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Words can hurt: How political communication can change the pace of an epidemic[1]

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Citizens' compliance with measures enacted by health authorities can have an important effect on the state of public health, particularly during epidemics. How much can political leaders influence compliance with such measures? In this paper, we analyze this question in the context of Brazil, where the president Jair Bolsonaro disrespected the recommendations and measures implemented by health authorities during a country-wide pro-government demonstration that took place amid the COVID-19 outbreak. We conclude that Bolsonaro's behavior increased the pace of COVID-19 diffusion. In particular, after the day of the manifestations, the daily number of new COVID-19 is 19% higher in cities that concentrate Bolsonaro's voters as compared to cities that concentrate opposition voters. The impact is verified even in cities where no demonstration took place, which indicates that the quicker spread of COVID-19 was not only due to people agglomerating during the manifestation, but also due to the changed behavior of Bolsonaro's supporters regarding social distancing measures. We directly test this later mechanism exploring an index of social isolation and find that citizens' compliance with social distancing decreased among pro-Bolsonaro cities after the demonstrations.

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1 Introduction

Citizens' compliance with health measures and policies can have an important effect on the state of public health. This is the case of mass immunization through vaccines, for example [Larson, 2016]. Because social distancing is key in preventing a rapid diffusion of COVID-19, the pandemic exposes the importance of co-production[1] for public health in democracies: the efficacy and efficiency of the measures are dependent upon citizens' compliance with them. What determines public compliance with such measures?

In this article, we address this question by focusing on the specific role of political leaders in persuading the public to comply. Recent evidence for the U.S. suggests that different stances taken by leaders of the Democratic and Republican parties on issues such as how big is the danger represented by COVID-19 and what would be an adequate response to it, made blue and red voters comply at different levels with social distancing measures and hold different attitudes towards the disease [Kushner Gadarian et al., 2020, Allcott et al., 2020, Grossman et al., 2020, Barrios and Hochberg, 2020].

These recent findings confirm that source cues and persuasion can have powerful effects on citizens' attitudes, support for public policies [Tesler, 2012, Nicholson, 2012, Brader and Tucker, 2012, Samuels and Zucco Jr, 2014] and behavior [Ajzenman, 2018] both in the U.S. and in newer democracies with less established party systems. Importantly, this literature concludes that citizens tend to follow the cues of their preferred leader or party when the issue that they have at hand is new or complex and hence heuristics can be particularly helpful in decision-making.

The question of how to reach a balance between controlling the spread of COVID-19 while mitigating the negative impact on the economy is one example of how a new complex policy issue suddenly becomes salient and voters find themselves having to make up their

[1] Co-production is the way through which residents of a community contribute to the production of public goods. This contribution does not need to be voluntary, nor the citizen needs to be a direct beneficiary of the service towards which she contributes. In short, co-production is part of "the duties and rights that residents within a community have towards the public administration" [Bertelli and Cannas, 2019]

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minds about it with no prior. In this article, we analyze how politicians persuade voters in making up their minds on this issue by exploiting a pro-government manifestation that happened amid the COVID-19 outbreak in Brazil.

On March 15th, 2020, the president Jair Bolsonaro ignored recommendations from the health ministry, his doctors, and the OMS by joining the manifestation, greeting and taking pictures with his supporters. Importantly, before this day Bolsonaro's position on social distancing was unclear as he had urged people to avoid agglomerations on one day and called the new coronavirus "just a flu" on the other. We compare pre and post-trends in daily numbers of new COVID-19 cases at the municipality level and conclude that Bolsonaro's clear taking of stand on that day caused the disease to spread more quickly in cities that concentrate his voters, but not in cities where he did poorly in the previous presidential election.

Jair Bolsonaro is not the only leader to have downplayed the risk of the pandemic for his country. Donald Trump in the U.S. [Lopez, 2020], Andres Manuel Lopez Obrador, in Mexico [Ward, 2020], and Daniel Ortega, in Nicaragua [Rivers and Gallon, 2020] are other examples. However, we argue that Brazil is a particularly interesting case for three main reasons. First, the clear turning point of the president's stance on March 15th, 2020 allows for a clear identification of the effect.

Secondly, the Brazilian case is an example of how cues from a single political leader can have important effects on public opinion and behavior. Indeed, Bolsonaro is increasingly the only relevant political leader in the country who voices skeptical stands on social distancing measures. His own then health ministry - Luiz Henrique Mandetta - repeatedly confronted the president on the issue and 25 out of the 27 governors declared that they would maintain the social distancing measures in spite of the president's open discontentment with them[2]. Moreover, when the outbreak emerged and evolved into an epidemic, Bolsonaro had no party, nor a majority in parliament. Therefore, we can be quite confident that the effect we observe

[2] https://g1.globo.com/politica/noticia/2020/03/25/governadoras-reagem-ao-pronunciamento-de-bolsonaro-sobre-coronavirus.ghtml.

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is due to a single man displaying a clear stand on the issue and not due to a coordinated response by an administration or party.

Thirdly, the specific context of Brazil allows us to shed light on how quickly political identities can form and serve as basis for heuristic reasoning. This is a topic that is still understudied. In fact, just recently scholars have started to analyze party cues in fluid party systems [Brader and Tucker, 2012], where political identities are less crystallized. In Brazil, Samuels and Zucco Jr [2014] show that identifying with the two main Brazilian parties (PSDB and PT) play a role in defining political attitudes through source cues, but they did not find the same effect for less established parties. Since Bolsonaro was barely known before 2018 presidential election campaign, our results can contribute to this literature by providing evidence on how quickly political identities can form and become the basis for heuristic reasoning.

In fact, our results show that in municipalities that concentrate Bolsonaro's supporters, the daily number of COVID-19 new cases increases at a higher pace post-manifestations as compared to the pre-manifestations period. Furthermore, this change in trend is not observed in municipalities that concentrate opposition voters. We also find that citizens' compliance with social distancing decreased in pro-Bolsonaro cities after the demonstrations. This suggests that at least in some contexts political identities can form and serve as basis for heuristic reasoning quite quickly, including in cases where the decisions at stake may incur huge costs.

This study contributes to three strains in the literature. First, it adds to the extended literature on source cues and political persuasion [DellaVigna and Gentzkow, 2010, Nicholson, 2012]. In particular, we contribute to the less developed literature on the influence of party and politicel leader cues on political behavior in new democracies where party systems are weaker [Brader and Tucker, 2012, Samuels and Zucco Jr, 2014]. We also add to the literature on how uninformative persuasion influence attitudes [Mullainathan et al., 2008, Bassi and Rasul, 2017]. Secondly, we contribute to quickly rising literature on political responses to

COVID-19. For example, Allcott et al. [2020], Kushner Gadarian et al. [2020] find that republicans worry less about COVID-19 and comply less with social distancing measures. In addition, Bisbee and Honig [2020] show that not only politics can affect epidemics, but also that epidemics can affect politics. More specifically, COVID-19 decreased support for Sanders in the primaries, because he is seen as a less secure option by anxious voters. We provide new evidence on the relationship between politics and the COVID-19 crisis in another context: Brazil.[3]

2 Context

The initial cases of COVID-19 happened in the province of Wuhan, in China, on December 2019 [Li et al., 2020]. Due to the highly contagious nature of the disease, in less than three months there were more than 81 thousand cases spread over almost forty countries [WHO, 2020c]. On January 30^{th} 2020, the World Health Organization declared COVID-19 outbreak a global health emergency [WHO, 2020a], further updating the status of the decease to a pandemic on March 11^{th} [WHO, 2020b].

Brazil was the first Latin American country to confirm a COVID-19 case. The outbreak of the virus in the country started on February 26^{th} 2020, in the city of São Paulo [De Sousa and Savarese, 2020]. By the second week of March, more than 400 people had tested positive in the country, mainly in the Southeast region, and state governors started to take action. Eight states started to implement measures of social distancing, such as closing schools, museums, and libraries, banning gatherings with more than 500 people, and limiting business hours [Cerioni, 2020].

Even though Bolsonaro has not taken the virus very seriously - on March 10^{th}, for instance, he said that the COVID-19 crisis was minor and that it was mainly "a fantasy from the media" [Globo, 2020] -, he gave some signals at first suggesting that people should follow

[3]Ajzenman et al. [2020], a paper developed independently and at the same time uses a similar approach to ours to show that president Jair Bolsonaro influenced his supporters to comply less with social distancing measures.

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social distancing measures. While his supporters were planning demonstrations on March 15^{th} against the Congress over an ongoing budget dispute, Bolsonaro went on TV on March 12^{th} to urge the organizers to postpone the demonstrations. He highlighted that at that moment the priority should be people's lives and that going to the demonstration would risk the health of many Brazilians [DW, 2020].

The protest organizers, however, decided to ignore the president's requests and to keep the demonstrations on the original date. They widely broadcast it on social media as a civil disobedience movement, where they apologized to the president, but said that they were going to protest anyway [Uribe and Linhares, 2020].

On march 15^{th} protests happened in around 250 cities in Brazil. In a move that surprised the media, the population, and his own health ministry, Bolsonaro contradicted his own advice and joined the protests in Brasilia to meet and greet demonstrators [Marshall, 2020]. This was particularly striking since he was supposed to be self-isolating after members of a Brazilian delegation to the US leaded by him were tested positive with COVID-19 [Phillips and Agren, 2020]. After this day, Bolsonaro shifted his attitudes towards COVID-19, and his discourse became increasingly critical to social distancing measures. On March 20^{th}, he criticized governors for closing business, on the ground that this would be detrimental to the economy [Militão, 2020]. On March 24^{th} Bolsonaro went a step further by urging governors in an official to re-open business and arguing that Brazil should implement a vertical quarantine. Moreover, he also mentioned that for the majority of the population, COVID-19 would not be more than a just sniffle [Economist, 2020].

As one can see, Bolsonaro's speech of skepticism regarding coronavirus has escalated quite fast. However, before March 15^{th}, his position was still unclear. Only when he joined the demonstrations disregarding all coronavirus warnings, his attitude towards the crises became clear enough. In section 5, we show how we explore this shift to estimate the impact of this change in stance on the growth of COVID-19 cases.

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3 Voters differences in Brazilians' response to COVID-19

In this section, we show some motivating evidence that Bolsonaro's supporters responded to the outbreak of COVID-19 differently from his opponents. A nationally representative poll taken between March 18^{th} and March 20^{th} asked Brazilians about their concerns and behaviors regarding COVID-19 [DataFolha, 2020]. Figure 1 shows responses by those who voted for Bolsonaro in the runoff of 2018 elections (hereinafter referred as "supporters") and those who did not vote for him (i.e., those who either voted for his opponent or who canceled their vote - hereinafter referred as "non-supporters"). Panel A shows that non-supporters were slightly more concerned about being infected by COVID-19: 39% of them were very afraid of being infected and 25% were not afraid. For supporters, these figures were 36% and 28%, respectively.

Panel B brings respondents' speculations of how many deaths will happen in Brazil due to COVID-19. The difference between supporters and non-supporters is more sizeable here: while 50% of non-supporters predicted that many people will die due to COVID-19, only 43% of supporters made the same prediction. Panel C presents support for different measures to stop the spread of the virus. The most striking differences between supporters and non-supporters regard closing non-essential business - interestingly, a higher share of supporters favored this measure (49%, against 42% of non-supporters) - and teleworking - where we see the opposite pattern: 75% of supporters favored such measure, while the share is quite larger among non-supporters (85%). Finally, panel D brings differences in self-reported behavior changes due to COVID-19. The differences between supporters and non-supporters are quite large here: while 77% of non-supporters decreased school/university attendance, only 70% of supporters did so. While 47% of non-supporters decreased the number of days going to work, only 39% of supporters did so. Their behavior regarding outside leisure activities is also different: while 80% of non-supporters decreased such activities, only 76% of supporters did so.

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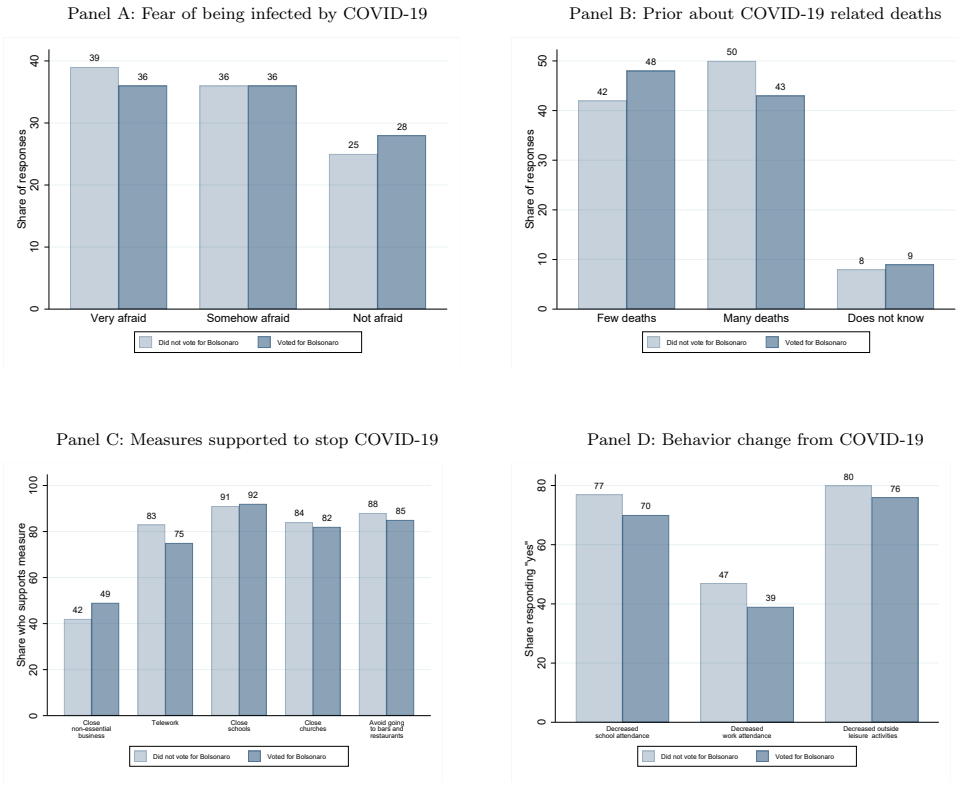
Figure 1: Electorate differences in beliefs and behavior regarding COVID-19



Notes: (i) This figure shows responses to a nationally representative poll [DataFolha, 2020] by Bolsonaro's voters and non-voters; (ii) The poll took place between March 18^{th} and March 20^{th} (iii) Panel A shows responses about the fear of being infected by COVID-19. Panel B shows priors about the number of deaths caused by COVID-19 in Brazil. Panel C shows support for measures aiming to stop the spread of COVID-19. Panel D shows self-reported changes in behavior due to COVID-19.

In general, Bolsonaro's supporters seem to take COVID-19 less seriously than non-supporters, and behave accordingly, taking less social distancing measures. Such differences between Bolsonaro's supporters and non-supporters could stem from different reasons, such as different risk attitudes - Bolsonaro's supporters might be less risk-averse, for instance -

or different costs and benefits from social distancing (as derived by Allcott et al. [2020] for Democrats and Republicans in the United States). However, part of these differences might emerge due to the influence that Bolsonaro has over his electorate. His behavior could change their risk perception, or reinforce an apparent trade-off between health and economy, which could induce his supporters to not follow social distancing as closely, eventually leading to a higher spread of the virus in more pro-Bolsonaro areas. In the next sections, we show evidence of this second source of difference. That is, we show that Bolsonaro's behavior did have an impact on his electorate, which led to an increase in COVID-19 cases in more pro-Bolsonaro cities. We also show that the mechanism in place is likely a decrease in social distancing.

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4 Data

Our analysis uses data from all Brazilian municipalities that had at least one confirmed COVID-19 case in the period between March 8^{th} and March 26^{th}. The data on COVID-19 cases come from daily updated reports of the State Health Secretariats with information about new confirmed cases, total cases, and deaths related to COVID-19 for each municipality.[4]

We use the results of the 2018 presidential elections to measure cities' support for Bolsonaro.[5] Brazilian presidential elections are run under a dual-ballot system, where unless a candidate gets more than 50% of votes in the first round, the two most voted candidates dispute a second round or runoff. For each city, we use the runoff results to define support for Bolsonaro in two ways.[6] The first measure is a binary variable that takes value equal to one if Bolsonaro had the majority of votes in that city, and the second measure is a continuous variable equal to the margin of votes above the 50% cutoff.

[4]This information was compiled by `https://covid19br.wcota.me/` and `https://brasil.io/dataset/covid19/caso`.

[5]Electoral results at the municipal level come from Tribunal Superior Eleitoral (TSE). For more details, see de Leon et al. [2014].

[6]The results for the first round are used in a robustness check specification.

We also explore data on the location of the March 15^{th} demonstrations to check for heterogeneous impacts of Bolsonaro's behavior. These data come from a document sent to the media by the demonstration's organizers ("Movimento Avança Brasil"), listing all the municipalities where protests were confirmed to happen. Out of the 257 municipalities listed in this document, 46 had at least one confirmed COVID-19 case in the time-frame of our analysis and are included in our specification.

Our estimations use the most recent data on cities' GDP per capita and population[7] as control. These data come from the Brazilian Bureau of Statistics.

Finally, to test whether social distancing is indeed the mechanism in place, we use an index of social isolation that explores data from over 60 million cellphone devices in Brazil and, for each municipality, measures the daily percentage of such devices that remained within a radius of 450 meters from the location identified as their home. This index was developed by In Loco, a Brazilian technology company.[8]

Table 1 presents municipalities' characteristics before the demonstrations. Column (1) brings the average characteristic for all municipalities while columns (2) and (3) report the figures for pro-Bolsonaro and against-Bolsonaro cities, respectively. Pro(Against)-Bolsonaro cities are cities where Bolsonaro won (lost) the runoff in 2018. Column (4) shows the p-value of the difference between columns (2) and (3), after controlling for States' fixed effects. It is reassuring that pro- and against-Bolsonaro cities do not display any striking difference regarding the number of COVID-19 cases before the demonstrations, GDP per capita, and population since the pace of COVID-19 spread and the number of tests performed in suspect cases heavily depend on these characteristics. Still, as shown in the next section, we perform several different checks to ensure that these two groups of municipalities are indeed comparable. The Table also shows that before March 15^{th}, pro- and -against Bolsonaro cities did not have any significant difference regarding their level of isolation.

[7] 2015 for the GDP per capita, and 2017 for the population.

[8] For more details about this index, visit `https://www.inloco.com.br`.

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	All	Pro Bolsonaro (runoff)	Against Bolsonaro (runoff)	P-Value
	(1)	(2)	(3)	(4)
Pro Bolsonaro (runoff)	0.82	1.00	0.00	
Pro Bolsonaro (1st round)	0.86	1.00	0.21	0.00
Margin over 50% (runoff)	0.13	0.19	-0.16	0.00
Margin over 50% (1st round)	0.03	0.09	-0.21	0.00
Pre-demonstration COVID-19 cases	0.13	0.14	0.10	0.12
Demonstrations	0.40	0.40	0.38	0.35
GDP per capita (in thousands of 2015 BRL)	33.40	36.30	20.30	0.99
2018 population (in thousands)	413.9	418.4	393.2	0.08
Pre-demonstration isolation index	0.262	0.262	0.264	0.25
N	215	176	39	

Notes: (i) "Pro-Bolsonaro" cities are cities where Bolsonaro got the majority of votes in the 2018 elections; "Margin over 50%" is a continuous variable indicating by how much Bolsonaro's votes exceed 50% in the elections; (ii) Column (4) shows the p-value of the difference between columns (2) and (3) after controling for States' fixed effects.

Table 1: Descriptive Statistics

Figure 2 presents a motivating illustration for our analysis. It shows the growth in COVID-19 cases between March 15^{th} and March 26^{th} in pro- and against-Bolsonaro cities. Initially, pro-Bolsonaro cities had a slower growth rate if compared to against-Bolsonaro cities. However, while against-Bolsonaro cities keep their growth pace throughout this period, pro-Bolsonaro cities present a sharp increase in their growth rate after March 19^{th}. This gives some evidence of a shift in the proliferation of COVID-19 in this later group of cities. The fact that the shift happened only four days after the demonstrations is consistent with the timing for the symptoms to show up after someone is exposed to the virus.[9] In the next section, we present the identification strategy to give a causal interpretation to this shift.

[9]The time varies between 2 and 14 days, see more at `https://www.cdc.gov/coronavirus/2019-ncov/about/symptoms.html`.

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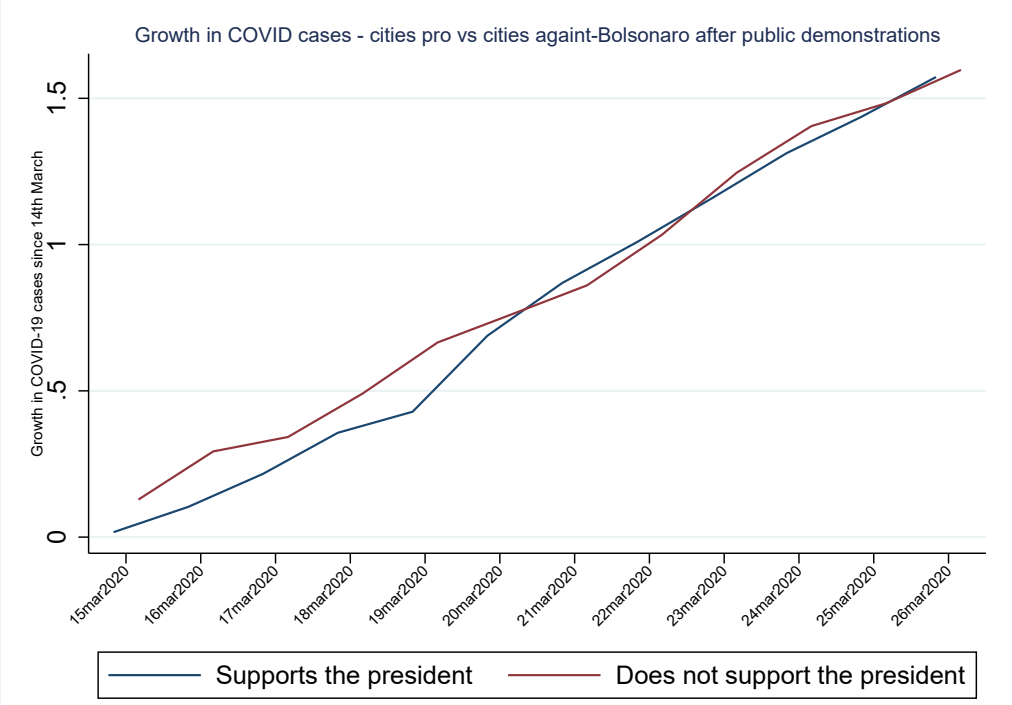
Figure 2: Average growth in the number of COVID-19 cases for cities with different support for the President during the 2018 Elections



5 Identification Strategy

We explore the facts described in section 2 to estimate the impact of Bolsonaro's behavior on the spread of COVID-19 among his supporters. More specifically, we identify the demonstrations on March 15^{th} - when the president disregarded all coronavirus warnings and joined the protests - as the event where Bolsonaro's attitude regarding the virus became clear. Therefore, we analyze trends in COVID-19 cases around this date, comparing cities with higher and lower support for Bolsonaro. The idea behind this comparison is that cities that concentrate Bolsonaro's voters are more responsive to his influence than cities that

concentrate opposition voters.

Our identification strategy is a difference-in-differences approach, described by the following estimation:

$$y_{i,s,t} = \alpha_i + \alpha_{st} + X_{i,s,t} * \beta + \delta * (\textit{Pro-Bolsonaro}_i) \times (\textit{Post-March 15th}) + \epsilon_{i,s,t} \tag{1}$$

where $y_{i,s,t}$ is the number of COVID-19 cases in municipality i, in State s, at time t. To make municipalities as comparable as possible, it is important to control for time-varying unobserved heterogeneity, such as trends among municipalities with similar characteristics. Hence, besides controlling this estimation for municipality fixed effects, α_i, we also control it for common State by time trends, α_{st}, which absorbs local spillovers among states. Moreover, vector $X_{i,s,t}$ controls for two other important variables. The first variable is municipalities' population interacted with time and with the number of cases one day before the demonstrations - that is, on March 14^{th}. The inclusion of this variable absorbs common trends among cities with a similar population and the same initial number of infected people. This is relevant since population density affects the spread of COVID-19 [Rocklöv and Sjödin, 2020, Stie et al., 2020]. The second variable is municipalities' GDP per capita interacted with time and with the number of cases right before the demonstrations. This absorbs common trends among cities with similar income levels and the same initial number of infected people. This is important since richer municipalities might test suspect cases at a higher rate than poorer municipalities.

Our parameter of interest is δ. As explained in section 4, the variable "*Pro-Bolsonaro*" is defined in two different ways: it is either a binary variable indicating that Bolsonaro had the majority of votes in a municipality, or a continuous variable equal to the margin over 50% of votes. The variable "*Post-March 15th*" is a binary variable that takes value one after

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March 15^{th} and zero before this date. Since we estimate equation 1 using the log number of cases, δ can be interpreted as the additional percentage growth in the number of cases in municipalities with higher support for Bolsonaro after the demonstrations on March 15^{th}.

The validity of this identification relies on the assumption that Bolsonaro's supporters were not able to learn about his attitude towards COVID-19 before the protests on March 15^{th}. The fact that the president urged his supporters three days before the protests to do not demonstrate due to health concerns helps to build this argument. Still, we test this assumption looking at dynamic effects of Bolsonaro's behavior before and after March 15^{th}. We implement the following specification:

$$y_{i,s,t} = \alpha_i + \alpha_{st} + X_{i,s,t} * \beta + \sum_{k=-7}^{10} \delta_k * (\textit{Pro-Bolsonaro}_i) \times I(\textit{Demonstrations}_k = 1) + \epsilon_{i,s,t} \quad (2)$$

where $I(\textit{Demonstrations}_k = 1)$ is a binary variable indicating each day before and after the demonstrations. We look at a window of one week before and ten days after March 15^{th}.

6 Results

Table 2 brings the results of our main estimation. Columns (1) to (4) show the results using the majority of votes as a measure of support for Bolsonaro, while columns (5) to (8) present the results using the margin over 50% as such a measure of support. Columns (1) and (5) control only for State by time fixed effects and the subsequent columns gradually add more controls.

The results of our baseline estimation are robust across all sets of controls we employ in each column. They point to a disproportional growth in cities in which the president has higher support. Our preferred specification with all controls (Column (4)), shows that after the demonstrations on March 15^{th}, cities where Bolsonaro won the majority of votes in

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2018 experienced an increase in COVID-19 cases 18.9% higher than cities where he did not have the majority of votes. Column (8) in turn shows that an increase of 1% of Bolsonaro's margin of votes over 50% increases the growth of COVID-19 in around 0.6%.

Figure 3 shows the dynamic results coming from equation 2. Panel A brings such results for cities where Bolsonaro won versus cities where he lost the runoff in 2018, while Panel B shows the results considering the margin over 50% of votes as a measure of the support for Bolsonaro. The figures show that the trends of COVID-19 cases are similar between pro- and against-Bolsonaro cities for a few days after the demonstrations - at least until March 18^{th}, as shown in Panel B. However, after that, pro-Bolsonaro cities experienced quite persistent higher growth in their COVID-19 cases. As said before, the window between March15^{th}, when the demonstrations took place, and March 18^{th}, when the trends start to diverge, is consistent with the timing for the symptoms to show up after someone is exposed to the virus.

6.1 Discussion about mechanisms

The effects presented in Table 2 could come from two different sources. First, the demonstration itself, since people agglomerating could increase the spread of the disease in localities where the demonstrations took place. Second, citizens could have changed their behavior after seeing Bolsonaro himself ignoring COVID-19 warnings. This could have happened even in cities where demonstrations did not take place. As the ultimate goal of this analysis is to check if the attitudes of the President shaped the behavior of his supporters, we need to understand whether at least part of these effects are coming from a decrease in citizens compliance with social distancing. We start this investigation exploring the location of the protests to isolate the effects of the demonstrations from the indirect effects of Bolsonaro's behavior, both for the cities where the protests took place and the ones where they did not.

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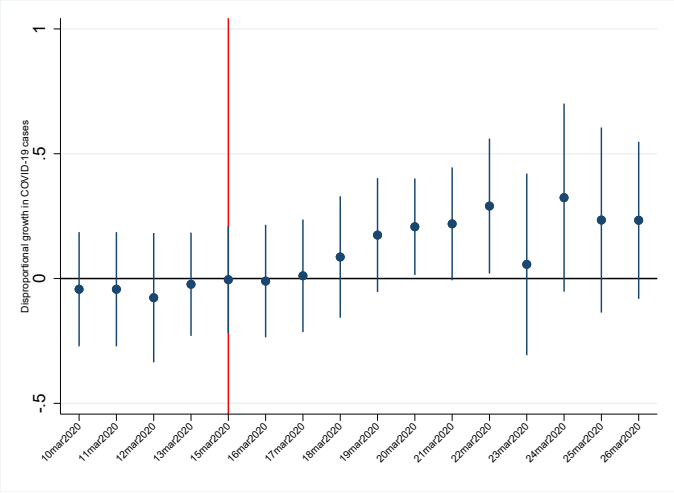
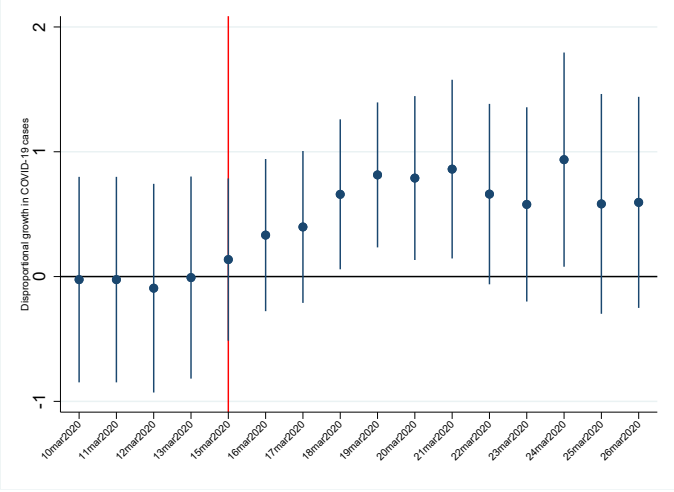
Figure 3: Disproportional growth of COVID-19 cases in pro-Bolsonaro cities

Panel A: Majority of votes



Panel B: Margin over 50%



Notes: (i) These graphs show the disproportional growth in the number of COVID cases in cities pro Bolsonaro over time when compared to cities against him. In Panel A, cities pro(against) Bolsonaro are the cities where he won(lost) the runoff in the 2018 elections. In Panel B, the support for Bolsonaro is measured with a continuous variable equal to the margins of votes over 50% in the runoff. On March 15^{th} Bolsonaro's supporters marched against the Congress and Bolsonaro ignored coronavirus warnings to join them. (ii) In this specification we control for locality, State by time, and number of cases before the demonstrations interacted with city characteristics (population and GDP per capita) by time FEs. (iii) Confidence interval of 90%. (iv) Standard errors clustered at state-time level.

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	Dependent variable: log(1+COVID-19 cases)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Majority of votes	0.049***	-0.012						
	(0.015)	(0.009)						
Post March 15^{th} × Majority of votes	0.404***	0.295***	0.240***	0.189***				
	(0.094)	(0.069)	(0.059)	(0.050)				
Margin over 50%					-0.046	0.007		
					(0.056)	(0.017)		
Post March 15^{th} × Margin over 50%					0.913***	0.919***	0.883***	0.596***
					(0.263)	(0.172)	(0.127)	(0.128)
Observations	5950	5850	5850	5850	5950	5850	5850	5850
R Squared	0.34	0.60	0.80	0.81	0.34	0.61	0.80	0.81
State x Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pre-demo N-cases x 2018 Population x Time FE	No	Yes	Yes	Yes	No	Yes	Yes	Yes
City FE	No	No	Yes	Yes	No	No	Yes	Yes
Pre-demo N-cases x GDP per capita X Time FE	No	No	No	Yes	No	No	No	Yes

Notes: (i) Standard errors clustered at state-time level; (ii) * p<0.10, * p<0.05, ** p<0.01; (iii) "Majority of votes": cities where Bolsonaro won the runoff of the 2018 elections; (iv) "Margins over 50%": continuous variable indicating by how much Bolsonaro's votes exceed 50% in the runoff; (v) On March 15^{th} Bolsonaro's supporters marched against the Congress and Bolsonaro ignored coronavirus warnings to join them.

Table 2: Growth in COVID-19 cases after demonstrations on March 15^{th}

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The specification of this test is the following:

$$\begin{aligned} y_{i,s,t} &= \alpha_i + \alpha_{st} + X_{i,s,t} * \beta + \delta_1 I(Demonstration_i = 1) \times (Post\ March\ 15th) \\ &+ \delta_2 (Pro\text{-}Bolsonaro_i) \times I(Demonstrations_i = 1) \times (Post\ March\ 15th) \\ &+ \delta_3 (Pro\text{-}Bolsonaro_i) \times I(Demonstrations_i = 0) \times (Post\ March\ 15th) \end{aligned} \tag{3}$$

where $I(Demonstrations_i = 1)$ is an indicator variable that takes value one if the city had a demonstration on March 15^{th} and $I(Demonstrations_i = 0)$ is an indicator variable that takes value one if the city did not have a demonstration on March 15^{th}. The parameter δ_1 represents the disproportional growth in the number of cases due to the direct effects of the demonstrations, which might be caused by the agglomeration. The parameters δ_2 and δ_3 are the indirect effects of the demonstrations for cities with a higher concentration of Bolsonaro's voters. For the cities that had a demonstration, the parameter δ_2 could be an effect of the size of the demonstrations in the locality since it is likely that these cities have more supporters. Parameter δ_3, however, is likely to represent the indirect effects of the President's behavior on his supporters' behavior after the demonstrations, since there were no agglomeration effects on these localities.

Table 3 presents the results of this estimation. Columns (1) and (2) use the majority of votes as a measure of support for Bolsonaro while columns (3) and (4) use the margin over 50% as such a measure of support. Among cities with a lower concentration of Bolsonaro's voters, the presence of protests on March 15^{th} increases the growth of COVID-19 from 21.8% to 26.2%, depending on the specification. This number is even higher among cities with a larger concentration of Bolsonaro's voters. In column (2), for instance, we see that cities where Bolsonaro won the runoff in 2018 and where a demonstration took place on March

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15^{th}, the growth in COVID-19 cases is 43.3% higher than in cities where he lost the runoff and that did not host demonstrations.

Most interestingly, even among cities where demonstrations did not take place, those with a higher concentration of Bolsonaro's voters experienced higher growth in COVID-cases than those with a lower concentration of his voters. In column (2) we see that places in which Bolsonaro had the majority of votes in 2018 experienced a growth in COVID-19 cases 14% higher than places where he did not get such a majority. Column (4), in turn, shows that if the margin over 50% of the votes for Bolsonaro increases by 1%, the growth in COVID-19 cases increases 0.43%. This indicates that the results found in Table 2 are not driven only to the fact that people agglomerated during the protests. This is certainly part of the increase in COVID-19 cases, but it does not explain all of it. The fact that the virus also spread faster in places that concentrate Bolsonaro's voters but did not host protests indicates that residents of these places might have stopped to follow social distancing measures after March 15^{th}, possibly influenced by Bolsonaro's behavior during the demonstrations.

Table 4 brings further evidence that these results are indeed driven by the behavior of Bolsonaro's supporters. We replicate the exercises presented in Table 3 using the results of the first round of the 2018 elections, instead of the runoff. Votes during the first round of a dual-ballot system are more likely to be sincere and less likely to be strategic than in the second round [Duverger, 1954, Fujiwara et al., 2011]. Therefore, we expect Bolsonaro to have more influence on those who voted for him already in the first round since they have a stronger admiration for him. If this is true, the impact of his behavior on March 15^{th} should be even higher among this group of voters. Table 4 shows that this is indeed the case. In particular, if we look at localities that did not host demonstrations in March 15^{th}, cities in which Bolsonaro had the majority of votes in the first round have a growth in COVID-19 cases 25.6% larger than in cities where he did not get this majority.

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	Dependent variable: log(1+COVID Cases)			
	(1)	(2)	(3)	(4)
Post March 15^{th} × Local demonstration	0.262***	0.247***	0.240***	0.218***
	(0.080)	(0.076)	(0.043)	(0.040)
Post March 15^{th} × Supports Bolsonaro × Local demonstration	0.238***	0.186***	0.728***	0.539***
	(0.064)	(0.054)	(0.133)	(0.137)
Post March 15^{th} × Supports Bolsonaro × No demonstration	0.266***	0.140*	0.692***	0.434***
	(0.085)	(0.081)	(0.166)	(0.167)
Observations	5850	5850	5850	5850
R Squared	0.75	0.82	0.80	0.82
City FE	Yes	Yes	Yes	Yes
Pre-demo N-cases x 2018 Population x Time FE	Yes	Yes	Yes	Yes
State x Time FE	Yes	Yes	Yes	Yes
Pre-demo N-cases x GDP per capita X Time FE	No	Yes	No	Yes

Notes: (i) Standard errors clustered at state-time level; (ii) * p<0.10, * p<0.05, ** p<0.01; (iii) ln in Columns (1) and (2), "Supports Bolsonaro" is a binary variable that takes value equal 1 if Bolsonaro won the runoff of the 2018 elections; in columns (3) and (4), it is a continuous variable indicating by how much Bolsonaro's votes exceed 50% in the runoff; (iv) On March 15^{th} Bolsonaro's supporters marched against the Congress and Bolsonaro ignored coronavirus warnings to join them.

Table 3: Heterogeneous impacts by local demonstrations

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	Dependent variable: log(1+COVID Cases)			
	(1)	(2)	(3)	(4)
Post March 15^{th} × Local demonstration	0.138	0.206*	0.182***	0.161***
	(0.123)	(0.120)	(0.036)	(0.035)
Post March 15^{th} × Supports Bolsonaro × Local demonstration	0.322***	0.302***	1.019***	0.859***
	(0.070)	(0.065)	(0.161)	(0.160)
Post March 15^{th} × Supports Bolsonaro × No demonstration	0.424***	0.256***	1.139***	0.902***
	(0.097)	(0.093)	(0.221)	(0.210)
Observations	4896	4896	4896	4896
R Squared	0.76	0.83	0.81	0.83
City FE	Yes	Yes	Yes	Yes
Pre-demo N-cases x 2018 Population x Time FE	Yes	Yes	Yes	Yes
State x Time FE	Yes	Yes	Yes	Yes
Pre-demo N-cases x GDP per capita X Time FE	No	Yes	No	Yes

Notes: (i) Standard errors clustered at state-time level; (ii) * p<0.10, * p<0.05, ** p<0.01; (iii) "Supports Bolsonaro" in Columns (1) and (2) is a binary variable that takes value equal 1 if Bolsonaro was the most voted candidate in in the first round of the 2018 elections, and in Columns (3) and (4) is a continuous variable indicating by how much Bolsonaro's votes exceed 50% in the first round of the 2018 elections; (iv) On March 15^{th} Bolsonaro's supporters marched against the Congress and Bolsonaro ignored coronavirus warnings to join them.

Table 4: Heterogeneous impacts by local demonstrations - first round of the 2018 elections.

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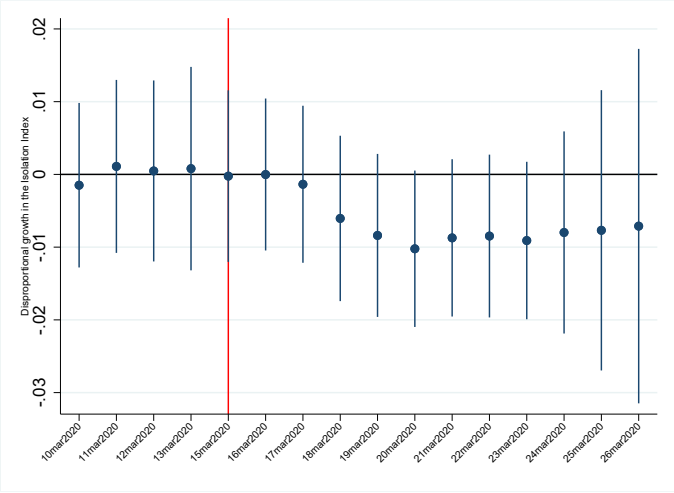
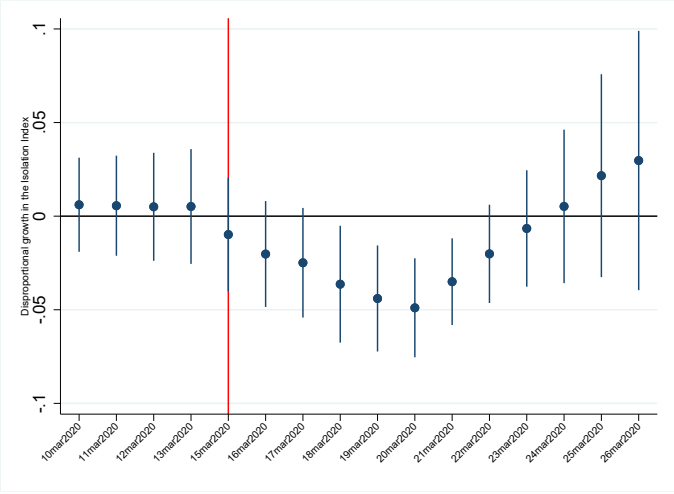
Figure 4: Disproportional decrease of social isolation in pro-Bolsonaro cities

Panel A: Majority of votes



Panel B: Margin over 50%



Notes: (i) These graphs show the disproportional decrease in index of social isolation in cities pro Bolsonaro over time when compared to cities against him. In Panel A, cities pro(against) Bolsonaro are the cities where he won(lost) the runoff in the 2018 elections. In Panel B, the support for Bolsonaro is measured with a continuous variable equal to the margins of votes over 50% in the runoff. On March 15^{th} Bolsonaro's supporters marched against the Congress and Bolsonaro ignored coronavirus warnings to join them. (ii) The index of social isolation represent the percentage of mobile devices that remained within a radius of 450m from the location identified as their home. (iii) In this specification we control for locality, State by time, and number of cases before the demonstrations interacted with city characteristics (population and GDP per capita) by time FEs. (iv) Confidence interval of 90%. (v) Standard errors clustered at state-time level.

We finally explore the index of social isolation to measure what is driving the increase

in COVID-19 cases in the most direct possible way. As explained in section 4, the index of social isolation gathers data from over 60 million mobile devices and estimates for each municipality/day the percentage of devices that remained within a 450 meters radius from their home. Similar data is used to measure how partisanship [Barrios and Hochberg, 2020, Grossman et al., 2020] and belief in science affects social distancing in the US [Brzezinski et al., 2020].

In addition, in a paper developed independently and at the same time as ours, Ajzenman et al. [2020] use this measure of social isolation to show that Bolsonaro has influenced his supporters to comply less with social distancing measures. Here, we use this index to check whether this also applies to the sub-sample of cities we analyze - that is, cities that had at least one COVID-19 case in the considered window of time and hence were at a similar stage of the epidemic. In our analysis, we also consider different trends depending on the number of cases before the demonstrations and municipality characteristics as controls.

There are some caveats of using this index as a proxy of compliance to social distancing. Firstly, it relies on data collected from mobile devices that have GPS, Bluetooth, and/or Wi-Fi running in their background. Such a sample of devices might not be representative of the population. In particular, it is more likely that people from higher socioeconomic status are over-represented in this sample.

Secondly, the radius established by such an index - 450 meters from people's home - is rather arbitrary and might represent different levels of non-compliance to social distancing depending on the size of the city - in a city like São Paulo or Rio de Janeiro, for instance, someone might have to go further than 450 meters just to do their groceries. Indeed, Barrios and Hochberg [2020] address this issue by using the change in average daily distance traveled from the pre-pandemic period, while Painter and Qiu [2020] do not consider movements from home to work. Unfortunately, the data provided by In Loco does not allow us to compute a similar measure. Finally, staying within such a radius also does not necessarily mean that one is complying with social distancing since people could still be meeting their neighbors.

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With these caveats in mind, we perform exercises similar to those described in equation 2 but with the index of social isolation as the dependent variable. In line with Brzezinski et al. [2020], we account for differences in people's propensity to travel during week days and weekends. Figure 4 brings the results of such an estimation. Panel A shows the results for cities where Bolsonaro won versus cities where he lost the runoff in 2018, while Panel B brings the results considering the margin over 50% of votes as a measure of the support for Bolsonaro. In Panel A we observe a decrease in social isolation, even though this is not significantly different from zero.[10] Panel B shows a more clear trend of decrease in cities where Bolsonaro enjoys higher support, starting already on March 16^{th} and persisting until March 22^{nd}. Overall, these results indicate that Bolsonaro's supporters reacted to his behavior during the demonstrations, decreasing their own isolation.

6.2 Robustness

Tables A.1 and A.2 in the Appendix bring some checks of the robustness of our results. Table A.1 presents estimations excluding cities in the State of São Paulo. São Paulo was the State where the outbreak of COVID-19 happened, and consequently had already a quite large number of confirmed cases when the demonstrations took place. Moreover, Bolsonaro had the majority of votes in all São Paulo cities present in our sample. The results observed in Table 3 could, therefore, be driven solely by the fact that the cluster of cities with the highest number of COVID-19 are also cities that support Bolsonaro. However, this does not seem to be the case, as the results are pretty stable when we exclude these cities from our sample.

Table A.2 reproduces our estimations with different measures for the occurrence of COVID-19 cases in the analyzed localities. Columns (1) and (2) present the result using the likelihood of having any confirmed COVID-19 case in the city as the dependent variable. Columns (4) and (5) in turn use the number of cases by thousands of inhabitants. In both

[10] Some of the coefficients after March 17^{th} are significant at 15% level.

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cases, results are quite similar to our original analysis.

Recent studies indicate that the number of cases of COVID-19 could be much higher due to low number of tests performed in Brazil. The number of cases can be 12 times larger than the official numbers according to studies which use the number of COVID-19 like deaths[11]. With this caveat in mind, we also analyse the effect of Bolsonaro's behavior on March 15th on growth in the number of deaths caused by COVID-19 and other related symptoms (henceforth COVID-19 related deaths), namely pneumonia, severe acute respiratory syndrome, respiratory failure and septicemia[12]. We decided to consider also death caused by these related symptoms because not all severely ill people who present COVID-19 symptoms are being tested in BraziLemos [2020]. In line with our other results, Figure 5 shows that pro-Bolsonaro cities also displayed a disproportional increase of COVID-19 related deaths . In the future, we plan to compare these numbers with the ones in 2019 and calculate the excess of deaths [Ghislandi et al., 2020].

7 Conclusion

Citizens' compliance with public health measures are extremely important for containing the spread of contagious diseases. Previous work has focused on different causes of compliance with health measures, concluding that trust in health authorities is relevant [Larson, 2016]. However, much less work has been developed on the politicization of health measures. In this paper, we shed light on how a single political leader - the Brazilian president Jair Bolsonaro - can influence compliance with health measures when his stance is in stark contrast with the position of health authorities and experts.

We conclude that Bolsonaro indeed influenced his supporters to comply less with social distancing measures by joining nation-wide demonstrations organized by his supporters on

[11]For more details, visit `https://www.businessinsider.com/brazils-coronavirus-cases-likely-12-times-higher-than-reported-2020-4`.

[12]Data on number of deaths and their causes come from legal death certificates (https://cartorionobrasil.com.br/)

March 15th. His participation to these demonstrations signaled to his supporters that he was not in favor of social distancing measures. As a result, we observe an increase of 18.9% on the daily number of new registered COVID-19 cases in municipalities that concentrate his supporters. This result is robust to a number of measures of municipalities' support for Bolsonaro. We also provide evidence that the increase in the number of cases was not caused only by the agglomeration of people in the day of the protest. Indeed, we show that a similar effect is observed also in pro-Bolsonaro cities where no manifestation was registered. Finally, we provide evidence as to which mechanisms underlie this effect. Specifically, we show that after the demonstrations, cities where Bolsonaro enjoys higher support decreased their levels of social isolation when compared to cities where he has lower support.

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A Appendix

	Dependent variable: log(1+COVID Cases)			
	(1)	(2)	(3)	(4)
Post March 15^{th} × Local demonstration	0.267***	0.250***	0.258***	0.247***
	(0.080)	(0.077)	(0.045)	(0.043)
Post March 15^{th} × Supports Bolsonaro × Local demonstration	0.210***	0.179***	1.006***	0.895***
	(0.062)	(0.054)	(0.141)	(0.142)
Post March 15^{th} × Supports Bolsonaro × No demonstration	0.281***	0.178**	1.119***	0.911***
	(0.086)	(0.084)	(0.163)	(0.166)
Observations	4975	4975	4975	4975
R Squared	0.76	0.83	0.81	0.83
City FE	Yes	Yes	Yes	Yes
Pre-demo number of cases x Time FE	Yes	Yes	Yes	Yes
State x Time FE	Yes	Yes	Yes	Yes
Pre-demo number of cases x 2017 GDP per capita X Time FE	No	Yes	No	Yes

Notes: (i) Standard errors clustered at state-time level; (ii) * p<0.10, * p<0.05, ** p<0.01; (iii) "Supports Bolsonaro" is the margin of votes for Bolsonaro above the 50% cutoff in the runoff of the 2018 elections; (iv) On March 15^{th} Bolsonaro's supporters marched against the Congress and Bolsonaro ignored coronavirus warnings to join them.

Table A.1: Robustness check - results from Table 3 excluding the state of São Paulo.

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	I(Number of cases>0)		Cases by 1k people	
Post March 15^{th} × Supports Bolsonaro	0.285***		0.030***	
	(0.077)		(0.006)	
Post March 15^{th} × Local demonstration		0.031		0.001
		(0.024)		(0.001)
Post March 15^{th} × Supports Bolsonaro × Local demonstration		0.231***		0.033***
		(0.084)		(0.007)
Post March 15^{th} × Supports Bolsonaro × No demonstration		0.360***		0.017***
		(0.113)		(0.006)
Observations	5850	5850	5850	5850
R Squared	0.82	0.82	0.64	0.64
City FE	Yes	Yes	Yes	Yes
Pre-demo number of cases x Population X Time FE	Yes	Yes	Yes	Yes
State x Time FE	Yes	Yes	Yes	Yes

Notes: (i) Standard errors clustered at state-time level; (ii) * p<0.10, * p<0.05, ** p<0.01; (iii) "Supports Bolsonaro" is the margin of votes for Bolsonaro above the 50% cutoff in the runoff of the 2018 elections; (iv) On March 15^{th} Bolsonaro's supporters marched against the Congress and Bolsonaro ignored coronavirus warnings to join them.

Table A.2: Robustness check - results from Tables 2 and 3 using alternative measures of the number of COVID-19 cases growth.

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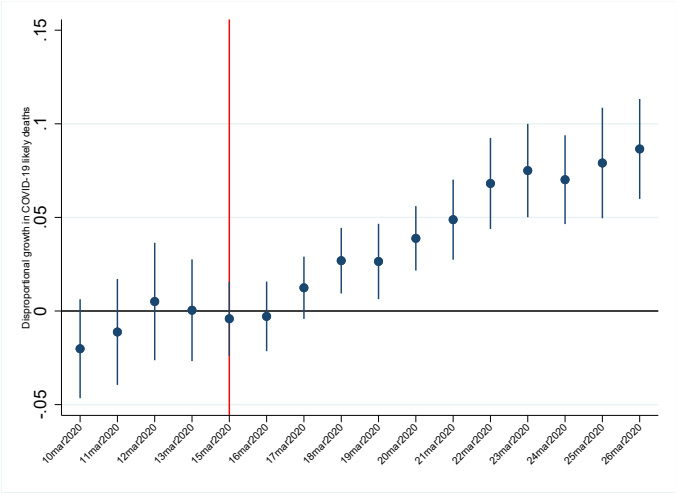
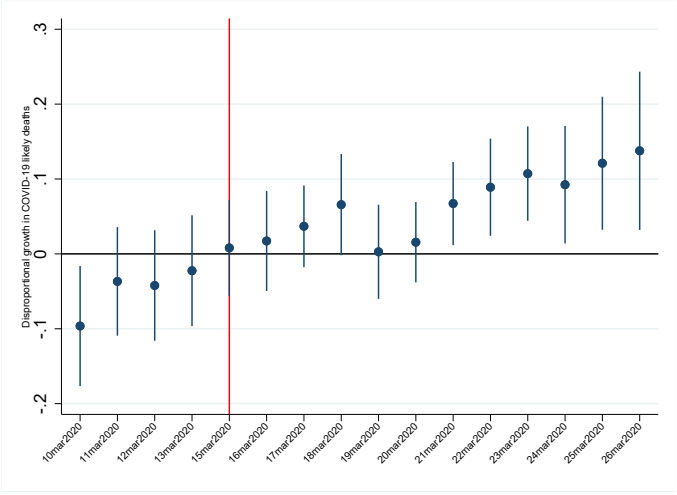
Figure 5: Disproportional growth in the COVID-19 like deaths in pro-Bolsonaro cities

Panel A: Majority of votes



Panel B: Margin over 50%



Notes: (i) These graphs show the disproportional growth in the COVID-19 like deaths in cities pro-Bolsonaro over time when compared to cities against him. In Panel A, cities pro(against) Bolsonaro are the cities where he won(lost) the runoff in the 2018 elections. In Panel B, the support for Bolsonaro is measured with a continuous variable equal to the margins of votes over 50% in the runoff. On March 15^{th} Bolsonaro's supporters marched against the Congress and Bolsonaro ignored coronavirus warnings to join them. (ii) The deaths included here are due to COVID-19, pneumonia, accute breathing insufficiency, and septicaemia. (iii) In this specification we control for locality, State by time, and number of cases before the demonstrations interacted with city characteristics (population and GDP per capita) by time FEs. (iv) Confidence interval of 90%. (v) Standard errors clustered at state-time level.