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Short communication

When politics collides with public health: COVID-19 vaccine country of origin and vaccination acceptance in Brazil

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ABSTRACT

This study examines the effect of the country of origin of the vaccine on vaccination acceptance against COVID-19. More specifically, we show how the political context in Brazil has affected acceptance of vaccines produced in China, Russia, the US, and England at the University of Oxford. Our data come from a survey experiment applied to a national sample of 2771 adult Brazilians between September 23 and October 2, 2020. We find greater rejection among Brazilians for vaccines developed in China and Russia, as compared to vaccines from the US or England. We also find that rejection of the Chinese-developed vaccine is particularly strong among those who support President Jair Bolsonaro—a COVID-19 denier and strong critic of China and vaccination, in general.

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1. Introduction

Overcoming the COVID-19 pandemic, caused by SARS-CoV-2, depends on the acceptance by the vast majority of the population to be immunized to reduce the circulation of the virus.

In early October 2020, when data for this study were collected, the disease had already killed over 1 million people worldwide, and several vaccines were still being subjected to massive testing on humans in multiple countries, generating expectations (now confirmed) that a safe vaccine would be available on a large scale in 2021.

Public opinion research conducted in countries where the virus has spread widely like in the United States [1,2] and Western Europe [3–5] indicates, however, that somewhere between 20% and 40% of the population do not intend to vaccinate against COVID-19. In countries traditionally associated with successful immunization programs like Brazil, rejection of a COVID-19 vaccine is lower but nevertheless reaches about 10% of the population [6].

The recent work about vaccination acceptance against COVID-19 suggests that women [3,5], the poor [2,4,7] and young people [3] are less inclined to accept vaccination.

Motivational and attitudinal factors, however, also affect the intention to vaccinate against COVID-19. Specifically, those less concerned with the disease [2,3], and supporters of extremist parties [4] and leaders who have minimized the severity of the pandemic [1,2]—like American and Brazilian presidents Donald Trump and Jair Bolsonaro—are less likely to vaccinate.

To our knowledge, not much is known about the effect of the country of origin of the vaccine on vaccination acceptance against COVID-19 and how political debates and conflicts may have affected the acceptance of vaccines developed in some parts of the world and, in particular, those developed in China where the pandemic originated (see [17] for an exception).

This short communication examines vaccination acceptance against COVID-19 in Brazil by randomly manipulating the country of origin of the vaccine. Results from a national sample of 2771 adult Brazilians reveal that the likelihood of vaccinating is strongly affected by the country of origin of the vaccine.

Precisely, Brazilians are significantly less likely to vaccinate if they are told that the vaccine was developed in another country, with greater resistance for vaccines from China and Russia, as compared to those developed in the US and England. More importantly, we also find that those that positively evaluate President Bolsonaro—an avid COVID-19 denier and strong critic of China and vaccination—are significantly less likely to vaccinate than those who hold negative views of him. Rejection of the vaccine from China is particularly strong among those who evaluate President Bolsonaro positively and is below majority.

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2. COVID-19 vaccine and politics in Brazil

In October 2020, more than 150 thousand people had already died from COVID-19 in Brazil¹, a figure then only lower than that registered in the United States. Brazilians were volunteering in large numbers in phase 3 testing of three vaccine developers: BioNTech (Germany), AstraZeneca - University of Oxford (England/Sweden) and Sinovac Biotech (China) [8].

Since July 2020, Brazilian political authorities, however, have been openly fighting about vaccination as a means to control the pandemic and, in particular, about the purchase of the Chinese vaccine developed by Sinovac Biotech. In a radio interview on October 21, 2020, President Bolsonaro said that: “We will not buy (the vaccine) from China. It is my decision. I do not believe that it is safe because of its origin.” [9] The president then ordered the cancellation of the purchase of 46 million doses of the Chinese vaccine placed by the Ministry of Health [10]. President Bolsonaro also cast doubt about vaccination, in general, arguing that no Brazilian will be forced to vaccinate against COVID-19.

Since the beginning of his term in January 2019, Bolsonaro and his political allies have publicly criticized the Chinese government [11] while showing great enthusiasm to tightening Brazil's relationship with the United States [12]. Political elites in Brazil, however, did not align uniformly around President Bolsonaro's rhetoric against China. For instance, Governor João Doria from São Paulo, Brazil's largest state with a population of over 44 million (out of a total of 211 million Brazilians), adopted a completely different approach. Specifically, he encouraged phase 3 testing with the Chinese vaccine, developed in collaboration with the prestigious state-funded biologic research *Butantã* Institute. The governor also promised to buy 100 million doses of CoronaVac, the Sinovac Biotech vaccine. Contrary to President Bolsonaro, Governor Doria said that vaccination against COVID-19 will be compulsory in the State of São Paulo [13].

The political fighting and bickering about vaccination and the safety of the Chinese-produced vaccine may carry important consequences in the fight to end the COVID-19 pandemic in Brazil. Thus we ask: 1) is there greater resistance among Brazilians for vaccines developed in other countries and, in particular, in China? and 2) is that resistance for vaccines developed in other countries moderated by political preferences?

3. Methodology

We conducted an online survey with a national sample of 2771 adult Brazilians from September 23 to October 2, 2020. Respondents were invited to take part in a study about current important issues and, provided their consent, answered a series of questions about politics and COVID-19.

We worked with Netquest, the largest online polling firm in Brazil with a panel of close to half a million participants, to select a sample that matches the characteristics of the Brazilian population, following quotas for age, gender, social class and region.² The average age of our respondents is 42, 53.3% are female, 46.0% define themselves as white and 59.0% have completed high school³.

To evaluate vaccination acceptance by the country of origin of the vaccine, we randomly assigned respondents to one of five groups, one control and four treatments. Respondents in the control group were asked how likely they are to vaccinate against

COVID-19 without mentioning a country of origin for said vaccine. The question reads:

“Some COVID-19 vaccines are already in the advanced testing phase. Please indicate how likely you are to take the vaccine against the coronavirus once it becomes available. Would you say that you are: 1) not likely at all to take the vaccine; 2) slightly likely to take the vaccine; 3) somewhat likely to take the vaccine; or 4) very likely to take the vaccine?”

Respondents in the four treatment groups received the same question but with the addition of information about the country of origin of the vaccine. The question reads as follows:

“Some COVID-19 vaccines are already in the advanced testing phase. One of them is being produced in [China/Russia/the United States/England by the University of Oxford]. Please indicate how likely you are to take the vaccine against the coronavirus produced in [China/Russia/the United States/England by the University of Oxford]. Would you say that...”

It is worth noting that we specified the University of Oxford to refer to the vaccine from England because this is how it is being presented in the Brazilian press (*vacina de Oxford*).

Our survey also asked other questions, including items tapping into people's political preferences. Specifically, respondents in our survey were asked about President Bolsonaro's job approval on a 5-point scale. They could classify his performance as either great (18.1%), good (16.2%), regular (21.9%), poor (12.9%) or terrible (31.0%). Job approval has been coded to run from 0 to 1, with higher values indicating more positive job approval of President Bolsonaro.

The survey instrument and experimental design were validated by three other researchers associated with the larger project about COVID-19 in Brazil of which this study emanates and also benefited from feedback from other scholars and graduate students. Moreover, we also proceeded with a soft launch of the study ($n = 100$) to evaluate possible issues arising in the field before fully deploying it.

Below we present difference-in-proportions tests for the treatment groups' main effects by applying two-tailed binomial proportion tests and applying the Bonferroni correction for multiple comparisons. Next, we present results from a regression analysis to account for the moderating effect of political preferences on vaccine acceptance, by treatment group.

4. Results

Fig. 1 shows how likely Brazilians are to vaccinate for the control (lower panel) and treatment groups (top four panels, by country). We find that 88.3% of Brazilians are very or somewhat likely to take the vaccine against COVID-19 when no country is specified as the developer of said vaccine. From the moment that a country is mentioned as being responsible for its development, the likelihood to vaccinate decreases substantially. This is particularly true for China and Russia where 67.0% and 72.6% percent of Brazilians say that they are very or somewhat likely to take the vaccine, respectively. These are significant drops of 21.3 and 15.7 percentage points in the likelihood of vaccinating, respectively, and both differences are statistically significant at 0.001 (two-tailed, binomial proportion test applying the Bonferroni correction for multiple comparisons).

Recall that we argued earlier that vaccine acceptance should be moderated by political preferences, especially for vaccines from China, given President Bolsonaro's strong stance against China and his downplaying of the COVID-19 pandemic. More precisely, we argued that those who have a more positive evaluation of

¹ As of early April 2021, more than 330 thousand people died from COVID-19 in Brazil.

² Netquest is the only online survey firm in Brazil that holds the ISO 26,362 certification for online panels.

³ A table describing the demographic characteristic of our sample is in the Supplementary material.

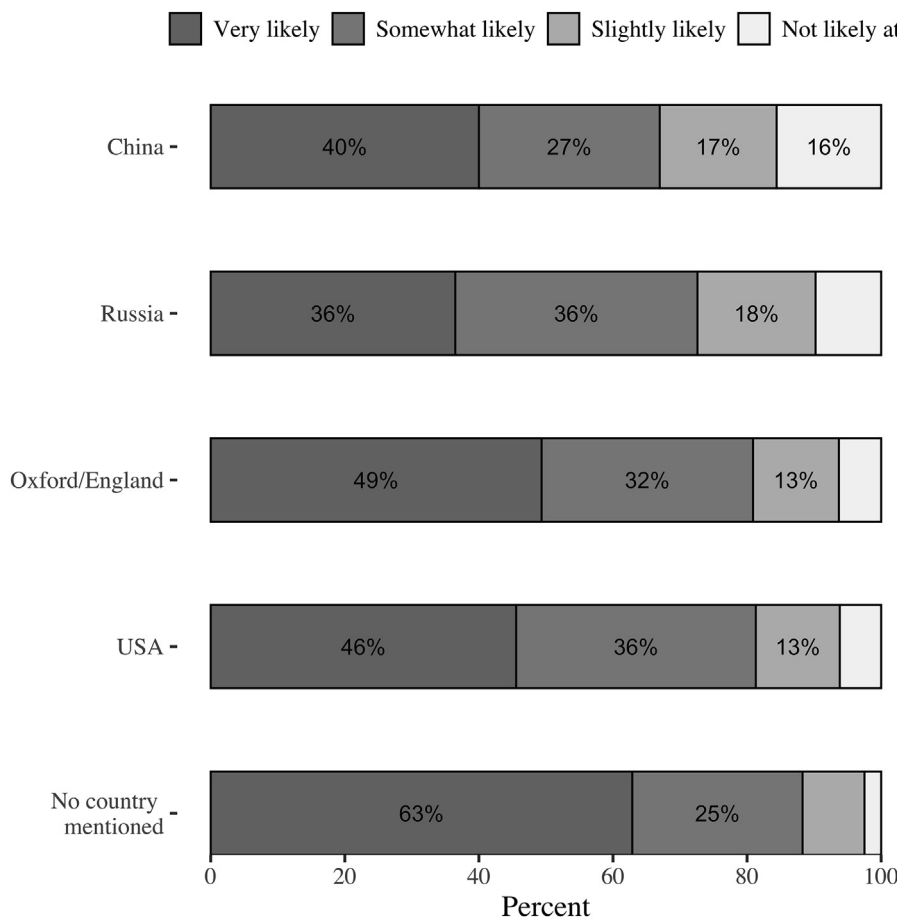


Fig. 1. Likelihood to vaccinate by origin of vaccine.

President Bolsonaro should show lower vaccine acceptance and, in particular, for vaccines from China. Table 1 presents results from a regression analysis where the dependent variable is the likelihood to vaccinate, as presented above in the Methodology section, measured on a 4-point scale from “Not at all likely” (1) to “Very likely” (4). The coefficient estimates were obtained from ordinary least squares.⁴ The regression equation includes dummies for all four treatment groups about the origin of the vaccine (China, Russia, US and England /Oxford), President Bolsonaro’s job approval and the interaction of job approval with all four treatment dummies to capture the moderating effect of political preferences on vaccine acceptance.

The estimates from Table 1 indicate that vaccine acceptance decreases from the moment that a country of origin is mentioned, as shown in Fig. 1. Precisely, all treatment dummies for country of origin are negative and statistically significant at 0.001 (two-tailed). The variable measuring President Bolsonaro’s job approval is negative, as expected, and also statistically significant at 0.001 (two-tailed). Its value indicates that the likelihood to vaccinate among control group subjects decreases by about 0.6 (on the 4-point scale) for respondents who perceive the Bolsonaro government to do a “great” job, as compared to those who perceived the same government to do a “terrible” one. This confirms the

⁴ We recognize that the dependent variable is an ordinal discrete variable and that OLS might not be the most optimal estimator, although it eases interpretation. In Table A2 in the Appendix, we present the estimates from the same regression equation using maximum likelihood, applying the ordered probit model. The results are substantively the same as those reported in Table 1.

Table 1
Likelihood to vaccinate by origin of vaccine and presidential job approval.

| | OLS coefficient estimates | SE | p-values |
|------------------------------------|---------------------------|-------|----------|
| Origin of vaccine | | | |
| China | −0.322 | 0.084 | <0.001 |
| Russia | −0.511 | 0.085 | <0.001 |
| US | −0.420 | 0.086 | <0.001 |
| England/Oxford | −0.400 | 0.084 | <0.001 |
| President Bolsonaro’s job approval | −0.588 | 0.105 | <0.001 |
| Approval*China | −0.563 | 0.147 | <0.001 |
| Approval*Russia | 0.058 | 0.147 | 0.694 |
| Approval*US | 0.338 | 0.148 | 0.022 |
| Approval* England/Oxford | 0.348 | 0.147 | 0.018 |
| Intercept | 3.742 | 0.060 | <0.001 |
| R-squared | 0.108 | | |
| N | 2737 | | |

Note: The dependent variable measures the respondent’s likelihood to vaccinate on a 4-point scale from “Not at all likely” (1) to “Very likely” (4).

hypothesis that Bolsonaro supporters are less likely to vaccinate when compared to respondents who are less supportive of him.

But, more importantly for present purposes, job approval moderates the effects of the treatment groups about the origin of the vaccine. For example, for respondents in the treatment group where the origin of the vaccine is China, the difference between those that perceive the Bolsonaro government to be “great” and those that perceive it to be “terrible” increases to about 1.2, that

is, the drop in the likelihood to vaccinate nearly doubles from what is found for control group respondents. This is a substantial drop, given that the dependent variable runs from 1 to 4. It represents more than a full change in the category options. The interaction term between the China treatment dummy and job approval is negative and statistically significant at 0.001 (two-tailed). Job approval, however, does not moderate the effect on vaccine acceptance for respondents in the treatment group where the country of origin is Russia. Interestingly, job approval moderates the effect on vaccine acceptance for respondents in both the US and England/Oxford treatment groups. This time, the gap between those that perceive the Bolsonaro government to be “great” and those that perceive it to be “terrible” is reduced *not* increased like in the China treatment group. The interaction terms between the US and England/Oxford treatment dummies and job approval are positive and statistically significant at 0.05 (two-tailed). This last finding is not too surprising given that President Bolsonaro has always exhibited pro-American inclinations.

5. Discussion and limitations

Our study draws attention to an important and hitherto neglected aspect of vaccination against COVID-19: vaccines produced in some countries may suffer greater rejection. Precisely, the acceptance or rejection of vaccines produced abroad is closely tied to the foreign policy preferences of sitting governments. In Brazil, President Jair Bolsonaro has been a firm critic of China since his inauguration in January 2019. That opposition has led him to openly criticize the vaccine developed by Sinovac Biotech, leading millions of Brazilians to now reject it. His stance has unduly put pressure on the Brazilian public health services and is undermining the campaign to get Brazilians vaccinated against COVID-19. In January 2021, however, the Brazilian drug agency (*Agência Nacional de Vigilância Sanitária, Anvisa*) approved the emergency use of CoronaVac and the Bolsonaro government finally signed a contract to buy 100 million doses of the Chinese vaccine after much pressure [14].

We note three important limitations of this short research communication. First, about a quarter of the Brazilian population does not have access to the Internet [15] and, consequently, could not have expressed their preferences in our survey. Our typical respondent is generally wealthier and better educated than the general population, but we have no reason to believe that Internet users are substantially different than non-users when it comes to attitudes toward President Bolsonaro or vaccine acceptance, for example. To our knowledge, no study on Brazil has looked closely at the differences between Internet users and non-users in surveys. Second, our study measures the intention to vaccinate and that may be different from the actual vaccination uptake, although a recent study published in this journal suggests that the intention to get vaccinated against influenza is a good predictor of actual immunization [16]. Third, and finally, we recognize that other attributes like the vaccine's effectiveness and safety are likely to affect vaccine acceptance and that the vaccines used in our study may differ in these respects.

6. Conclusion

Vaccination acceptance against COVID-19 is a crucial step in overcoming the current coronavirus pandemic. Unfortunately, politics has found a way to downplay the risks associated with COVID-19 and efforts to combat it. The debate about vaccination against

COVID-19 has not escaped from political fights, undermining the hopes to eradicate the virus. In this study, we have shown that one important factor that explains the likelihood to accept a vaccine concerns the country of origin where said vaccine is developed, especially in countries like Brazil where the debate about the vaccine and its origin have been made a salient political issue. Policymakers would be well-advised to consider this information when engaging in vaccination campaigns to guarantee the success of such public health actions.

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Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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