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Quantitative Analysis of Countries' Initial Responses to COVID-19 Pandemic: The Effect of Change Readiness

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ABSTRACT: Worldwide pandemics, like COVID-19, can cause major disruptions and instill fear in countries globally. 2020 saw the rapid spread of COVID-19, leading to significant loss of life and economic turmoil as nations shut down to combat the virus. This paper explores how a country's change readiness influences its ability to control the spread of an international crisis. We argue that higher change readiness levels help countries better manage risks and uncertainties resulting from environmental changes and shocks. Consequently, greater change readiness enables countries to effectively control crises, especially during pandemics. Our analysis of 135 countries during the COVID-19 pandemic's first three months in 2020 supports our hypotheses. This study enhances our understanding of how a nation's change readiness may impact its crisis management capabilities.
KEYWORDS: Change readiness, Global Pandemic, Spread of Covid-19, Resiliency

1. Introduction

The frequency of disasters happening in recent decades illustrates the importance and role of a resilient disaster management framework. In 2018, the SwissRe Institute estimated that more than 11,000 people were victims of disaster events, and the economic losses estimated to be USD 155 billion (Bevere 2019). The impacts and severity of a disaster is different in every country. Responding to large-scale disasters are very challenging. When a nation's capability fails to face large-scale disaster, international assistance is required. (Haddow et al. 2017). As no country is immune to enormous shocks, it is expected that the extent to which a country is prepared for handling short term or long-term changes would be a critical determinant for disaster preparedness, response, and recovery plans. To minimize the risks and impact of potential disasters and to increase the safety and wellbeing of residents, communities should be more resilient to address the threats and decrease the vulnerabilities to the risks (Jabareen 2013). Therefore, change management is one of the critical factors to minimize the impacts of a disaster on the population.

We use the organizational *change readiness* literature as a springboard to propose the notion of *change readiness* at a country level. We argue that *change readiness* is a function of how prepared a country is for change, how capable they are for managing a change, and how able they are to take advantage of the opportunities provided by the change (Moeini Gharagozloo et al. 2022a). These changes can be the result of shocks like economic crisis, social conflicts, or disasters. Readiness is reflected in beliefs, attitudes, and intentions of the necessity of change and the capacity to handle the change successfully. Changes always include risks due to moving from a known state to an unknown one. Adapting Change

readiness (Moeini Gharagozloo et al. 2022a) analysis helps to eliminate the risks. by providing evaluations and adjustments toward the situation. The analysis must include several factors, such as the influences of internal and external conditions, details of the phenomenon that has led to change, identified risks, anticipated actions, and control measures (KPMG Report 2019).

2. Theory and hypotheses

Past research has identified several country-level factors that would influence responding to disasters. In this paper, we add to this stream of research by arguing that change readiness can help countries provide more efficient controlling measures in response to a disaster.

2.1. Change Readiness

For a country to be ready for changes, the ability to address both sudden-onset events and build resilience against long-term structural changes is required. This readiness would be based on collaboration and coordination among multiple actors and underscores scaling up and targeting vulnerable groups. As a country fails to recognize the impact of changes and cannot handle them properly, their citizens, their society, and their economy (Bennett et al. 2021) would experience high costs of lack of change readiness (KPMG 2019).

In this study, change readiness is viewed as a multidimensional capability at the country level. It represents and measures how ready a country is for handling threats from sudden negative changes and shocks such as financial crisis or natural disaster while taking advantage of other forms of changes (such as technology).

2.2. Change readiness and disaster response

Disasters are sudden and overwhelming events that might take a significant amount of time for the affected area to recover (Ritchie 2008). McEntire and Myers (2004) claim that in this era, there has been a greater need to anticipate disaster and be ready to deal with the adverse consequences effectively. A post-disciplinary approach is required for disaster preparedness that reviews in detail all the steps necessary that a country should consider increasing the readiness in dealing with a disaster. The readiness factors such as leadership, stakeholder involvement, and technological innovations, along with the knowledge improvements, can reduce risks, strengthen local governing capacity, and promote adaptation and long-term monitoring systems. These factors can enhance the countries' abilities to control and manage a disaster. In case of an international disaster, countries with a more considerable change readiness levels can resist, absorb, accommodate, and recover from the effects of the hazards in a timely and efficient manner and continue to perform (Jabareen 2013).

It is expected that the level of change readiness of a country to handle technology shocks, economic crisis, natural disasters, and social changes would work as a buffer to enhance community resilience facing a disaster. We argue that countries that are advanced in terms of their change readiness are more capable of providing control measures to respond to a disaster response would be more resilient. Thus, we except:

H1: Countries with a higher level of change readiness are more likely to be able to bring the spread of a disaster under control.

H1a: Countries with better change readiness in regulatory and government are more likely to be able to bring the spread of a disaster under control.

H1b: Countries with better change readiness in their society and among their people are more likely to be able to bring the spread of a disaster under control.

H1c: Countries with better change readiness in their private sector and among their enterprises are more likely to be able to bring the spread of a disaster under control.

3. Data and methods

We study the effect of change readiness of countries on the spread of COVID-19 across countries around the world. To do so, we considered the data for the first four months since COVID-19 was first identified in China. A country is included in our sample if coronavirus was known to be spreading in the country in the first four months of the year 2020. Our COVID-19 data is collected from The European Union Open Data Portal (EU ODP) database. European Union (EU) provides access to an expanding range of data from the EU institutions. In this study, we examine whether the change readiness affects the ability of a country to bring the spread of COVID-19 (as a deadly virus) under control. Our sample includes the countries that have COVID-19 data as well as change readiness data for the year 2019 and 2020. After removing missing data, there are 135 country observations in our sample.

3.1. Dependent variables

In this study, we use two dependent variables to test the impact of change readiness on the increasing or decreasing trend of the spread of COVID-19. To do so, we look at the first 30 days that a country is infected and measured the trend of the spread of COVID-19 in that country in that first 30 days. We measure the first dependent variable (our main variable) by taking the average of the daily new cases in the last 5 days of the spread of the virus in a country and dividing it by the average of the daily new cases in the first 5 days of the spread of the virus in that country. To make it more precise, the formula that we used to calculate the primary dependent variable is as follow:

$$\mathbf{DV1} = \frac{\text{Average of the daily new cases in the } \mathbf{last\ 5\ days} \text{ of the first 30 days of spread}}{\text{Average of the daily new cases in the } \mathbf{first\ 5\ days} \text{ of the first 30 days of spread}}$$

We measure the second dependent variable (we designed this variable for robustness purposes) by taking the average of the daily new cases in the last 10 days of the 30 day window of the spread of the virus in a country and dividing it by the average of the daily new cases in the first 10 days of the 30 day window of the spread of the virus in that country. The formula that we used to calculate the second dependent variable is as follow:

$$\mathbf{DV2} = \frac{\text{Average of the daily new cases in the } \mathbf{last\ 10\ days} \text{ of the first 30 days of spread}}{\text{Average of the daily new cases in the } \mathbf{first\ 10\ days} \text{ of the first 30 days of spread}}$$

We defined our dependent variables by examining the trend of the spread of the virus in a country, allowing us to compare each country by itself by looking at the trend of the spread in that country. We did this for two major reasons: The first reason is that this virus is very brand new to the world of science and even for identifying the new cases, especially for the first three months sophisticated technology and devices are needed. This makes some countries that are more developed to be more efficient at identifying new cases while some developing or under-developed countries have serious problems to gain access to the technology and necessary devices needed to test the cases. The second reason is the influence of politics in announcing numbers of daily new cases. Unfortunately, in some countries (mostly countries with less transparent governments), there is an intention to hide bad news and basically manipulate the numbers related to bad news. Therefore, if we just look at the absolute number of daily new cases or total cases, these numbers might be the result manipulation by some governments, which can make the results of our analysis misleading. Instead, looking at the trend of the spread of the virus can help us gain a more accurate and transparent view of the status of a country.

3.2. Independent variables

There have been tremendous changes happening around the world recently, such as technology progress, culture change, and political shift. These changes can reshape the business environment dramatically. The difference in change readiness of countries can lead to different levels of their capability to respond to extreme changes, including global disasters.

To measure the change adaptability of a country, we use the Change Readiness Index (CRI) as our independent variable. The CRI is compiled by KPMG (an auditing organization) and is designed to measure the effectiveness of a country in preparing to manage changes, respond to threats of those changes, and cultivate their potential opportunities. KPMG identifies change in two parts: (1) changes in the environment such as natural and global disasters, and (2) political opportunities, economic opportunities, and risks, such as changes in demographics, government, and technology. To test our hypotheses, we used overall CRI, which reflect the overall change readiness of a country, and three specific pillars, which are government capability, enterprise capability, and people and civil society capability1. The government capability captures the ability of government and public regulatory institutions to manage change. The enterprise capability reflects the ability of private and state-owned institutions to manage change and grow within a dynamic economic environment. Society capability measures the extent to which individuals and societies are ready to adapt to change and respond to opportunities. Our data is collected form the latest version of the CRI report by KPMG in 2019.

3.3. Methods

We use multivariate regression to analyze the spread of COVID-19 among countries around the world. In all models, the reported standard errors are heteroscedasticity robust.

4. Results and Conclusion

4.1. Main results

Tables 1 and 2 present the regressions of the 5-day and 10-day trend in the first 30 days of the spread of COVID-19 on CRI, including the overall CRI and the CRI pillars. In the first model in table 1 (model 1) we have only included the base model, which consists of control variables only. As the results of model 1 shows, the only variable that is significant here is the size of the population.

In table 1 the model 5 shows that the "overall CRI" (b=-372.714) is negatively associated with the 5-day trend in the first 30 days of the spread of COVID-19, and the relationship is significant at the 5% level. Model 2 shows that the "government change readiness" (b= -311.689) is negatively associated with the 5-day trend in the first 30 days of the spread of COVID-19, and the relationship is significant at the 5% level. The model 3 reports that the "people and civil society change readiness" (b= -368.955) is also negatively and significantly associated with the 5-day trend in the first 30 days of the spread of COVID-19. In model 4, the relationship (b= -242.297) between enterprise change readiness and 5-day trend in the first 30 days of the spread of COVID-19 is again negative but not significant. Generally, with the exception of enterprise change readiness, the results for the overall CRI and CRI pillars are consistent.

[1] For detailed methodology for CRI compilation, please see: kpmg.com/changereadinessmethodology.

Table 1: Fixed effect analysis of Change Readiness Index and its sub-indexes effect on the 5 day trend in the first 30 days of the spread of COVID-19

	DV=5 day trend in the first 30 days of the spread of COVID-19				
Variables	(1)	(2)	(3)	(4)	(5)
Culture	-1.594	-2.249	-2.551^{+}	-2.016	-2.387^{+}
	1.415	1.411	1.439	1.438	1.43
GDP per capita	10.16	36.009*	39.586*	28.614	39.866*
	13.532	16.872	17.815	18.462	18.361
Openness Index	-0.203	-0.187	-0.16	-0.175	-0.166
	0.25	0.245	0.245	0.249	0.246
Area Size	-12.416	-15.698*	-16.848*	-16.709*	-17.216*
	7.972	7.923	8.015	8.462	8.094
Geographic region	0.715	2.027	1.382	0.797	1.547
	2.973	2.961	2.926	2.96	2.942
Population size	18.408*	21.154*	22.124*	23.956*	23.345*
	9.214	9.097	9.154	9.926	9.293
Population density	-0.018	-0.015	-0.021	-0.018	-0.018
	0.017	0.016	0.016	0.017	0.016
Urban Population (%)	0.626	0.259	0.554	0.399	0.341
	0.673	0.676	0.66	0.687	0.672
Population ages 65 and above	1.655	0.786	2.896	1.74	1.763
	2.213	2.196	2.226	2.203	2.174
The Month Covid-19 emerged	2.959	3.1	2.111	2.574	2.684
	8.259	8.093	8.101	8.225	8.114
Government sub-index		-311.689*			
		125.799			
People sub-index			-368.955*		
			149.155		
Enterprise sub-index				-242.297	
				165.76	
Overall Change Readiness Index					-372.714*
					158.927
Constant	-139.165	-147.19	-178.448	-174.147	-173.348
	188.493	184.733	185.400	189.155	185.736
Observations	135	135	135	135	135
F Change	2.110	6.139	6.119	2.137	5.500
R Square	0.145	0.186	0.186	0.160	0.182
ΔR Square		0.041	0.040	0.015	0.037

***$p < .001$. **$p < .01$. *$p < .05$. $^{+}p < .1$

Table 2 presents the results of regressing a 10-day trend in the first 30 days of the spread of COVID-19 on CRI, including the overall CRI and the CRI pillars. We tested our model with a second dependent variable to make sure about the solidity of our predictions. In model 5, the coefficient of overall CRI is -145.443 and significant at the 5% level. In model 2, the government capability (b=-135.928) is negatively associated with the 10-day trend in the first 30 days of the spread of COVID-19 and significant at the 5% level. The coefficient of people & civil society capability is -126.863 and significant at the 5% level. The coefficient

of enterprise capability is -93.164 and not significant. Once again, generally, with the exception of enterprise change readiness, the results for the overall CRI and CRI sub-indexes are consistent.

Table 2: Fixed effect analysis of Change Readiness Index and its sub-indexes effect on the 10 day trend in the first 30 days of the spread of COVID-19

	DV = 10 day trend in the first 30 days of the spread of COVID-19				
Variables	(1)	(2)	(3)	(4)	(5)
Culture	-0.072	-0.357	-0.401	-0.234	-0.381
	0.595	0.593	0.611	0.606	0.604
GDP per capita	5.664	16.936*	15.781*	12.759	17.255*
	5.695	7.087	7.559	7.78	7.751
Openness Index	-0.091	-0.084	-0.077	-0.081	-0.077
	0.105	0.103	0.104	0.105	0.104
Area Size	-3.287	-4.718	-4.811	-4.937	-5.159
	3.355	3.328	3.401	3.566	3.417
Geographic region	1.224	1.797	1.454	1.256	1.549
	1.251	1.244	1.242	1.248	1.242
Population size	7.91*	9.107*	9.187*	10.043*	9.836*
	3.878	3.821	3.884	4.183	3.923
Population density	-0.003	-0.002	-0.004	-0.003	-0.003
	0.007	0.007	0.007	0.007	0.007
Urban Population (%)	-0.017	-0.177	-0.042	-0.104	-0.128
	0.283	0.284	0.28	0.29	0.284
Population ages 65 and above	1.192	0.812	1.618^{+}	1.224	1.234
	0.931	0.923	0.944	0.929	0.918
The Month Covid-19 emerged	3.829	3.891	3.538	3.681	3.722
	3.476	3.4	3.437	3.466	3.425
Government sub-index		-135.928*			
		52.843			
People sub-index			-126.863*		
			63.287		
Enterprise sub-index				-93.164	
				69.858	
Overall Change Readiness Index					-145.443*
					67.092
Constant	-132.737^{+}	-136.236^{+}	-146.244^{+}	-146.187^{+}	-146.076^{+}
	79.325	77.599	78.666	79.717	78.409
Observations	135	135	135	135	135
F Change	1.884	6.617	4.018	1.779	4.699
R Square	0.132	0.176	0.159	0.144	0.164
ΔR Square		0.044	0.027	0.012	0.032

***$p < .001$. **$p < .01$. *$p < .05$. $^{+}p < .1$

4.2. Conclusion

After experiencing a significant financial meltdown in almost all market around the world, understanding change readiness of countries from an economic perspective can help business communities realize where the governments are ready to collaborate (Moeini Gharagozloo et al. 2021; Chen et al. 2022; Moeini Gharagozloo et al. 2022b) or to respond to an ongoing change, where the risk of lack of change readiness prevents achieving better performance and where people in a society provide a better prepared environment.

Overall, our findings contribute to the international crisis literature from the perspective of change management by looking at the level of change readiness of countries. To the best of our knowledge, this is one of the first studies to theorize the change readiness of countries influence on a disaster's severity of impact on each country and the propositions provide clear implications for government officials, local communities and how it matters for business executives and entrepreneurs (Bennett et al. 2018). Understanding the concept of change readiness on a national level can help policymakers realize the risks and provide decision plans for potential disasters. The lack of change readiness prevents achieving better performance in disaster responses and increase morality rate, economic losses, and social disruption.

The COVID-19 crisis response calls for further research in the areas of readiness as there has been significant variation in the perceived success of bringing the virus under control in different countries. While some countries perceived success in managing the crisis has been extremely slow and undisciplined (such as Italy), others reported that the virus is under control in a much faster manner (such as South Korea). Therefore, in addition to studying the effect of change readiness that seems essential, there might be other sorts of readiness such as readiness of infrastructure or health system as well that need to be addressed in the future.

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