Assessing the Relevance of Governmental Characteristics to Address Wicked Problems in Turbulent Times

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Governments have long faced traditional bureaucratic problems and developed a set of mechanisms to handle them but few studies have examined the government's underlying characteristics in addressing such problems. Wicked problems – those with unclear definitions, causal complexity and conflicting goals – are increasingly emerging and are frequently observed in highly turbulent environments – those where variables behave in unpredictable ways. We study the relevance of a range of governmental characteristics during the COVID-19 pandemic and find that, while all government characteristics are sometimes relevant, no single characteristic is always relevant and so they are best treated as a portfolio.

Keywords: Wicked problems, turbulence, COVID-19, QCA, government, technology

Introduction

Public organizations have traditionally been quite good in solving simple bureaucratic problems that are amendable to traditional mechanisms such as means-end rationality, the application of legal rules and processes, and exploitation of economies of scale (Ansell et al. 2021). However, these mechanisms have been less effective in dealing with "wicked problems", which are those problems with unclear problem definitions, exhibit causal complexity, have conflicting goals and lack uniform solutions that can be applied to them (O'Flynn 2021). Wicked problems often require multi-actor networks to collaborate in order to envision, build and deploy solutions (Ansell and Gash 2008; Roberts 2000; Sørensen and Torfing 2011; Torfing 2019; Weber and Khademian 2008; Wegrich 2019).

Wicked problems are increasingly showing up in turbulent settings. The concept of turbulence argues globalization, advanced technologies, demands for public-private-not-for-profit partnerships and short fuse problem solving have created a highly turbulent world in which these variables behave and interact in inconsistent and unpredictable

ways (Merget 2003). As such, wicked problems formed in turbulence are stubbornly resistant to the prior mechanisms of rationality (legal rules, etc) that were frequently applied in less turbulent times and to traditional bureaucratic problems. Additionally, solutions to wicked problems often cut across various domains (Wirz et al. 2020) and it makes sense to look at characteristics of government that exist to solve those wicked problems – particularly those that exist within a turbulent environment – rather than a myopic focus on a single characteristic in isolation.

Historically research has focused on the usage of tools to solve governmental problems (Margetts & Hood 2016) but a relatively scant amount of research has focused on the underlying characteristics of government in addressing such problems. While a tool can be immediately deployed, the government's use of the tool can be quite uneven with some government wielding a certain tool very effectively with other governments are much less capable in using such a tool.[1] However, certain governmental characteristics underlie all governments but these characteristics can be somewhat to highly fixed and thus cannot be easily changed or applied in the same manner as tools. While the existence of organizational culture and its impact on various outcome variables is well-established in public sector literature (Andrews et al. 2006; Bysted and Hansen 2015; Moynihan and Pandey 2006) no known studies have attempted to study governmental characteristics in the context of wicked problems, especially not in turbulent settings.

The current COVID-19 pandemic certainly fits the definition of a wicked problem in turbulent times, with successive waves of infection spreading across the globe driven by rapidly and unpredictably evolving virus variants. As such, there is a gap in literature and practice in understanding how effective governmental characteristics are in the face of wicked problems in a turbulent setting. As aptly said by O'Flynn (2021, p.4), COVID-19 demands a fundamental reshaping of our domain and requires an expansion into even the definition of our field. The global nature of the pandemic provides a natural experiment to understand which characteristics are effective and which are not. Thus, in this research, we seek to understand the importance of governmental characteristics during times of wicked problems in a turbulent environment.

[1] We appreciate this framing that was brought to us by one of our anonymous reviewers.

Background and Theory

Wicked Problems and Turbulence

The idea of wicked problems emerged from the planning and policy domains and several definitions have been provided by leading scholars. Conklin (2006) summarizes wicked problems having the following characteristics: (1) problem is not fully understood prior to the formulation of the solution (2) stop at random times (aka no stopping rule) (3) solutions are neither fully right nor fully wrong (4) are essentially novel and unique (5) every solution is a "one-shot operation" and (6) have no given alternative solutions. Because of these characteristics, wicked problems cannot be solved with the traditional sequential application of definition, analysis and solution, and this is largely because there is no clear problem definition to wicked problems. What makes wicked problems worse is that they often have significant conflict over the values that are salient to the problem and lack a single institution or structure that can "own" the problem (Geuijen et al. 2017). Without a clear problem definition, solutions are not possible.

Wicked problems are more challenging to solve in times of turbulence. In her speech entitled "Times of Turbulence" to the American Society for Public Administration (ASPA), Merget (2003) described the turbulent environment that faces public administration as involving several factors. First, turbulence is increased by the global nature of the political economy, which reflects the interdependence of all countries in the dimensions of politics, economics and social concerns. As such, issues of public policy are no longer bound by national borders or cultures. Rather issues, problems and solutions flow across borders without friction. Second, increased technology drives greater turbulence by rapidly and continuously recasting public policy and management. This opens up both the amount of information available to policy makers and scholars but also demands a much broader set of skills rather than simply traditional public management. Third, turbulence is increased based on the requirement for partnerships between the public sector, private sector and the not-for-profit sector. Addressing societal problems is no longer the sole duty of the public sector but requires the active participation of the private and not-for-profit sector. Like with the global nature of the policy economy having low friction borders, the same is true for these partnerships. Solving problems in turbulent times demands low friction interactions between all the

sectors of the economy. Fourth, with the accelerating pace of change comes the challenge to address complexity and change. High turbulent environment eschews the ability to simply apply the typical command and control template of bureaucracy that worked in less turbulent times. These templates, developed in simpler times, did generally not consider attributes like flexibility and adaptability to solve problems. Rather this lack of easily repeatable templates challenges simple solutions. Finally, turbulence challenges the status quo and does not allow for the often laborious process of research to understand and then react to a problem. The speed of changes does not permit deep research.

Therefore, it is not surprising that problems in a turbulent environment are not solvable using pre-planned solutions (Newland 2008; Ansell and Trondal 2018). Coupling wicked problems in a turbulent environment creates a "perfect storm," however, scholars have been relatively slow to embrace the need to study turbulent environments in favor of more predictable routine environment despite the increasingly interdependent global environment and the speed and unpredictability of world events.

The COVID-19 pandemic is a great example of a wicked problem existing in a turbulent environment. Between 1 January 2020 and 31 December 2021, there were 5.94 million COVID-19 deaths reported. However it is estimated based on excess deaths that the true toll of the pandemic was 18.2 million deaths (Wang et al. 2022). With COVID came a host of governmental problems, from border controls to public health measures to funding for research versus healthcare. National Centers for Disease Control were criticized for not being the center of attention and allowing various other voices to be heard, which resulted in confusion about the truth. Additionally, other governmental agencies were attacked for a lack of trust, scepticism and conspiracy.[2]

In short, COVID neatly fits into our definition of wicked problem in that the problem (and potential solutions) to COVID were not immediately understood, systems were not fully right or fully wrong to address COVID, every solution (e.g. masking) was a one-shot operation and the parameters of the disease were, for a long time, perceived to be novel and unique. We also suggest that the environment that COVID emerged in fits the definition of a turbulent one since the world is highly interconnected from a political,

[2] We appreciate this phrasing from one of our anonymous reviewers.

economic and social perspective, rapid technology changes exist to speed knowledge accumulation and knowledge sharing, international coalitions are no longer just limited to the public sector but also include the private and not-for-profit sector and COVID did not allow for a laborious process to understand and react to the disease.[3] We are not suggesting that wicked problems occur more often during turbulent times but rather than it just adds to the complexity of trying to address them.

In short, there is great variability in both the case rate and the death rate reported across different countries. Thus, it is clear that the different governmental characteristics of the various countries could help explain the spread of the virus.

Characteristics of Government

The knowledge that organizational characteristics matter in all types of performance-related outcomes is not new and scholars have found linkages between performance environmental instability and organizational structure on performance (Keats and Hitt 1988), and between organizational characteristics and innovation (Arad et al. 1997). With public sector scholarship, linkages have been found between organizational characteristics and innovation (Bysted and Hansen 2015), between organizational characteristics and organizational resiliency (Boin and Van Eeten 2013) and organizational characteristics and cross-sector collaboration (Bauer et al. 2022).

Underpinning the research on organizational characteristics is the sheer breadth of characteristics that exist and may be relevant to the goal of this paper: understanding which characteristics – either alone or in concert with other characteristics – have the potential to address wicked problems in a turbulent environment. In this research, we focus on five characteristics (trust in politicians, civil liberties, stringent pandemic policies, GDP per capita and technical readiness). We do not argue that these are all of the possible characteristics that could address wicked problems in a turbulent environment. Rather, we readily acknowledge that a virtually unlimited number of characteristics could be salient but chose these characteristics since they range from

[3] This is not suggest that no pre-planning had been done for a pandemic. Prior to leaving office, U.S. President Obama left a document entitled, "Playbook for Early Response to High Consequence Emerging Infection Disease Threats and Biological Incidents". We thank one of our anonymous reviewers for bringing this to our attention.

highly fixed (e.g. GDP per capita) to highly variable (e.g. stringency of pandemic policies). The other characteristics are somewhat changeable but generally not very quickly. Given the relatively short duration of COVID, it is unlikely that any characteristic, other than stringency of pandemic policies) would have material movement during the COVID era. Even then, the propensity of a national government to employ stringent pandemic policies is a characteristic of that government. As such, we believe that these factors touch on different governmental characteristics and offer the ability to provide broad insight into solutions.

Trust in Politicians

For policymaking, politicians occupy a central place in an information network, which allows them to deal with complex, multi-level policy areas such as COVID-19 (McNutt and Rayner 2012). Government is at the physically and informationally centered in the control and flow of information, and if exercised properly, this centrality gives government – both bureaucrats and politicians – a reason for the government to be heard. However, the effectiveness of position is limited by the credibility of the government and those that represent it (politicians) (Hood and Margetts 2007). That is, if government is viewed as non-credible, it means that the government is unable to effectively coordinate its citizens and create collaboration among all of the government's stakeholders (McNutt and Rayner 2012) and we would suggest that this makes it relatively difficult to change this trust in the short term. An example of low trust in government is the frequent cries of "fake news" that have permeated the U. S. public discourse and serve to highlight cracks in this trusted position. Governments that cannot gain the trust of their citizens have lesser capability to act on their behalf (O'Flynn 2021). Thus, a government's ability to take action is less dependent upon the function that it operates with but rather the amount of influence that it can bring to bear.

Therefore, trust is an important part of managing a pandemic and highly trusted governments try to leverage that trust by providing scientific and technical information to legitimize problems and encourage appropriate responses (Weible et al. 2020). Trust in government and politicians plays an important role in increasing the public's confidence so that official advice will be heeded.

Trust is complicated though. For citizens, trust in government refers to their belief that its government and its politicians are capable of and are acting in a way that is consistent with impartial data. These perceptions can be skewed by partisanship, news reports, and past interactions with government (Resnick 2020). In the era of COVID-19, trust in government underpins public actions and actions and is closely related to the citizen's following the rules and guidelines espoused by the government (Fancourt et al. 2020). However, lack of trust fuels the spreading of misinformation and, this is especially true during the COVID-19 pandemic (Laato et al. 2020).

Governments are expected to care about their citizens and thus we would expect that most governments would offer information to help its citizens avoid COVID. Hence, we would expect that if politicians were trusted, citizens would experience better COVID outcomes (high vaccine and testing and low cases and deaths).

Civil Liberties

There are numerous ways to categorize governments along their use of civil liberties, which refers to the government's ability to command and permit actions using its legal or statutory power (Hood 1983). The political compass model arrays governments on two dimensions, how the economy should be run and the extent of personal liberties that should be allowed (Lester 1994). The personal liberties axis has as its endpoints "libertarian," which reflects the belief that personal freedoms should be maximized while the other endpoint is "authoritarian", which reflects the belief that the government should be obeyed. An authoritarian government is one that possesses strong centralized control and provides limited political freedoms for its citizens, while a libertarian government believes in the right of the people to make decisions (Lester 1994).

The ability of government to maintain civil liberties during the pandemic is a citizen concern (Friedersdorf 2020) and is likely difficult to change, at least within the short term. The challenge for citizens of countries with high civil liberties is that they are simply not experienced in having those liberties curtailed and will, after a while, rebel against such restrictions (Friedman 2020). Not surprisingly, a citizenry that is not used to having many civil liberties may prove to make it easier for authoritarian governments to control the actions of its citizens (Bertrand 2015). As such, highly repressive governments have the ability, for better or worse, to strictly control the information that

is shared with the public and can demand the public to acquiesce to different requirements. However, countries with high civil liberties would tend to trust their people to do the right thing despite having the opportunity to not do so. Thus, we would expect that countries with high civil liberties would be more likely to experience better COVID outcomes (e.g. high vaccine and testing and low deaths and cases).

Stringent Pandemic Policies

One way that governments took action is by how strict its policies were for dealing with the pandemic (Gostin and Wiley 2020). These policies are different from civil liberties in that these refer to the stringency of the policies themselves while civil liberties is focused on the propensity of individuals to follow those policies. For example, an estimated 92% of people in Singapore adopted mask wearing, while only approximately 1% of people in Finland did (Council on Foreign Relations, n.d.).

Numerous policies were enacted by different countries throughout the pandemic and these were captured by the Government Stringency Index. The policies included school closures, workplace closures, cancellation of public events, restrictions on public gatherings, closures of public transportation, state-at-home requirements, public information campaigns, restrictions on internal movements and internal travel controls: all aspects that are within the government's purview to change quickly. While government use of stringent pandemic policies may vary, there is an enduring, underlying propensity to use such measures that is a characteristic of the government itself, which would be difficult to change quickly. Governments with a high propensity towards stringent pandemic policies will show higher stringency maxima and greater use of such measures in comparison to governments with lower propensity. Given that these policies were governed by the best science that existed at the time, we would expect that countries who, by their propensity to do so, employed more stringent pandemic policies would be more likely to experience better COVID outcomes (e.g. high vaccine and testing and low deaths and cases).

GDP per Capita

Simply put, fighting a pandemic is a costly proposition in many ways. First, the cost to conduct research into the causes and possible cures for COVID are out of reach of most

countries due to the tremendous cost of doing so. Second, the cost to develop and deploy vaccines to the citizenry is similarly out of reach to most countries both in terms of government expenditures plus private industry expenditures. Third, there is a tremendous cost to simply shutting down major functions and industries as was done under the more stringent pandemic policies.

It is tempting to only look at the value of government expenditures in assessing the financial cost of COVID but, for several reasons, we suggest that GDP per capita is a better measure of the costs necessary to fight the pandemic. First, while government certainly spent a considerable amount to fight the pandemic, there was also a substantial price paid by industry and private citizens. For example, the *Journal of the American Medical Association (JAMA)* estimates that the total cost of the virus to be $16t when considering the direct and indirect economic losses due to the pandemic (Cutler and Summers 2020). Second, government spending alone fails to capture how the money is being used and how efficiently it is being spent. Hence, we suggest that GDP per capita is a better measure of the total financial resources available to fight the pandemic and suggest that having substantial financial resources in both the public and private sector should lead to better COVID outcomes (e.g. high vaccine and testing and low deaths and cases). While this characteristic is somewhat changeable, it is difficult to rapidly change.

Technical Readiness

Technology is an important tool in fighting the pandemic and its uses range from the biomedical technology used to understand the virus and build the vaccine to the technology required to manage a national (or global) supply chain to deliver the vaccine into the arms of individuals spread throughout a country. Already government is using technology to improve productivity, enhance cross-functional collaborations, and increase personalized e-services for taxpayers. Information technology has transformed the way that the public sector runs its operations, delivers services, and manages for the public good (Dawson et al. 2016). As such, we incorporate technological readiness into our model and recognize that this characteristic, while changeable, is not changeable within the period of study.

Much of the transformation has been prompted by the private sector as citizens expect government to deliver high-quality, real-time digital services (Mergel et al. 2019). As a result of this citizen pressure, governments are changing their mode of operation to improve public service delivery, increase transparency, and be more efficient in their technology design and infrastructure.

As such, technical readiness, one of the twelve pillars of the Global Competitiveness Index (World Economic Forum 2018) refers to the country's ability to quickly adopt existing technologies to meet the changing demands of the country, for example, in a pandemic. A critical component of this is the omnipresence of technology in the daily life of a country as this creates greater innovation and greater efficiency. At its heart, technical readiness refers to the characteristic of a national government to have and be able to deploy technology that can be used to face a variety of problems (World Economic Forum 2018). As such, we would expect a country with high technical readiness to have better COVID outcomes (e.g. high vaccines and testing and low deaths and cases).

Research Question

We situate this study in the public sector context and examine various governmental characteristics in stopping the spread of COVID-19. All governments have all of these characteristics but exhibit them at different levels. For example, the U.S. has a GDP per capita of $63 thousand while South Africa's was $5 thousand. Similarly, in May 2022 Shanghai was under hugely restrictive pandemic policies while in New Zealand virtually all pandemic policies were removed.

Accordingly, our research question is: What characteristics or combination of characteristics shape government effectiveness when dealing with wicked problems in times of turbulence?

Data and Methods

Data

There are fixed and variable components of the sets – the variable component is stringent pandemic policies as the government can quickly change the policy

restrictions on a population; the fixed components are the remaining elements of the model, as, ceteris paribus, they generally take longer to move and 18 months is too short to measure change in their values. Data for fixed national indicators were selected at a time closest prior to the WHO's pandemic declaration on 11 March 2020, representing the country's pre-pandemic readiness. Data for stringent pandemic policies were captured around the 3, 6, 9, 12, 15 and 18 month anniversaries of the first reported instance of COVID-19 in the country. We note that while strategic pandemic policies may change between observations, each country has a tendency towards higher or lower values, indicating a fixed and underlying predisposition to use such policies in comparison to other nations.

We also tracked the change of the country's outcomes in each three-month period and benchmarked it against the global sample. This allowed countries to move between effective and ineffective over time. Recent literature has noted an average time between policy implementation and effectiveness of the policy as being two weeks (Dey et al. 2021). In addition, recent literature has also identified the average lag between cases and deaths as being four weeks (Donovan et al. 2021). This allows us to calculate the policy impact for all four outcomes of interest as the appropriate point. The cases, vaccination and testing outcome variables are captured at time D, while the government stringency index of pandemic policies is captured at D-14 and the death outcome at D+28. This then forms a set at a particular point in time.

Our data set is comprised of 130 countries for which all national data elements were reported. All statistics were either specific to a national condition (i.e. technological readiness) or were normalized to the population (i.e. GDP). The sources of data are described in Table 1. Where an ordinal Likert scale was used (i.e. technical readiness), a linear scale was applied; and where orders of magnitude difference were observed (i.e. COVID-19 cases), a logarithmic scale was applied.

Element	Condition	Data Source	Data Type	Scale
Conditions	Trust in Politicians	World Economic Forum Global Competitive Index (GovData360)	Likert	Linear
	Technical Readiness		Likert	Linear
	GDP per Capita	IMF World Economic Outlook 2020	Dollars per person	Log
	Civil Liberties	Democracy Index 2019 (The Economist)	Likert	Linear
	Stringent Pandemic Policies	Oxford Stringency Index	Percent	Linear
Outcomes	Cases	European Centre for Disease Prevention and Control	Cases per million	Log
	Deaths		Deaths per million	Log
	Tests	Ministry of Health Data and World Health Organization (Our World in Data)	Test per thousand	Log
	Vaccination		Vaccines per hundred	Log

Table 1 – Dataset Sources and Characteristics

Qualitative Comparative Analysis (QCA)

For our analysis, we employed Qualitative Comparative Analysis (QCA), which seeks to identify causal recipes of conditions related to the occurrence of an outcome in a set of cases (Fiss et al. 2013). In QCA, each case is viewed as a configuration of conditions that we need to understand through examining the conditions, the relationships among the conditions, and the relationship of the conditions to the case as a whole (Ragin 2000). QCA applies Boolean logic to determine configurations of conditions, where each condition does not have a unique impact on the outcome, but rather acts in combination with all other conditions (Berg-Schlosser et al. 2009). The presence of a condition may contribute to a positive outcome in one configuration and a negative outcome in another, while those positive and negative outcomes are described by different configurations (Fiss et al. 2013). The concept of causal complexity suggests that no single condition is either necessary or sufficient for the outcome, while the concept of equifinality suggests that multiple combinations may produce the outcome rather than a single optimum solution (Rihoux and Ragin 2008). These two concepts make QCA particularly well suited to address wicked problems in turbulent environments.

Fuzzy-set Qualitative Comparative Analysis (fsQCA) is a type of QCA with condition scores in the interval between 0 and 1, representing being fully-in and fully-out of the set of interest (Ragin and Davey 2016). A variation of fsQCA is time series QCA (tsQCA), which adds a temporal element to the analysis, essential creating panels of data by an entity in successive time periods (Hiro 2009). QCA is generally divided into three steps: data table construction, truth table construction and logical reduction (Fiss et al. 2013). First, a data table is constructed by converting the raw data into its operationalized form where each respondent becomes a case with the value of each condition between 0 and 1, representing the degree of absence or presence of the condition and hence set membership, through the process of calibration (Fiss 2011). Calibration involves determining points of full membership and full non-membership and a point of maximum indifference regarding membership in order to transform raw scores into the degree of set membership in the interval between 0 and 1. The second step is designed to reduce the number of rows to a truth table, which is a table of configurations that shows how each configuration yields a particular outcome. The third step addresses the logical reduction of the truth table into simplified combinations by

making inferences about the presence or absence of non-observed data that can simplify a solution (Ragin 2000).

Consistency and coverage are two concepts important to consider in the evaluation of QCA solutions. Consistency is the degree to which a relation of necessity or sufficiency between a combination of conditions and an outcome is met within a given set of data (Fiss 2007). Consistency can range from 0 (indicating no consistency) to 1 (indicating perfect consistency). Consistency is reported as raw, but there is also an error-correcting version of consistency known as Proportional Reduction in Inconsistency (PRI) that eliminates the influence of cases where the causal condition is a subset of both the outcome and the negation of the outcome (Mendel and Ragin 2010). For raw consistency, 0.75 is the minimum with 0.80 to 0.90 preferred and for PRI consistency, 0.50 is the minimum and with 0.60 to 0.80 preferred (Rihoux and Ragin 2008). Coverage is a measure of empirical relevance that captures the degree of overlap between sets or between a set and the overall solution space, again ranging from values of 0 to 1 (Fiss 2007). Coverage can be either unique to a particular configuration or shared between configurations (Rihoux and Ragin 2008). Consistency resembles the correlational concept of significance whereas coverage resembles the concept of R-squared (Schneider and Wagemann 2010). Conditions can be core or peripheral, with the former having a stronger causal relationship with the outcome than the latter based on their different treatment of redundant and unobserved conditions (Fiss 2011; Ragin 2000).

Results

In order to identify if there were any dominant conditions, we first examined the correlations between conditions and outcomes as provided in Table 2.

The strongest correlation was between GDP per capita and technical readiness, which would indicate that those countries with the greatest productivity invest their wealth into technology that serves an organizing function. Around GDP per capita and technical readiness is a third construct that is also highly correlated (at least 0.50) with them – civil liberties. Together, these conditions suggest that the democratic countries with high civil liberties tend to have higher resource levels and better technical preparedness

than autocratic countries with lower civil liberties. Trust in politicians and stringent pandemic policies have very few or no high correlations with other constructs.

Condition/ Outcome	Mean	Standard Deviation	Trust in Politicians	Civil Liberties	Pandemic Policies	GDP per Capita	Technical Readiness	Cases per Million	Deaths per Million	Tests per Thousand	Vaccinations per Hundred
Trust in Politicians	.410	.263	1								
Civil Liberties	.671	.342	-.008	1							
Stringent Pandemic Policies	.508	.308	-.120**	0.000	1						
GDP per Capita	.581	.245	.422**	.502**	.125**	1					
Technical Readiness	.634	.241	.489**	.582**	0.014	.915**	1				
Cases per Million	.457	.325	0.040	.390**	.301**	.547**	.500**	1			
Deaths per Million	.472	.342	-.164**	.383**	.310**	.386**	.331**	.876**	1		
Tests per Thousand	.442	.296	.433**	.300**	0.015	.767**	.748**	.593**	.352**	1	
Vaccines per Hundred	.451	.332	.252**	.424**	.276**	.658**	.657**	.597**	.451**	.591**	1

Table 2 – Correlation Matrix

The various conditions' correlations with the outcomes have some very common features. Civil liberties, GDP per capita and technical readiness are significantly and *positively* correlated with all four of the outcomes – cases, deaths, tests and vaccines. Stringent pandemic policies are also significantly and positively related to cases, deaths and vaccines.

Following the correlation analysis, regression models were developed for each of the four outcomes, as presented in Table 3. For each model, the variables were entered into the model in a stepwise fashion.

	Cases			Deaths			Testing			Vaccination		
	B	SE	P	B	SE	P	B	SE	P	B	SE	P
(Constant)	-.082	.031	.008				-.087	.025	<.001	-.251	.039	<.001
Trust in Politicians	-.228	.044	<.001	-.393	.045	<.001						
Civil Liberties	.085	.036	.019	.184	.035	<.001	-.157	.027	<.001			
Stringent Pandemic Policies	.242	.031	<.001	.250	.034	<.001	-.052	.025	<.001	.266	.040	<.001
GDP per Capita	.512	.096	<.001	.550	.056	<.001	.616	.079	<.001	.245	.125	<.050
Technical Readiness	.246	.111	.027				.476	.084	<.001	.670	.126	<.001
	R^2=0.398 SE=0.253			R^2=0.341 SE=0.279			R^2=0.626 SE=0.181			R^2=0.507 SE=0.234		

Table 3 – Regression Models

Findings from the regression models both support but also contradict the findings in the correlation analysis and our observations for cases and deaths. While trust in politicians had limited correlation to other constructs, it was a key variable in the cases and deaths outcome in that *higher* trust in politicians led to *lower* cases and deaths. Higher civil liberties appeared to contribute in a limited fashion to both higher cases and deaths. Stringent pandemic policies were higher in countries with high cases. Higher GDP per

capita was the most significant factor in both higher cases and deaths. Technical readiness appeared to play a limited role in higher cases but no role in deaths.

GDP per capita was important as testing and vaccination appeared higher in high GDP countries, though this was more the case for testing than vaccination. Civil liberties proved to be negatively correlated to testing and not correlated to vaccination. The most positive correlation for vaccination and second most significant for testing was technological readiness.

For the tsQCA, the frequency cut-off was set at 90% of the cases to avoid any single-nation outliers – this ranged from seven case cut-off for vaccinations, 11 for testing and 19 for cases and deaths (the first two due to the lack of consistency of reporting in some countries). Truth tables are reported in Appendix A (available as an online supplement). The consistency cut-off for automatic inclusion was set at a raw consistency of 0.80 and a PRI consistency of 0.50 (Rihoux and Ragin, 2008).

	Cases				Deaths				
	CH1	CL1	CL2A	CL2B	DH1	DL1	DL2A	DL2B	DL2C
Trust in Politicians		⊗	●	⊗	⊗	⊗	⊗	●	⊗
Civil Liberties	●		⊗	⊗	●		⊗	⊗	⊗
Stringent Pandemic Policies	●			●	●	⊗	●		●
GDP per Capita	●	⊗	●	●	●	⊗		●	●
Technical Readiness	●	⊗	●		●	⊗	⊗	●	
Raw Coverage	.583	.544	.238	.233	.486	.403	.269	.251	.233
Unique Coverage	.583	.288	.025	.005	.486	.181	.019	.036	.001
Consistency	.816	.893	.811	.872	.832	.865	.885	.831	.849
Solution Coverage	.583	.580			.486	.530			
Solution Consistency	.816	.834			.832	.823			

Table 4 – tsQCA Results for Cases and Deaths

	Testing				Vaccination			
	TH1	TL1A	TL1B	TL2	VH1	VL1A	VL2A	VL1B VL2B
Trust in Politicians	●	⊗	⊗		●	⊗		⊗
Civil Liberties	●			⊗	●		⊗	⊗
Stringent Pandemic Policies					●			●
GDP per Capita	●	●	⊗	●	●	⊗	●	
Technical Readiness	●	●	⊗	●	●	⊗	●	⊗
Raw Coverage	.591	.586	.508	.254	.401	.556	.295	.263
Unique Coverage	.591	.178	.112	.020	.401	.257	.035	.006
Consistency	.754	.778	.980	.779	.803	.923	.819	.943
Solution Coverage	.591	.719			.401	.599		
Solution Consistency	.754	.771			.803	.856		

Table 5 – tsQCA Results for Tests and Vaccinations

The most striking thing about this analysis is the similarity of the attributes that produce negative outcomes (cases and deaths) and positive outcomes (testing and vaccination). High civil liberties, stringent pandemic policies, high GDP per capita and high technical readiness were linked to more cases and deaths. High civil liberties, high GDP per capita and high technical readiness were linked to higher testing and higher vaccination, along with strict pandemic policies for just higher vaccination. The most notable difference between high outcomes is that high trust in politicians was important for testing and vaccination but not cases or deaths.

Almost all European states (25 including the UK), five Middle Eastern states (Israel, Bahrain, Jordan, Kuwait and Qatar), and four Americas states (US, Canada, Panama and Chile) were high in all outcomes in the majority of time periods. Common across all countries in all time periods was a high GDP and technical readiness. Two thirds of the countries changed from high to low pandemic policies and back during the 18 months and the majority of those that did not change maintained high pandemic policies throughout. There were three archetypes of high-performing states – those western countries with high civil liberties, fast rising Gulf States, and eastern European and Mediterranean countries tilting from the Russian to EU sphere of influence who had citizens with a healthy distrust of their politicians.

Almost all of the Western, Central and Eastern African countries in the sample (14 of them) and the majority of South Central and South East Asian countries (12 of them, including China, Japan and South Korea) were low in all outcomes in the majority of the time periods. The most common configuration for these countries were low in all policy characteristics, but there were many more configurations than in the high outcome set, up to and including high in all characteristics. The vast majority of these countries were in an archetype low in trust in politicians, low GDP and low technical readiness but there was a much wider variety in civil liberties and pandemic policies. The South East Asian countries were the exceptions in that this archetype had high GDP and technical readiness in comparison to the other low outcome states.

Interpretation of Results

Construct Analysis

We first discuss each construct individually, comparing correlation, regression and tsQCA findings, and then interpret their causally complex relationship together.

Trust in politicians was moderately correlated to GDP per capita and technical readiness but only moderately correlated with testing in outcomes and negatively correlated with deaths. Similarly, a negative relationship was found with cases and deaths in the regression model, but no relationship with testing and vaccination. In the configurational analysis, for cases and deaths, trust in politicians was almost uniformly low (or unimportant) for high and low outcomes. For tests and vaccinations, trust in politicians became much more important and indicative of positive outcomes, including being a core condition in some configurations. This support's O'Flynn's (2021) observation that trust is necessary for capacity to act. There were mixed results across analyses, but the preponderance of evidence is tied to higher trust in politicians resulting in somewhat lower cases and deaths but higher testing and vaccinations. Certainly one of the observations from this is that, while high trust in politicians can be helpful, other nodes in the network can provide the necessary information if the politicians are not trusted. Despite that, taking active steps – testing and vaccinating people – requires substantial trust and, in numerous cases, government has not shown itself to be trustworthy (Fancourt et al. 2020). This echoes a key theme in wicked problems: the tossing out of rationality in the solution set.

Civil liberties was most highly correlated to GDP per capita and technical readiness and with all the outcomes. It had a small but significant positive impact on cases and deaths but negative impact on testing. High civil liberties was a core condition for all high outcomes and low civil liberties was frequently a core condition for low outcomes. It is clear that civil liberties is a double-edged sword. People in high civil liberties countries have been posited to initially acquiesce and then later rebel against restrictions but, if they did rebel, they would still seek the vaccine (Friedman 2020). In addition, highly liberal countries may have more expectations to correctly report pandemic statistics – whether good or bad – than more authoritarian regimes. This may reveal the double-edge sword in solving wicked problems as highlighted by Geuijen et al. (2017) who pointed out that wicked problems are made worse when the problem is not confined to a single agency or department. In this case, countries that have low civil liberties may have a distinct advantage in solving problems such as COVID that requires consistent

collective action, since these countries have the ability to speak with a single voice and then direct – rather than request – that citizen take certain actions.

The implementation of stringent pandemic policies had negligible correlations with any other government characteristics, but had significant correlations with cases, deaths and vaccinations. Stringent pandemic policies had small contributions to the regression models and was a core condition in the tsQCA for the same three outcomes. Pandemic policy interventions can scale up or down based on technological sophistication of the country (Esmark 2019). This was most clearly demonstrated in the tsQCA where both pandemic policies and technical readiness were present together in three high outcome configurations. Overall, pandemic policies and the underlying propensity of the government to deploy them had a moderate impact on pandemic outcomes but that impact was accentuated or attenuated by other factors. This suggests that this government characteristic was helpful in resolving the pandemic but was not likely the panacea that governments imagined it to be.

GDP per capita was highly correlated to civil liberties and technical readiness as well as with all the outcomes but deaths. GDP per capita had the highest loading in the cases, deaths and testing regression models. High GDP per capita was a core condition for cases and deaths and a peripheral condition for testing and vaccinations. This would be expected in the latter two, but is unexpected for the former two. However, both high and low GDP per capita appeared in all low outcome configurations, suggesting that while having a high GDP is necessary to achieve a positive outcome, it is not sufficient to avoid negative outcomes. This would seemingly align with calls for higher wealth countries to share more vaccines and other resources with lower wealth countries. This embodies the problem with wicked problems: the typical rational response made by government is not sufficient in solving wicked problems (O'Flynn 2021).

Technical readiness was highly correlated with civil liberties and GDP per capita and all outcomes, most strongly with testing and vaccination. The strength of this relationship was reinforced by the regression models, where technical readiness was the most critical contributor to vaccination and the second most to testing. In the configurational analysis, technical readiness was a peripheral condition in all high outcome solutions. However both high and low technical readiness appeared in low outcome configurations, suggesting that while high technical readiness is necessary to achieve a

positive outcome, it is not sufficient to avoid negative outcomes. Again, the first two outcomes were contrary to our expectations while the last two supported them.

Country Analysis

It is important to note that the ideal positioning for a country to be in would have to be low cases and deaths and high testing and vaccinations (the latter in the second year of the pandemic). Please see Appendix B for details (available as an online supplement).

There is no single country that appears in all six periods within the group of high-performing countries. The highest-performing state was Hong Kong with five appearances in the list, which was high in all areas other than pandemic policies for the first year of the pandemic and then shifted to high in all areas. It is also notable, however, that the approach of Hong Kong since early fall 2020 when civil liberties were curtailed has evolved towards more severe use of pandemic policies and so the lessons to be learned from March 2020 may be limited (Law 2021). Finland, New Zealand, Bhutan, Saudi Arabia and Singapore each appeared four times in the list. Finland, New Zealand and Singapore were very similar to early Hong Kong in that they had were high in all areas but pandemic policies, using the latter sparingly or not at all. Bhutan and Saudi Arabia were both low in civil liberties, and used, and could be inferred to have had a higher propensity to use, pandemic policies more than the other three countries, mirroring the approach in Hong Kong from late 2020 onwards.

The key difference between high and low outcome countries was based almost solely on the dramatic differences in the much lower GDP and a much poorer technical readiness in the latter. While the majority of countries in both extremes had low trust in politicians, which supports Margetts and Hood's (2007) belief that in the absence of "trust, governments are more likely to have to resort to the use of treasure or organization to effect changes" (p. 151). In addition, more high outcome states had high civil liberties, while more low outcome states had low. While it is possible that lower civil liberties permit these low outcome nations to more effectively contain the spread of the virus, due to the high transmissibility of the virus it may be more likely that these countries are either unable to report an accurate number of cases for technical reasons (e.g. lower technical readiness) or they choose not to accurately report them for political reasons (e.g. low civil liberties) (Eliasaf and Motwany 2020). Finally, pandemic policies and the propensity to use them varied greatly among high and low outcome nations,

suggesting that while changes to pandemic policies could be tangible short-term demonstrations of government decisiveness, their effectiveness was amplified or attenuated by the longer-term underlying strengths or weaknesses of the country in GDP per capita and technical readiness.

Summary

In reviewing our research question, we would expect positive conditions such as deploying stringent pandemic policies, technical readiness, and GDP per capita, in countries with more trust in government to test and vaccinate more and thus better control cases of COVID-19 with lower cases and deaths. However, we only found this to be true for higher rates of testing and vaccination. Conversely, we would expect countries with lower propensity to employ stringent pandemic policies, technical readiness, and GDP per capita in countries with closed, authoritarian and distrusted governments would be less able to mobilize testing and vaccination programs and hence see greater spread of COVID-19 and hence higher cases and deaths. However, we again only found that they tested and vaccinated less. This suggests that we were observing differences in reported cases of and deaths from COVID-19, and that this novel (in 2020) COVID was much more widespread than the statistics would indicate, particularly in nations lacking the technical capacity and/or political motivation to report accurately.

Interestingly, we found that stringent pandemic policies, while important, had different levels of importance to our COVID-related outcomes. From a cases standpoint, a propensity towards stringent pandemic policies was one of several government characteristics that reduced the number of cases and deaths and improved vaccination rates but were not related to increased testing. This suggests that this heavily enacted strategy to fight COVID was, at most, a contributor to solving the problem versus the panacea for all things COVID that many governments believe or espoused. That is, the key to solving COVID is heavily embedded with basics of good government that should have been done in the years or decades prior to the pandemic.

From a theoretical standpoint in examining the COVID-19 pandemic as a case study of wicked problems, we can see several of the different suggested concepts in action. Problem definition from the outset was an issue (Conklin 2006) – from containment to testing to PPE distribution to vaccination programs - and each problem had different

sets of agency actors who were often in conflict with each other (Geuijen et al. 2017). To address the pandemic challenge, nations used different methods to generate candidate solutions (Roberts 2000) - from authoritative to competitive to collaborative - the latter often resulting in delays to reaction (Rittel 1972). Recognizing that existing plans and solutions were unable to address the ever-shifting problem (Newland 2008), countries focused on intervening with different pandemic policies to intervene in the trajectory of the pandemic (Knapp 2008). However, our analysis suggests that those policy choices were constrained by the underlying characteristics of the government in power at the time of the pandemic.

We also find theoretical support from viewing this as a turbulent time period, using Merget's (2003) lens. First, the fact that the virus was easily transferred from one unknowingly infected passenger on a plane to another passenger emphasizes the interdependence of all countries in addressing the problem. That is, the lax attitude of one country in addressing the pandemic greatly impacted the spread of the virus from the lax country to a significantly stringent one. Second, we saw that the rapid mutation of the virus added to the complexity of the challenge of solving the pandemic. The virus did not allow for scientists and other researchers to engage in their normal and often lengthy process of research. Developing solution for one mutation did not completely resolve the issue due to the rapid mutation of the virus, as some strains were more virulent while others were more transmissible, each requiring different policy solutions. The global nature of the political economy and the challenges to address complexity and change are two of the core elements of turbulence research.

In addition to the theoretical support that our study uncovered, it also challenged some of the basic theoretical premises of studies in turbulent times and this calls for review of the study of turbulence. First, a key component of turbulence (Merget 2003) is that turbulent times require partnerships to form between the public sector, private sector and not-for-profits. While we agree that these entities are important, this theorizing does not go far enough in acknowledging the global aspect of the COVID-19 pandemic and does not address the communication that comes with it. At various times, some countries, including Morocco, Bhutan, Australia, Israel and New Zealand (McClanahan, 2022) closed down completely to try to stop the virus but, due to vast interconnected global travel and the incubation period of the virus, global partnerships were required, not merely national ones. Further, the national governments were not the only conduits

of information to the private companies and not-for-profits within the given country. Rather, while national governments spoke to other national governments, private companies in one country spoke to their counterparts in other countries (as well as to the national government of the other country) and not-for-profits did the same, all in a strongly networked fashion. While we note that nothing in the turbulence literatures obviates the partnership concept to be bound within a single country, few if any known studies have explicitly considered the global partnership requirements as well as the network style of communication. This finding offers the possibility of a much more robust view of wicked problem solving in the era of turbulence.

A second theoretical challenge that we found to the current literature on turbulence is regarding the impact of increased technology. Merget (2003) argues that greater levels of technology drive greater turbulence by providing vast amounts of data for policy makers to absorb and act on. However, in this case, we would suggest that the greater amount of technology enabled more targeted policy solutions since many (but not all) entities from around the world shared data allowing quick convergence on the basic parameters of the problem and the potential solution. In this way, technology, we argue, decreased turbulence due to its widespread availability. While countries acted on this information at different speeds, the information was widely available and then repeatedly confirmed. Thus, we find that turbulence research may be short-sighted in viewing greater technology as a detriment (due to the vast amount of information it can generate) and needs to consider it as an enabler in solving the problem.

Conclusion

This paper makes several important contributions.

First, we find support for adopting a characteristics-based approach for studying outcomes of wicked situations in turbulent times. Different government characteristics had dramatically different efficacy in facing some issues (e.g. death rate) but also very low efficacy in predicting other issues (e.g. testing). This is helpful given the relative strength and immutability of some of the characteristics (e.g. GDP per capita). As such, to address further pandemics, a government can use our research to compare what worked during COVID-19, assess itself relative to our characteristics and then focus on a smaller handful of additional characteristics that could be helpful. This sort of analysis

shows that the insistency of a certain characteristic (e.g. stringent pandemic policies) are not the only successful path in fighting future pandemics.

Second, this research shows that there is not one single configuration predicting all of outcomes of interest. Rather casual complexity exists and this offers different paths for predicting cases, deaths, testing and vaccinations. That is, there is no imperative for all nations to follow a single path. This is helpful as not all governments are dealt the same hand of characteristics, however, those governments can evolve over time to model those who are more successful in protecting their citizens. Insights of this type are a particular strength of using a configurational method paired with traditional correlational techniques when facing causally complex problems. What is clear is that the more resource rich to organize, technically able to identify and politically free to report cases a nation is, the more cases and deaths they will find. This supports the imperative of nations to invest heavily in testing and to cooperate in transparent sharing of data on the pandemic as national vaccination programs progress at different rates.

Third, troubling data issues exist with regards to the reporting of cases and deaths. While, on the one hand, it is tempting to simply dismiss these are innocent errors, we cannot help but notice that the countries that were dramatic outliers in cases and deaths also have a history of distorting unpleasant news to suit their political aims. While we are not asserting this to be the case, a number of reputable news agencies in the West have reported that China's actual death rate is under-reported by an astounding 17,000% (Calhoun 2022). Similar accusations have been made against Russia (Rainsford 2021). Current estimates are that the actual number of worldwide deaths is more than threefold the reported deaths (Wang et al. 2022). As such, the true final analysis of the impact of COVID and the effectiveness of different measures may not ever be known, which is particularly disconcerting as the COVID virus continues to mutate.

Fourth, we found both support for prior theorizing regarding turbulent times and found areas where research needs to catch up to practice. Exploring these conditions is a valuable endeavour for future researchers.

In conclusion, COVID-19 is not the final pandemic that the world will face but is only the most recent one. Others are sure to follow. What we can learn from COVID-19 is that governments display a variety of characteristics at that create or constrain options to

address wicked problems such as the pandemic. Governments must consider those characteristics as a particular recipe of elements rather than a single ingredient that will cure all. We do not assert that these are the only characteristics governments have, rather we vigorously assert that many others exist and could potentially be important ingredients. However, rigorous research is necessary to uncover what additional characteristics exist, what combinations of characteristics work together most efficaciously and under what situations. In some sense, the world was fortunate with COVID as only 18m people worldwide died from the disease two years into the pandemic (Wang et al. 2022). The effort to deeply understand what government characteristics allowed nations to face more or less effectively the pandemic is a necessary first step to addressing future such wicked problems in turbulent times.

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