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What factors drive the satisfaction of citizens with governments' responses to COVID-19?

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ABSTRACT

Objectives: This research scrutinizes the important factors influencing the satisfaction of citizens concerning their governments' responses to the COVID-19 pandemic based on an open-sourced survey of 14 countries.
Methods: To collect information on public sentiment regarding governments' reactions to COVID-19, we consider five factors for analysis: number of confirmed cases per million population, number of deaths per million population, and governments' containment and health policies, stringency policies, and economic support policies. We examine the Kendall correlations of variables in the 14 countries and use the wild bootstrap method for regression models to find important regressors.
Results: Our results show that people pay stronger attention to the results of their governments' battle against COVID-19 (number of confirmed cases and deaths per million population) rather than to what policies they initiate. Health policy and economic support do influence the approval of any national response to COVID-19. We also find that public satisfaction in Japan and South Korea toward the two governments' responses to the pandemic varies greatly compared to that of other countries' citizens to their governments' responses.
Conclusions: The results herein offer some suggestions to governments when initiating policies to balance public health, livelihoods, and economic support.

Introduction

Forced to react swiftly to the rapid spread of the COVID-19 pandemic in early 2020, many governments have tried to balance the implementation of containment policies against other important factors like national economy or citizens' livelihoods, with priority mostly given to protecting people's health (Sabat et al., 2020). Consequently, heated debates have arisen in nearly all countries about whether or not such measures taken are appropriate after witnessing the propagation of COVID-19 (So et al., 2020). Facing the difficulty of enforcing health-related regulations, governments must persuade their citizens to initiate behavioral changes and respect future containment interventions. It is therefore crucial to understand people's worries about the pandemic and their perceptions concerning the effects of containment policies, in order to be better informed when designing further policies and contingency measures. Moreover, people's trust and satisfaction in the government are central to achieving the successful implementation of future measures, whereas lacking them may hinder the fight against the pandemic (Sibley et al., 2020).

This study thus scrutinizes several important factors that influence citizens' satisfaction concerning their governments' responses to the COVID-19 pandemic from an open-sourced survey of 14 countries. The data source is the Pew Research Center, which conducted a survey from June 10 to August 3, 2020, on 14,276 adults in 14 countries: United States, Canada, Belgium, Denmark, France, Germany, Italy, the Netherlands, Spain, Sweden, United Kingdom, Australia, Japan, and South Korea. The survey's goal is to investigate public attitudes toward a country's approach in dealing with the COVID-19 epidemic and how national unity relates to feelings of trust in others and economic confidence in one's government.

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We study five potential factors that influence public sentiment toward governments' reactions during the pandemic: number of confirmed cases per million population, number of deaths per million population, and governments' containment and health policies, stringency policies, and economic support policies. The first two factors serve as "surrogate variables" for government responses to COVID-19. Although it is difficult to measure the effectiveness of government policies in regard to the pandemic, it is relatively easy to assess it via the number of confirmed cases per million population and number of deaths per million population. We can measure these variables and thus use them in place of ones that are difficult to measure. The second purpose of this study is to understand the behaviors of respondents in East Asia versus other countries outside this region.

When there is a small sample and unknown underlying distribution, the bootstrap method for resampling can be used to make stronger inferences. Efron (1979) sets up the bootstrap method, with further developments in Efron (1982) and numerous other publications. Studies often apply bootstrap methods when the distribution of the target population is not specified, and the sample is the only information available. This study thus employs the wild bootstrap method of Liu (1988), which is designed for regression models having heteroscedastic errors.

Using a dataset of 14 countries with the wild bootstrap sampling method as the regression model, we offer findings that people pay greater attention to the results of their government's battle against COVID-19 (numbers of confirmed cases and deaths) than to what policies the government introduces. When viewing the latter, however, health policy and financial assistance from the government are two major factors among three government policy responses on the COVID-19 outbreak that aptly reflect the level of government action toward people's health protection (e.g., lockdown restriction), income support, crisis payment, debt relief, etc. We also find that people in Japan and South Korea react differently compared to those in western countries. These results provide some hints to governments when making policies to balance public health, people's livelihoods, and the general economy.

Data description

We collected the data from public sources concerning citizens' satisfaction with governments' responses to the COVID-19 pandemic. Figure 1 illustrates the percentage of people's "overall satisfaction with how their nation has dealt with the COVID-19 outbreak." The detailed information is available from the Pew Research Center (2020), while data on "total confirmed cases per million population" and "deaths per million population" are from the "Worldometers" (Worldometers, 2020) website. Three other government policy responses are available from the website of Oxford COVID-19 Government Response Tracker (2020) as follows.

(1) Containment and health index: denotes how many measures and how forceful they are at containing the virus and protecting citizens' health (in combination with "lockdown" restrictions and closures, together with measures such as testing policy and contact tracing, short-term investment in healthcare, as well investments in vaccine).

(2) Stringency index: measures government responses to COVID-19 by recording the strictness of "lockdown style" policies that primarily restrict people's behavior. It also records the presence of public information campaigns in each country.

(3) Economic support index: measures government responses to COVID-19 by recording measures such as income support

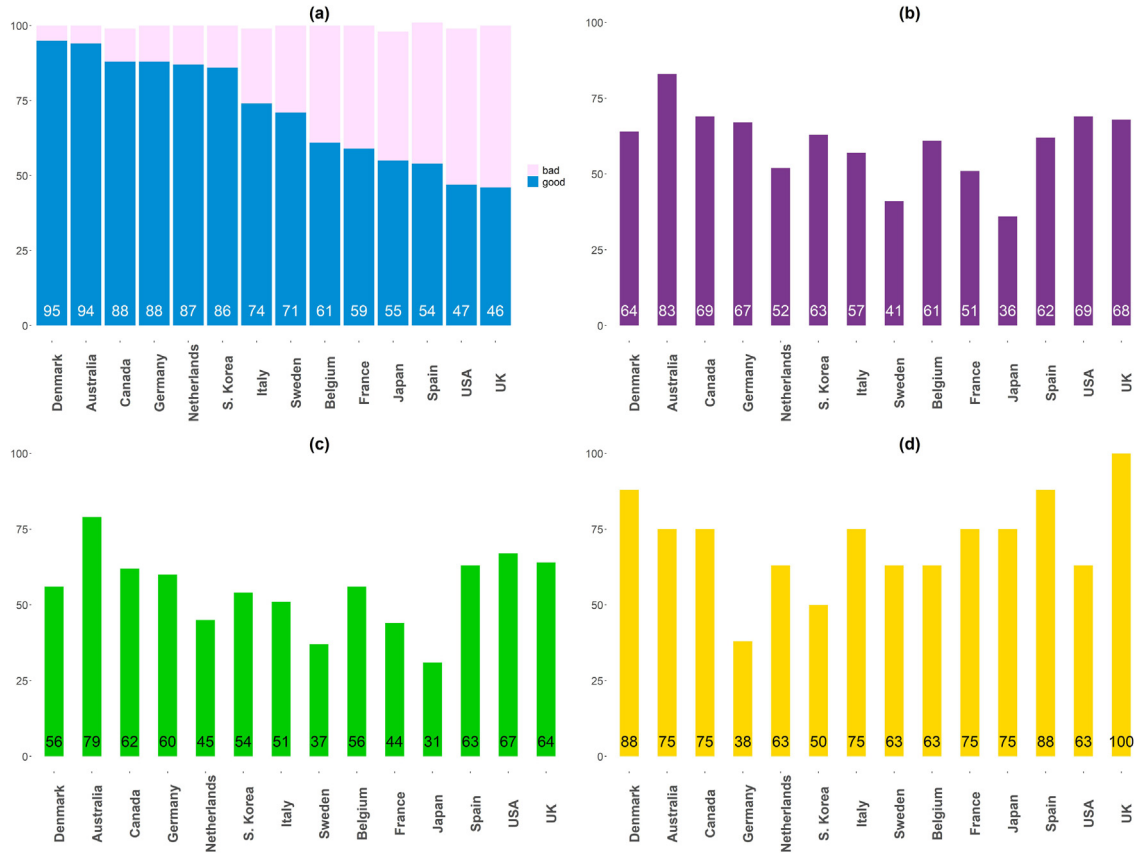

Figure 1. (a) Satisfaction (in percentage) concerning governments' pandemic response, (b) containment and health index, (c) stringency index, and (d) economic support index.

(a government providing direct cash payments to people who lose their jobs or cannot work) and debt relief (a government freezing financial obligations for households).

Table 1 lists the summary statistics for all variables of the 14 countries. The citizens' "satisfaction" variable ranges within 0–100, and there are large differences among countries (minimum of 46 and maximum of 95). The range in government responses is quite large, showing big variations in different approaches to combat the spread of COVID-19 and their effectiveness. The lowest scores for the "containment and health index" and "stringency index" are in Japan, and Germany has the lowest score on financial support in response to COVID-19 (Figure 1).

Methodology

Pearson's correlation is the most frequently used coefficient for normally distributed data, whereas the nonparametric method of Kendall's tau correlation coefficients usually applies for nonnormal data. We thus examine the Kendall correlation of variables in the 14 countries. The bootstrap method is a kind of nonparametric Monte Carlo method that estimates the distribution of a population via resampling. Resampling methods treat an observed sample as a finite population, and then random samples are resampled from it to estimate population characteristics and make inferences about the sampled population.

There are several popular bootstrap methods for regression, such as residual bootstrap and wild bootstrap; see Flachaire (2005). Our study employs the wild bootstrap rather than the conventional residual bootstrap method, because we observe the variance of error depends on the value of regressor x_i (this is called heteroskedasticity), and hence the wild bootstrap method is more suitable. The residual bootstrap will be unstable, because it will swap all the residuals regardless of the corresponding regressor values.

This study measures the response variable ("satisfaction") on a scale of 0–100, bounded by 100. We first propose a pre-transformation before using the following linear equation to examine the relationship between citizens' satisfaction with their government's responses to COVID-19 pandemic and the five potential regressors (predictors):

$$Y_i^* = \alpha_0 + \beta_1 X_{i1}^* + \beta_2 X_{2i} + \ldots + \beta_5 X_{5i} + \varepsilon_i, \quad i = 1, \ldots, n, \tag{1}$$

where $Y_i^* = \ln\left(\frac{Y_i}{100-Y_i}\right) \times 10$, and $X_{i1}^* = \ln(X_{i1})$.

In Model (1) we select the logistic transformation to deal with the bounded response variables (Kieschnick and McCullough, 2003), as this approach appears among diverse applications, especially clinical trials. One often can linearize nonlinear relationships between a response variable and regressors by transforming the predictor values. Henceforth, we transform predictor X_1 to $\ln(X_{i1})$ due to its large scale and take the wild bootstrap approach, described as follows.

Step 1. We generate independent and identically distributed random variables $V_1, \ldots, V_n \sim N(0, 1)$. We obtain the bootstrap sample $(\boldsymbol{X}_1, Y_1^{**}), \ldots (\boldsymbol{X}_n, Y_n^{**})$ by:

$$Y_i^{**} = \hat{\beta}_0 + \hat{\beta}_1 X_{i1}^* + \ldots + \hat{\beta}_5 X_{i5} + V_i \times e_i, \tag{2}$$

where $\boldsymbol{X}_i = (X_{i1}^*, \ldots, X_{i5})^T$ and $(\hat{\beta}_j, e_i)$ are the ordinary least squares estimates and residuals, respectively.

Step 2. We generate each time a set of n new observations from the original dataset. Assuming we repeat the entire process B times, the B bootstrap samples lead to:

$$\hat{\beta}_j^{*(1)}, \ldots, \hat{\beta}_j^{*(B)}, \qquad j = 0, \ldots, 5.$$

One can therefore make inferences based on the bootstrap samples.

Table 1
Summary statistics.

	Notation	Min	Max	Mean	Std
Satisfaction	$\{Y\}$	46	95	71.79	17.88
[a]Cases/1 M Pop	$\{X_1\}$	512	18,256	5139.14	4654.67
[b]Deaths/1 M Pop	$\{X_2\}$	10	852	367.36	279.39
Health	$\{X_3\}$	36	83	60.21	12.17
Stringency	$\{X_4\}$	31	79	54.93	12.65
Economic support	$\{X_5\}$	38	100	70.79	15.89

[a] total confirmed cases per million population.
[b] deaths per million population.

Results and discussion

Citizens' satisfaction mainly correlates with "total confirmed cases per million population" and "number of deaths per million population" due to COVID-19, while there is weak evidence for an association between citizens' satisfaction and government policy to contain the pandemic (Table 2). It is worth noting that the correlation between "health" and "stringency" is high (0.862), for which only one regressor (either "health" or "stringency") is needed to describe the variable "satisfaction." Different nationalities generally present varying attitudes to the way that their government has reacted to the pandemic. The number of COVID-19 deaths per 100 confirmed COVID-19 cases (called observed case–fatality ratio) fluctuates for countries; see the website of Johns Hopkins Coronavirus Resource Center. It is not necessary to imply a high correlation between "total confirmed cases per million population" and "number of deaths per million population." The lower panel of Table 2 illustrates the Kendall correlation of variables in non-Asian countries after the exclusion of two Asian countries (Japan and South Korea). The relationships between "satisfaction" versus "total confirmed cases per million population" as well as "satisfaction" versus "number of deaths per million population" increase significantly after excluding these two cases.

We now investigate the causal effects of the five regressors in Eq. (1) on "satisfaction" using the wild bootstrap regression. Based on 3000 bootstrap replicates of all regressors' coefficients with data from all 14 countries, fewer parameters are significant due to the high correlation between "health" and "stringency." To avoid the problem of ill-conditioned least squares, we only include the "health" regressor in the model. Since some of the 95% bootstrap confidence intervals of coefficients include zero, we merely confirm causal effects for "the number of deaths per million population" and "containment and health policy" on citizens' satisfaction.

We further examine the causal effects of regressors on "satisfaction" for 12 non-Asian countries in our dataset. Interestingly, "cases," "deaths," "containment and health policy," and "economic support" are important factors for citizens' satisfaction with non-Asian countries' government response policies (Table 3). The first two variables explicitly indicate how governments efficiently manage the spread of COVID-19.

The regressor "economic support" is relatively less significant among the selected regressors because a few of its estimates have positive values among mostly negative values. Faced with the severe global pandemic crisis, people have been turning to their governments for leadership and hope. Therefore, in countries with a high number of confirmed COVID-19 cases and deaths, there is less faith in the government, and thus the negative impacts of "cases" and "deaths" on citizens' satisfaction are reasonable. Negative coefficients indicate negative correlations of "satisfaction" with "health" and of "satisfaction" with "economic support."

Table 2
Kendall correlations of variables in all 14 countries.

	Satisfaction	[a]Cases/ 1 M Pop	[b]Deaths/ 1 M Pop	Health	Stringency	Economic support
Satisfaction	1.000					
[a]Cases/1 M Pop	−0.442	1.000				
[b]Deaths/1 M Pop	−0.398	0.780	1.000			
Health	0.211	0.044	−0.044	1.000		
Stringency	0.056	0.199	0.110	0.856	1.000	
Economic support	−0.184	0.024	0.146	0.061	0.159	1.000
Non-Asia cases						
Satisfaction	1.000					
[a]Cases/1 M Pop	−0.687	1.000				
[b]Deaths/1 M Pop	−0.626	0.697	1.000			
Health	0.092	−0.137	−0.260	1.000		
Stringency	−0.062	0.015	−0.107	0.862	1.000	
Economic support	−0.102	−0.085	0.085	0.170	0.239	1.000

[a] total confirmed cases per million population.
[b] deaths per million population.

Table 3
The wild bootstrap estimates for a subset model (ex-Asia).

Non-Asia cases	Mean	Median	2.5%	97.5%
β_0	81.284	80.567	61.895	103.313
β_1	−5.279	−5.311	−7.481	−2.941
β_2	−0.028	−0.028	−0.040	−0.017
β_3	−0.153	−0.147	−0.306	−0.026
β_5	−0.048	−0.046	−0.162	0.061
R^2	0.966	0.968	0.932	0.991
$adj\ R^2$	0.947	0.949	0.893	0.986
y_{KR}	96.812	96.815	95.747	97.765
y_{JP}	98.015	97.900	96.467	99.014

Note: $Y_i^* = \alpha_0 + \beta_1 X_{i1}^* + \beta_2 X_{2i} + \beta_3 X_{3i} + \beta_3 X_{5i} + \varepsilon_i$, where $Y_i^* = \ln\left(\frac{Y_i}{100-Y_i}\right) \times 10$ and $X_{i1}^* = \ln(X_{i1})$.

They show that governments, which have been swamped by the COVID-19 crisis, have tightened containment policies and put more effort on health protection policies and financial support, which have caused lower satisfaction rates from citizens. The adjusted R^2 in this model for non-Asia countries increases to 94.66% compared to 69.85% based on all 14 datapoints. Many countries have imposed quarantines, entry bans, or other restrictions upon citizens or recent travelers to areas most affected by COVID-19, thus lowering people's "satisfaction." However, this scenario is not applicable to Japan.

We thus further predict the "satisfaction" values for Japan and South Korea that are not used in the analysis during the model estimation process. The last two rows of Table 3 list the predicted values and bootstrap confidence intervals for Japan and South Korea. The predicted "satisfaction" values are 98.01 and 96.81 for Japan and South Korea compared to the true responses of 55 and 86, respectively.

Our final model excludes the regressor "stringency index," for which the lowest score appears in Japan (Figure 1c). Because the correlation between "stringency" and "health" is high for these two regressors, we only include the "health" regressor in our final model to eliminate the problem of ill-conditioned least squares. The lowest scores for "containment and health" reflect "satisfaction" in Japan's responses as well (Figure 1b).

Japan and South Korea are in East Asia and generally share similar sentiments that differ from those of western countries. Some Japanese and Koreans exhibit some dissatisfaction compared to neighboring countries that appear to have more effectively controlled the spread of COVID-19 much sooner. Countries like Taiwan implemented government-controlled face mask distribution very early and set up smartphone Apps to provide the public with information on the availability of face masks in users' neighborhoods as well as to track people in home quarantine.

There have been many discussions focusing on the effects of wearing masks in public; see Greenhalgh et al. (2020). The majority of people in Japan and South Korea are generally receptive to the concept of wearing masks to help reduce COVID-19 transmission in public places (e.g., Eikenberry et al., 2020). However, Japan and South Korea did not announce a face mask export ban policy until March, and subsequently a shortage arose soon thereafter. The South Korean government reportedly sent two million face masks as humanitarian aid to China on January 30, but on March 5 started to introduce a domestic distribution system for face masks, limiting two masks per person a week, along with a mask export ban. Furthermore, on March 24, Japan and the International Olympic Committee announced postponement of the 2020 Tokyo Olympic Games for one year, and then Japan initiated domestic emergency measures. Such circumstances might have undermined the degree of satisfaction in the two countries of their citizens in regard to their governments' handling of COVID-19.

Conclusions

The COVID-19 pandemic has raised new challenges for policymakers around the world. The imminent threat to public health at the onset of the health crisis led most governments to impose quick and tough policies. This research thus examines which important factors might affect citizens' satisfaction with their government's policies to contain COVID-19. Our analysis shows that people tend to pay greater attention to the result of their government's battle against COVID-19 (numbers of confirmed cases and deaths per million population) rather than what policies their government initiates. It also shows that people in Asian countries have their own distinct personalities and thus may have dissimilar degrees of satisfaction toward their government's responses.

Our results raise some implications for governments when enacting policies against the spread of COVID-19. Governments in general have tried to strike the right balance between the effects on public health (saving lives) and on the economy (saving jobs) when implementing possible exit-strategies from their current lockdown situation. Some governments are more willing to re-open their market to minimize the impacts of the pandemic on their economy, while others are not, because that would cause a rapid growth of potentially infectious cases. This issue is quite controversial and it is difficult to find the right equilibrium, as there is no perfect answer given the current status of no complete treatments or vaccines for COVID-19. A country applying physical distancing, quarantine, and isolation in a lax manner could have a

better GDP growth rate, but if a stricter and more extensive quarantine policy is imposed, then GDP could suffer for a longer period of time. This may lead to adverse effects on future public sentiment and eventually cause downward adjustments in consumption behavior as well as a worsening economic situation.

Author contributions

C.W.S. Chen conceptualized this study. C.W.S. Chen and M.C. Dong collected and analyzed the data. C.W.S. Chen, S. Lee, and M. Taniguchi interpreted the results. C.W.S. Chen and M.C. Dong drafted the manuscript. C.W.S. Chen and S. Lee finalized the manuscript. All authors read and approved the final version of the manuscript.

Declarations

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Ethical approval

No human or animal subject was involved in the study. Therefore, ethical approval is not applicable.

Conflict of interest

All authors have no conflict of interest to declare.

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