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Weaving public health and safety nets to respond the COVID-19 pandemic

Di Fan a, Yi Li b, Wei Liu c, *, Xiao-Guang Yue d, Georgios Boustras e

a Department of Management & Marketing, Swinburne Business School, Faculty of Business and Law, Swinburne University of Technology, Melbourne 3123, Australia
b Discipline of International Business, The University of Sydney Business School, Sydney, NSW 2006, Australia
c Business School, Qingdao University, Qingdao 266110, China
d Department of Computer Science and Engineering, School of Sciences, European University Cyprus, Nicosia 1516, Cyprus
e Center of Excellence in Risk & Decision Sciences, European University Cyprus, Nicosia 2404, Cyprus

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ABSTRACT

How do governments take strategic actions in weaving public health and safety nets to respond to the COVID-19 pandemic? Embracing Moore’s strategic action framework, this study investigates how municipal governments can configure authorizing environment—operational capacity—public value attributes to weave public health and safety nets, in order to prevent and control the public health and safety emergency. Leveraging fuzzy-set Qualitative Comparative Analysis (fsQCA) with a sample of 323 Chinese cities, we identify a distinctive taxonomy of four equally effective configurations of urban actions in blocking COVID-19 transmission: social reassurance, proactive defence, decisive resiliency, and strengthened coercion. Overall, this study provides a novel insight of public health and safety management into battles against COVID-19 in human society.

1. Introduction

When the Chinese central government imposed a lockdown policy to prevent corona virus disease 2019 (COVID-19) on 23 January 2020, the World Health Organization (WHO) marked it as an “unprecedented” event in public health and safety history (Reuters, 2020). However, after 180 days’ experience, this ‘unprecedented’ lockdown has been accelerated as an exemplary urban policy option for mayors and governors across the globe. As COVID-19 is continually spreading, locating an effective public health and safety solution is essential to all municipal governments, if still not one of their central governments’ major concerns. To prevent such a challenging health and safety disaster, countries and their urban societies are adopting various strategies and measures (e.g., scientific research, legislation, community support, organization rearrangement, lifestyle change, economic recovery and education) to gradually reduce the number of confirmed cases and fatalities.

Among these efforts, it has been shown that government functioning and the efficiency of strategic actions play a key role (cf. Chen et al., 2020; Sebastiani et al., 2020). However, in a recent comprehensive review of workplace health and safety research from 1956 to 2019 in 17 leading journals, Fan et al. (2020) found that surprisingly few studies recognize governmental functions or interventions as one of the antecedents to improving public health and safety. To address this gap, this study aims to investigate the strategic actions of governments in preventing or controlling public health emergencies. In particular, we attempt to address an important research question—How do governments weave public health and safety nets to prevent or rescue the COVID-19 pandemic?

To guide our investigation on the effectiveness of governmental responses towards the public health and safety emergencies, we draw on the influential strategic action framework introduced by Moore (1995). Challenging neo-liberal thinking, Moore (1995) contends that governments at different levels should take proactive and entrepreneurial actions to implement public policies in order to create public value (Williams and Shearer, 2011). This study further extends Moore’s (1995) strategic action framework through a configurational approach by combining the three key theoretical angles (e.g., authorizing environment, operational capacity, and public value) in examining the effectiveness of municipal governments preventing COVID-19 transmissions.

Our research context covers 323 cities in China for two reasons. Although the outbreak of COVID-19 is recorded as starting from Wuhan,
and spreading rapidly to most of Chinese cities, Chinese central and municipal governments acted responsibly and promptly in stopping the epidemic transmissions (Chen et al., 2020). The past two decades have witnessed how Chinese governments have successfully managed public safety, disaster prevention and rescue operations, and have significantly reduced the accident rate in their public sector and industry systems (Gao et al., 2019; Wang et al., 2018, 2020). It is useful to share China’s experience with the world, and in so doing to enrich our knowledge in improving public health and safety administration.

This study makes three theoretical contributions. First, to our knowledge, this study pioneers application of Moore’s strategic action framework to analyse the effectiveness of the government’s role in public health and safety management. More importantly, we extend the theory by adding configuration insights and claiming multi-pathways towards weaving public health and safety nets. Second, our findings address Chen et al. (2020) future research direction in order to understand how governments can combine multiple policies, capacities and resources to effectively prevent epidemic transmission. Third, based on empirical findings, we develop a taxonomy of managing public health emergency modes, namely, social reassurance, proactive defence, decisive resiliency, and strengthened coercion. Such a classification not only articulates the multiple paths for configuring public health and safety administration, but also suggests multiple public strategic ‘toolkits’ for policy makers to weave their public health and safety nets.

2. Literature review

2.1. Moore’s strategic action framework and public health administration

When criticizing the dysfunctional status of governmental administration in the US public sector, Moore (1995), embracing a proactive and entrepreneurial spirit, refines the role of governments to create public value through their authorizing power and operational capacity. Combining three key theoretical blocks—the authorizing environment, operational capacity, and public value—governments should take strategic actions to create value and benefit the majority in human society, instead of acting merely as regulators or public service providers (Moore, 1995; Williams and Shearer, 2011).

Moore’s strategic action framework provides a comprehensive analytical approach that reflects how public administration can connect goals and means in their continuous improvement of public services (Williams and Shearer, 2011). From the experiences from multiple countries, such as China, Japan, New Zealand, Singapore and Germany, it is evident that these governments have taken proactive strategic action as a vital step towards controlling and preventing the COVID-19 pandemic (cf. Chen et al., 2020; Cheng et al., 2020). In this sense, Moore’s (1995) theoretical framework is relevant to analysis of public health administration (e.g., coping with the public health crisis of COVID-19 worldwide). We thus detail the relevance of each of Moore’s (1995) theoretical angles in managing public health and safety.

Authorizing environment refers to how governments take legitimating and supporting actions to build a coalition of stakeholders from the public and private sectors (Benington and Moore, 2011; Johansson et al., 2009). Compared with traditional functionalism theories concerning chiefly the regulatory role of governments (such as the functional resonance analysis method (Hollnagel, 2012) and the governmental safety regulatory function view (Gao et al., 2019), this authorizing environment perspective emphasizes legitimating the contingency response for all relevant governmental agencies and administrative mechanisms (cf. Williams and Shearer, 2011). When dealing with public health and safety emergencies, governmental agencies should not only perform their health and safety regulatory functions, but, more importantly, go beyond these to activate or empower other major stakeholders’ responses to an emergency. During the COVID-19 crisis, municipal governments must launch policies directed at three major aspects: (1) to deal with the pandemic itself, (2) to activate social security mechanisms for supporting individuals and communities that are being affected, and (3) to stimulate or protect firms and other local economic players, which, in turn, ensures a sustainable approach in rescuing the locals from the negative impacts caused by the pandemic while maintaining necessary social and economic development (Chen et al., 2020; Cheng et al., 2020; Fang et al., 2020; Sebastiani et al., 2020).

Operational capacity examines the extent to which a government can harness and mobilize surrounding resources and constraints in implementing policies (Moore, 1995). Van Mieghem (2003) suggests that operational capacity can be divided into two aspects: operational constraints and processing capability. When extended to the public health administration domain, the dichotomy is particular pertinent. Operational constraints examine how hedging factors affect government’s implementation processes. Review of overserving experience worldwide shows that tragic outcomes often derive from operational incapacity. For example, the COVID-19 outbreak (e.g., the huge number of patients) can flood the public health system (e.g., the maximum number of clinicians and beds in hospitals). In Wuhan, while beds in hospitals were prioritized for patients with severe symptoms, the largest number of infected patients with mild infection were quarantined in so-called ‘Fang Cang’ (shelter or temporary hospitals) that were quickly established through renovation of public spaces (e.g., stadiums and conference centers) (Chen et al., 2020). Moreover, processing capability assesses how fast a municipal government can respond the epidemic situation. For example, when evaluating the case of containing COVID-19 in Italy, Sebastiani et al. (2020) conclude that, as one of the successful approaches, local government promptly responded by establishing ‘red zones’ in two ‘hot spots’ located in Italian northern regions within 24 hours.

Public value can be best understood and achieved with the ‘public sphere’, which is the aggregated individuals’ values and attitudes, and their trust and cooperation with governmental agencies (Benington and Moore, 2011). Public value is not given as made; it is often treated as a conceptual framework within which competing values and interests are expressed and debated (Benington and Moore, 2011; Williams and Shearer, 2011). Embracing this angle in the public health and safety domain, we can further classify the public value doctrine as two specific types of pre-crisis and post-crisis-based public interest. The pre-crisis-based public interest represents overall public attitudes towards healthcare investment. As observed above, during the COVID-19 pandemic many municipal governments were stressed by the limited medical resources available to the public (e.g., the number of beds in hospitals and of healthcare workers). Yet all these resources were not taken for granted, but rather represented an overall expenditure on these public goods, which were sourced from annual budgets, even if via negotiated and compromised outcomes among various stakeholders in earlier years. The post-crisis-based public interest refers to the extent to which the public tolerates the negative impacts after the launch of new policies. For instance, the inconvenient lifestyle changes (e.g., wearing face masks and maintaining social distance), the rapid rise in the unemployment rate and the downturn of economic development are all negative consequences of the lockdown policy (e.g., Chen et al., 2020; Cheng et al., 2020).

2.2. Towards a configurational perspective of public health and safety nets

The central construct of Moore’s strategic action framework is the strategic triangle of ‘authorizing environment—operational capacity—public value’ (Moore, 1995; see Fig. 1). Benington and Moore (2011) also suggest that public sector strategy must align these three distinct but interdependent processes. Yet the literature lacks a holistic approach to examine how the three strategic angles and their underlying attributes can be independent or can interact with each other to achieve a desired strategic outcome (Williams and Shearer, 2011). To address this deficiency in the literature around applying Moore’s strategic action framework, our study adopts a configurational approach.
A configurational approach refers to “any multidimensional constellation of conceptually distinct characteristics that commonly occur together” (Meyer et al., 1993: 1175; Misangyi et al., 2017). The configurational approach has advantages for capturing patterns among key theoretical elements, establishing a taxonomic perspective for theory development in management science, and enriching our understanding on public administration coherence (cf. Fiss, 2007, 2011). It is worth noting that the configurational approach itself is not new; rather the thinking is deeply rooted in modern management theory development (Fiss, 2007). Yet the approach has not achieved popularity in earlier years mainly due to methodological limitations (Misangyi et al., 2017). Together with fuzzy-set Qualitative Comparative Analysis (fsQCA) becoming a mature analytical technique, configurational thinking not only does not stay at the theoretical level, but also realizes its empirical relevance in different contexts of administrative science (Ragin, 2008; Fiss, 2007).

Compared with the conventional, dominant, regression-based approaches that are more suited for isolating the net effect of individual factors, the configuration approach captures three key features to enrich our theoretical understanding and practical relevance of Moore’s (1995) strategic action framework. First, the concept of conjunctural causation can be realized: this explores causal complexity among all three of Moore’s strategic action attributes for achieving high levels of public health administrative performance (Fiss, 2011; Misangyi et al., 2017). Second, the method has the advantage of capturing causal configuration equifinality, which allows for discovery of multiple and equally effective pathways towards weaving public health and safety nets in order to respond to the COVID-19 pandemic (cf. Fiss, 2007). Third, the approach recognizes the possibility of the asymmetric nature of causal conditions. In other words, attributes found to be causally related in one highly effective configurational solution used by one municipal government may be unrelated or even inversely related to another configuration adopted by other cities (cf. Ragin, 2008). Thus, our overall configurational perspective of building up effective public health and safety nets is conceptualized in Fig. 1.

3. Methods

3.1. Sample and data

We conducted fsQCA on the prevention and control of COVID-19 transmission in Chinese cities. While China is the first country recorded as suffering from the spread of COVID-19 in most cities, Chinese central and municipal governments stopped epidemic transmission through their responsible actions (Chen et al., 2020). China is also a vast country geographically and has sub-national regions with diversified institutional and public health structures (Gao et al., 2019; Shi et al., 2012). The heterogeneity of the urban public health sectors makes China a perfect context for extending Moore’s strategic action framework to urban safety management.

To gather records of 323 Chinese cities during COVID-19 pandemic period, we constructed a unique dataset drawing on multiple archival sources. The city-level data of the number of COVID-19 cases, including the confirmed, cured and fatal cases, were collected from the website of the National Health Commission of the People’s Republic of China. We searched for and manually collected the starting time for measures taken for the pandemic lockdown, outdoor restrictions and closed management of communities across provinces and cities that were released by the local governments. We also manually collected the pandemic-related policies of provincial governments from official local pandemic prevention service platforms. Then these policies were classified into three
categories: (1) social restriction policy to deal with the pandemic, (2) social security policy to support individuals and communities, and (3) economic support policy to stimulate or protect firms and other local economic players. In addition, to reflect the pre-crisis-based public interest across regions, we sourced public healthcare data at the provincial level from the 2019 China Health Statistical Yearbook and economic data at the city level from the 2019 China City Statistical Yearbook.

3.2. Measurement and calibration

Calibration is one of the advantages of fuzzy-set analysis (Ragin, 2008). Through external and internal criteria, fsQCA can calibrate important variations for each condition (Fiss, 2011). Specifically, we calibrated each causal condition with specified values of 75%, 50% and 25% percentiles, which corresponded to anchors for full membership, the crossover point, and full non-membership. In Table 1 we summarize the measurements and calibration rules for all variables in this study.

3.3. Analytical results

In Table 2, we report results from fsQCA. None of the individual conditions exceeded the consistency threshold of 0.90 as a necessary condition (see Appendix A for descriptive statistics and necessity analysis). Table 2 presents the results of the configurations associated with effective control of reproductive COIVD-19 patient numbers. Following the style recommended by Ragin (2008), black circles (●) in Table 2 indicate the presence of a condition and circled crosses (⊗) indicate its absence, while blank spaces indicate that the corresponding causal condition plays an insignificant role in the configuration. We adopted fsQCA to identify distinct logical configurations leading to high control of reproductive numbers. These configurations provide a holistic view of how public health and economic players. In addition, to reflect the pre-crisis-based public interest across regions, we sourced public healthcare data at the provincial level from the 2019 China Health Statistical Yearbook and economic data at the city level from the 2019 China City Statistical Yearbook.

A representative case city associated with this configuration is Jingmen (Hubei Province). Due to its geographic proximity to Wuhan, the spread of the pandemic has received focused attention, and the first lockdown measure was introduced in Jingmen only a day after the occurrence of the first local pandemic case. The municipal government issued a series of social restriction policies, accounting for 67.7% of all emergency measures. The rich public health resources in the local area (approximately 45 hospital beds per 10,000 people and RMB 196 million per 10,000 people in public budget expenditure on health services) also contributed to countering the COVID-19 pandemic.

Configuration 2 indicates the effective pandemic controlling mode, which we term proactive defence. This mode reports that cities with a strong future-orientated economic support policy, a fast emergency response and sufficient public healthcare reserves can control COVID-19 reproduction effectively. The representative case city is Haikou (Hainan Province). As a city located on a well-known tourist island, a large number of potential migrants and tourists prompted the local government to introduce rapid lockdown measures (14 days after the occurrence of the first local pandemic case). Abundant public healthcare reserves (approximately 81 hospital beds per 10,000 people) and the closed (bounded) terrain gave the local government more confidence, and it issued a series of emergency measures with a focus on economic support (accounting for 50% of total policies launched).

Configuration 3 represents the third municipal government’s strategic action mode, which is named decisive resiliency. The mode has a two-fold aspect. On the one hand, the municipal government remained agile and decisive when the pandemic threatened the city (e.g., combining both high emergency response sensitivity and sufficient public healthcare reserves). On the other, the municipal government prepared for the long-term economic recovery after the pandemic was controlled (i.e., launching a strong economic support policy, as well as showing substantial public interest in economic recovery). Shijiazhuang (in Hebei Province) serves as a representative case city. When the first lockdown measure was implemented, the COVID-19 morbidity rate among local residents was at an extremely low stage with a proportion of less than 0.0003%, reflecting the sensitivity of the city government in responding to sudden crises. As a provincial capital, Shijiazhuang had a good base of public healthcare reserves (approximately 50 hospital beds per 10,000 people), while the low unemployment rate (5%) also supported the economic recovery. Based on these local conditions, the government also issued substantial emergency policies on economic support (accounting for 50% of total policies launched), in the hope that the economic downturn caused by the pandemic quarantine could be eliminated quickly.

Configuration 4 highlights the fourth mode, strengthened coercion, that urban governments can prevent COIVD-19 reproduction in the local city. The mode indicates that strong policy interventions put in place by local authorities (e.g., social restrictions, social security and economic support policies), in addition to fast emergency responses and substantial public health inputs. Zhenjiang (Jiangsu Province) is a representative case city in our sample. In Zhenjiang city, the government took a leading role in order to cope with the COVID-19 pandemic. The lockdown measure was introduced speedily (9 days from case detection) to slow the further spread of the pandemic. The generous public health investments (approximately RMB 312 million per 10,000 people) also underpinned the fight against the pandemic. The local government also launched a large number of policies in areas of social restriction, social security and economic support. These measures produced good results in Zhenjiang’s anti-pandemic campaign.
Table 1
Calibration of sets.

| Type                | Variable                                      | Measurement                                                                 | Calibration method | Fuzzy sets | Note and references |
|---------------------|-----------------------------------------------|----------------------------------------------------------------------------|-------------------|------------|---------------------|
| Control of Reproductive Number (R0) | R0 at the city level can be calculated as: $$R_0 = 1 + \frac{\ln(Y(t))}{\ln(T_g)} + \frac{T_g - T_i}{T_g} \left( 1 - \frac{T_g - T_i}{T_g} \right) \left( \frac{\ln(Y(t))}{\ln(T_g)} \right)^2$$ where $Y(t)$ is the total confirmed cases at time $t$; $t$ is the number of days between the day with the highest number of new confirmed cases per day and the first day thereafter without the number of new confirmed cases; $T_g$ is the generation time of COVID-19 and $T_i$ is the incubation time, and we know that $T_g = 5.2$ and $T_i = 4$ based on Guan et al. (2020) (Zhou et al. 2020). | 5.30, 3.86, 3.20 | 3 | 75%, 50%, 25% percentiles as calibration anchors. See Ragin (2008) |
| Authorizing Environment | Social Restriction Policy | The number of policies related to social restriction issued by the provincial governments since the pandemic began. | 52, 34, 27 | 3 | 75%, 50%, 25% percentiles as calibration anchors. See Ragin (2008) |
| | Social Security Policy | The number of policies related to social security issued by the provincial governments since the pandemic began. | 26, 16, 11 | 3 | 75%, 50%, 25% percentiles as calibration anchors. See Ragin (2008) |
| | Economic Support Policy | The number of policies related to economic support issued by the provincial governments since the pandemic began. | 30, 21, 9 | 3 | 75%, 50%, 25% percentiles as calibration anchors. See Ragin (2008) |
| Operational Capacity | Emergency Response Sensitivity | The number of local confirmed cases scaled by the local population at the time of the first lockdown measure introduced by the city governments. | 0.191, 0.324, 0.554 | 3 | Reverse Calibration of 75%, 50%, 25% percentile anchors. See Ragin (2008) |
| | Emergency Response Speed | The number of days between the occurrence of the first local pandemic case and the first lockdown measure introduced by the city governments. | 10, 13, 15 | 3 | Reverse Calibration of 75%, 50%, 25% percentile anchors. See Ragin (2008) |
| Public Value | Pre-crisis-based Public Interest (Public Healthcare Reserves) | The number of hospital beds per 10,000 people at the city level. | 54.49, 43.94, 35.64 | 3 | 75%, 50%, 25% percentiles as calibration anchors. See Ragin (2008) |
| | Pre-crisis-based Public Interests (Public Healthcare Inputs) | Public budget expenditure on health service per 10,000 people (in 100,000,000 Chinese yuan) at the province level. | 2.37, 1.47, 1.02 | 3 | 75%, 50%, 25% percentiles as calibration anchors. See Ragin (2008) |
| | Post-crisis-based Public Interest (Public Interest in Economic Recovery) | Unemployment rate at the city level. | 6.78, 4.64, 3.24 | 3 | 75%, 50%, 25% percentiles as calibration anchors. See Ragin (2008) |

4.2. Robustness tests

We conducted a number of robustness checks to understand the stability of the solutions. In particular, following the suggestions of Ragin (2008), we replicated the analyses with reduced consistency thresholds. The configurations are similar with those presented in Table 2, but they are less precise, as might be expected when applying a lower consistency threshold.

5. Discussion

Revisiting Moore’s strategic action framework. Based on our results (see Table 2), it is evident that, to achieve effective control of reproductive COVID-19 patient numbers, Chinese cities need to have at least one condition from each of three blocks under Moore’s strategic action framework present in the configurations. In other words, each configurational solution (mode) must contain causal conditions representing all three theoretical blocks (i.e., authorizing environment, operational capacity, and public value). This finding confirms the relevance of Moore’s strategic action framework in public administration, especially when dealing with a public health and safety emergency. Scholars (Benington and Moore, 2011; Williams and Shearer, 2011) suggest that public sector strategic actions must align three distinct but interdependent constructs. Our study pioneers investigating how the three distinct and interdependent constructs can interact with or be aligned through a configurational approach. Our findings further confirm that such an alignment is important indeed in examining the effectiveness of municipal governments’ prevention of COVID-19 transmission. In so doing, we also respond to calls for future research to unleash the potential of Moore’s (1995) theory, via empirical testing, to other public domains (e.g., public safety management) (Williams and Shearer, 2011).

Understanding the complexity of strategic action attributes. Since COVID-19 has become a global pandemic, municipal governments worldwide have been taking various levels of strategic action. Some cities rely on single or multiple governmental policy interventions (e.g., lockdown, social distance, job protection, inter alia), while others lean on accumulated welfare reserves. Facing the heterogeneity of public administration strategies, global citizens have started reflecting on or debating the relevance and effectiveness of “best practices” in anti-pandemic campaigns (cf. Chen et al., 2020; Cheng et al., 2020). To echo our proposed configurational perspective of building public health and safety nets, our findings suggest the complex nature of strategic action attributes. Our results indicate that there is no single “best policy or practice”. For instance, social restriction policy plays a vital role in
both social reassurance and strengthened coercion modes (see Configurations 1 and 4 in Table 2), but not in other two modes (i.e., proactive defence and decisive resiliency). Based on configurational thinking, the cause of policy ineffectiveness is due to the conjunctural and asymmetrical nature of strategic action conditions (Misangyi et al., 2017; Ragin, 2008). That is, the effectiveness of any policy does not just come from the authorizing environment in the city, but also depends on operational capacity and public value.

Moreover, among the four configurational solutions, we find that, to some extent, these attributes are complementary or substituted. For example, emerging response sensitivity and speed are substituted with each other. In other words, municipal governments need to either 1) be agile and decisive before the COVID reproduction rate gets out of control, or 2) take a fast track in launching public policies. The complementary nature of these strategic action attributes reflects the co-(dis)appearance of social restriction policy and public healthcare inputs. As shown in the four modes identified (see Configurations 1 and 4, or 2 and 3 in Table 2), if the focal city can sufficiently invest in public health service, launching a social restriction policy can more likely take effect, and vice versa.

A taxonomy of municipal administration patterns of preventing the public emergency. When interpreting the four configurations (Table 2), we contribute novel insights into the variations of urban governance patterns in controlling the negative effects of the public emergency. These patterns are labelled social reassurance, proactive defence, decisive resiliency and strengthened coercion. In contrast to typology that is purely theory-driven, a taxonomy (i.e., empirical classification) is constructed through empirically identifiable modes or patterns (Cui et al., 2017). Classification or categorization has long been a central agenda of management research (Cui et al., 2017; Fiss, 2011; Misangyi et al., 2017). Our findings, via a taxonomy of dealing with a public emergency, address the research question so as to reflect how municipal governments have woven public health and safety nets to respond to the COVID-19 pandemic. In addition, it provides a theoretical toolkit for analysing individual cities on their strategic actions in coping with health and safety emergency, and this holds implications for future research on their public outcomes. In so doing, we extend the literature on safety science, which dominantly emphasises individual or organisational level of analysis, towards an urban or regional level of analysis on governmental function as one of the antecedents to improving public health and safety (cf. Fan et al., 2020; Johansson et al., 2009; Sebastiani et al., 2020).

### 6. Limitations and future research directions

The context of this study necessarily induces limitations on the generalizability of its findings, such as empirical evidence being generated from a single country, possibly omitted attributes when applying Moore’s strategic action framework, and undertaking an “in-progress” investigation (that is, these effective modes of municipal strategic actions in blocking COVID-19 transmission countries cannot be proven as “ultimate solutions”). Although we agree that our findings need to be interpreted with caution, we encourage future studies to address these limitations. As a research community, it is our social responsibility to explore our human wisdom in fighting threatening events, even though these experiences have learned from “staged or temporary success”. In line with Moore (1995), we suggest that local governments should take entrepreneurial initiatives to connect the authorizing environment and operational capacity with deep understanding on public value, and then take a holistic bundle of strategic actions to prevent societal health and safety risks (e.g., the COVID-19 pandemic). Our timely research insights are likely to help those who are fighting the pandemic now and in coming days.

### Appendix A. Descriptive statistics and necessity analysis

Note: The necessity test is conducted by the fsQCA 3.0 software.

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**Table 2**

| Configurational solutions.*  | Effective Control of Reproductive Number (High R0) |
|------------------------------|----------------------------------------------------|
| **Block I: Authorizing Environment** | | |
| Social Restriction Policy | ● | ○ | ○ | ● |
| Social Security Policy | ○ | ○ | ● | ● |
| Economic Support Policy | ○ | ● | ● | ● |
| **Block II: Operational Capacity** | | |
| Emergency | ○ | ○ | ● | ● |
| Response Sensitivity | ● | ● | ○ | ● |
| Response Speed | ● | ● | ● | ● |
| **Block III: Public Value** | | |
| Pre-crisis-based Public Interest (Public Healthcare Reserves) | ● | ● | ● | ● |
| Pre-crisis-based Public Interest (Public Healthcare Inputs) | ● | ○ | ● | ● |
| Post-crisis-based Public Interest (Public Interest in Economic Recovery) | ○ | ○ | ● | ● |

Note: The necessity test is conducted by the fsQCA 3.0 software.

*Black circles indicate the presence of a condition, and circles with “X” indicate its absence. Blank spaces indicate “don’t care”.

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Appendix B. Truth table based on the fuzzy-set data matrix

| Causal Conditions | Number | Outcome | Raw consist. | PRI consist. |
|-------------------|--------|---------|---------------|--------------|
| SRP | SS | ESP | ERSE | ERSP | PHR | PHI | PIE | High R0 |
| 1 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 1 | 0.94 | 0.89 |
| 1 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 2 | 1 | 0 | 0.92 | 0.88 |
| 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 0.89 | 0.79 |
| 0 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 0.86 | 0.79 |
| 1 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 0.86 | 0.74 |
| 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0.85 | 0.75 |
| 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 0.83 | 0.69 |
| 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0.83 | 0.72 |
| 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 2 | 0 | 0.82 | 0.73 |
| 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 2 | 0 | 0 | 0.76 | 0.62 |
| 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 2 | 0 | 0 | 0.76 | 0.61 |
| 1 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0.75 | 0.58 |
| 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 2 | 0 | 0.74 | 0.61 |
| 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0.73 | 0.52 |
| 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 2 | 0 | 0 | 0.72 | 0.56 |
| 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 3 | 0 | 0 | 0.70 | 0.55 |
| 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0.70 | 0.52 |
| 1 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 0.69 | 0.51 |
| 1 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0.68 | 0.48 |
| 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0.68 | 0.50 |
| 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0.67 | 0.45 |
| 1 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 2 | 0 | 0.66 | 0.47 |
| 1 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0.66 | 0.45 |
| 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0.65 | 0.48 |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0.65 | 0.45 |
| 0 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 0.65 | 0.45 |
| 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0.65 | 0.42 |
| 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 2 | 0 | 0.63 | 0.47 |
| 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0.63 | 0.47 |
| 1 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 2 | 0 | 0 | 0.62 | 0.48 |
| 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 0.62 | 0.46 |
| 1 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0.61 | 0.36 |
| 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 2 | 0 | 0.61 | 0.43 |
| 0 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0.60 | 0.29 |
| 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 2 | 0 | 0 | 0.59 | 0.45 |

Appendix B. Truth table based on the fuzzy-set data matrix

| Configurations of Causal Conditions | Mean | Standard Deviation | Effective Control of Reproductive Number (High R0) |
|-------------------------------------|------|--------------------|-----------------------------------------------|
| Block I: Authorizing Environment    |      |                    | Consistency Coverage                            |
| Social Restriction Policy           | 36.82| 14.21              | 0.68                                           |
| Social Security Policy              | 21.24| 14.94              | 0.65                                           |
| Economic Support Policy             | 21.20| 14.46              | 0.60                                           |
| Block II: Operational Capacity      |      |                    |                                                |
| Emergency Response Sensitivity      | 0.40 | 0.24               | 0.47                                           |
| Emergency Response Speed            | 11.74| 5.17               | 0.54                                           |
| Block III: Public Value             |      |                    |                                                |
| Pre-crisis-based Public Interest    | 47.82| 18.67              | 0.59                                           |
| Pre-crisis-based Public Interest    | 2.23 | 4.31               | 0.60                                           |
| Post-crisis-based Public Interest   | 5.30 | 3.04               | 0.51                                           |

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Di Fan is a professor of management in the Department of Management and Marketing of Swinburne Business School at Swinburne University of Technology, Melbourne, Australia. His current research interest includes, international business strategies, and international human resource management. His publications appear in journals, such as Organization Studies, Regional Studies, Technovation, Academy of Management Learning & Education, Journal of World Business, Industry Marketing Management, International Business Review, Global Strategy Journal, Long Range Planning, International Journal of Human Resource Management, Human Resource Management Review, and Journal of Business Ethics, etc.

Yi Li is a Senior Lecturer in Discipline of International Business, at the University of Sydney Business School, Australia. His research interests include internationalization of firms in emerging economy, institutional approaches of business strategy, and dynamic evolution of control in international joint ventures. His work has been published or forthcoming in journals such as Organization Studies, Regional Studies, Global Strategy Journal, International Business Review, Management International Review, Journal of Business Research, Management and Organization Review, Technovation and others. He has won national competitive research grants such as National Natural Science Foundation of China Grant. In April 2020, He was elected as a Fellow of Royal Society of Arts (FRSA) in United Kingdom. He currently serves as communication editor of Journal of International Management, and an associate editor of Chintese Management Studies.

Wei Liu is a distinguished professor in Business School, at Qingdao University, China. His research covers corporate social responsibility, sustainable management and corporate strategies in emerging economies. his works has been appeared or forthcoming in journals such as Technological Forecasting & Social Change, Renewable & Sustainable Energy Review, Emerging Markets Review, Finance Research Letters, One Earth (Cell Press) and others. He was elected as a Fellow of Royal Society of Arts (FRSA) in United Kingdom, and a Full Member of Sigma Xi in the USA.

Xiao-Guang Yue is an adjunct professor in Department of Computer Science and Engineering, School of Sciences, at European University Cyprus, Cyprus. His research focuses on risk management, energy economics, decision science and others. His work has been published in journals such as Resource Policy, Journal of Risk and Financial Management, Sustainability, International Journal of Environmental Research and Public Health and others.

Georgios Boustris is a professor in Risk Assessment at European University Cyprus, Dean of the Ioannis Gregoriou School of Business Administration, Director of the Centre for Risk, Safety and the Environment (CERISE). His current research interest includes risk assessment, occupational safety and health, process safety. His publications appear in journals, such as Nature, Safety Science, International Journal of Heritage Studies, Current issues in Tourism and others.