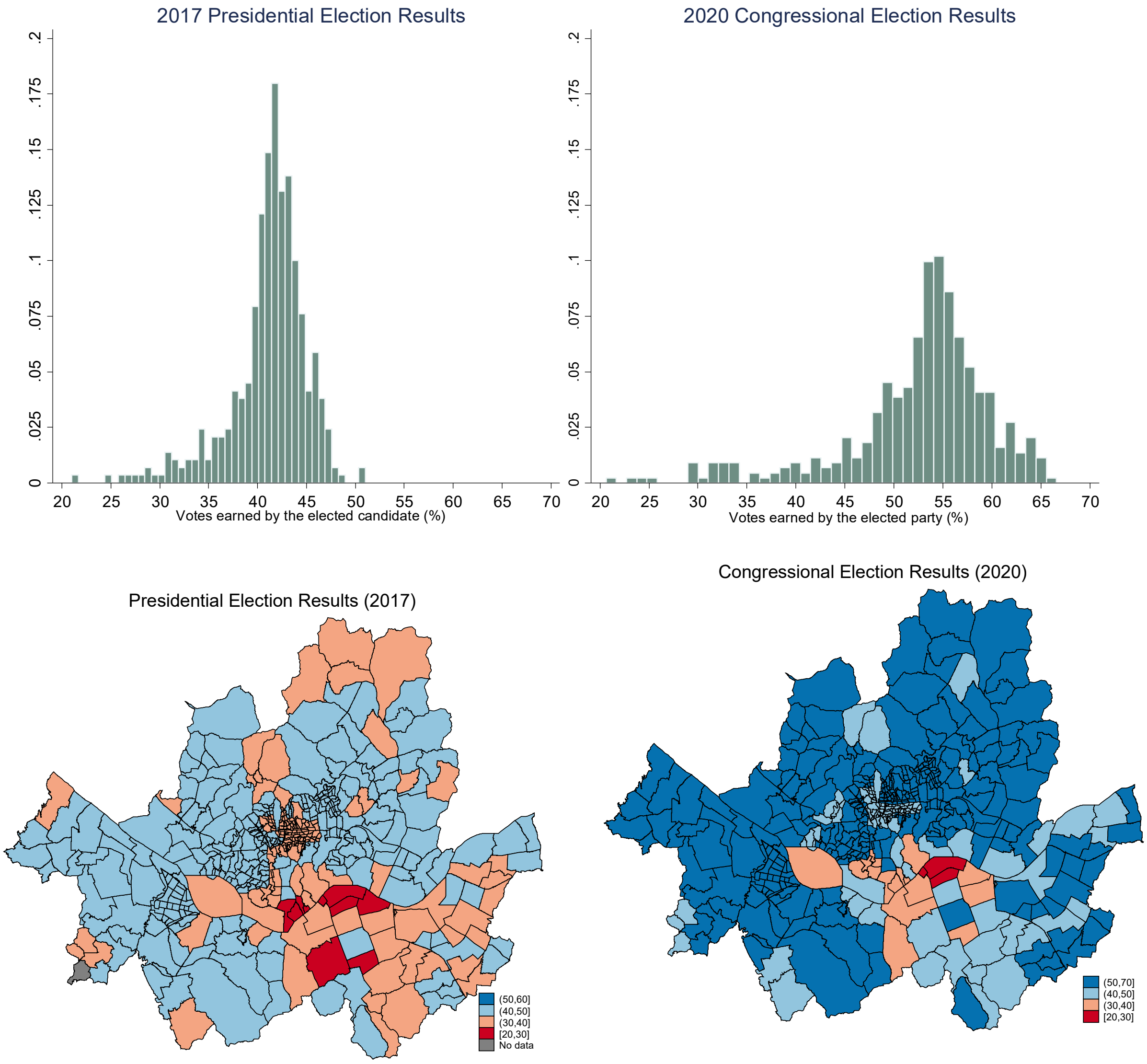
Note: Standard errors are clustered by ward and are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Level of regional fixed effect is determined by 25 districts. Note that the first wave is excluded from analysis, since the widespread had less effect on our region of interest.

Table 9: Effect of Political Orientation on Mobility Reduction by Occupation

	Proportion of Service Occupations Workers				Proportion of Elementary Occupations Workers			
	Presidential Election (May 2017)		Legislative Election (April 2020)		Presidential Election (May 2017)		Legislative Election (April 2020)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Variables	Low	High	Low	High	Low	High	Low	High
	Panel A: Second COVID-19 Widespread (Aug 2020 ~ Sept 2020)							
Votes Earned × Post	0.281***	0.203*	0.125***	0.023	0.283***	0.039	0.134***	-0.115
	(0.079)	(0.105)	(0.040)	(0.071)	(0.070)	(0.120)	(0.035)	(0.073)
Mean of dep. variable	-31.23	-29.84	-31.16	-29.84	-31.32	-29.33	-31.26	-29.33
Approval Rating (%)	40.08	42.20	49.87	55.40	40.33	42.40	50.99	55.21
Observations	3,376	3,408	3,360	3,408	4,112	2,672	4,096	2,672
R-squared	0.808	0.872	0.811	0.871	0.811	0.882	0.814	0.882
	Panel B: Third COVID-19 Widespread (Dec 2020 ~ Jan 2021)							
Votes Earned × Post	0.298**	0.076	0.144***	0.079	0.287***	-0.023	0.167***	-0.022
	(0.066)	(0.095)	(0.035)	(0.054)	(0.058)	(0.082)	(0.029)	(0.050)
Mean of dep. variable	-38.20	-35.63	-38.12	-35.63	-38.29	-34.78	-38.23	-34.78
Approval Rating (%)	40.08	42.20	49.87	55.40	40.33	42.40	50.99	55.21
Observations	3,376	3,408	3,360	3,408	4,112	2,672	4,096	2,672
R-squared	0.877	0.909	0.880	0.908	0.878	0.913	0.881	0.913
	Panel C: Fourth COVID-19 Widespread (July 2021 ~ Aug 2021)							
Votes Earned × Post	0.141***	0.159*	0.088***	0.118**	0.184***	-0.084	0.115***	-0.018
	(0.0392)	(0.095)	(0.022)	(0.0469)	(0.039)	(0.072)	(0.020)	(0.032)
Mean of dep. variable	-31.59	-29.48	-31.51	-29.48	-31.52	-28.99	-31.46	-28.99
Approval Rating (%)	40.08	42.20	49.87	55.40	40.33	42.40	50.99	55.21
Observations	3,376	3,408	3,360	3,408	4,112	2,672	4,096	2,672
R-squared	0.476	0.521	0.482	0.511	0.472	0.520	0.475	0.516

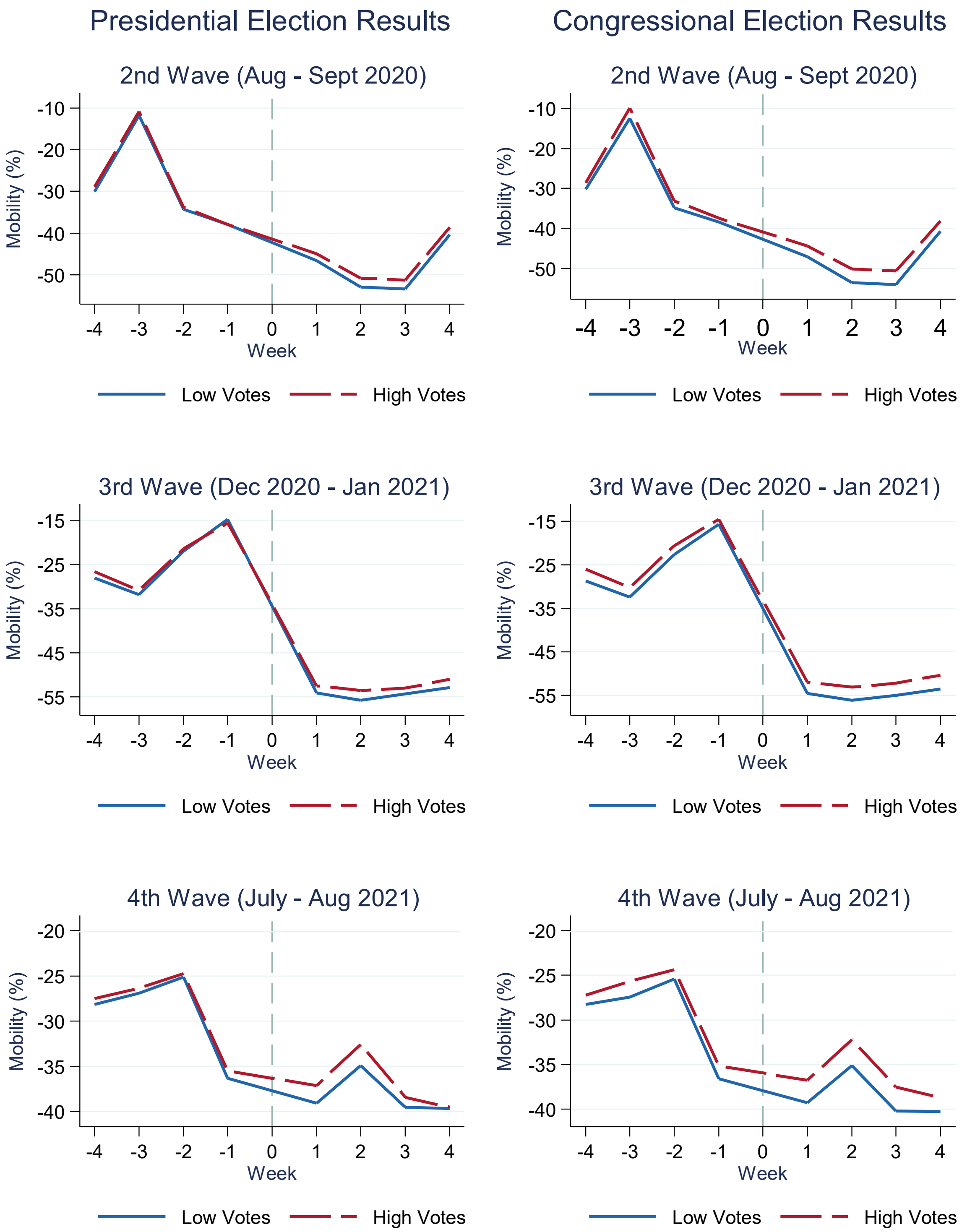
Note: Standard errors are clustered by ward and are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Level of regional fixed effect is determined by 25 districts. Note that the first wave is excluded from analysis, since the widespread had less effect on our region of interest.

Figure 1: Election Results (in Seoul by Wards)



Note: The election results are based on the 19th presidential election statistics and the 2First national assembly elected candidate statistics data from Republic of Korea National Election Commission, according to the 425 wards in Seoul are used. The "spmap" package in *STATA* is applied to visualize the election results according to 425 wards in Seoul, South Korea.

Figure 2: Mobility Reduction Trend by Votes Earned (Sundays)



Note: Figure 2 presents mobility reduction rates for wards that have casted large votes on the president or the ruling congress party (red dash line) and wards with less votes (blue straight line). The green vertical line separates the treatment and reference periods. Both specifications using the presidential and congressional election results are presented. Among four major waves of COVID-19, results for Second-Fourth waves are provided. Note that the first wave is excluded from analysis, since the widespread had less effect on our region of interest.

Appendix Table 1: Treatment and Reference Periods for Waves of COVID-19

Reference Period (PRE)									Treatment Period (POST)								
First Wave (Social Distancing Enforcement: Mar 22, 2020)																	
Year	Days of Observation								Year	Days of Observation							
2019	2/23	2/24	3/2	3/3	3/9	3/10	3/16	3/17	2019	3/30	3/31	4/6	4/7	4/13	4/14	4/20	4/21
2020	2/22	2/23	2/29	3/1	3/7	3/8	3/14	3/14	2020	3/28	3/29	4/4	4/5	4/11	4/12	4/18	4/19
Second Wave (Social Distancing Enforcement: Aug 16, 2020)																	
Year	Days of Observation								Year	Days of Observation							
2019	7/20	7/21	7/27	7/28	8/3	8/4	8/10	8/11	2019	8/24	`8/25	8/31	9/1	9/7	9/8	9/14	9/15
2020	7/18	7/19	7/25	7/26	8/1	8/2	8/8	8/9	2020	8/22	8/23	8/29	8/30	9/5	9/6	9/12	9/13
Third Wave (Social Distancing Enforcement: Nov 19 and Dec 8, 2020)																	
Year	Days of Observation								Year	Days of Observation							
2019	10/26	10/27	11/2	11/3	11/9	11/10	11/16	11/17	2019-20	12/14	12/15	12/21	12/22	12/28	12/29	1/4	1/5
2020	10/24	10/25	10/31	11/1	11/7	11/8	11/14	11/15	2020-21	12/12	12/13	12/19	12/20	12/26	12/27	1/2	1/3
Fourth Wave (Social Distancing Enforcement: July 12, 2021)																	
Year	Days of Observation								Year	Days of Observation							
2019	6/15	6/16	6/22	6/23	6/29	6/30	7/6	7/7	2019	7/20	7/21	7/27	7/28	8/3	8/4	8/10	8/11
2021	6/12	6/13	6/19	6/20	6/26	6/27	7/3	7/4	2021	7/17	7/18	7/24	7/25	7/31	8/1	8/7	8/8

Note: The days of observation are provided for four major COVID-19 waves. Mobility reduction rate in the COVID-19 era is calculated by taking the difference between mobility in 2020-2021 to mobility in 2019-2020. Then, each widespread periods are separated into reference and treatment periods by the day of enforcement of social distancing policies. Note that the first wave is excluded from analysis, since the widespread had less effect on our region of interest.

Appendix Table 2: Effect of Political Orientation on Mobility Restriction (Overall Road Traffic, Binary Specification)

Variables	(1) Second Wave (Aug.2020 – Sept. 2020)	(2) Third Wave (Nov. 2020 – Jan. 2021)	(3) Fourth Wave (Jul.2021 – Aug. 2021)
	Panel A: Presidential Election Results (May 2017)		
High Approval Rating × Post	1.354	1.809*	1.564
	(1.572)	(1.055)	(1.046)
High Approval Rating [0-1]	2.906	-0.483	1.002
	(2.120)	(1.131)	(1.840)
Post	-7.722***	-25.01***	-10.25***
	(1.436)	(0.990)	(1.080)
Mean of dep. variable	-9.939	-14.25	-12.88
Observations	1,996	1,935	1,985
R-squared	0.572	0.706	0.359
	Panel B: Congressional Election Results (April 2020)		
High Approval Rating × Post	0.998	2.037*	2.653**
	(1.496)	(1.048)	(1.033)
High Approval Rating [0-1]	1.781	-0.778	0.759
	(2.707)	(1.413)	(1.765)
Post	-7.614***	-25.06***	-10.77***
	(1.479)	(1.111)	(1.095)
Mean of dep. variable	-9.939	-14.25	-12.88
Observations	1,996	1,935	1,985
R-squared	0.568	0.706	0.361

Note: Standard errors are clustered by ward and are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Level of regional fixed effect is determined by 25 districts. Note that First COVID-19 Widespread results were excluded in the main table, since the First wave of the pandemic occurred in Dae-gu, not in Seoul.

Appendix Table 3: Effect of Political Orientation on Mobility Reduction (Eliminating Outliers, Binary Specification)

Variables	(1) Second Wave (Aug.2020 – Sept. 2020)	(2) Third Wave (Nov. 2020 – Jan. 2021)	(3) Fourth Wave (Jul.2021 – Aug. 2021)
	Panel A: Presidential Election Results (May 2017)		
High Approval Rating × Post	1.205**	0.514	0.501*
	(0.487)	(0.443)	(0.296)
High Approval Rating [0-1]	-0.190	-0.065	0.220
	(0.603)	(0.607)	(0.747)
Post	-23.49***	-26.70***	-15.14***
	(0.499)	(0.386)	(0.394)
Mean of dep. variable	-30.23	-36.67	-30.31
Observations	5,712	5,712	5,712
R-squared	0.836	0.885	0.494
	Panel B: Congressional Election Results (April 2020)		
High Approval Rating × Post	0.811*	0.283	0.615**
	(0.488)	(0.433)	(0.293)
High Approval Rating [0-1]	0.910*	1.356**	0.466
	(0.552)	(0.537)	(0.664)
Post	-23.23**	-26.53***	-15.16***
	(0.505)	(0.383)	(0.397)
Mean of dep. variable	-30.18	-36.62	-30.26
Observations	5,696	5,696	5,696
R-squared	0.840	0.888	0.497

Note: Appendix Table 3 is the estimation results using a binary specification for the main regressor 'votes received'. Regions are separated into high approval and low approval groups using the median level of votes received by the president and the ruling party. The Standard errors are clustered by ward and are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Level of regional fixed effect is determined by 25 districts. Note that the first wave is excluded from analysis, since the widespread had less effect on our region of interest.

Appendix Table 4: False Specification Test (Binary Specification)

Variables	(1) Second Wave (Aug.2020 – Sept. 2020)	(2) Third Wave (Nov. 2020 – Jan. 2021)	(3) Fourth Wave (Jul.2021 – Aug. 2021)
	Panel A: Presidential Election Results (May 2017)		
High Approval Rating × Post	-0.289	0.555	0.009
	(0.447)	(0.448)	(0.407)
High Approval Rating [0-1]	-2.203	-3.173	-3.598
	(2.326)	(2.454)	(2.714)
Post	0.832**	0.832**	0.013
	(0.350)	(0.350)	(0.467)
Mean of dep. variable	0.268	-0.040	1.665
Observations	5,922	6,768	5,922
R-squared	0.184	0.229	0.284
	Panel B: Congressional Election Results (April 2020)		
High Approval Rating × Post	-0.131	0.319	0.280
	(0.449)	(0.662)	(0.407)
High Approval Rating [0-1]	-3.252*	-2.423	-3.579
	(1.932)	(1.769)	(2.264)
Post	0.738**	2.795***	-0.155
	(0.366)	(0.741)	(0.475)
Mean of dep. variable	0.324	-0.006	1.750
Observations	5,908	6,752	5,908
R-squared	0.226	0.230	0.284

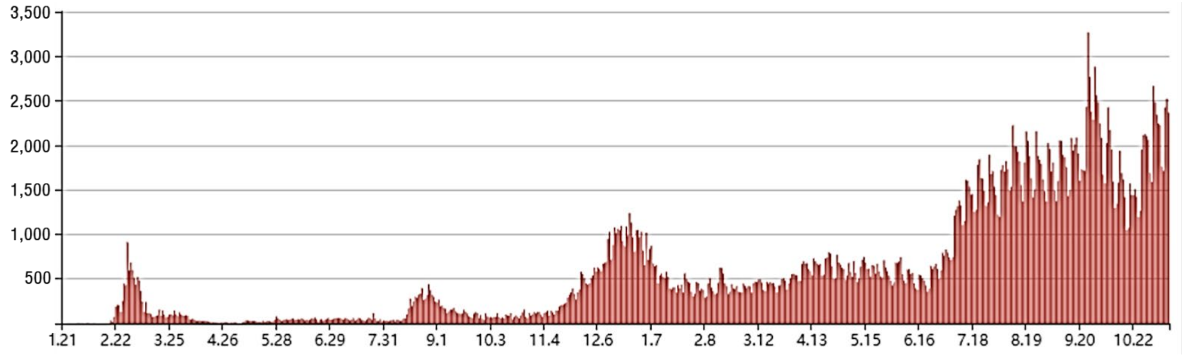
Note: Appendix Table 4 is the estimation results using a binary specification for the main regressor ‘votes received’. Regions are separated into high approval and low approval groups using the median level of votes received by the president and the ruling party. The Standard errors are clustered by ward and are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Level of regional fixed effect is determined by 25 districts. Note that the first wave is excluded from analysis, since the widespread had less effect on our region of interest.

Appendix Table 5: Effect of Political Orientation on Mobility Reduction by Students and Education

	Number of students (grade 1-12)				Number of private institutions			
	Presidential Election (May 2017)		Legislative Election (April 2020)		Presidential Election (May 2017)		Legislative Election (April 2020)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Variables	Low	High	Low	High	Low	High	Low	High
	Panel A: Second COVID-19 Widespread (Aug 2020 ~ Sept 2020)							
Votes Earned × Post	0.359***	0.215***	0.165***	0.100***	0.393***	0.164**	0.091	0.101**
	(0.105)	(0.079)	(0.061)	(0.036)	(0.099)	(0.078)	(0.058)	(0.042)
Mean of dep. variable	-30.30	-30.81	-30.30	-30.73	-30.02	-31.40	-30.02	-31.31
Observations	3,696	3,088	3,696	3,072	4,256	2,528	4,256	2,512
R-squared	0.838	0.836	0.836	0.840	0.840	0.833	0.839	0.837
	Panel B: Third COVID-19 Widespread (Dec 2020 ~ Jan 2021)							
Votes Earned × Post	0.302***	0.290***	0.102**	0.197***	0.280***	0.264***	0.093**	0.190***
	(0.092)	(0.064)	(0.051)	(0.029)	(0.086)	(0.072)	(0.044)	(0.035)
Mean of dep. variable	-36.65	-37.23	-36.65	-37.13	-36.19	-38.12	-36.19	-38.02
Observations	3,696	3,088	3,696	3,072	4,256	2,528	4,256	2,512
R-squared	0.889	0.894	0.887	0.900	0.890	0.893	0.889	0.899
	Panel C: Fourth COVID-19 Widespread (July 2021 ~ Aug 2021)							
Votes Earned × Post	0.182**	0.162***	0.165***	0.088***	0.254***	0.091**	0.149***	0.070***
	(0.084)	(0.031)	(0.043)	(0.015)	(0.071)	(0.038)	(0.038)	(0.018)
Mean of dep. variable	-30.29	-30.81	-30.29	-30.72	-29.96	-31.48	-29.96	-31.37
Observations	3,696	3,088	3,696	3,072	4,256	2,528	4,256	2,512
R-squared	0.509	0.492	0.502	0.491	0.516	0.476	0.508	0.473

Note: Standard errors are clustered and are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Level of regional fixed effect is determined by 25 districts(gu). Cluster levels are determined by 424 wards(dong). Note that First COVID-19 Widespread results were excluded in the main table, since the First wave of the pandemic occurred in Dae-gu, not in Seoul.

Appendix Graph 1: COVID-19 Daily Incident, during years 2020-2021



Note: Red bars indicate the daily number of COVID-19 infections happening during the years 2020 to 2021.