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Political stability as a major determinant of the Covid-19 pandemic outcomes

Rui Gao [a], Hai-Hong Liu [b,*]

[a] School of Economics, Qingdao University, Kedazhi Road, Qingdao, Shandong, 266000, China
[b] School of Infectious Diseases, Qilu Hospital, Wenhuaxi Road, Shandong University, Jinan, Shandong, 250012, China

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ABSTRACT

This paper explores the role of political stability in explaining the cross-country variation of Covid-19 pandemic outcomes. Based on the international evidence, we find that lower pre-Covid-19 levels of political stability are associated with worse Covid-19 pandemic outcomes. Politically unstable countries are more likely to suffered significantly higher morbidity and mortality. Further analysis shows that political stability only matters in countries prepared with requisite medical capacity to deal with health emergencies. We also find that political stability is more crucial in countries with higher poverty rates. Overall, to combat Covid-19 and the subsequential collective threats successfully, the national authorities should pay more attention to maintain political stability.

1. Introduction

The Covid-19 pandemic has spread rapidly and enveloped around the world with increasing morbidity and mortality. Wide range of policy measures have been deployed including Covid-19 surveillance and testing [1,2]; lockdowns and social distancing [3–5]; raising public health awareness on behavioral health affairs [6,7]; building trust through risk communication and community engagement [8]; reaching Covid-19 vaccination targets [9,10] and so on.

Although policy measures deployed by governments have been similar in many regions, countries are in very different situations. Some countries have not only contained the Covid-19 pandemic but also resumed near normal economic activity in the short run, while others are still struggling in deepening crisis. Why have these countries responded remarkably better than others? What explains the among-countries variation of the pandemic outcomes?

Previous studies have identified a number of factors to explain this variation, including differences in cognitive biases [11,12]; predisposition to comply with regulations [13,14]; public trust [15,16]; access to and use of Covid-19 diagnostics, therapeutics and vaccines [17,18]; reliable information [19]; economic and demographic character [20]. Literature have also addressed diverse aspects of the politics of Covid-19 and related issues [21,22].

This paper sheds light on the above questions by exploring the link between political stability and the Covid-19 pandemic. Though limited evidence exists on how political stability influences Covid-19 pandemic outcomes, relevant studies have proven that social conflict, government stability, political regimes, and political corruption badly affect public health.

As for the effects of social conflicts on public health, there are four channels: first, social conflict destroys the medical capacity. In

* Corresponding author.
E-mail address: lhaihong1224@yeah.net (H.-H. Liu).

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Myanmar, many healthcare workers stopped working, a part of ‘Civil Disobedience Movement’ as a peaceful, non-violent protest against the military coup [23]. Social conflict also destroys infrastructure including water, electricity and health care, which are essential to public health [24,25]. Second, social conflict makes international cooperation unlikely, while joint prevention and control are essential in a bid to conquer pandemic [26,27]. Third, some studies suggest that social conflict exacerbates migration flow, which may in turn aggravate the spread of virus [28]. Fourth, psychological stress caused by social conflict makes people more vulnerable to diseases in Lebanon [29] and in Czechia and Romania [30]. As for government instability, government instability ruins the trust in policy makers and officials and undermines people’s compliance with pandemic containment policies [31,32]. As for political regimes, democratic political institutions are considered as an disadvantage in responding quickly to pandemics [33,34]. As for political corruption, political corruption has been recognized as a threat to achieving health goals [35,36]. The non-governmental organization Transparency International has warned that political corruption hampers health care, particularly for infectious diseases [37].

On the basis of documents available, this paper examines the affect of political stability on Covid-19 pandemic outcomes. To this end, we conduct a unified analysis to examine the role of political stability in explaining the cross-country variation of the Covid-19 pandemic morbidity and mortality. To this end, we use ICRG (International Country Risk Guide) political risk rating as the measure of political stability for each country. It is done by assigning points to a preset group of factors, including government stability, socio-economic conditions, investment profile, internal conflict, external conflict, corruption, military in politics, religious tensions, law and order, ethnic tensions, democratic accountability, and bureaucracy quality.

We find political stability as a major determinant of the Covid-19 Pandemic Outcomes. To the best of our knowledge, this is the first paper directly establishing the link between political stability and Covid-19. Further, our analysis uses the countries’ poverty status to explore heterogeneity in the effects of political stability. Since the start of the Covid-19 pandemic there is a large literature explaining the key factors driving and restraining the pandemic. Although the impact of the Covid-19 pandemic is largest for the world’s poorest [38], only a few of this research took poverty status into consideration. Emerging evidence shows that exposure to infection is unequal. Poorer communities that live in overcrowded, substandard housing and use shared modes of transport are challenged in adhering to preventive measures [39,40] and exposed to the health risks of epidemics [41]. People in low-paid sectors have been more exposed to covid-19 as telecommuting is not feasible and their face-to-face jobs cannot be done from home [42–44]. Poorer communities have also been more vulnerable to severe disease once infected because of higher levels of pre-existing illness and less access to affordable health care [45]. Additionally, recent research identified the extra costs involve in having children at home for longer without access to vital free services [46,47]. Since the fight against the Covid-19 pandemic is entangled in the fight against political instability and poverty, it means that poverty, Covid-19 and political instability form a deadly trangle [48].

Our findings yield some important insights. First, we establish that political stability may be a major determinant of Covid-19 pandemic outcomes. Countries plagued with worse political stability have suffered higher morbidity and mortality. Second, we find that political stability only matters in countries prepared with requisite medical capacity to deal with health emergencies. Third, we find that political stability is more crucial in countries facing serious poverty. After presenting a range of robustness tests based on alternative measures of variables and different specifications, our findings hold true.

This study provides at least two contributions to existing literature. First, by identifying political stability as an additional source of the cross-country variation of Covid-19 pandemic outcomes, we contribute to the efforts to develop better understanding of pandemics. New interventions are needed to maintain political stability as countries continue to combat Covid-19 and the subsequential collective threats. Correspondingly, by quantifying additional costs of political instability, we contribute to debates on the politics of pandemics. Second, we analyze the deadly triangle formed by poverty, political instability and pandemic. Political instability worsens the pandemic as well as increases poverty, while these problems are in return destabilizing for the political situation and may become more so. By showing the results vary according to the poverty status of countries, we present a possible approach to break the deadly triangle which is to maintain political stability.

The remainder of our paper is organized as follows. Section 2 presents our empirical methodology. Section 3 describes data and

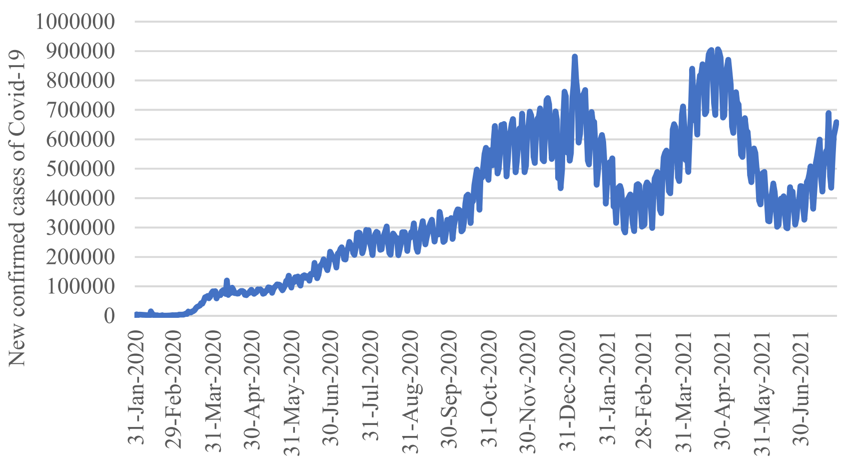

Fig. 1. 7-day rolling average of new confirmed cases of Covid-19 worldwide.

variables used in our analysis. Section 4 presents and interprets empirical findings. Section 5 concludes.

2. Methodology

To examine the relationship between political stability and the Covid-19 pandemic, we estimate the following OLS specification:

$$CR_i = \alpha + \beta_1 PS_i + \beta_2 X_i + \varepsilon_i \tag{1}$$

Where *CR* is the Covid-19 pandemic cumulative case rate, a measure of pandemic outcomes. For robustness test, we re-estimate our model using an alternative definition of pandemic outcomes, the Covid-19 pandemic cumulative death rate (*DR*). *PS* is the key dependent variable corresponding to political stability indicator. ***X*** consists of control variables that are likely to impact the Covid-19 pandemic morbidity or mortality.

A definitive cross-country analysis cannot be done until the Covid-19 pandemic has been eradicated, as is also noted in Ozkan et al. (2021) [49]. However, we can still retrieve sufficient information to examine the link between Covid-19 pandemic and political stability once we figure out the periodic features of the pandemic. As in Fig. 1 and Fig. 2, the whole world has passed the peak of two waves of Covid-19 pandemic in terms of both new cases and new deaths. The first wave ended by February 2021 and the second wave ended by May 2021. Accordingly, we carry out our empirical analysis using the Covid-19 pandemic cumulative case rate (*CR*) on the two corresponding dates respectively: Feb 29, 2021, and May 31, 2021.

3. Data and variables

We construct a cross-section database set including 83 countries and regions to analyze the effect of political stability on the Covid-19 pandemic (Appendix 1). The following briefly discusses database sources and variable definitions.

3.1. *The Covid-19 pandemic*

Morbidity describes the general severity degree of Covid-19 pandemic outcomes, which is defined as the 7-day rolling average of cumulative number of cases per 100,000 population due to Covid-19 by Feb 29, 2021 (CR_1) and May 31, 2021 (CR_2). The data on Covid-19 are retrieved from John Hopkins CSSE GitHub Data Source, which provides daily updates of the number of Covid-19 cases globally (Table 1).

3.2. *Political stability*

We use ICRG political risk rating (*PS*) for 2020 as the measure of political stability. The higher the rating point, the greater the political stability. Data for alternative years has been used to conduct robustness tests, including 2019 (PS_{2019}) and average from 2018 to 2020 ($PS_{average}$). The ICRG model for forecasting country risks was created in 1980 by the editors of International Reports. In 1992, ICRG became an integral part of the PRS Group's services to international business community, providing ratings for 140 countries and regions and is widely used in country risks analysis [50–52].

3.3. *Control variables*

Pandemic morbidity and mortality are closely linked with medical capacity so that we control for the number of hospital beds per 1000 population (*Hospital bed*) [53]. We use *Stringency*, Government Response Stringency Index retrieving from Oxford Covid-19

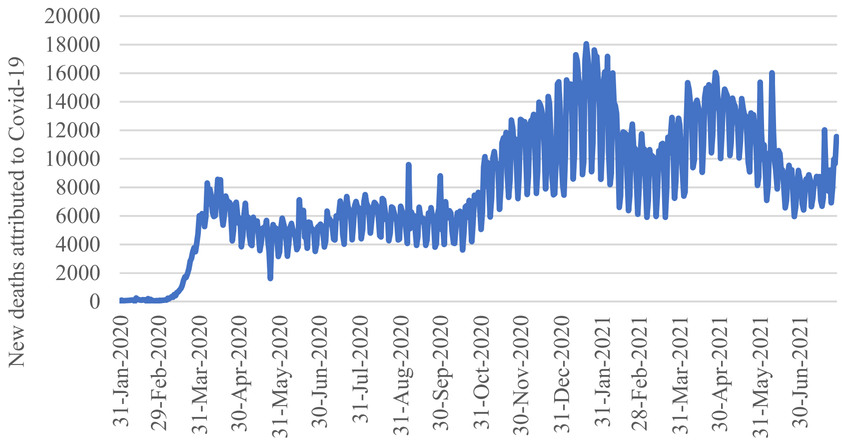

Fig. 2. 7-day rolling average of new deaths of Covid-19 worldwide.

Table 1
Descriptive statistics.

Variable	Obs	Mean	Std. Dev.	Min	Max
CR_1	83	3398.600	3144.464	17.601	11547.730
CR_2	83	5047.155	4328.301	52.574	15527.510
PS	83	66.479	16.533	0.000	87.125
Hospital bed	83	34.96	27.42	2.000	130.50
Stringency	83	61.193	10.845	29.611	83.073
Test-case rate	83	141.153	365.996	3.033	2377.558
Urbanization	83	68.896	20.100	16.937	100.000
Population growth	83	102.518	109.928	−95.419	492.116
Trade	83	90.240	59.361	27.095	387.103
GDP per capita	83	11.745	2.324	7.429	17.831
GDP growth	83	2.297	2.037	−3.467	6.838
Human development	83	80.000	12.749	48.300	95.700

Notes: This table reports the descriptive statistics for main variables used in our analysis. Variable definitions are presented in Appendix 2.

Government Response Tracker to capture the strictness of government policy response [54].

Under-reporting is an important concern when analyzing morbidity and mortality. The numbers of Covid-19 cases and deaths are likely to be under-reported due to insufficient tests especially at the early stage when the testing ability was still weak. Following Gelfand et al. (2021) [55], we use tests conducted per new confirmed case of Covid-19 (*Test-case rate*) as the primary proxy for under-reporting. A low ratio of tests to cases suggest that a country was mostly testing people with symptoms and the level of under-reporting may be high.

The condition can be quite different in rural areas compared with urban areas. For one thing, the population density and mobility in rural areas are remarkably lower, which helps to interrupt transmission of virus. For another, rural areas with relatively poor health infrastructures may not be able to handle infections, leading to higher mortality. We control for urban population as percentage of population (*Urbanization*) to feature these urban-rural differences. Considering the virus spread through international trade, we incorporate trade volume (*Trade*) expressed as exports and imports of goods and services as percentage of GDP. In addition, we

Table 2
Political stability and Covid-19 morbidity.

VARIABLES	(1)	(2)	(3)	(4)
	CR_1	CR_2	CR_1	CR_2
PS			−66.947***	−115.157***
			(-3.37)	(-4.19)
Hospital beds	−15.871	−7.135	−24.687*	−22.300
	(-1.08)	(-0.34)	(-1.76)	(-1.15)
Stringency	26.264	50.693	12.496	27.010
	(0.73)	(0.98)	(0.37)	(0.57)
Test-case rate	−2.614***	−2.871**	−2.789***	−3.173***
	(-2.94)	(-2.26)	(-3.35)	(-2.76)
Urbanization	21.545	42.545	11.141	24.650
	(0.93)	(1.29)	(0.51)	(0.82)
Trade	11.796*	17.789**	11.301**	16.938**
	(1.98)	(2.09)	(2.03)	(2.20)
Population growth	−5.196	−4.651	−5.482	−5.143
	(-1.33)	(-0.83)	(-1.50)	(-1.02)
GDP per capita	−168.747	−151.895	−233.489*	−263.260
	(-1.27)	(-0.80)	(-1.86)	(-1.52)
GDP growth	31.411	98.640	−4.221	37.348
	(0.15)	(0.33)	(-0.02)	(0.14)
Human development	79.255**	86.086	137.056***	185.511***
	(2.03)	(1.54)	(3.39)	(3.32)
Constant	−3731.547	−6789.314	−1096.654	−2256.948
	(-0.98)	(-1.25)	(-0.30)	(-0.45)
Observations	83	83	83	83
R-squared	0.370	0.319	0.456	0.453
F test	5.31e-05	0.000573	1.39e-06	1.67e-06
r2_a	0.293	0.235	0.380	0.376
F	4.767	3.797	6.029	5.951

Notes: This table reports our regression results to assess the impact of political stability on Covid-19 case rates by Feb 29, 2021 (CR_1) and May 31, 2021 (CR_2). The specifications are estimated by OLS regression. Variable definitions are presented in Appendix 2. T-statistics are in parentheses. ***, **, * denote the significance level at 1%, 5%, and 10%, respectively. We estimate multicollinearity via the variance inflation factors for our model. A variance inflation factor of above 5 generally means that a model has high multicollinearity which is biasing the estimates and standard errors. Appendix 3 shows that no variables had problematic multicollinearity.

incorporate population growth (*Population growth*) to capture population characteristics, and GDP per capita (*GDP* per capita), GDP growth rate (*GDP growth*) as well as Human development index (*Human development*) to control for economic conditions. All the control variables are by the latest pre-Covid-19 years for which data are available.

4. Political stability and the Covid-19 pandemic

4.1. Main results

Table 2 presents our empirical results from estimating Eq. (1). Column (1) and (2) report the baseline specifications corresponding to case rates on Feb 29, 2021 (CR_1) and May 31, 2021 (CR_2) separately, which only include control variables. In Column (3) and (4), we incorporate the key dependent variable *PS*. Explanatory power of specifications gets better after incorporating *PS*, as can be seen in R^2. We find a negative and significant relation between the Covid-19 case rate (both CR_1 and CR_2) and *PS*, suggesting countries plagued with political instability are likely to suffer from higher Covid-19 morbidity.

4.2. Heterogeneity tests

Considering the impact of political stability on Covid-19 morbidity varies meaningfully across countries, we conduct two sets of subgroup analyses to test the potential heterogeneity.

4.2.1. Public health capacity, political stability, and Covid-19 pandemic

Medical resource and capacity play a fundamental role in the battle against pandemics. In fact, the strength of the state capacity and public health programs matter more than the form of government in face of a pandemic. It is a legitimate inference that the impact of political stability on the Covid-19 pandemic could be different across countries depending on medical capacity.

We test the heterogeneity based on medical capacity measured by the number of hospital beds per 10,000 population (*Hospital beds*) for each country. Country *i* is classified as a "Below (Above or equal to) the median" subgroup if the *Hospital beds* is smaller (equal to or larger) than the medial value of the corresponding number of all countries.

Table 3 reports the heterogeneity results based on medical capacity. Columns (1) and (3) present the empirical results for the

Table 3
Public health capacity, political stability, and Covid-19 morbidity.

VARIABLES	(1)	(2)	(3)	(4)
	CR_1	CR_1	CR_2	CR_2
	($\geq$ 2.76)	(<2.76)	($\geq$ 2.76)	(<2.76)
PS	−92.583***	−36.822	−147.539***	−55.212
	(-4.10)	(-0.90)	(-5.00)	(-0.95)
Hospital beds	−23.733	−157.847	−32.171	−260.407*
	(-1.40)	(-1.52)	(-1.46)	(-1.77)
Stringency	59.293	−10.839	83.528	−20.175
	(1.39)	(-0.19)	(1.50)	(-0.25)
Test-case rate	−3.521***	−1.204	−2.892*	−1.831
	(-2.95)	(-0.89)	(-1.85)	(-0.95)
Urbanization	−9.448	57.443	7.330	81.835
	(-0.34)	(1.53)	(0.20)	(1.54)
Trade	18.715***	−8.045	28.388***	−11.238
	(2.89)	(-0.74)	(3.36)	(-0.73)
Population growth	−8.160	−3.914	−12.345*	−0.092
	(-1.59)	(-0.64)	(-1.84)	(-0.01)
GDP per capita	−270.782	−157.005	−272.101	−162.069
	(-1.32)	(-0.91)	(-1.02)	(-0.66)
GDP growth	−180.094	−160.614	−158.185	−248.047
	(-0.66)	(-0.56)	(-0.44)	(-0.61)
Human development	261.928***	87.721	255.906**	157.604
	(3.26)	(1.14)	(2.44)	(1.44)
Constant	−10,819.398	1212.203	−7434.726	−1049.040
	(-1.43)	(0.21)	(-0.75)	(-0.13)
Observations	42	41	42	41
R-squared	0.657	0.393	0.648	0.421
F test	5.72e-05	0.0781	8.21e-05	0.0483
r2_a	0.547	0.191	0.534	0.228
F	5.944	1.943	5.706	2.182

Notes: This table reports the heterogeneity results from subgroup regressions to assess the impact of political stability on Covid-19 case rate by Feb 29, 2021 (CR_1) and May 31, 2021 (CR_2). The grouping variable is the number of hospital beds per 10,000 population. The specifications are estimated by OLS regression. Variable definitions are presented in Appendix 2. T-statistics are in parentheses. ***, **, * denote the significance level ate 1%, 5%, and 10%, respectively.

"Above or equal to the median" subgroup. The estimated relation between political stability and Covid-19 morbidity is negative and significant at 1% level. As for the "Below the median" subgroup, the coefficients of *PS* are insignificantly negative in Columns (2) and (4). These findings point to an adverse impact of political stability on Covid-19 case rates only exists in the "Above or equal to the median" subgroup, which verifies that political stability only matters in countries prepared with requisite medical capacity to address health emergencies.

4.2.2. Poverty, political stability, and Covid-19 pandemic

The impact of Covid-19 is not shared equally and the vulnerable are left disproportionately exposed to the virus. A survey in 2020 has found infection rate to be as high as 94% among some people living in precarious situations in Paris, indicating that Covid-19 is more easily spread among people living in poor conditions [56]. Indeed, the rich have some ability to save themselves because they are far more accessible to appropriate accommodation and healthcare tools, while the poor are in greater need of government assistances as they are powerless against the pandemic. Since political stability is the prerequisite for the effective functioning of governments, political stability should matter more to countries facing serious poverty.

Therefore, we infer that the impact of political stability on the Covid-19 pandemic morbidity vary with poverty. We utilize the share of the population living in extreme poverty (*Poverty*) as the measure of poverty levels. Country *i* is classified as a "Below (Above or equal to) the median" subgroup if the *Poverty* is smaller (equal to or larger) than the medial value of the corresponding number of all countries.

Table 4 reports the heterogeneity results based on poverty. Columns (1) and (3) present the empirical results for the "Above or equal to the median" subgroup, the estimated relation between political stability and Covid-19 case rates are negative and significant at the 1% level. In contrast, the coefficients on *PS* is insignificant for the "Below the median" subgroup in Columns (2) and (4). Our findings indicate an adverse impact of political stability on Covid-19 pandemic outcomes only exists in the "Above or equal to the median" subgroup, which suggests that political stability matters more in countries facing serious poverty. We conclude that the authorities in politically stable countries, do better to fix healthcare inequality and exclusion, and protect the vulnerable from Covid-19.

Table 4
Poverty, political stability, and Covid-19 morbidity.

VARIABLES	(1)	(2)	(3)	(4)
	CR_1	CR_1	CR_2	CR_2
	($\geq$ 3.55)	(<3.55)	($\geq$ 3.55)	(<3.55)
PS	−121.161***	3.285	−163.136***	−51.172
	(-4.69)	(0.09)	(-4.33)	(-0.98)
Hospital beds	−44.718*	−3.083	−48.809	−0.869
	(-1.89)	(-0.15)	(-1.41)	(-0.03)
Stringency	−2.508**	−2.561*	−3.503**	−2.175
	(-2.15)	(-1.79)	(-2.06)	(-1.02)
Test-case rate	−37.737	69.555	−24.098	64.993
	(-0.78)	(1.17)	(-0.34)	(0.73)
Urbanization	5.657	6.890	5.083	33.272
	(0.17)	(0.23)	(0.11)	(0.73)
Trade	7.920	10.551	12.265	16.796
	(0.89)	(1.44)	(0.94)	(1.54)
Population growth	−6.412	−2.725	−3.843	−5.378
	(-1.12)	(-0.48)	(-0.46)	(-0.63)
GDP per capita	−121.679	−327.663*	−189.804	−297.155
	(-0.66)	(-1.78)	(-0.71)	(-1.09)
GDP growth	−81.629	15.598	−45.062	76.946
	(-0.26)	(0.06)	(-0.10)	(0.21)
Human development	173.386***	132.907*	262.667***	130.690
	(3.01)	(1.76)	(3.12)	(1.16)
Constant	3046.143	−8778.591	−100.549	−5694.890
	(0.56)	(-1.17)	(-0.01)	(-0.51)
Observations	42	41	42	41
R-squared	0.631	0.433	0.609	0.265
F test	0.000155	0.0389	0.000337	0.405
r2_a	0.512	0.244	0.483	0.0204
F	5.302	2.289	4.824	1.083

Notes: This table reports the heterogeneity results from subgroup regressions to assess the impact of political stability on Covid-19 case rate by Feb 29, 2021 (CR_1) and May 31, 2021 (CR_2). The grouping variable is the share of the population living in extreme poverty. The specifications are estimated by OLS regression. Variable definitions are presented in Appendix 2. T-statistics are in parentheses. ***, **, * denote the significance level ate 1%, 5%, and 10%, respectively.

4.3. Robustness tests

4.3.1. Alternative measures for the Covid-19 pandemic

In this section, we use an alternative measure, the Covid-19 pandemic cumulative death rate by Feb 29, 2021 (DR_1) and May 31, 2021 (DR_2), to conduct robustness tests. The coefficients of *PS* are negative and significant at the 5% level in Columns (1) and (2) for Table 5, associated with the prediction that an increase in political stability contributes to decreasing Covid-19 mortality. Along with our main results, these results show that political stability helps to reduce both morbidity and mortality for the Covid-19 pandemic.

4.3.2. Political stability indicator by different years

Given that countries are going through different stages of the Covid-19 pandemic, we use ICRG political risk rating by different dates to conduct robustness tests instead of 2020: 2019 (PS_{2019}) and average from 2018 to 2020 ($PS_{average}$). As presented in Table 6, the coefficients of PS_{2019} and $PS_{average}$ are negative and significant at the 1% level, suggesting political instability exacerbate Covid-19 morbidity.

4.3.3. Tobit regression

Because the dependent variables are left censored which may produce biased estimates, we re-estimate our base-line regression using the Tobit model and present the results in Table 7. The coefficients of *PS* in Columns (1) and (2) are significantly negative.

5. Conclusions and discussions

This paper, through its use of a cross-section database set including 83 countries and regions, explores the role of political stability in explaining cross-country variations of Covid-19 pandemic outcomes. In accordance with expectation, we find that lower pre-Covid-19 levels of political stability are associated with worse Covid-19 pandemic outcomes. This basic result is compatible with recent findings from the literature that unstable political situations including social conflict [23–30], government stability [31,32], and political corruption [35–37] badly affect public health.

However, the result conflicts with Cepaluni et al. (2020) and Cepaluni et al. (2021) to a certain extent, which argue that democratic political institutions to be a disadvantage in halting the pandemics [33,34]. According to ICRG political risk rating standards, higher degree of democracy is corresponding to higher level of political stability, which is associated with better Covid-19 pandemic outcomes

Table 5
Political stability and Covid-19 mortality.

VARIABLES	(1) DR_1	(2) DR_2
PS	−1.081**	−2.069**
	(-2.14)	(-2.29)
Hospital beds	−0.441	−0.748
	(-1.24)	(-1.17)
Stringency	0.887	1.104
	(1.02)	(0.71)
Test-case rate	−0.047**	−0.064*
	(-2.22)	(-1.69)
Urbanization	0.058	0.550
	(0.10)	(0.55)
Trade	0.083	0.085
	(0.59)	(0.33)
Population growth	−0.275***	−0.443***
	(-2.96)	(-2.67)
GDP per capita	−5.434*	−6.922
	(-1.70)	(-1.21)
GDP growth	−1.482	−0.054
	(-0.30)	(-0.01)
Human development	2.079**	2.426
	(2.02)	(1.32)
Constant	24.769	94.239
	(0.27)	(0.57)
Observations	83	83
R-squared	0.342	0.270
F test	0.000451	0.00805
r2_a	0.250	0.168
F	3.737	2.659

Notes: This table reports the regression results to assess the impact of political stability on Covid-19 death rate by Feb 29, 2021 (DR_1) and May 31, 2021 (DR_2). The specifications are estimated by OLS regression. Variable definitions are presented in Appendix 2. T-statistics are in parentheses. ***, **, * denote the significance level ate 1%, 5%, and 10%, respectively.

Table 6
Political stability and Covid-19 morbidity.

VARIABLES	(1) CR_1	(2) CR_1	(3) CR_2	(4) CR_2
PS_{2019}	−63.705***		−111.089***	
	(-3.22)		(-4.06)	
$PS_{average}$		−63.707***		−110.819***
		(-3.21)		(-4.04)
Hospital beds	−25.218*	−24.922*	−23.435	−22.879
	(-1.78)	(-1.76)	(-1.20)	(-1.17)
Stringency	11.726	11.189	25.341	24.469
	(0.34)	(0.33)	(0.53)	(0.52)
Test-case rate	−2.800***	−2.802***	−3.195***	−3.199***
	(-3.34)	(-3.34)	(-2.76)	(-2.76)
Urbanization	12.488	12.553	26.752	26.905
	(0.57)	(0.57)	(0.88)	(0.89)
Trade	11.347**	11.245**	17.007**	16.830**
	(2.02)	(2.01)	(2.20)	(2.17)
Population growth	−5.505	−5.480	−5.189	−5.146
	(-1.50)	(-1.49)	(-1.02)	(-1.01)
GDP per capita	−224.159*	−224.612*	−248.522	−249.074
	(-1.78)	(-1.78)	(-1.43)	(-1.43)
GDP growth	0.347	2.259	44.471	47.930
	(0.00)	(0.01)	(0.17)	(0.18)
Human development	134.803***	134.686***	182.951***	182.510***
	(3.31)	(3.31)	(3.26)	(3.25)
Constant	−1270.219	−1251.646	−2497.264	−2475.467
	(-0.35)	(-0.34)	(-0.49)	(-0.49)
Observations	83	83	83	83
R-squared	0.449	0.449	0.446	0.445
F test	2.00e-06	2.05e-06	2.43e-06	2.61e-06
r2_a	0.373	0.372	0.369	0.368
F	5.876	5.867	5.795	5.767

Notes: This table reports the regression results to assess the impact of political stability on Covid-19 case rate by Feb 29, 2021 (CR_1) and May 31, 2021 (CR_2). We use ICRG political risk rating for 2019 (PS_{2019}) as well as average from 2018 to 2020 ($PS_{average}$) instead of 2020. The specifications are estimated by OLS regression. Variable definitions are presented in Appendix 2. T-statistics are in parentheses. ***, **, * denote the significance level ate 1%, 5%, and 10%, respectively.

as our result shows. The discrepancy occurred because the ICRG political risk rating is an aggregative measure of political stability, which is done by assigning points to a preset group of 12 factors, including the degree of democracy (democratic accountability). Thus, we could not reveal the relationship between political regimes and Covid-19 pandemic outcomes definitely.

Our study reconfirms the fundamental role of national medical capacity in the battle against public health emergencies. Though political stability is a major determinant of Covid-19 pandemic outcomes, it only matters in countries prepared with requisite medical capacity. In fact, strong national health systems and a competent public health workforce have been considered key conditions for the delivery of effective public health services for decades [57].

We also use national poverty status to analyze the heterogeneity in the effects of political stability on Covid-19 pandemic outcomes. Political stability is pivotal for pandemic management especially in countries with higher poverty rates. A potential reason is the poor are in greater need of government assistances as they are disproportionately exposed to the virus and far less accessible to appropriate health care services, and political stability is the prerequisite for the effective functioning of governments.

A key policy lesson is that measures deployed to tackle pandemics could be based on an understanding on how political instability affect national health systems functioning and individual behaviors. New interventions are needed to maintain political stability as countries continue to combat Covid-19 and the subsequential collective threats. For instance, Saudi coalition declared a ceasefire in bid to contain coronavirus, two weeks after the UN Secretary-General issued a global appeal to all belligerents to down their weapons to help halt the spread of the new coronavirus. Meanwhile, reorientation of health systems with strengthened ability to prepare for and respond to public health emergencies will be required to combat Covid-19 and the subsequential collective threats successfully, due to its fundamental role for public health emergency management.

As the poor are in greater need of government assistances in face of the threat of virus, policy measures and programs should integrate poverty status. Further, when we show the results vary according to the poverty status of countries, it means that maintaining political stability could be a possible approach to break the deadly triangle formed by poverty, political instability and pandemic, as it may both halt the pandemic and enhances economic growth, transforming the vicious circle into a virtuous circle.

Limitations of the data and methods warrant further discussion. First, the data on Covid-19 was collected during the first two waves of the pandemic, so that we cannot conduct the tests dynamically according to the changes of the pandemic and policy responses. Thus, this is not a definitive cross-country analysis, which cannot analyze the long-run effects of political stability on Covid-19 pandemic outcomes. Second, as a national level study, we neglect the heterogeneity among different regions within one country. Third, though we find a significant affect of political stability on Covid-19 pandemic outcomes, we have not empirically examined the multiple

Table 7
Tobit regression.

VARIABLES	(1)	(2)
	CR_1	CR_2
PS	−66.947***	−115.157***
	(-3.61)	(-4.50)
Hospital beds	−24.687*	−22.300
	(-1.89)	(-1.24)
Stringency	12.496	27.010
	(0.39)	(0.62)
Test-case rate	−2.789***	−3.173***
	(-3.59)	(-2.96)
Urbanization	11.141	24.650
	(0.55)	(0.88)
Trade	11.301**	16.938**
	(2.18)	(2.36)
Population growth	−5.482	−5.143
	(-1.61)	(-1.09)
GDP per capita	−233.489**	−263.260
	(-2.00)	(-1.63)
GDP growth	−4.221	37.348
	(-0.02)	(0.15)
Human development	137.056***	185.511***
	(3.64)	(3.57)
Constant	−1096.654	−2256.948
	(-0.32)	(-0.48)
Observations	83	83
F test	2.16e-07	2.67e-07
Prob > chi2	0.0000	0.0000
Pseudo R2	0.0321	0.0308

Notes: This table reports the regression results to assess the impact of political stability on Covid-19 case rate by Feb 29, 2021 (CR_1) and May 31, 2021 (CR_2). The specifications are estimated by Tobit regression. Variable definitions are presented in Appendix 2. T-statistics are in parentheses. ***, **, * denote the significance level ate 1%, 5%, and 10%, respectively.

mechanisms.

In closing, we highlight with some open questions for potential follow-up research. First, an essential next step is to assess the effects of political stability on Covid-19 pandemic outcomes in the long run. Second, to assess whether the heterogeneity within countries is present, and how much, it is necessary to conduct the analysis in the specific countries, especially countries suffering from extreme poverty and political chaos. Third, comprehensive mechanism tests should be considered.

Data availability statement

Data will be made available on request.

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CRediT authorship contribution statement

Rui Gao: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing. **Hai-Hong Liu:** Conceptualization, Formal analysis, Supervision.

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.

Appendix tables

Appendix 1
Sample

CODE	COUNTRY	CODE	COUNTRY	CODE	COUNTRY
1	Albania	29	Greece	57	Panama
2	Argentina	30	Guatemala	58	Paraguay
3	Australia	31	Hungary	59	Peru
4	Bahrain	32	India	60	Philippines
5	Bangladesh	33	Indonesia	61	Poland
6	Belgium	34	Iraq	62	Portugal
7	Bolivia	35	Ireland	63	Qatar
8	Bulgaria	36	Israel	64	Romania
9	Belarus	37	Italy	65	Russia
10	Sri Lanka	38	Jamaica	66	Saudi Arabia
11	Chile	39	Japan	67	Serbia
12	Colombia	40	Kazakhstan	68	Singapore
13	Denmark	41	Jordan	69	Slovakia
14	Costa Rica	42	Kenya	70	Slovenia
15	Croatia	43	Korea, South	71	South Africa
16	Cuba	44	Kuwait	72	Zimbabwe
17	Cyprus	45	Latvia	73	Spain
18	Czechia	46	Lithuania	74	Sweden
19	Dominican Republic	47	Luxembourg	75	Switzerland
20	Ecuador	48	Madagascar	76	Togo
21	El Salvador	49	Malawi	77	Ukraine
22	Ethiopia	50	Mongolia	78	Turkey
23	Estonia	51	Morocco	79	US
24	Finland	52	Oman	80	Uganda
25	France	53	Netherlands	81	United Arab Emirates
26	Gambia	54	New Zealand	82	Uruguay
27	Germany	55	Norway	83	United Kingdom
28	Ghana	56	Pakistan		

Appendix 2
Variable definitions

Variable	Definition	Data Source
Covid-19 morbidity and mortality		
CR	Covid-19 pandemic case rate: 7-day rolling average of cumulative number of cases per 100,000 population.	John Hopkins CSSE GitHub Data Source
DR	Covid-19 pandemic death rate: 7-day rolling average of cumulative number of deaths per 100,000 population.	
Political stability		
PS	ICRG political risk rating. Political risk components include government stability, socioeconomic conditions, investment profile, internal conflict, external conflict, corruption, military in politics, religious tensions, law and order, ethnic tensions, democratic accountability, and bureaucracy quality.	ICRG reports
Control variables		
GDP per capita	Gross Domestic Product per capita	World Bank
GDP growth	Gross Domestic Product growth rate	World Bank
Urbanization	Urban population as percentage of population	World Bank
Population growth	Exponential rate of growth of midyear population from year t-1 to t (expanded by 100 times)	World Bank
Trade	Sum of exports and imports of goods and services as percentage of Gross Domestic Product	World Bank
Hospital beds	Number of hospital beds per 1000 population	Our World in Data
Human development	A composite index measuring average achievement in three basic dimensions of human development: a long and healthy life, knowledge, and a decent standard of living. (expanded by 100 times)	United Nations Development Programme
Stringency	Government Response Stringency Index: composite measure based on 9 response indicators including school closures, workplace closures, and travel bans, rescaled to a value from 0 to 100 (100 = strictest response)	Oxford Covid-19 Government Response Tracker
Test-case rate	Tests conducted per new confirmed case of Covid-19, given as a rolling 7-day average	Our World in Data
Poverty	The share of the population living in extreme. This is a grouping variable which is not included in specifications.	

Appendix 3
Multicollinearity Analysis

Variable	VIF	1/VIF

(*continued on next page*)

Appendix 3 (*continued*)

Variable	VIF	1/VIF
PS	1.45	0.690908
Hospital beds	1.98	0.505433
Stringency	1.83	0.546594
Test-case rate	1.25	0.802922
Urbanization	2.58	0.388178
Trade	1.46	0.682984
Population growth	2.16	0.463032
GDP per capita	1.14	0.878257
GDP growth	2.08	0.481311
Human development	3.56	0.281094
Mean VIF	1.95	–

References

[1] Z. Kozlakidis, M.J. Struelens, Editorial: insights in coronavirus disease (Covid-19) - surveillance, prevention and treatment, Front. Public Health 10 (2022), 998998, https://doi.org/10.3389/fpubh.2022.998998.

[2] U. Cirakli, I. Dogan, M. Gozlu, The relationship between Covid-19 cases and Covid-19 testing: a panel data analysis on OECD countries, Journal of the Knowledge Economy 2021 (2021) 1–14, https://doi.org/10.1007/s13132-021-00792-z.

[3] A. Brodeur, A.E. Clark, S. Fleche, et al., Covid-19, lockdowns and well-being: evidence from google trends, J. Publ. Econ. 193 (2023), 104346, https://doi.org/10.1016/J.JPUBECO.2020.104346, 2021 Jan.

[4] D. Koh, Covid-19 lockdowns throughout the world, Occup. Med. (Lond.) (2020), https://doi.org/10.1093/occmed/kqaa073, 2020 May 2:kqaa073.

[5] P. Tran, L. Tran, L. Tran, The influence of social distancing on Covid-19 mortality in US counties: cross-sectional study, JMIR Public Health Surveill 7 (3) (2021), e21606, https://doi.org/10.2196/21606.

[6] M. Faus, F. Alonso, A. Javadinejad, S.A. Useche, Are social networks effective in promoting healthy behaviors? A systematic review of evaluations of public health campaigns broadcast on, Twitter. Front. Public Health 10 (2022), 1045645, https://doi.org/10.3389/fpubh.2022.1045645.

[7] J.L. Grantham, C.L. Verishagen, S.J. Whiting, C.J. Henry, J.R. Lieffers, Evaluation of a social media campaign in Saskatchewan to promote healthy eating during the Covid-19 pandemic: social media analysis and qualitative interview study, J. Med. Internet Res. 23 (2021), e27448, https://doi.org/10.2196/27448.

[8] G.W. Warren, R. Lofstedt, Risk communication and Covid-19 in Europe: lessons for future public health crises, J. Risk Res. 2021 (5) (2021) 1–15, https://doi.org/10.1080/13669877.2021.1947874.

[9] J.J. Wiegel, SARS-CoV-2 Vaccination: the time is now, Kidney360 2 (9) (2021) 1402–1404, https://doi.org/10.34067/KID.0005352021.

[10] K.W. Zhu, Why is it necessary to improve Covid-19 vaccination coverage in older people? How to improve the vaccination coverage? Hum. Vaccines Immunother. 19 (2) (2023) https://doi.org/10.1080/21645515.2023.2229704.

[11] S.D. Halpern, R.D. Truog, F.G. Miller, Cognitive bias and public health policy during the Covid-19 pandemic, JAMA, J. Am. Med. Assoc. 324 (4) (2020), https://doi.org/10.1001/jama.2020.11623.

[12] K. Mohamed, N. Yazdanpanah, A. Saghazadeh, N. Rezaei, Cognitive biases affecting the maintenance of Covid-19 pandemic, Acta Biomed. 92 (2) (2021), e2021102, https://doi.org/10.23750/abm.v92i2.11073.

[13] P. Cabrera-Álvarez, M.J. Hornsey, J. Lobera, Determinants of self-reported adherence to Covid-19 regulations in Spain: social norms, trust and risk perception, Health Promot. Int. 37 (6) (2022) daac138, https://doi.org/10.1093/heapro/daac138.

[14] T. Mevorach, J. Cohen, A. Apter, Keep Calm and Stay Safe: the relationship between anxiety and other psychological factors, media exposure and compliance with Covid-19 regulations, Int J Environ Res Public Health 18 (6) (2021) 2852, https://doi.org/10.3390/ijerph18062852.

[15] C. Stanica, A. Crosby, S. Larson, Trust in government and Covid-19 response policy: a comparative approach, J. Comp. Pol. Anal.: Research and Practice 25 (2023) 2, https://doi.org/10.1080/13876988.2022.2103672.

[16] V.T. Vu, Public trust in government and compliance with policy during Covid-19 pandemic: empirical evidence from Vietnam, Publ. Organ. Rev. 21 (2021), https://doi.org/10.1007/S11115-021-00566-W.

[17] B. Bright, C.P. Babalola, N.A. Sam-Agudu, A.A. Onyeaghala, A. Olatunji, U. Aduh, P.O. Sobande, T.A. Crowell, Y.K. Tebeje, S. Phillip, N. Ndembi, M.O. Folayan, Covid-19 preparedness: capacity to manufacture vaccines, therapeutics and diagnostics in sub-Saharan Africa, Global Health 17 (1) (2021) 24, https://doi.org/10.1186/s12992-021-00668-6.

[18] S. Narayanasamy, B. Okware, W. Muttamba, K. Patel, K.O. Duedu, N. Ravi, N. Ellermeier, M. Shey, C.W. Woods, W. Sabiiti, Covid-19 clinical research coalition, virology, immunology, and diagnostics working group, in: Global Inequity of Covid-19 Diagnostics: Challenges and Opportunities, J Epidemiol Community Health, 2022, https://doi.org/10.1136/jech-2022-219333 jech-2022-219333.

[19] C.J. Anderson, S.B. Hobolt, Creating compliance in crisis: messages, messengers, and masking up in Britain, W. Eur. Polit. 46 (2022) 2, https://doi.org/10.1080/01402382.2022.2091863.

[20] G. Sorci, B. Faivre, S. Morand, Explaining among-country variation in Covid-19 case fatality rate, Sci. Rep. 10 (2020), 18909, https://doi.org/10.1038/s41598-020-75848-2, 2020.

[21] R. Parker, D. Ferraz, Politics and pandemics, Global Publ. Health 16 (2021) 8–9, https://doi.org/10.1080/17441692.2021.1947601.

[22] S. Daher-Nashif, In sickness and in health: the politics of public health and their implications during the Covid-19 pandemic, Sociology Compass (2021), e12949, https://doi.org/10.1111/soc4.12949.

[23] S.M. Han, K.S. Lwin, K.T. Swe, S. Gilmour, S. Nomura, Military coup during Covid-19 pandemic and health crisis in Myanmar, BMJ Glob. Health 6 (4) (2021), https://doi.org/10.1136/bmjgh-2021-005801.

[24] J.L. Sowers, E. Weinthal, N. Zawahri, Targeting environmental infrastructures, international law, and civilians in the new Middle Eastern wars, Secur. Dialog. 48 (5) (2017) 410–430, https://doi.org/10.1177/0967010617716615.

[25] P.H. Wise, M. Barry, Civil war & the global threat of pandemics, Daedalus 146 (4) (2017) 71–84, https://doi.org/10.1162/DAED_a_00460.

[26] C.J. Carlson, G.F. Albery, A. Phelan, Preparing international cooperation on pandemic prevention for the Anthropocene, BMJ Glob. Health 6 (3) (2021), https://doi.org/10.1136/bmjgh-2020-004254.

[27] S. Taghizade, V.K. Chattu, E. Jaafaripooyan, S. Kevany, Covid-19 pandemic as an excellent opportunity for global health diplomacy, Front. Public Health 9 (2021), https://doi.org/10.3389/fpubh.2021.655021.

[28] J.E. Campos, D. Lien, Political instability and illegal immigration, J. Popul. Econ. 8 (1) (1995) 23–33, https://doi.org/10.1007/BF00172036.

[29] R. Jaspal, M. Assi, I. Maatouk, Potential impact of the Covid-19 pandemic on mental health outcomes in societies with economic and political instability: case of Lebanon, Ment. Health Rev. 25 (3) (2020), https://doi.org/10.1108/MHRJ-05-2020-0027.

[30] R. Creţan, D. Light, Covid-19 in Romania: transnational labour, geopolitics and the Roma 'outsiders', Eurasian Geogr. Econ. (2020) https://doi.org/10.1080/15387216.2020.1780929, 61.

[31] D.C. Glik, Risk communication for public health emergencies, Annu. Rev. Publ. Health 28 (2007), https://doi.org/10.1146/annurev.publhealth.28.021406.144123.
[32] T. Abraham, Lessons from the pandemic: the need for new tools for risk and outbreak communication, Emerg. Health Threats J. 4 (2011), https://doi.org/10.3402/ehtj.v4i0.7160, 7160-7160.
[33] G. Cepaluni, M.T. Dorsch, R. Branyiczki, Political regimes and deaths in the early stages of the Covid-19 pandemic, J. Publ. Financ. Public Choice 37 (1) (2022) 27–53. https://doi.org/10.1332/251569121X16268740317724.
[34] G. Cepaluni, M. Dorsch, S. Dzebo, Populism, political regimes, and Covid-19 deaths, Working paper, 2021. ISBN: 1556-5068, https://ssrn.com/abstract=3816398.
[35] P.J. Garcia, Corruption in global health: the open secret, Lancet 394 (10214) (2019), https://doi.org/10.1016/s0140-6736(19)32527-9.
[36] J.C. Kohler, A. Bowra, Exploring anti-corruption, transparency, and accountability in the world health organization, the united nations development programme, the world bank group, and the global fund to fight AIDS, tuberculosis and malaria, Glob. Health 16 (1) (2020), https://doi.org/10.1186/s12992-020-00629-5.
[37] T. Burki, Corruption is an "ignored pandemic", Lancet Infect. Dis. 19 (5) (2019), https://doi.org/10.1016/s1473-3099(19)30178-1, 471-471.
[38] World Bank, Global Economic Prospects, 2022. January 2022, https://openknowledge.worldbank.org/server/api/core/bitstreams/1a18a651-c40b-5316-8898-bb3bd60ca390/content.
[39] M. Buheji, K. da Costa Cunha, G. Beka, T.C. Yein, The extent of covid-19 pandemic socio-economic impact on global poverty. A global integrative multidisciplinary review, Am. J. Econ. 10 (2020) 213–224, https://doi.org/10.5923/j.economics.20201004.02.
[40] Lancet, India under Covid-19 lockdown, Lancet 395 (10233) (2020) 1315, https://doi.org/10.1016/S0140-6736(20)30938-7, 2020.
[41] K. Daras, A. Alexiou, T.C. Rose, I. Buchan, D. Taylor-Robinson, B. Barr, How does vulnerability to covid-19 vary between communities in England? Developing a small area vulnerability index (SAVI), Social Science Research Network 75 (8) (2020), https://doi.org/10.2139/ssrn.3650050.
[42] R. Chetty, J.N. Friedman, N. Hendren, M. Stepner, The opportunity insights team, in: How Did Covid-19 and Stabilization Policies Affect Spending and Employment? A New Real-Time Economic Tracker Based on Private Sector Data, National Bureau of Economic Research, Cambridge, MA, 2020. NBER Working Paper 27431, https://www.nber.org/system/files/working_papers/w27431/revisions/w27431.rev1.pdf.
[43] M. Brussevich, E. Dabla-Norris, S. Khalid, Who will bear the brunt of lockdown policies? Evidence from tele-workability measures across countries, IMF Working Paper (2020) 20–88, https://doi.org/10.5089/9781513546285.001.
[44] Z. Darvas, The unequal inequality impact of the Covid-19 pandemic, 2021. Working Papers 41764, Bruegel.Handle: RePEc:bre:wpaper:41764, https://www.jstor.org/stable/pdf/resrep32250.pdf.
[45] M. Whitehead, D. Taylor-Robinson, B. Barr, Covid-19: we are not "all in it together"—less privileged in society are suffering the brunt of the damage, BMJ Opinion (2020), 22 May 2020, https://blogs.bmj.com/bmj/2020/05/22/covid-19-we-are-not-all-in-it-together-less-privileged-in-society-are-suffering-the-brunt-of-the-damage/.
[46] C. Hefferon, C. Taylor, D. Bennett, C. Falconer, D. Taylor-Robinson, Priorities for the child public health response to the Covid-19 pandemic recovery in England, Arch. Dis. Child. 106 (2020), https://doi.org/10.1136/archdischild-2020-320214, 6:archdischild-2020-320214.
[47] M. Brewer, R. Patrick, Pandemic Pressures: Why Families on Low Income Are Spending More during Covid-19, Resolution Foundation, 2021. https://www.resolutionfoundation.org/app/uploads/2021/01/Pandemic-pressures.pdf.
[48] M. Sepahvand, P. Verwimp, Fighting Covid-19 amidst civil conflict: micro-level evidence from Burkina Faso, World Dev. 170 (106343) (2023) 1–34, https://doi.org/10.1016/j.worlddev.2023.106343.
[49] A. Ozkan, G. Ozkan, A. Yalaman, Y. Yildiz, Climate risk, culture and the Covid-19 mortality: a cross-country analysis, World Dev. 141 (2021), https://doi.org/10.1016/j.worlddev.2021.105412.
[50] S. Hoti, M. McAleer, R. Shareef, Modelling international tourism and country risk spillovers for Cyprus and Malta, Tourism Manag. 28 (6) (2007), https://doi.org/10.1016/j.tourman.2007.02.014.
[51] S.H. Law, T.C. Lim, N.W. Ismail, Institutions and economic development: a Granger causality analysis of panel data evidence, Econ. Syst. 37 (4) (2013) 610–624, https://doi.org/10.1016/j.ecosys.2013.05.005.
[52] H. Chen, H. Liao, B.J. Tang, Y.M. Wei, Impacts of OPEC's political risk on the international crude oil prices: an empirical analysis based on the SVAR models, Energy Econ. 57 (2016) 42–49, https://doi.org/10.1016/j.eneco.2016.04.018.
[53] N. Sussman, Time for Bed(s): Hospital Capacity and Mortality from Covid-19, vol. 11, COVID Economics, 2020. https://www.researchgate.net/publication/341043555_Time_for_beds_Hospital_capacity_and_mortality_from_COVID-19.
[54] R.M. Anderson, H. Heesterbeek, D. Klinkenberg, T. Hollingsworth, How will country-based mitigation measures influence the course of the Covid-19 epidemic? The Lancet, Mar21 395 (10228) (2020) 931–934, https://doi.org/10.1016/S0140-6736(20)30567-5.
[55] M.J. Gelfand, J.C. Jackson, X. Pan, D. Nau, D. Pieper, E. Denison, M. Wang, The relationship between cultural tightness-looseness and Covid-19 cases and deaths: a global analysis, Lancet Planet. Health 5 (3) (2021) e135–e144, https://doi.org/10.1016/s2542-5196(20)30301-6.
[56] Roederer, T., Mollo, B., Vincent, C., et al., High seroprevalence of SARS-CoV-2 antibodies among people living in precarious situations in Ile de France, working paper. doi: https://doi.org/10.1101/2020.10.07.20207795.
[57] S. Van den Broucke, Strengthening public health capacity through a health promotion lens, Health Promot. Int. 32 (5) (2017), https://doi.org/10.1093/heapro/dax064.