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Nicolás Ajzenman (Sao Paulo School of Economics - FGV)
Tiago Cavalcanti (University of Cambridge/CEPR/Sao Paulo School of Economics)
Daniel Da Mata (Sao Paulo School of Economics - FGV)

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More than Words: Leaders' Speech and Risky Behavior During a Pandemic*

Nicolás Ajzenman† Tiago Cavalcanti‡ Daniel Da Mata§

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Abstract

How do political leader's words and actions affect people's behavior? We address this question in the context of Brazil by combining electoral information and geo-localized mobile phone data for more than 60 million devices throughout the entire country. We find that after Brazil's president publicly and emphatically dismissed the risks associated with the COVID-19 pandemic and advised against isolation, the social distancing measures taken by citizens in pro-government localities weakened compared to places where political support of the president is less strong, while pre-event effects are insignificant. The impact is large and robust to different empirical model specifications. Moreover, we find suggestive evidence that this impact is driven by localities with relatively higher levels of media penetration and is stronger in municipalities with a larger proportion of Evangelic parishioners, a key group in terms of support for the president.

JEL classification: D1, I31, Z13

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†São Paulo School of Economics-FGV. E-mail: nicolas.ajzenman@fgv.br.

‡University of Cambridge, CEPR and São Paulo School of Economics-FGV. E-mail: tvdvc2@cam.ac.uk.

§São Paulo School of Economics-FGV. E-mail: daniel.damata@fgv.br.

I Introduction

Leadership is a powerful tool for influencing human behavior. From Plato to present-day literature in economics (Hermalin (1998)), the sociology of organizations (Weber (1947)), and management (Burns (1978)), scholars widely agree that leadership matters. Leaders can affect individual beliefs and behavior through different channels: by reducing information asymmetries and thus minimizing coordination problems (e.g. Dewan and Myatt, 2008), by setting a social norm (e.g. Acemoglu and Jackson, 2015) or simply by emotionally and symbolically transmitting a message (e.g. Hermalin, 2017; Antonakis et al., 2014).

A growing body of empirical work has recently shown that leaders – with their actions and their words – have the power to influence people in a variety of ways, including persuading them to behave more or less honestly (e.g. Ajzenman, 2018; d'Adda et al., 2017), or to increase their contributions to public goods (e.g. Güth et al., 2007; Andreoni, 2006). Yet a crucial but virtually unexplored domain in which leaders may have an important impact is health-related risky behavior. Information on recommended prevention practices is typically asymmetrical between governments and citizens, and this issue becomes even more relevant during a public health emergency, such as a pandemic. Regular citizens may not only ignore medical best practices but, more fundamentally, be unaware of the global spread of the disease and ignore negative externalities. The role of leaders in this context is therefore critical, above and beyond incentives and institutions.

We aim to bridge this gap in the literature by exploring the effect of a high-profile political leader's behavior and public speeches on citizens' preventive and risky behavior. We focus on the recent outbreak of COVID-19 in Brazil, a particularly suitable setting for addressing our research question.[1] Since the start of the pandemic, the official response has been notably heterogeneous among the different levels of government. Many sub-national governments have declared non-pharmaceutical interventions with varying levels of strictness (e.g. Anderson et al., 2020) and recommended adherence to social distancing. In contrast, President Bolsonaro has minimized the risks of the disease, to the point of explicitly and publicly contradicting the instructions communicated by governors. On a number of different occasions (e.g., FT, 2020; The Economist, 2020), the president publicly encouraged citizens to go out and thus break social isolation policies.

This context is thus ideal for testing whether the words of a public leader (in this case, the head of state) may affect individual risk perception and behavior, with potential negative externalities on the community at large. Moreover, Brazil is a polarized country, in which the president has an almost equal level of strong approval and disapproval from citizens (e.g. Hunter and Power, 2019). We hypothesize that the his supporters are significantly more prone to being persuaded by his speeches than are his critics, even in a context of high-stake decisions, such as adherence (or not) to preventive measures recommended by the World Health Organization, Brazil's sub-national governments, and even the national Ministry of Health.

In order to address our research question, we conduct an event-study type of analysis at the day-municipality level. We first deploy a social distancing index at the municipal-day level based on granular location data from tens of millions of anonymous mobile devices across Brazil. The index is defined as the proportion of mobile phones in a given municipality that remained within a radius of 450 meters from their habitual home during a day. We then combine this information with municipal data from the 2018 presidential election. In our setting, the "intervention" is defined by the interaction of a "pro-government" dummy (based on the average municipal support for the current president in the 2018 elections) and the dates corresponding

[1] Brazil is a three-tiered federation with 26 states, a federal district, and 5,571 municipalities.

to the events in which the president publicly challenged the social distancing policies.

We show that, following public and prominent speeches of the president against social isolation policies, the average social distancing index immediately falls in those municipalities with a majority of supporters. The effect is significant, persists for at least a week, and is robust to several specifications and definitions of political support. We also show insignificant pre-event effects. Further, we present suggestive evidence of a larger effect in municipalities with a higher presence of local media or internet penetration among households, a result consistent with other papers that emphasize the role of local media in disseminating political news in Brazil (e.g. Ferraz and Finan, 2008; Bessone et al., 2019). Finally, we document suggestive evidence of a stronger effect in municipalities with a larger proportion of Evangelicals, a religious group that represents around a quarter of the population and who heavily voted for Bolsonaro in the 2018 election.[2] [3]

We complement the empirical analysis with a simple theoretical model, in which individuals are willing to self-isolate voluntarily when the probability of contracting the disease is tangible. However, people also weigh the contagion risk against income loss and the inconvenience of living in isolation. Thus, voluntary social distancing can keep people at home only when the infection risk starts to become visible and individuals might overexpose themselves to infection. We show how the perceived loss of infection risk changes equilibrium social distancing.

Our paper relates to several strands of the literature. First, it builds on studies examining the role of leaders in shaping people's beliefs and behavior. Although economics has traditionally focused on transactional leadership (e.g. Burns, 1978) – incentives as the main channel through which the principal can induce behavior among the agents (e.g. Lazear and Rosen, 1981) or Holmstrom and Milgrom (1994)) – there is a growing theoretical (Acemoglu and Jackson (2015)) and empirical literature that explores how leaders can motivate followers, through speeches and exemplary behavior, to voluntarily behave in certain ways. Ajzenman (2018), shows that when a corruption scandal involving a political leader is revealed in Mexico, citizens become more dishonest (results consistent with those of d'Adda et al. (2017)). In a different setting, Antonakis et al. (2014) demonstrate that listening to a leader's charismatic speech can induce prosocial behavior among workers (results consistent with Gächter and Renner (2018)). Particularly related to our paper, Bassi and Rasul (2017) show that the 1991 Pope's visit to Brazil had a significant effect on beliefs and behavior related to fertility. We complement these papers by focusing on a particularly relevant type of leader – the head of state – and showing how his speech affects citizens' risky health-related behavior.

Second, we contribute to the very recent literature on the COVID-19 pandemic and social distancing compliance. Barrios and Hochberg (2020) document a partisan divide in compliance with social distancing, results consistent with those of Allcott et al. (2020) and Kushner Gadarian et al. (2020). In a paper closer to ours, Painter and Qiu (2020) show that Democrats in the US are more likely to abide state-level "stay-at-home" orders when the governor is also a Democrat. Using twitter data, Grossman et al. (2020) show that governors' recommendations to stay at home, which preceded actual orders to do so, led to a large and significant reduction in mobility, an effect that was larger in Democratic than Republican-leaning counties, and more pronounced under Republican governors. Our paper builds on this literature by showing how the actions

[2] Around 70% of Evangelicals voted for Bolsonaro. See Folha (2018).

[3] In the Appendix A, we show evidence of a change in the trend of reported cases a few days after the events. There are, however, serious issues with case reporting data in Brazil due to underreporting, which make them unreliable. Although this is true for many countries, testing in Brazil seems disproportionately low in comparison to other nations (see The Washington Post (2020)). Moreover, testing is not uniformly distributed among states (or municipalities) or days, and there is no reason to believe that its distribution across time or space is unrelated to other relevant variables or events.

and words of the president can affect the behavior of his followers, regardless of the actual legal or official policies (e.g., "stay-at-home" orders) in place.

Finally, our study is pertinent to the literature on behavioral change promotion in public health through opinion leaders. Most of the papers in this field focus on the identification of efficient channels for spreading positive change in health behavior, such as through celebrities or peer leaders (see Valente and Pumpuang (2007) for a comprehensive review). Kearney and Levine (2015) show that a popular MTV show ("16 and Pregnant") reduced teen births in the US. In a context similar to ours, Bursztyn et al. (2020) show that prevention messages broadcasted on TV shows has had a significant impact on viewer behavior during the COVID-19 pandemic in the US. We contribute to this literature by showing that the head of state can be an effective agent of behavioral change, in this case leading to a lessening of preventive health behavior.

The paper is structured as follows. Section II introduces the context and chronology of events in Brazil. Section III discusses the theoretical model of social distancing compliance. Section IV describes the data. Section V presents the empirical model and the main results and Section VI concludes.

II Context and Chronology

Since the outbreak of the current pandemic, most nations have reported exponential growth in the incidence of COVID-19 cases. Numerous countries have actively implemented non-pharmaceutical interventions to reduce the spread of the virus, ranging from travel restrictions, home isolation, or even mandatory quarantines. The so-called mitigation strategy, as popularized by the Imperial College Report, aims to "flatten the curve" in order to keep the number of critical cases at a manageable level and thus avoid a collapse of the health system. Although some of the measures are beyond individuals' control (e.g., school closures), the level of compliance largely depends on citizens' actions, particularly in countries where isolation is not legally enforced.

The official response to the pandemic on the part of the Brazilian government has been heterogeneous and uncoordinated. In Brazil's federation, state governments have real power to implement their own social distancing policies (Figure B.1 in Appendix B shows that although every state government eventually adopted social distancing policies, the timing varied across locations).

As cases and fatalities began to rise, President Jair Bolsonaro minimized the pandemic. He encouraged people to go out and frequent stores and markets, and even attend public demonstrations in the streets, contradicting his own health minister. Bolsonaro was dismissive of the effects of the virus, calling it "just a little dose of flu" (see The Wall Street Journal, 4/2) and a "media trick" (see The Guardian, 3/23). His behavior was so controversial that it rapidly attracted the attention of dozens of international media outlets, including The Times of India, 3/16, The Economist, 3/26, and The New York Times, 4/1, among many others.

Despite such opposition to drastic social distancing measures, the president's messages have not always been clear and uniform. In what follows, we summarize Bolsonaro's actions and public pronouncements relative to the COVID-19 pandemic. We highlight two key events where his critiques focused on condemning social distancing policies and, unlike other days, made the front pages of the main national media outlets.

(i) In a televised presidential statement on March 6, Bolsonaro stated that people "must

strictly follow experts' recommendations on the best protective measures." However, there was no clear recommendation on social distancing.

(ii) On an official visit to the United States on March 10, the president recognized that there is a world crisis related to COVID-19. On March 12, he appeared with his health minister on television, both wearing face masks. The health minister recommended postponing the public protests against the Congress and the Supreme Federal Court (STF) scheduled for the coming Sunday. In an official pronouncement later that day, Bolsonaro stated that these public marches should be "reconsidered" given the "current events."

(iii) **March 15 - Demonstration:** The protests planned for March 15 took place. Bolsonaro, despite possibly being infected with COVID-19, joined one of the demonstrations in Brasilia. He took selfies and fist bumped several supporters, as well as posted a record number of tweets (47) since becoming president. Most of these tweets included videos of the rallies across different cities of the country.

His behavior quickly captured the interest of national and international media. On March 16, a picture of Bolsonaro participating in the demonstration appeared on the front page of the three largest newspapers in Brazil (Folha de Sao Paulo, O Globo and Estadao), with headlines directly alluding to his actions in relation to prevention of the virus and his "bad example to the nation" (see Figure B.2 in Appendix B as an example).[4]

(iv) On March 18, Bolsonaro and several of his ministers, all wearing face masks, spoke with the press and presented policies aiming to mitigate the economic and health impacts of the pandemic. There was no message on social distancing.

(v) **March 24 - Official Presidential Pronouncement:** From the beginning of the outbreak to April 14, five official presidential pronouncements were made. This type of message is particularly relevant because every TV or radio station in the country must mandatorily broadcast the pronouncement. They are thus scarce and reserved for especially relevant communications from the president.[5] In the first two pronouncements (March 6 and 12), the president gave short speeches and the messages were not related to social distancing. He emphasized the work of the federal government and tried to calm and encourage people to follow the prevention measures recommended by specialists.

Notably, the tone of these messages completely changed in his speech on March 24. This time, Bolsonaro directly referred to the social distancing policies implemented by the sub-national governments. He first emphasized that the risk group was mainly the elderly and argued that there was no point in closing schools. He also stressed that jobs should be maintained and criticized the media for diffusing news on Italy ("a country with a large elderly population and completely different weather").

He spoke of his personal situation, contending that because of his "history of athleticism," he need not worry even if he got infected. As with the public protests on March 15 (and unlike any of his previous or subsequent official communications), his speech again made the front pages of the three main national newspapers the following day, all of which explicitly reported his position against social distancing and contrary to "world's trends" (see Figure B.3 in Appendix B as an example).

(vi) In the next official pronouncement on March 31, Bolsonaro's attitude was more moderate. He cited the World Health Organization, and praised the policies implemented by the

[4]Each of the main newspapers' front pages can be downloaded from https://vercapas.com.br.

[5]The text of each of these speeches can be accessed publicly at this website: https://www.gov.br/planalto/pt-br/acompanhe-o-planalto/pronunciamentos.

federal government to mitigate the effects of the epidemic together with sub-national governments.

(vii) Finally, on April 8, the president's pronouncement maintained the same character of the previous one, praising his intervention policies and the coordination of the federal government with the states. If anything, the media's interpretation was that Bolsonaro was "toning down" his message.[6]

The two events highlighted in bold above were both very significant and outliers in spreading a message against social distancing. The first was his participation in the demonstrations of March 15, where by joining the crowds he broke public health guidelines. The second event was his official pronouncement on March 24, in which he pushed to end social distancing measures implemented by some sub-national governments. Notably, Figure B.4 in Appendix B shows that March 15 and 24 were key dates relative to internet searches for the words "protests" and "'Bolsonaro pronouncements," respectively.

III Theoretical Model

In this section, we present a simple model to characterize how differences in the perceived risk of infection, and the cost associated with it, influence equilibrium social distancing and the spread of the disease. Since individuals may be uninformed about the severity and spread of the pandemic, a leader's words can have an impact on their priors, which can be inferred from the reduced-form effect on their actions. This is a stylized model and a modified version of the basic SIR (Susceptible (S), Infected (I) and Recovered(R)) framework presented by Kermack and McKendrick (1927) and extended by Kremer (1996) to the case of equilibrium social distancing.[7] We introduce heterogeneity in the perceived expected loss of being infected.

Time is continuous and the population size is normalized to one such that $S_t + I_t + R_t = 1$. In the initial period, the number of recovered (or immune) individuals is $R_0 = 0$ and a small measure of individuals get infected such that S_0 is just below 1 and I_0 is just above zero. There are $n \in \{1, 2..., N\}$ types of individuals. The share of type-n agents is $\pi_n \in [0, 1]$ with $\sum_{i=1}^{N} \pi_n = 1$ and their expected perceived loss of being infected is L_n. Without loss of generality assume that $0 \leq L_1 < L_2 < ... < L_N$. Agents can take actions to avoid contagion by being vigilant. The social distancing effort of an agent n is v_n, which decreases the infection rate, as further described below. In practical terms, this means avoiding going out or visiting relatives, working from home, using masks, more hand washing and cleaning, self isolation, and so on. The social distancing effort v_n to avoid infection comes with a cost described by the function $c(v_n) = \frac{v_n^2}{2}$. This can be interpreted as the foregone income of working from home, employment loss, and the non-monetary stress and mental challenge of being deprived of a social life.

At each instant, individuals match randomly. Susceptible individuals S_t may become infected once they match with infected individuals I_t. The rate at which infection spreads to an individual n is

$$\beta f(v_n) \left[\sum_{i=1}^{N} \pi_n f(\bar{v}_n) \right] \quad \text{with} \quad f(v_n) = 1 - \zeta v_n,$$

[6] See, for instance, https://www.vercapas.com.br/edicao/capa/folha-de-s-paulo/2020-04-01/ and https://www.vercapas.com.br/edicao/capa/o-globo/2020-04-0.

[7] See also Toxvaerd (2019), Toxvaerd (2020), Greenwood et al. (2019) and Keppo et al. (2020).

where $\zeta > 0$ is a parameter describing the effectiveness of an individual's own vigilance in avoiding infection and $\bar{v}_n$ the social distancing adopted by the other agents. When $\zeta = 0$, the model is the equivalent of a standard SIR model without endogenous social distancing and the infection rate is β. The aggregate rate at which a susceptible individual becomes infected is

$$x_t(v_{nt}/\bar{\mathbf{v}}_\mathbf{t}) = \beta f(v_{nt}) \left[\sum_{i=1}^{N} \pi_n f(\bar{v}_{nt})\right] S_t I_t.$$

Given other players' strategy $\bar{\mathbf{v}}_\mathbf{t}$, an individual type-$n$ chooses social distancing v_{nt} to minimize the perceived expected total loss:

$$v_{nt}^* = \arg\min_{v_{nt}\geq 0} \left\{ x_t(v_{nt}/\bar{\mathbf{v}}_\mathbf{t}) L_n + \frac{v_{nt}^2}{2} \right\}.$$

In a Nash equilibrium of this contagion game, we have

$$v_{nt}^* = \frac{\zeta\beta I_t S_t L_n}{1 + \zeta^2 \beta I_t S_n [\sum_{i=1}^{N} \pi_i L_i]} > 0 \quad \text{and} \quad f(v_{n,t}^*) = (1 - \zeta v_{nt}^*) \in (0,1). \tag{1}$$

Therefore, the lower agent-n's perceived expected loss L_n, the less cautious the agent is and the lower her vigilance. In addition, the lower the other agents' perceived expected loss, $\bar{L} = \sum_{i=1}^{N} \pi_i L_i$, the greater her vigilance. Clearly, social distancing rises with contagion $\beta I_t S_t$. The dynamics of the system are given by:

$$\dot{S}_t = -\beta \left[\sum_{i=1}^{N} \pi_i (1 - \zeta v_{it}^*)\right] \left[\sum_{i=1}^{N} \pi_i (1 - \zeta v_{it}^*)\right] S_t I_t, \tag{2}$$

$$\dot{I}_t = \beta \left[\sum_{i=1}^{N} \pi_i (1 - \zeta v_{it}^*)\right] \left[\sum_{i=1}^{N} \pi_i (1 - \zeta v_{it}^*)\right] S_t I_t - \gamma I_t, \tag{3}$$

$$\dot{R}_t = \gamma I_t. \tag{4}$$

Figure I(a) shows the dynamics (solid line) of a typical epidemiological model without endogenous social distancing as well as the dynamics of a model with equilibrium social distancing (dotted line).

As the number of infected people increases and contagion rises, individuals become more vigilant, equilibrium social distancing rises, and therefore the number of infected people is reduced relative to the typical epidemiological model. While equilibrium vigilance flattens out the infection curve by decreasing the reproduction rate $r_t = \frac{\beta_t}{\gamma}$, it can quantitatively be very different from an imposed lockdown, which can be captured by a reduction in β. Individuals are willing to self-isolate when the probability of contracting the disease is tangible. However, they also weigh the contagion risk against losses of income and the inconvenience of living in isolation. As a consequence, voluntary social distancing keeps people at home only when the infection risk starts to become visible, and the epidemic is already well underway. This can differ significantly from a policy that enforces strict social distancing measures.

Figure I(b) shows the equilibrium vigilance for three different individuals who are heterogeneous in terms of their perceived expected loss of infection. The highest curve is associated with the individual with the highest perceived expected loss of infection.

What are the effects on the infection rate of a rise in the share of individuals who perceive COVID-19 to be a minor health problem? There are two opposing effects. The first is a composition effect since there will be more individuals with the lowest equilibrium vigilance,

i.e. with v^*_{1t}, and therefore the infection rate should rise. Yet the average perceived expected loss $\sum_i^N \pi_i L_l$ in society falls and caution to avoid infection on the part of all agents rises, decreasing the infection rate. With two types of individuals, the following proposition shows that the former effect dominates the latter and that a rise in the share of individuals with the lowest perceived loss of infection increases the infection rate. A similar result is also shown when the perceived expected loss of any individual falls.

Proposition 1. *Assume that there are two types of individuals $n \in \{1, 2\}$ with $\{L_1 < L_2\}$ and the share of type-1 individuals (with the lowest perceived expected loss of infection) is π. Denote the society's infection rate by β_t where*

$$\beta_t = \beta \left[\pi(1 - \zeta v^*_{1,t}) + (1 - \pi)(1 - \zeta v^*_{2,t})\right]^2, \text{ with } v^*_{n,t} = \frac{\zeta \beta I_t S_t L_n}{1 + \zeta^2 \beta I_t S_n [\pi L_1 + (1 - \pi) L_2]}.$$

Then a rise in the share of individuals with the lowest expected perceived loss (π) increases the society's infection rate β_t. A fall in the perceived expected loss of any agent (L_1 or L_2) increases the society infection rate β_t

Proof. Taking partial derivatives of β_t with respect to π, L_1 and L_2 proves the results. □

IV Data

We use several sources of data to conduct our empirical analysis, and the unit of study is the municipality. In order to measure social distancing, we use an index created and developed by In Loco (https://inloco.com.br/), a Brazilian technology company that provides information based on mobile location data. Specifically, In Loco collects anonymized location data from 60 million devices, enabled by mobile apps that provide location-aware services while ensuring the privacy of their users. Using Bluetooth, Wi-Fi, and GPS, the company can track the devices' location as well as their movement to different places, with a precision of three meters.[8]

The social distancing index measures the percentage of devices in a given municipality that remained within a radius of 450 meters of the location identified as home. The index is computed on a daily basis, and ranges from zero to one. We use data for 3,975 (out of the 5,571) municipalities in Brazil for which the social index is measured — some small-sized municipalities do not have enough mobile devices, such that the index is not computed. Figure II shows that while the social distancing index has risen nationally, the changes have not been homogeneous, with some municipalities adopting more social distancing than others. The mean of the index for the total period is 0.37 (0.25 in February, 0.41 in March and 0.53 in the first two weeks of April).[9] Furthermore, Figure B.6 in Appendix B compares In Loco's and Google's social distancing indexes for each Brazilian state and shows a high correlation between the two measures during these three months.[10]

To measure support for Bolsonaro, we use electoral data provided by the Superior Electoral Court (TSE — "Tribunal Superior Eleitoral"). To match the geographical unit of our social distancing outcome, we collected data on vote counts for the 2018 presidential election in Brazil

[8] See Peixoto et al. (2020) for a complete description of how the data is collected and computed.

[9] Figure B.5 in Appendix B shows that social distancing in the states of Sao Paulo and Rio de Janeiro began to rise once these states introduced non-pharmaceutical interventions.

[10] We use Google's mobility trends for places of residence — for further details see https://www.google.com/covid19/mobility/data_documentation.html?hl=en. We compare the measures at the state-level in Brazil since this is the most disaggregated level available for the Google's index.

aggregated at the municipality level. Since this data contains vote totals for each candidate by municipality, we use several vote-related measures as a proxy for the president's local support. Figure B.7 in Appendix B shows the distribution of votes for Bolsonaro across municipalities in the 2018 presidential election.

The 2010 Population Census carried out by the Brazilian Bureau of Statistics (IBGE) provides data on income, poverty, religion and consumption of durable goods at the municipal level. We use the 2019 estimate of population counts provided by the IBGE. We also gathered data from the IBGE's 2018 MUNIC ("Perfil dos Municipios Brasileiros") containing information on local-level media presence, such local TV broadcasters. Table B.1 in Appendix B presents the descriptive statistics of the variables used in this paper.

V Empirical Model and Results

V.1 Empirical Model

In order to identify the causal effect of Bolsonaro's public demonstration participation and his messages against social distancing on citizens' behavior, we estimate a two-way fixed effects model (day, municipality), with leads and lags. This allows us to to test pre-trends (placebo) and post-trends (dynamic effects). In particular, we estimate the following empirical model:

$$SocialDistancing_{md} = \sum_{l=-10}^{+10} \alpha_l Treated_{md-l} + \alpha Treated_{md} + \phi_d + \rho_m + \lambda X_{md} + \delta Z_{sd} + \epsilon_{smd},$$

where $SocialDistancing_{md}$ is the social distancing index for the municipality m, on day d; and $Treated_{md}$ is a dummy that takes a value of 1 if two conditions are fulfilled: the municipality m is defined as "pro-government" (voting for Bolsonaro was above 50% in the first round of the 2018 election) and the day d corresponds to one of the two events that we defined: March 16 and March 25 (taking a value of zero, otherwise). We define t=0 (treatment) the first day after the demonstration that took place on the afternoon of the 15$^{\text{th}}$ and the first day after the official pronouncement by Bolsonaro on the evening of the 24$^{\text{th}}$. These are also the dates when the news appeared on the front pages of the main Brazilian newspapers. We include ten leads and ten lags of this variable to detect pre-treatment and post-treatment effects. ρ_m and ϕ_d are municipality and day fixed effects, respectively.[11]

We control for a number of relevant time-varying characteristics at the municipality-day and state-day levels. First, we include dummies indicating the type of non-pharmaceutical intervention in place in a given state (s) and day (d). These dummies (Z_{sd}) cover three categories: school closure only, school closure plus a general ban, or no ban at all. Further, to account for the fact that the support for the government is strongly correlated with variables such as poverty and condition of rurality (both time-invariant), we control for the interaction between day fixed effects and a poverty dummy, and fixed effects and a rurality dummy (X_{md}).[12] In our main specification, we also include a state-specific linear trend. To account for the plausible temporal correlation of policies within states, we cluster the standard errors at the state-day level and weight the municipal observations by their population in 2019.[13]

[11] Our model, which includes multiple events in close succession, follows the standard specification in the literature. See Sandler and Sandler (2014) for a detailed description.

[12] The poverty dummy equals one if the municipal poverty rate is above the national-level median. The rurality dummy equals one if the proportion of residents living in rural areas is above the national-level median.

[13] Results, available upon request, using other levels of clustering (municipality or micro-region) are almost identical.

V.2 Baseline Results

The baseline results are presented in Figure III (graph "a"). As expected, all except one lead (t = -9) are indistinguishable from zero. By contrast, every single day starting on day 1 is negative, and all starting from day 2 are significantly different from zero. Back-of-the-envelope calculations – using the coefficients from the event-study analysis (average of 1 p.p.) and the total population of pro-government municipalities (roughly 100 million) – show that approximately 1 million people strayed further than 450 metres from their home on each of the ten days following the key events under study.

As a robustness check, we estimate the same model using different definitions of "pro-government" support. As the two graphs in Figure B.8 in Appendix B show, there is a clear regional divide in support for Bolsonaro. In classifying municipalities where the president obtained more than 50% of the votes in the first round of the 2018 presidential election as "pro-government," we lose within-state variability in our treatment variable for about 14% of the observations. This is due to the fact that there were some states where every single municipality was either anti- or pro-Bolsonaro. Because most of the social distancing policies have been implemented at the state level, accounting for within state variability is important for our empirical analysis.[14]

To address this issue, we estimate the same model, but we alternatively define a municipality as "pro-Bolsonaro" if the votes for the president in the first round were above the median observed in the state. In Figure III (graph "b") we show that the results are, if anything, more pronounced. This specification raises, however, the concern that in extremely "anti-Bolsonaro" states a municipality might instead be considered as "pro-Bolsonaro" when the support for the president was actually quite low. To account for this problem, we re-estimate the baseline equation, but now restrict the municipalities to the states in which Bolsonaro obtained more than 50% in at least a third of the municipalities. A "pro-government" municipality is defined as where the president obtained more than the state median within the restricted sample. This model could be interpreted as the effect of the treatment within the most pro-Bolsonaro states. The results are presented in Figure III (graph "c"). Again, if anything, the effect seems to be more pronounced. The magnitude of the effect appears to be large, close to 2pp on average (compared to a mean of around 0.37 for the entire period).

V.3 Further Analysis

In order to provide suggestive evidence on the mechanisms underlying our results, we first explore the potential role of the local media presence in each municipality. Although we cannot present conclusive results, Figure IV documents several interesting patterns. Specifically, in graphs "a" and "b" we estimate the baseline model for two sub-samples: municipalities where there is no presence of local TV broadcasters ("a") and those where there is at least one ("b"). In graphs "c" and "d"), we run a similar regression but divide the sample into groups according to households' average internet penetration per municipality: "low internet penetration" ("c") if the municipality is below the top 50% of the distribution of this variable according to the census, or "high internet penetration" ("d") otherwise.[15] Across all the graphs a similar pattern

[14] An expected consequence of breaking isolation is a growing number of cases. Yet analyzing this pattern with the current data is challenging due to serious issues of data quality and underreporting. In the Appendix we explain in detail difficulties related to the data and, with this caveat, show suggestive evidence of a shift in the trend in reported cases around 4 days after the respective events.

[15] In Figure B.9 we show the results of estimating the same model but now combining the definitions of the previous two. "Low media penetration" (left) if the municipality is below the top 50% of the distribution of

emerges: the effects seem to be driven by those municipalities with higher levels of media penetration.

Second, we explore the presence of Evangelicals who represent around a quarter of the population and heavily supported Bolsonaro in the 2018 election. The estimated difference in votes between the elected president and the runner-up was 11.5 million among Evangelicals (see Folha (2018)) and Bolsonaro won the election by approximately 10.5 million votes. Support among evangelicals was around 70% (72% among Pentecostals), the largest among any religious group. We thus analyze whether municipalities with a greater share of Evangelicals show a different pattern of social distancing after the critical events. We separate municipalities in two sub-samples: below or above the municipal median of the proportion of Evangelical parishioners. We also present results for (a) non-Pentecostal Evangelicals and (b) Pentecostal Evangelicals. Figure V suggests that the effect is driven by municipalities where there is a larger population of Evangelical parishioners.[16]

VI Conclusion

Studying the effects of leadership is particularly relevant during a crisis such as the present pandemic. While citizens may neglect to follow best practices from a medical point of view, they are, more importantly, likely to be unaware of the global spread of the disease, and ignore negative externalities. The role of leaders in this context is thus crucial to coordinating information, responding to expectations, and establishing norms.

In this paper, we focus on Brazil during the COVID-19 pandemic, a politically polarized country where president Bolsonaro has actively and publicly spread an anti-isolation message. In doing so, he has encouraged citizens to challenge regulations imposed by sub-national governments and the advice of several important organizations. The setting is particularly suitable for exploring the effect of a high-profile political leader's words and actions on the behavior of his followers, above and beyond incentives and institutions.

We deploy a social distancing index at the municipal-day level, based on granular location data from tens of millions of anonymous mobile devices across Brazil. We find a strong persuasion effect of Bolsonaro on the behavior of his supporters. Specifically, we document a significant decrease in social distancing in pro-Bolsonaro municipalities following the most visible events of the president against self-isolation behavior and policies. Our empirical results emphasize behavioral change among citizens induced by this political leader's example and words that contrasts regulations, even in times of a severe pandemic.

internet penetration and there is no local TV broadcaster in the municipality, or "high media penetration" (right) otherwise.

[16] In the Appendix, we also explore how our effect varies by different demographic groups. Specifically, we show that the effect is driven by municipalities where the share of potentially active workers (male, between 15-64 years old) is larger (Figure B.10 in the online Appendix B).

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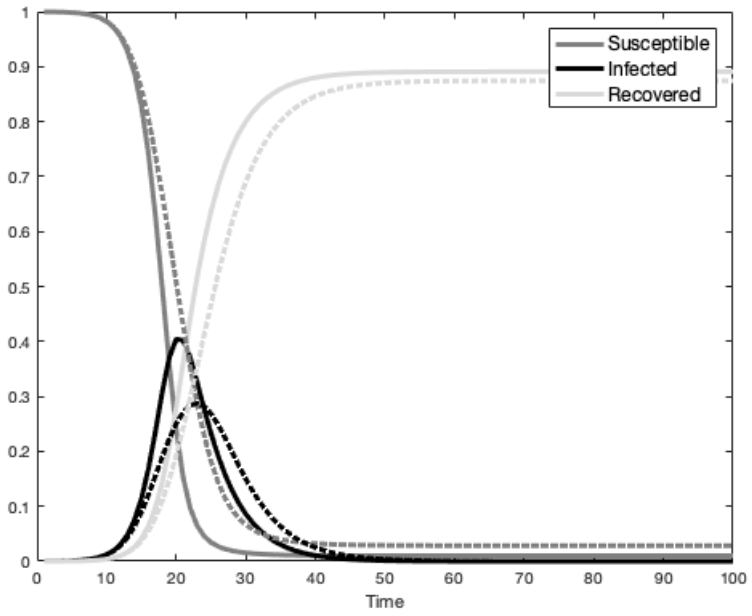
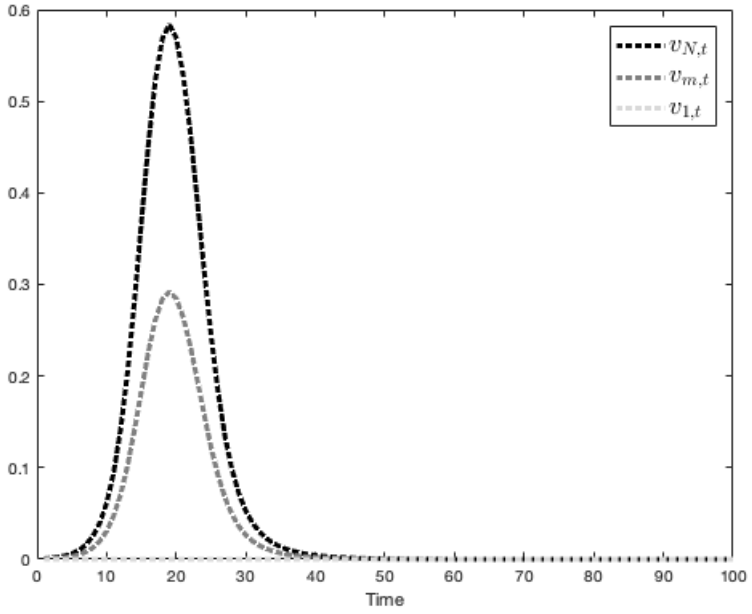
VII Figures

Figure I. SIR model with social distancing.

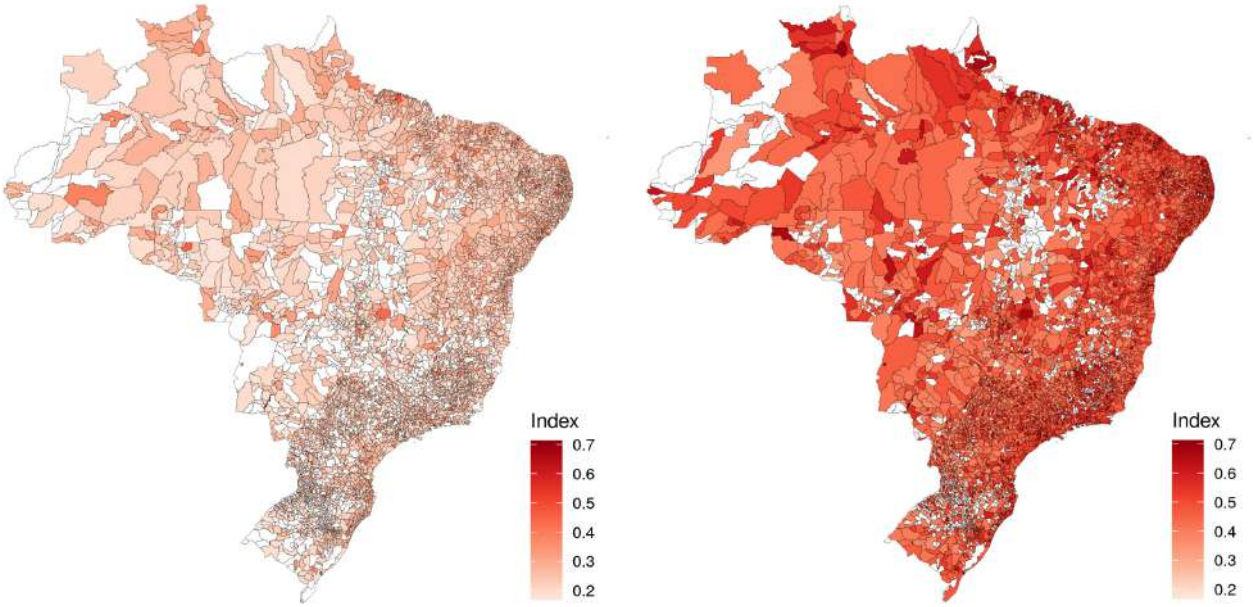


(a) Dynamics of the SIR model without (solid) and with (dashed) social distancing.



(b) Social distancing by different agents who are heterogeneous in their perceived expected loss.

Figure II. Social Distancing Index: Before and After

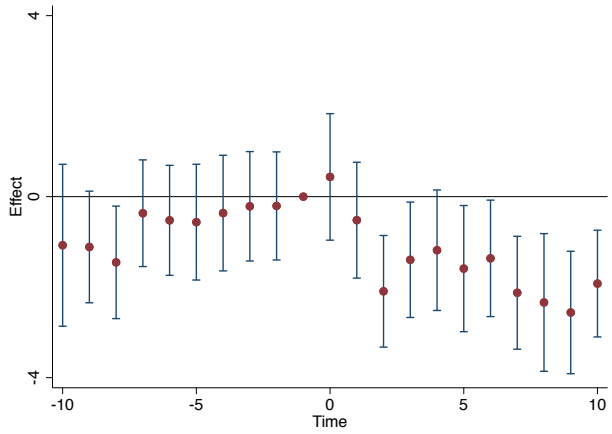


(a) Social Distancing Before: Feb 4

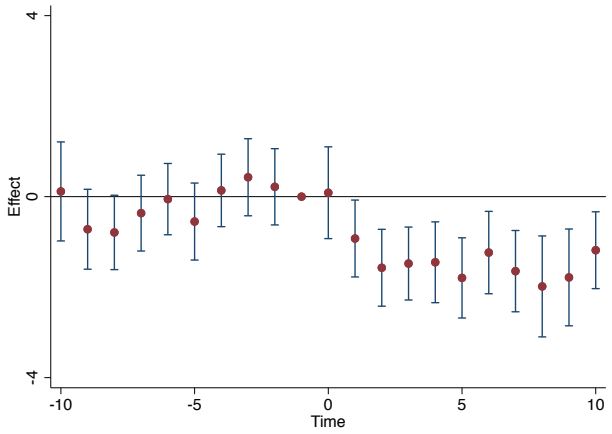
(b) Social Distancing After: Apr 7

Notes. The figures show the social distancing index for all municipalities in Brazil on 4 February and 7 April 2020. Municipalities in white are those without data on social distancing. The social distancing index is calculated by the technology company In Loco using location data from mobile devices.

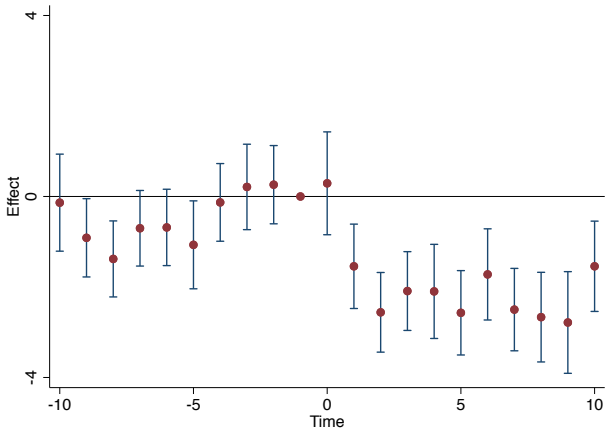
Figure III. Baseline results and robustness



(a) Baseline results: Average Effect on Social Distancing



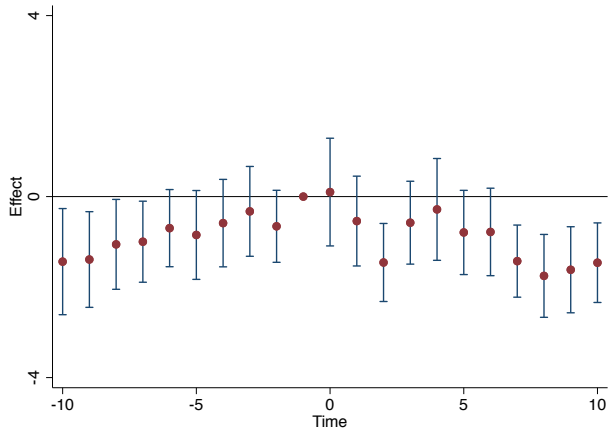
(b) Robustness: Average Effect on Social Distancing - Support for Bolsonaro: above state median



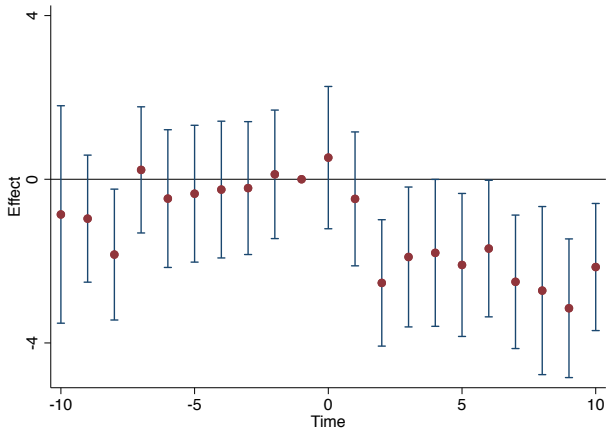
(c) Robustness: Average Effect on Social Distancing - Support for Bolsonaro: above state median in Pro-Bolsonaro states

Note: CI: 90%. Standard Errors clustered at state day level. Estimations normalized to 0 at t=-1

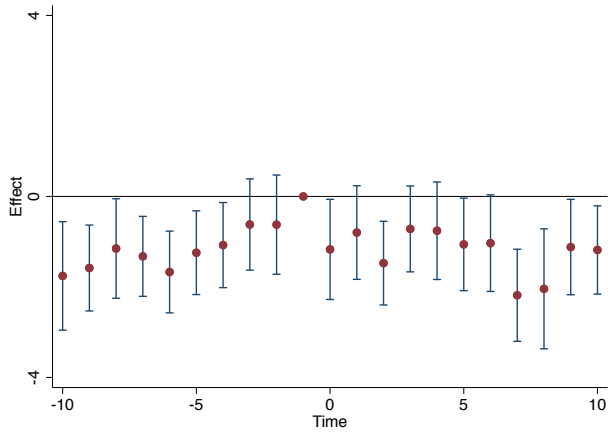
Figure IV. Average Effect on Social Distancing - By media presence or Internet penetration



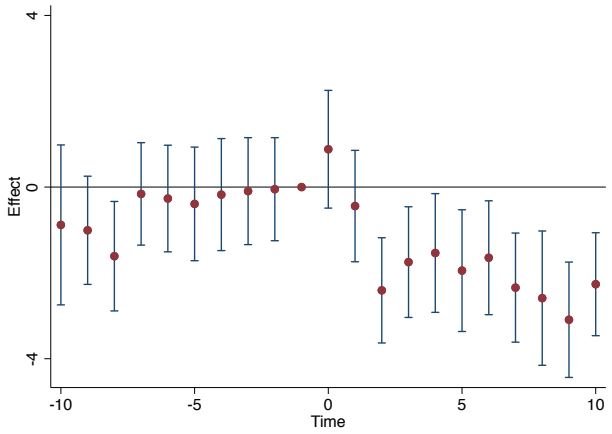
(a) No local TV broadcaster in the municipality



(b) At least one local TV broadcaster in the municipality



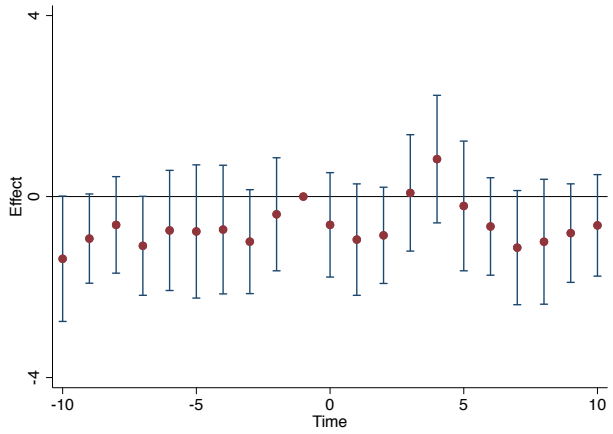
(c) Below p50 of Internet penetration



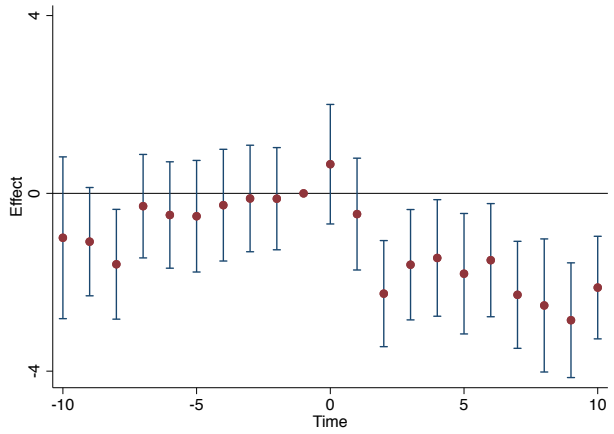
(d) Above p50 of Internet penetration

Note: CI: 90%. Standard Errors clustered at state day level. Estimations normalized to 0 at t=-1. Internet data comes from the 2010 Census. Internet penetration is defined as the proportion of households with internet at home in the municipality.

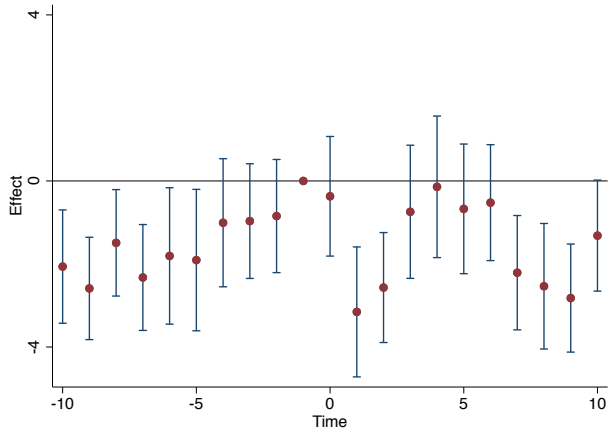
Figure V. Average Effect on Social Distancing - By Proportion of Evangelist Parishioners



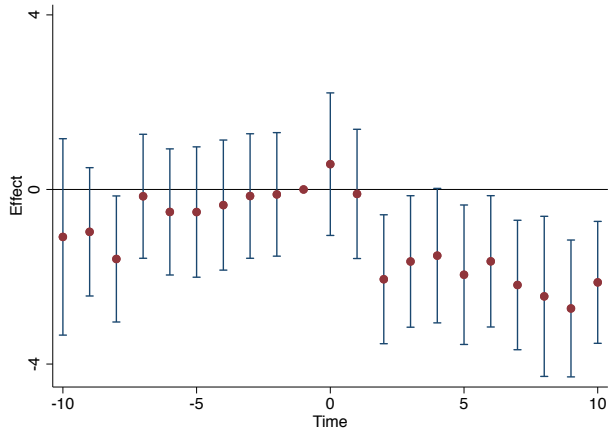
(a) Below p50 of % Evangelist Parishioners (Non-Pentecostal)



(b) Above p50 of % of Evangelist Parishioners (Non-Pentecostal)



(a) Below p50 of % Evangelist Parishioners (Pentecostal)



(b) Above p50 of % of Evangelist Parishioners (Pentecostal)

Note: CI: 90%. Standard Errors clustered at state day level. Estimations normalized to 0 at t=-1. Religion data comes from the 2010 Census.

A Appendix: Analysis of Reported Cases

Analyzing the effect of Bolsonaro's speeches and actions on reported cases is difficult with the current data, because of least two potential problems. Firstly, the number of cases is suspected to be heavily under-reported. The official number of cases – provided by the Ministry of Health – depends on testing and, besides, testing capacity is not uniformly distributed across municipalities. Moreover, there is no reason to believe its distribution in time or space is uncorrelated to other relevant variables for our analysis. Although this is true for many countries, in the case of Brazil, testing seems to be disproportionally low in comparison to other countries, even within the same Region. Brazil, up to now, has tested people at a rate far lower than any other nation with at least 40,000 cases. For instance, Brazil has tested 12 times fewer people than Iran and thirty-two times fewer than the United States (see The Washington Post (2020)). In the worst case, the estimation would be biased and, in the best case, the variable has a large measurement error.

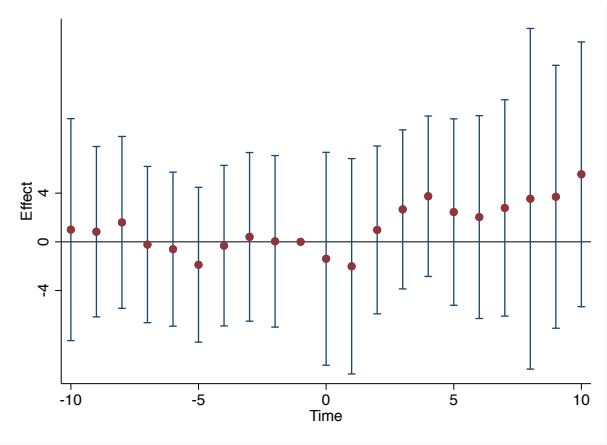
Secondly, the distribution of the number of cases is heavily skewed, as the large majority of the municipalities have not had any recorded case so far (around 80% have zero cases until April 14th; around 90% with only one case. Overall, 95% of the observations in our dataset have zero cases). Figure A.3 maps the confirmed cases in Brazilian municipalities in 4 April 2020, where one can virtually only see the municipalities with zero cases.

With this caveat in mind, we estimate our baseline model using the log of the number of cases as the outcome.[17] We show the estimations using the three models presented above. In Figure A.1 we show the result using our baseline model (defining that a municipality is "pro-government" when voting for Bolsonaro was above 50% in the first round of the 2018 election). Figure A.2 shows the result using the alternative definitions of support: above the state-median voting for Bolsonaro (left) and above the state-median voting for Bolsonaro, restricted to states in which Bolsonaro won at least 50% of the municipalities (right).

In every model point estimates seem to grow around 3/4 days after our baseline. Although the point estimates seem to suggest an effect, overall, the estimations are very imprecise (as expected, given how noisy the outcome is).

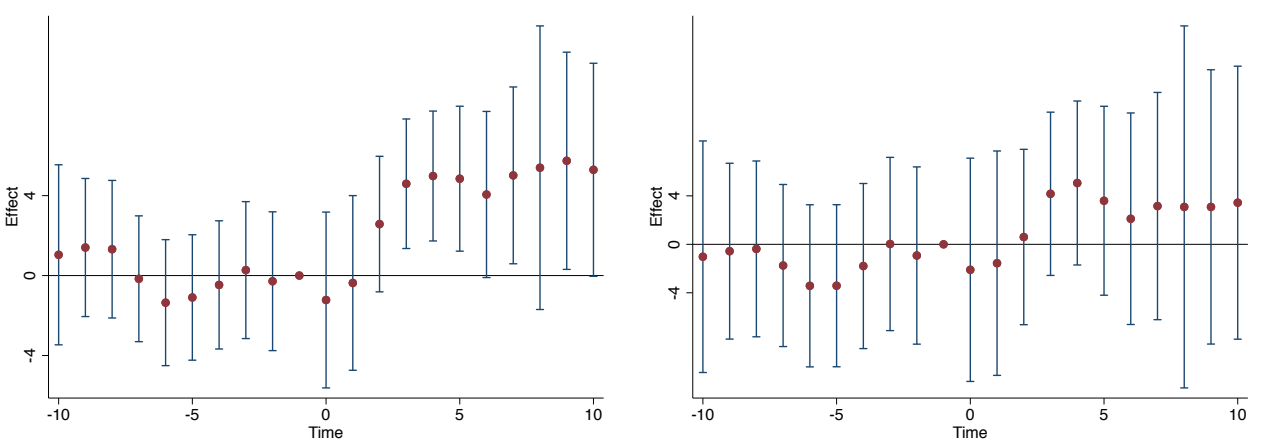
[17] In this specification, without population weights, given that the outcome is not a municipal average.

Figure A.1. Average Effect on Confirmed Cases



Note: CI: 90%. Standard Errors clustered at state day level. Estimations normalized to 0 at t=-1

Figure A.2. Average Effect on Confirmed Cases - Support for Bolsonaro: above state median in Pro-Bolsonaro states

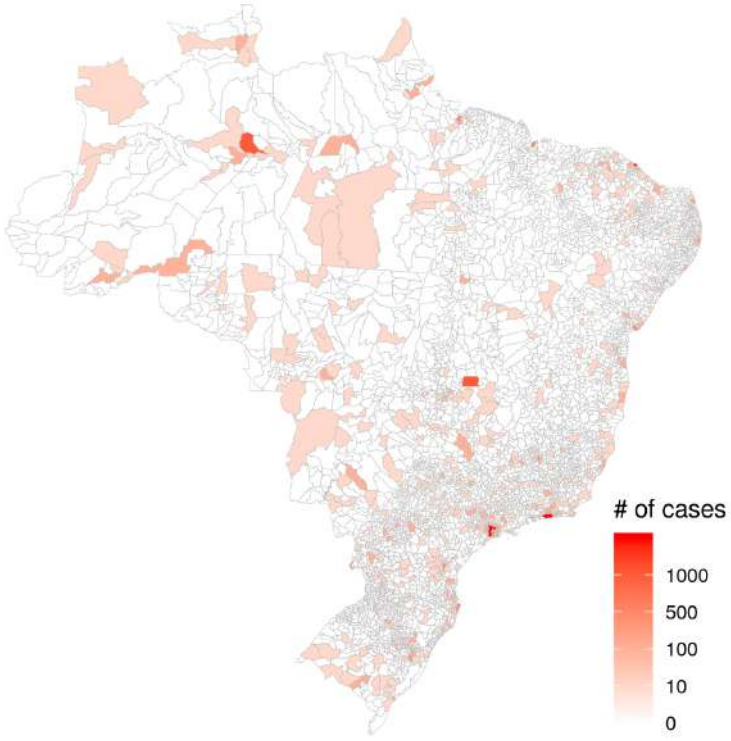


(a) Support for Bolsonaro: above state median

(b) Support for Bolsonaro: above state median in Pro-Bolsonaro states

Note: CI: 90%. Standard Errors clustered at state day level. Estimations normalized to 0 at t=-1

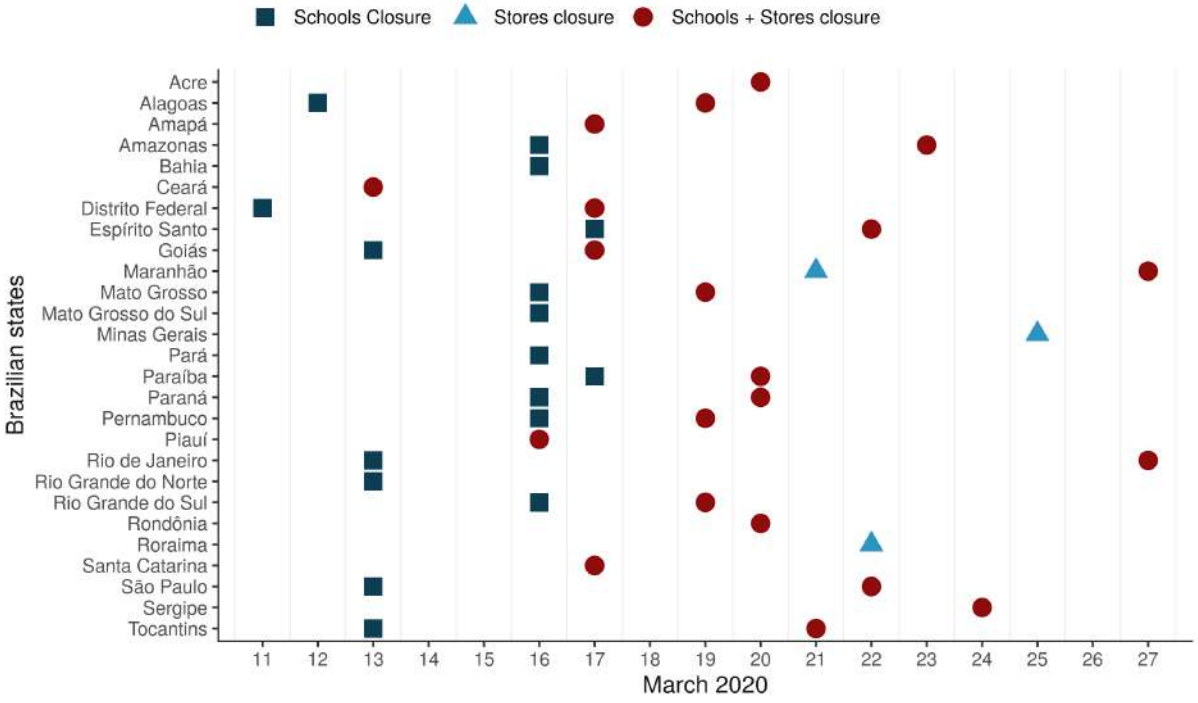
Figure A.3. Confirmed cases in Brazilian municipalities in 7 April 2020



Note: The figure shows the location of confirmed cases in Brazilian municipalities in 7 April 2020.

B Appendix: Additional Figures and Tables

Figure B.1. NPI Policies implemented by each Brazilian state



Note: The figure shows non-pharmaceutical policies (school closure and stores closure) implemented by all Brazilian states between March 11^{th} and March 27^{th}.

Figure B.2. Media on March 16


O ESTADO DE S. PAULO

Infectologistas criticam Bolsonaro por dar mau exemplo à Nação

Presidente ignorou recomendação de médicos para manter isolamento contra o coronavírus, foi a ato e teve contato físico com 272 apoiadores

FODA-SE
FORA MAIA

Casos chegam a 200 no País, salto de 65%

SP tem 136 registros; Argentina e Colômbia fecham fronteiras

Fed corta os juros e pressiona Brasil

Escassez de estadistas

Brincadeira de vida ou morte

Ele parece satisfeito com reprovações.

Afonso Arinos Filho 1930 – 2020

Note: Cover of the newspaper O Estado de Sao Paulo - Monday, March 16th of 2020

Figure B.3. Media on March 25th


O ESTADO DE S. PAULO

A CIDADE EM QUARENTENA

Bolsonaro critica confinamento e quer lojas e escolas abertas

Presidente reprova restrições como suspensão de aulas e a adoção de isolamento, cita cloroquina como remédio contra coronavírus e acusa imprensa de espalhar histeria

Governo muda tática e prevê 22,9 milhões de testes

Presidente restringe Lei de Acesso à Informação

Sob pressão, Japão adia Olimpíada para 2021

NA QUARENTENA

VISÃO DA PERIFERIA

Moradores de favelas usam carros de som e letras de funk adaptadas para espalhar informação sobre o vírus.

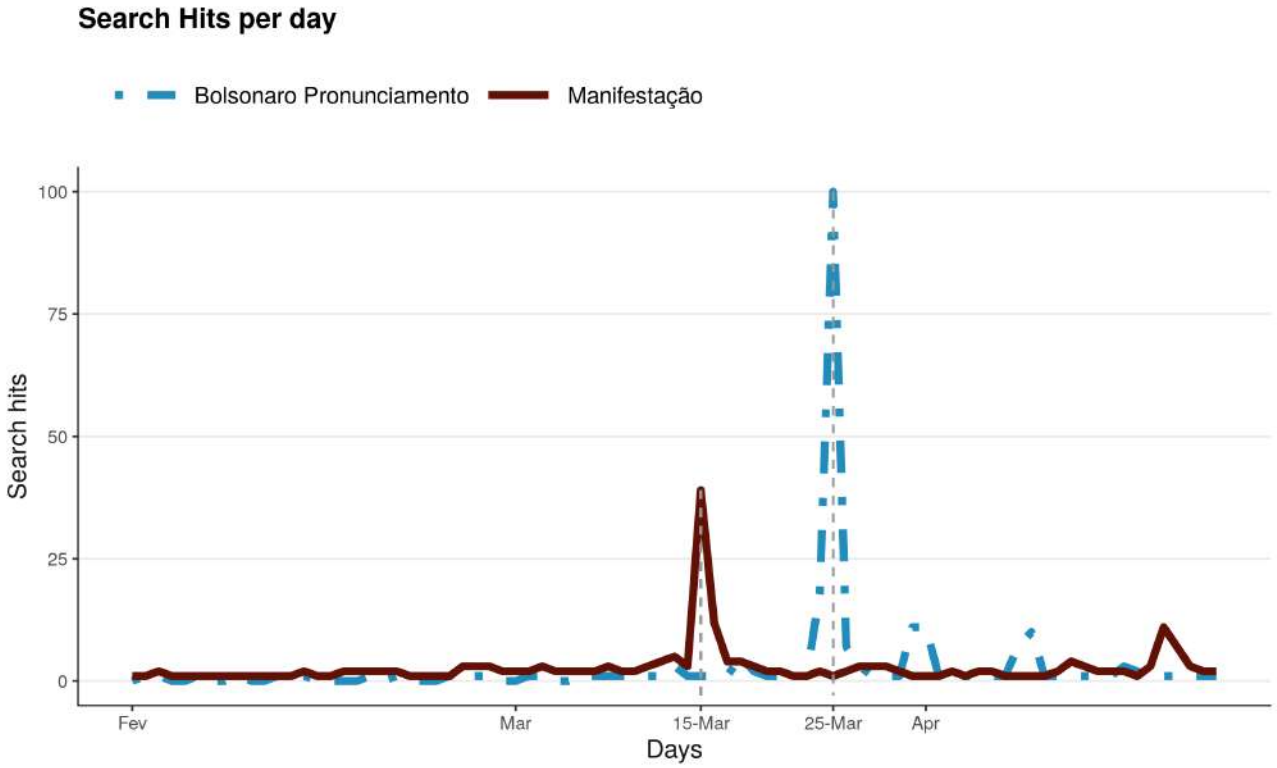
ASTERIX E OBELIX FICAM ÓRFÃOS

O AMANHÃ NO EXÍLIO ESPANHOL

IDOSOS, ISOLADOS E FELIZES

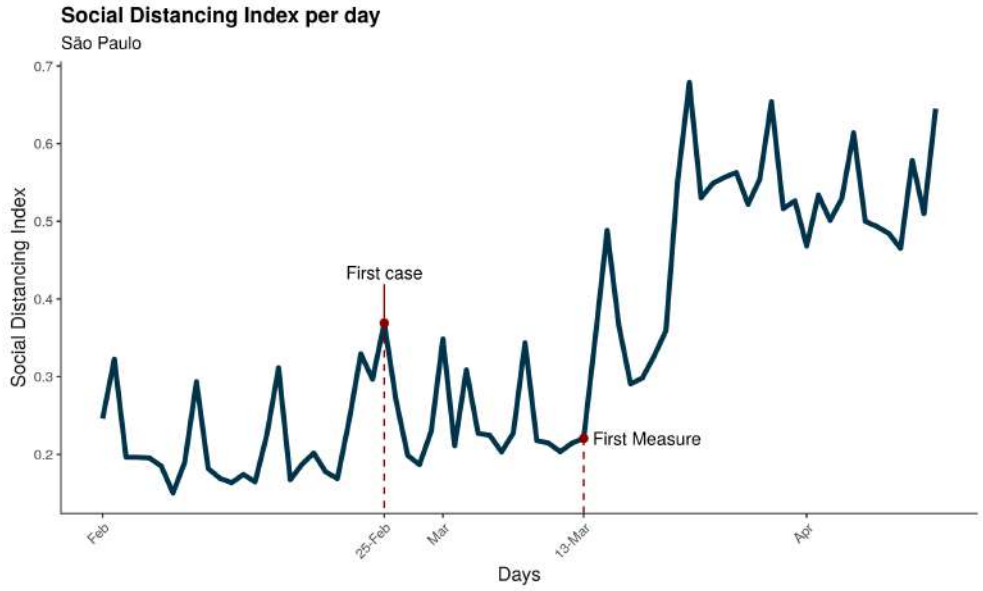
Note: Cover of the newspaper Estado de Sao Paulo - Tuesday, March 25th of 2020

Figure B.4. Google search hits: Protests and Bolsonaro Pronouncement

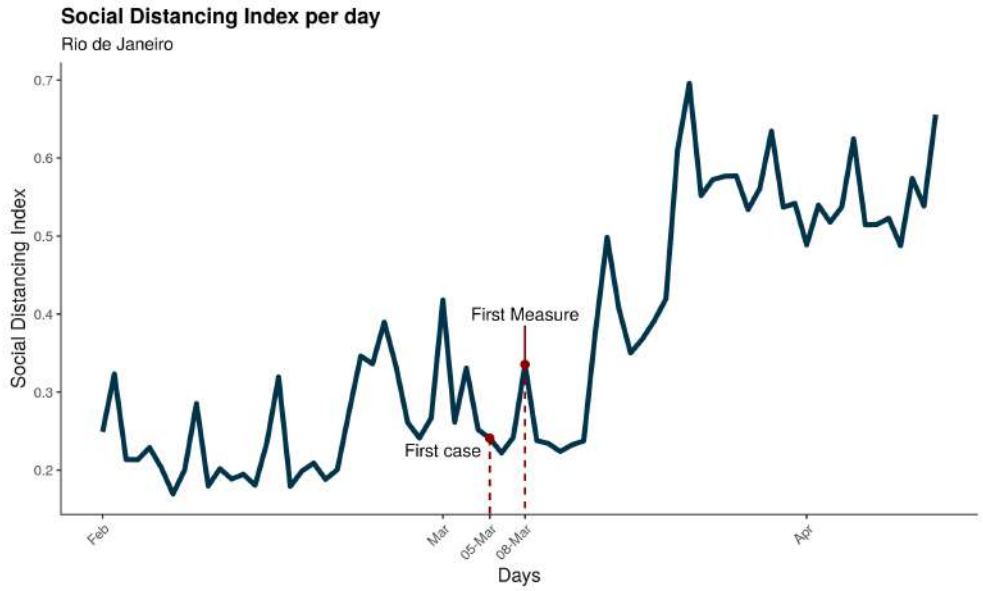


Note: This figures shows the results for Google search in Brazil for the "protests" and "Bolsonaro Pronouncement" (in Portuguese)

Figure B.5. Evolution of Social Distancing in Sao Paulo and Rio de Janeiro.



(a) Sao Paulo.



(b) Rio de Janeiro.

Notes. The figures show the daily social distancing index for the state of Sao Paulo and Rio de Janeiro from 1 February to 14 April 2014. The social distancing index is calculated by the technology company In Loco using location data from mobile devices.

Figure B.6. Social Distancing Measures: Comparing Google and In Loco for each Brazilian state

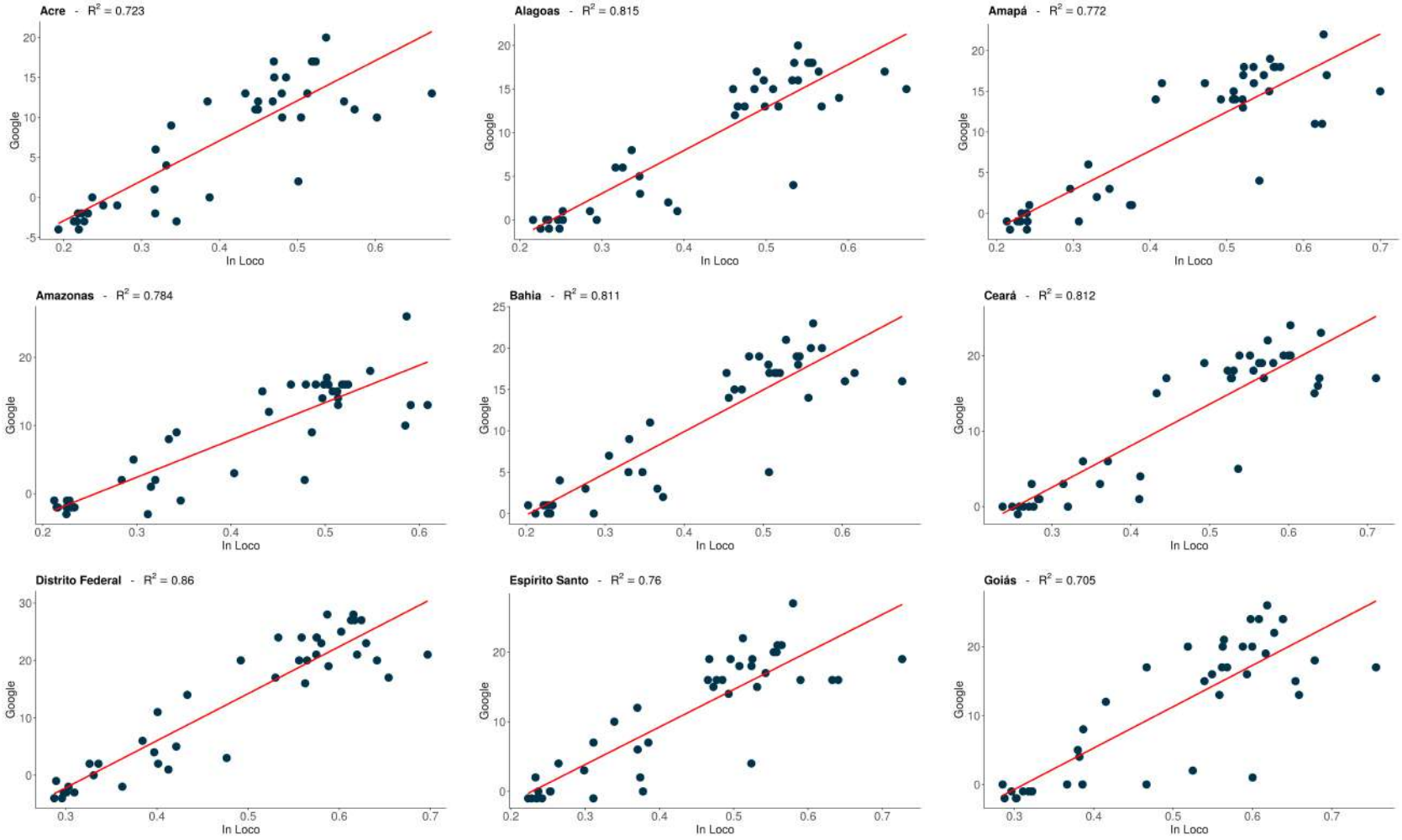


Figure B.6. Social Distancing Measures: Comparing Google and In Loco for each Brazilian state (continued)

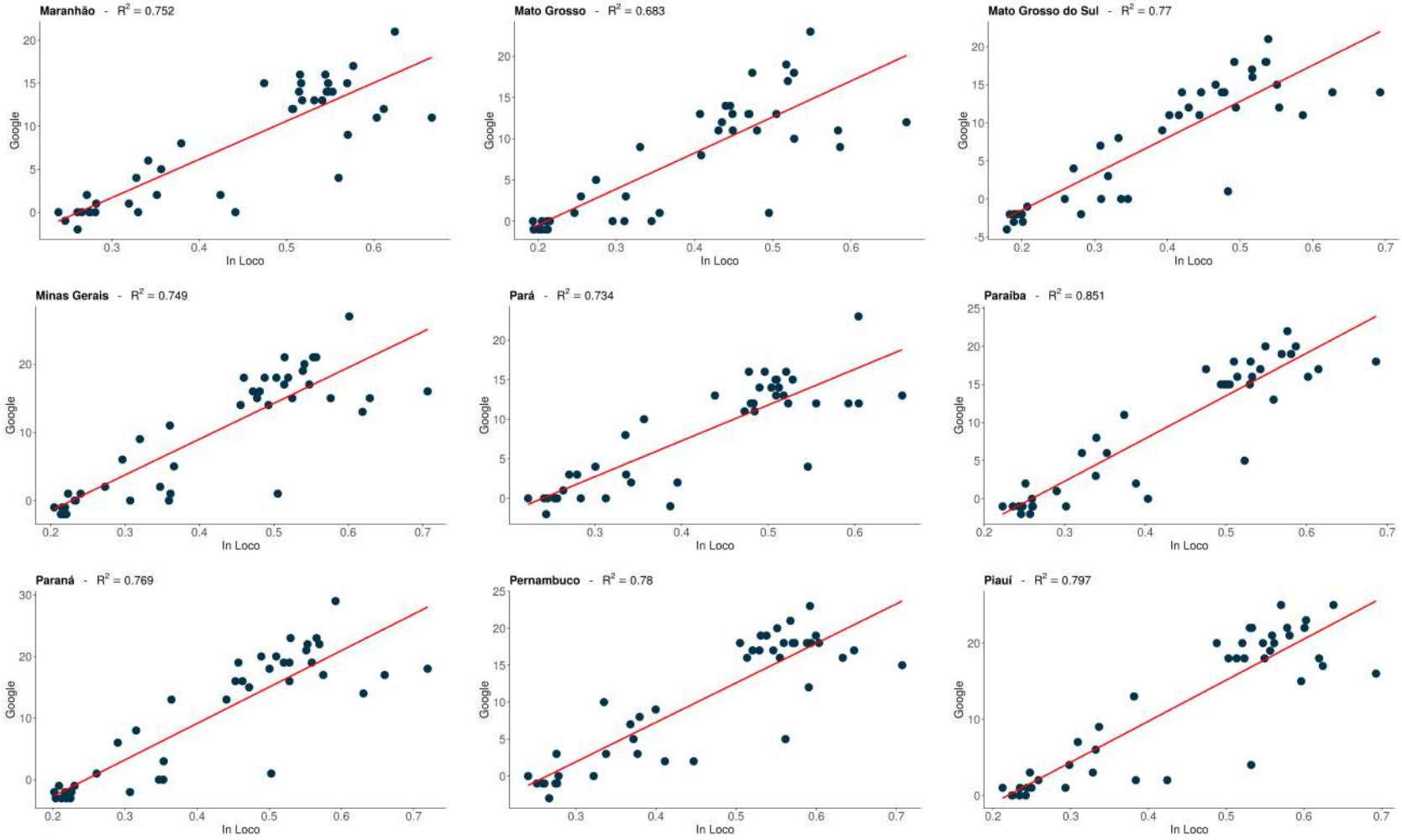
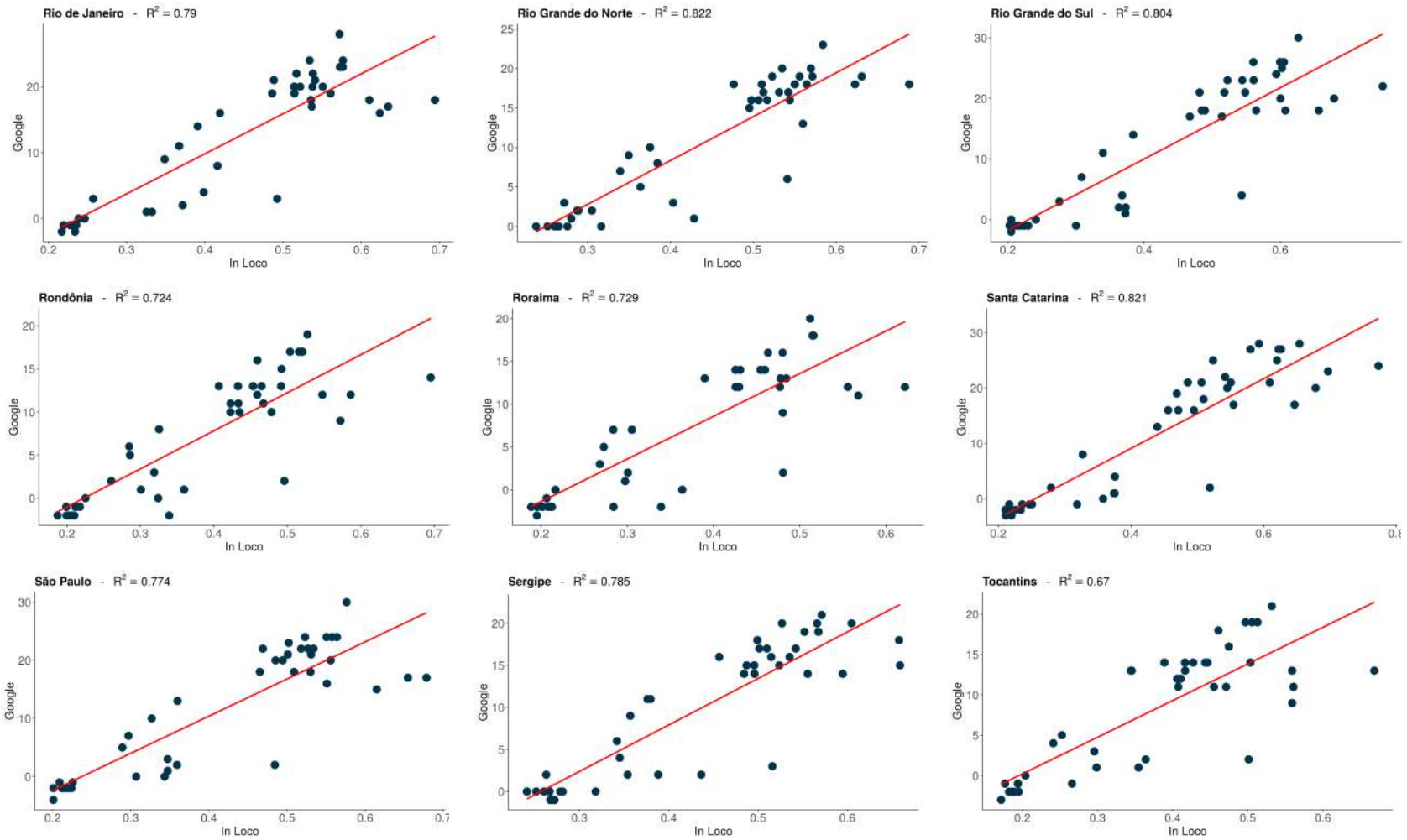
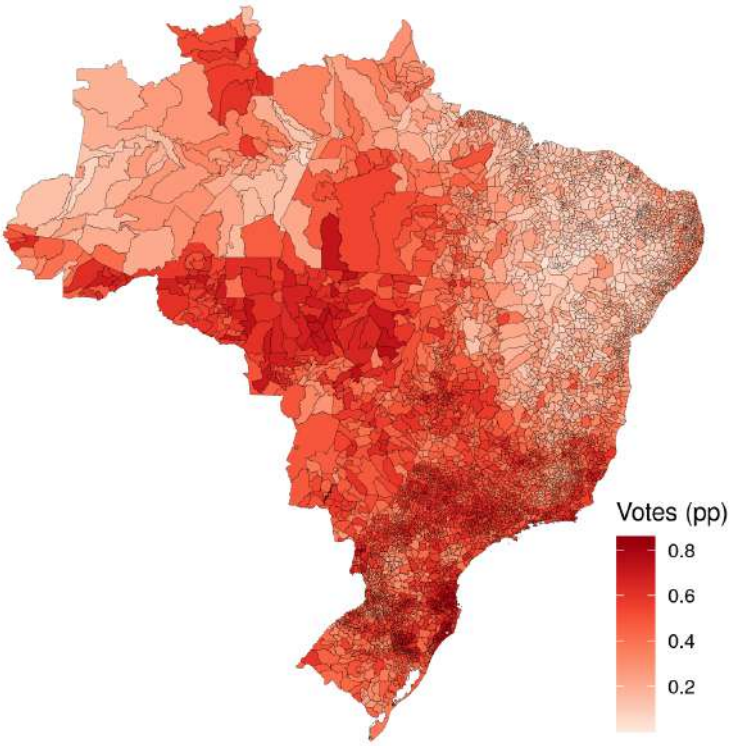


Figure B.6. Social Distancing Measures: Comparing Google and In Loco for each Brazilian state (continued)



Note: These figures show the correlation between In Loco's social distancing index and Google's social distancing index. We use Google's mobility trends for places of residence — see more details on https://www.google.com/covid19/mobility/data_documentation.html?hl=en. There are 27 scatter plots, one for each Brazilian state. Each point in the scatter shows a date between 15 February and 11 April 2020.

Figure B.7. Votes for Bolsonaro in the 2018 Presidential Elections



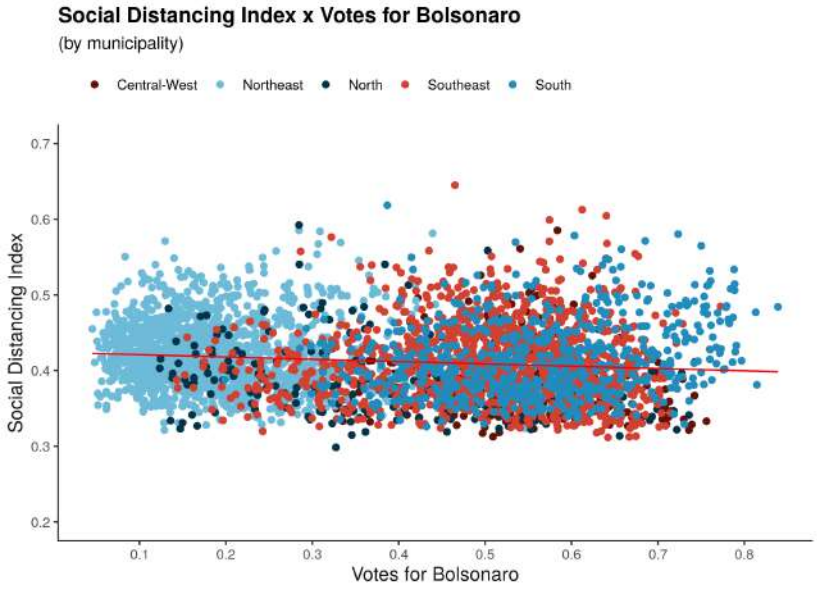
Note: The figure shows votes for Bolsonaro in the first round of the 2018 Presidential Elections in Brazil.

TABLE B.1. Summary statistics

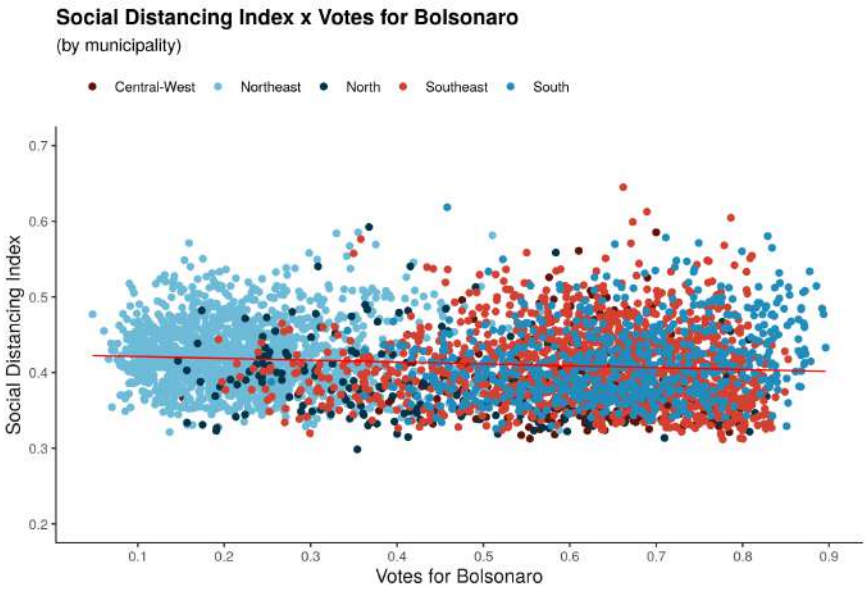
Variable	Mean	Std. Dev.	N
Social distancing index	0.366	0.153	306,359
support_bolsonaro	0.354	0.478	319,458
not_poor	0.544	0.498	319,458
religion			
Consumption of durables			
Local TV			

Notes. Total number of observations is XXXX, which represents XXX days and 3,975 spatial units (municipalities). The social distancing index varies from zero to one. The poverty dummy equals one if the municipal poverty rate is above the national-level median. The rurality dummy equals one if the proportion of residents living in rural areas is above the national-level median.

Figure B.8. Voting 2018 Election



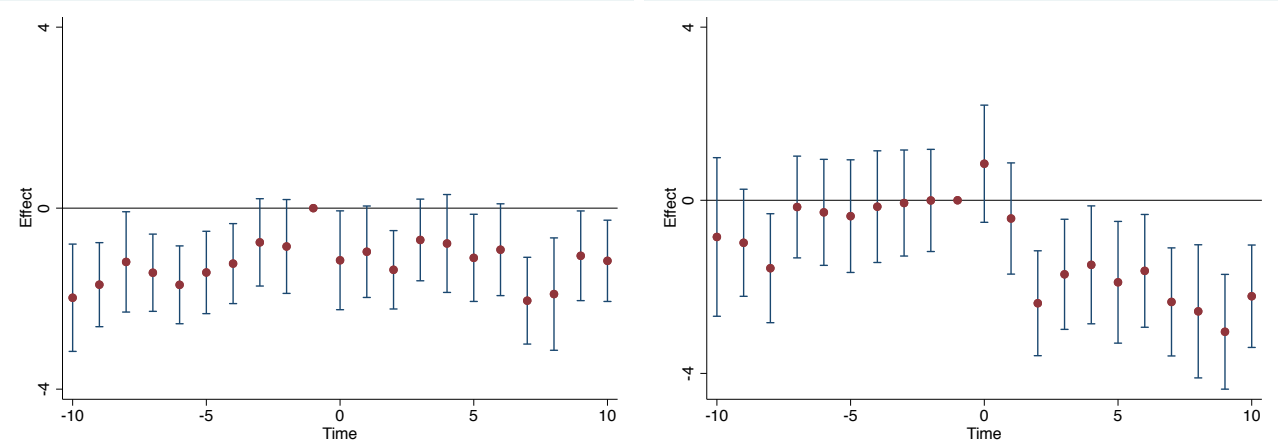
(a) 1st



(b) 2nd

Note: The figures show the association between social distancing and votes in the 2018 election.

Figure B.9. Average Effect on Social Distancing - By household's internet penetration and local TV broadcaster

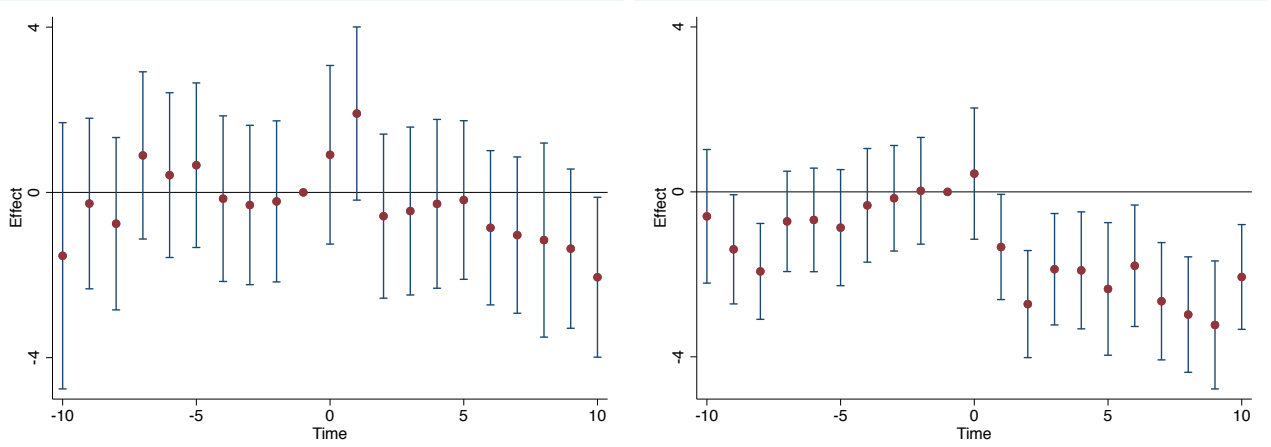


(a) Below p75 of Internet penetration AND no local TV broadcaster

(b) Above p75 of Internet penetration OR at least one local TV broadcaster

Note: CI: 90%. Standard Errors clustered at state day level. Estimations normalized to 0 at t=-1. Internet data comes from the 2010 Census. Internet penetration is defined as the proportion of households with internet at home in the municipality

Figure B.10. Average Effect on Social Distancing - By Proportion of Active Population



(a) Below p50 of % Active Population

(b) Above p50 of % of Active Population

Note: CI: 90%. Standard Errors clustered at state day level. Estimations normalized to 0 at t=-1. Demographic data comes from the 2010 Census. Active population is defined as the proportion of men of age between 15 and 64 years.