Determinants of Chinese Provincial Governments' Responses to the 2018 Vaccine Scandal: Policy Orientation and Neighboring Effect

Abstract

Scholars who study governance in authoritarian countries have long highlighted the importance of fiscal capacity and vertical pressure from the central government. However, policy orientation plays consequential roles in shaping subnational governments' responses. Using provincial governments' responses during the Chinese 2018 vaccine scandal, I find strong evidence to support that provincial governments' policy orientations in public health, as well as governance diffusion from neighboring provinces, catalyzed their responses. Moreover, issue salience substitutes for the vertical pressure. Statistical findings remain robust in a variety of alternative specifications, including models that account for spatiotemporal interdependence. The paired case study of Hubei and Hunan not only shows that provincial policy orientation is implemented at the sub-provincial level through one-level-down cadre management mechanism but also sheds light on understanding Hubei's delay in responding to COVID-19 at the early stage from its performance at normal times.

KEYWORDS: policy orientation, diffusion, Chinese governance, government's response, vaccine

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In the face of crises or social issues, governments have shown different response speeds and effectiveness during the pandemic as opposed to the normal times (Hassid and Brass 2015; Toshkov, Carroll, and Yesilkagit 2021). Compared to a growing number of studies on variations across national governments or across subnational governments in democracies (Gaskell et al. 2020; Adolph et al. 2021), there are relatively few studies on subnational governments' responses in authoritarian countries, though subnational governments play a more important role as the implementors of responses and policies. In an authoritarian context, due to the central authority control (He, Shi, and Liu 2020), the disparities in subnational governments' responses are not expected, especially in countries with centralized decision-making powers, like China (Schwartz 2012). The institutional design in authoritarian countries raises an essential question: what are the reasons for variations in subnational governments' response within an authoritarian country if the variation exists?

In this paper, I argue that policy orientation and neighboring effect shape the subnational governments' response to a crisis during normal times. Policy orientation is a government's relative emphasis on a certain policy domain. Since resources are always limited, this relative emphasis can be reflected in resource allocation and demonstrates a will to effectively govern a policy domain. I evaluate these arguments in the context of Chinese provincial governments' responses to the 2018 vaccine scandal. China is a particularly interesting case, featuring not only a monopoly of political power but also decentralized governance and local innovative experiments (Heilmann 2008; Teets and Hurst 2014). Previous studies showed that there is variation in local governance regarding policy experiment and adoption during the decentralized time (Teets, Hasmath, and Lewis 2017; Jiang and Zeng 2020). However, a recentralized power under Xi Jinping's administration, a top-level design, has constrained local governance innovation (Chen 2017). In this circumstance where variation in local governance is not expected, the 2018 vaccine scandal showed the variation in governments' responses. It took only ten days from when the scandal first broke for the central and all provincial governments except Xinjiang to respond. However, during this short ten-day period, some provinces had responded before the public even noticed the scandal, while others were sluggish to respond, even after the central government required them to be transparent and accountable. With the variation in

responses, the 2018 vaccine scandal serves as an excellent case to test my arguments.

Using event history analysis and spatiotemporal autoregressive models, I found that provincial governments with a policy orientation in public health were more likely to respond quickly to the scandal, regardless of their economic capacity. In addition, neighboring effect sped up governments' responses. One unexpected finding was that the vertical pressure from the central government disappeared when issue salience was controlled. Though previous studies found that vertical pressure was a primary driving force of policy adoption and can substitute for horizontal diffusion (Zhang and Zhu 2020), this paper found that issue salience substituted for the vertical pressure. Moreover, subnational governments responded to the increasingly negative nationwide public attitude only when the central government required provincial governments to respond. These results were robust within alternative explanations. A paired case study of Hubei and Hunan further showed provincial policy orientation could be upheld and carried out by prefectural-level governments through one-level-down management. This case study provided nuances for understanding Hubei's delay in responding to COVID-19 cases during the early stage by looking at its performance in normal times.

By exploring nuances in subnational governance revealed in this study, two implications become evident. First, rather than overall fiscal capacity, it is governments' policy orientation that affects their governance in a certain field. Even with more resources and under pressure from the central government, subnational governments may only improve their governance in policies where they have policy orientation. A lack of orientation in a certain policy and consequential sluggish responses might yield adverse social outcomes. However, an additional implication emerges when horizontally diffused responses through neighboring effect compensate for these potentially negative outcomes by triggering localities' reactions to the good governance of their neighbors, at least in normal times. This compensation cannot work well in a crisis because waiting and adopting others' responses causes them to miss the optimal response time. In other words, policy orientation is the more important determinant for governments' quick responses in crises that occur in fields that require a long-term investment to produce results. Looking beyond China, these findings indicate that subnational politics are

important for understanding governments' responses to crises.

THE 2018 VACCINE SCANDAL

This study explores government's responses in the 2018 Chinese vaccine scandal. On July 15, 2018, the State Food and Drug Administration launched an investigation into Changsheng Bio-technology Co Ltd, based in northeast Jilin province, because Changsheng was found to have falsified production records and product inspection records of freeze-dried rabies vaccines for human use. Two days later, more information and scandals were disclosed. Changsheng Co and another company, Wuhan Biotechnology Co Ltd, were found to have produced 653,100 ineffective diphtheria, pertussis, and tetanus (DPT) vaccines in 2017, and the defective vaccines had already flowed into the market (Caixin 2019).

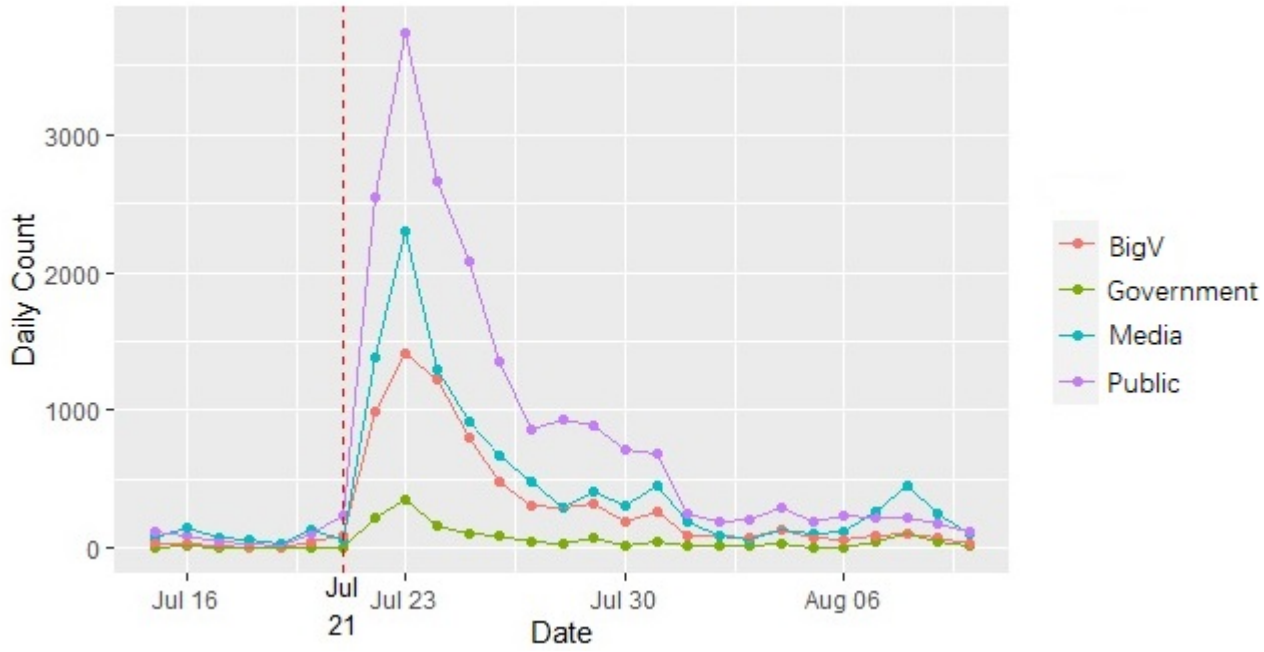
This scandal did not get public attention until July 21 when the WeChat article "King of Vaccine," which disclosed Changsheng's inside story, was spread on social media platforms. The article implied that Changsheng bribed local officials to sell their vaccines, and the number of children potentially exposed to the ineffective vaccine was likely huge given that DPT is a mandatory vaccine in China, and Changsheng held more than a quarter of the vaccine market. Since vaccine scandals had repeatedly occurred and this one involved a mandatory vaccine for children, this scandal sparked nationwide public fury. Facing the public outcry, at midnight on July 22, the central governments website announced Chinese Premier Li Keqiang's response to the scandal: the vaccine incident has crossed a moral line, and the nation should be given a clear explanation; no mercy should be offered for any wrongdoing regardless of who was involved (The State Council of The People's Republic Of China 2018).

Based on 43,392 microblogs about the 2018 vaccine scandal on Sina Weibo from July 15 to August 10, 2018, collected via a series of keyword searches [1], the number of online discussions of the scandal changed dramatically during the short period. As shown in Figure 1, the public had not noticed this scandal, which had been disclosed by the administration, until the widespread dissemination of the WeChat article on July 21. Discussion of the scandal hit

its peak immediately after the central government's response and then dropped dramatically.

Though this dramatic change in public opinion occurred nationwide almost instantly, provinces' responses were spread out over ten days. As shown in Figure 2, twelve provincial administrations responded to the scandal by releasing governmental information about the vaccine distribution before July 22 when the public noticed the scandal; eight administrations responded on July 22 before the central government's statement; eleven provinces were slow to respond or did not respond at all even after the central government's statement. By July 24, all provinces except Xinjiang had responded to the scandal at least once. These differences allow us to examine reasons for the variation in responses.

Figure 1. Daily Count of Microblogs on the 2018 Vaccine Scandal during July 16 and August 10

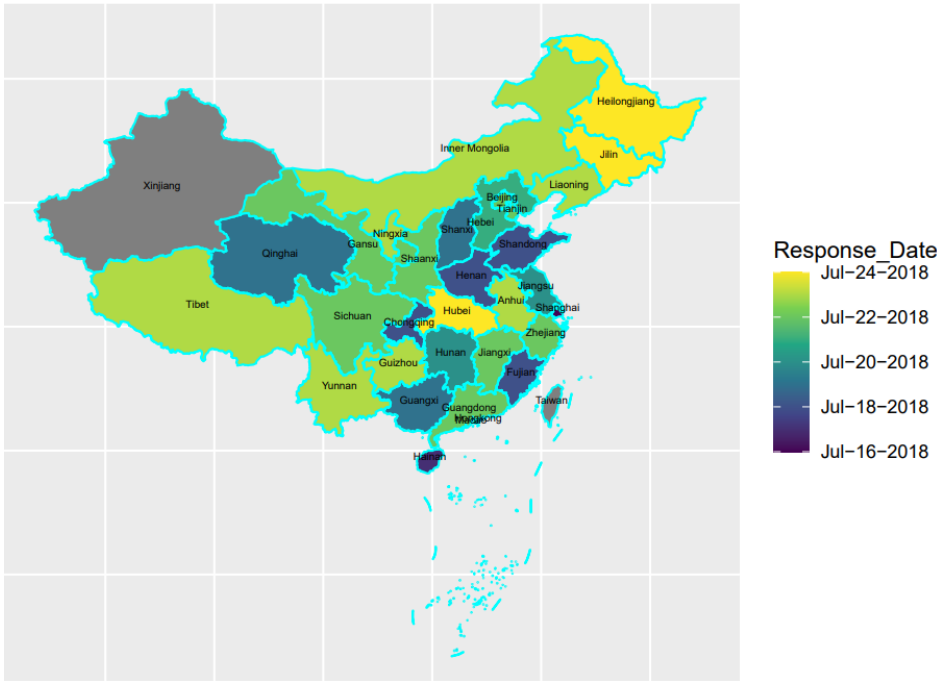


Note:Weibo data was categorized into four groups: public users, BigV, Media, and Government, according to their account verification information. The public group is composed of active users. The BigV group includes verified influential users who have more than 500,000 followers. The media group is composed of accounts verified as media. The government group includes government accounts and party-organ media agency accounts.

POLICY ORIENTATION AND DIFFUSION IN GOVERNANCE

The existing studies on responsiveness in China have advanced our knowledge of governments' responses to public opinion. Although "responsiveness" implies that government actors adhere

Figure 2. The First Response Date of Provinces to the 2018 Vaccine Scandal During July 16 and 24



Note: Xinjiang was colored grey because it did not respond to the vaccine scandal during the observation period. Only 31 provincial governments in the mainland were included in the analysis.

to the signals of voters' wishes in democracies (Przeworski et al. 1999), in authoritarian countries, responsiveness has a broader concept and different forms (Su and Meng 2016). In the context of China, the forms of responsiveness range from congruence between public opinion and policies to information release in response to public demands (Chen, Pan, and Xu 2016; Kornreich 2019). Chinese subnational responsiveness can be affected by the threat level in requests (Chen, Pan, and Xu 2016), local leaders' informal networks with higher-level decision-makers (Jiang and Zeng 2020), requesters' ethnic identities(Distelhorst and Hou 2014), and the state-society relationship (Meng, Pan, and Yang 2017). However, responsiveness studies cannot explain responses that governments might take before the raising of public opinion. Why did some provinces respond to the scandal before the public noticed it, while others responded slowly even after the central government required them to do so? To address these questions, this paper examines the determinants of provincial governments' responses to the 2018 vaccine scandal, focusing on governmental level factors.

Subnational Governance: Policy Orientation

Studies show that local governance challenges are the primary drivers for local governance innovation (Teets and Hurst 2014), and being responsive to public opinion is one of the governments' strategies to avert a potential crisis of governance (Noesselt 2014). Governments' responses could be reactions to public opinion or local challenges regardless of whether these challenges arouse public opinion or not.

A locality's domestic context is one main determinant of governments' performance. Even the effects of the central government's mandates are constrained by local needs and officials' interests (Kennedy and Chen 2014). A critical determinant of subnational governance is governments' fiscal capacity. Fiscal revenue, a proxy for officials' loyalty and competence (Lü and Landry 2014), influences officials' decisions about governance. Fiscally strong localities are more likely to implement governance reforms, such as environmental transparency regulations, because implementing such reforms will take away from localities' efforts to achieve economic growth, which is a trade-off that fiscally weak localities are less likely to make (Kamp, Lorentzen, and Mattingly 2017). Fiscally strong governments also are less likely to censor or manipulate information because they have the resources to shoulder the cost of policy adjustments based on public opinion if unfavorable information comes to light (Chen and Xu 2017).

However, I argue that policy orientation, rather than fiscal capacity, drives a government's performance. In this paper, policy orientation is defined as the government's relative emphasis on a certain policy domain. Policy orientation is shaped by the government's economic capacity, administrative departments' powers and expertise, and governance willingness. Governance willingness is a will to effectively govern a policy domain. It has been widely discussed that Chinese officials' performance is driven or incentivized by promotion whose main criteria is economic development. Governance willingness could be driven by promotion incentives, especially in economic fields. However, not all officials at the same level have an equal chance to be promoted, thus the evaluation system incentivizes upwardly mobile officials (Teets, Hasmath, and Lewis 2017). Rather than promotion incentives, local needs for governance and

individual preferences are more important determinants for governance innovation (Ma and Pang 2017). While fiscal capacity constrains governments' choices in governance via promotion concerns, other factors in governance willingness can overcome a trade-off from promotion incentives.

There are many approaches to capture policy orientation, such as a government's working plans or reports. Among others, one approach to capture policy orientation is resource allocation. In democracies, allocation of resources reflects local leaders' policy priorities (Fuchs 2010; Kirkland 2021) and is influenced by officials' ideology, partisanship, and occupation (Connolly and Mason 2016; Benedictis-Kessner and Warshaw 2016; Kirkland 2021). In China, allocation of resources is shaped by both the central government's policy priorities (Yang and Pang 2014), and officials' policy priorities and work experience (Meng and Su 2021; Wan and Xie 2022). However, unlike these existing studies, policy orientation emphasizes objective governance challenges and subjective motivations. Governments with a high fiscal capacity can deal with crises better only if they are willing to employ their resources. The variation in African countries' responses to HIV demonstrated that levels of economic development and regime types alone cannot account for differences (Boone and Batsell 2001). Instead, domestic health financing plays a more important role in achieving health-related sustainable development goals (Micah et al. 2020). Economic growth offers a chance for countries to increase health spending, but it is countries' will to allocate these dividends to health services that is central to the governance of sustainable health (United Nation 2018; Bekker et al. 2018). Policy orientation reflects both objective restraints and governance needs, and subjective willingness in domains in which governments would like to allocate and invest resources.

More importantly, provincial policy orientation can be conveyed to lower-level governments through the cadre management system. The cadre management system is the primary mechanism for upper-level governments to promote and oversee policy implementation. Performance criteria highlight a diverse array of priorities from one-level-up government leaders (Whiting 2006). To gain advantages in their performance evaluations, sub-provincial governments are motivated to perform better in prioritized policies (Whiting 2006), which prepares

and facilitates quick responses at the provincial level. I argue that policy orientation endows governments with relatively more resources and preparedness to respond to issues and public opinion in the oriented fields. Specifically, I argue that provincial governments' policy orientation in public health led to a quick response to the 2018 vaccine scandal.

Neighboring Effect

There is emerging governance literature on policy diffusion in China. Scholars have theorized the micro-foundations for policy diffusion in China (Teets and Hurst 2014) and found evidence that classic diffusion mechanisms exist for the diffusion of administrative licensing centers (Zhang and Zhu 2019). However, existing studies focused on the city level which is the subprovincial level, while classic diffusion theories were developed at the state level which is the subnational level (Zhang and Zhu 2019). The diffusion pattern could be different at different government levels. For example, the neighboring effect, as one of the main horizontal diffusions, did not have an impact on the diffusion of administrative licensing centers at the provincial level (Zhang and Zhu 2019), though, it had a strong effect at the city level (Zhu and Zhang 2019). In terms of governments' responsiveness, the neighboring effect was not found even at the city level (Jiang and Zeng 2020).

In this paper, I argue that the effects of neighboring areas push governments' responses because governments may look to their peers to determine their actions. There are different ways to define peers, but this paper considers neighbors as peers for two reasons. First, governments are more likely to look to neighbor's behaviors in this case. At that time, the public primarily requested that governments release information about problematic vaccines in their districts. Citizens might not notice a far-away government's performance, but ignoring a neighboring government's behavior is hard. Consequently, a government might feel more pressure from its neighbors because citizens might compare their home provincial government to the neighboring governments. Second, officials do not consider their economic or political competitors' behaviors as influential in this case because collecting and releasing the information does not require economic resources. Officials did not have to make a difficult decision between se-

curing economic development or responding to the issue, therefore they did not refer to their competitors' behaviors.

EMPIRICAL ANALYSES

Quantitative Analysis

Variables and Measurement

To measure provinces' responses, I operationalized governments' responses as whether a government responded to the vaccine scandal on a given day. The dependent variable was a dummy variable, recorded as 1 if a provincial government or provincial Centers for Disease Control and Prevention (CDC) publicly released information about problematic vaccines in their jurisdiction on a particular day or as 0 if a province did not respond. Thus, the dependent variable captured whether a provincial government responded or not and when they responded. I collected provinces' responses through their official accounts on Weibo or WeChat, official websites, or press conferences (see details in Appendix A). I recorded the date when the provincial and central governments responded to the scandal by explicitly addressing whether and how much they had received the problematic vaccines in their jurisdictions.

I collected the responses between July 16 and July 25 because the first provincial-level government responded to the scandal on July 16 and most provinces had issued their second or even third responses before July 25. Since some provinces responded more than once, I also set an indicator "episode" to capture which response period a provincial government was in, such as the first, second, third, or fourth response period. The data set is pooled data, yielding one observation per provincial government per day per episode.

Provincial Governments' Policy Orientation in Public Health

Since the public health system is fully financially supported by the government, I used the percentage of a province's health spending in its total expenditure as the proxy of its policy orientation in public health. There are two reasons for using this measure. First, although policy

orientation can be reflected in many other ways, such as governments' working plans or reports, financial support intuitively reflects policy orientation. Second, the absolute public health expenditure is restricted by provincial fiscal capacity and cannot reflect governance willingness in specific fields. The data was collected from the China Statistic Yearbook 2019.

Measuring Neighboring Effect

The neighboring effect was measured by the fraction of provincial units which responded to the scandal by day_(t-1) in the neighborhood of province i in each episode. If i had already responded to the scandal once, only the bordering provinces that responded to the scandal for at least a second time could pressure i in i's second episode. In other words, province i is only influenced by neighbors that took at least the same degree of action before province i. By using the fraction of neighbors instead of the number of neighbors responding, the extent to which neighboring governments' activities could affect local government i is captured (Parinandi 2020).

Other Variables

The vertical pressure from a higher-level government plays a vital role in policy diffusion and subnational governments responsiveness (Zhang and Zhu 2019; Chen, Pan, and Xu 2016). I controlled the vertical pressure from the central government. The vertical pressure was coded as 0 if provinces' responses took place before the central government's response, otherwise as 1.

In a democratic context, a nationally salient policy issue impels politicians in subnational governments to adopt the policy (Boushey 2016). This conditional effect of issue salience on local governments' responsiveness was also found in China (Jiang and Zeng 2020). Since the central government garners a high level of trust and support from its hyper-responsiveness, a salient national issue that attracts the public probably attracts the central government's attention simultaneously. When subnational governments think the central government has already noticed the issue, the pressure from the central government's supervision should have existed irrespective of a clear statement. Therefore, issue salience could precipitate provinces' re-

sponses. In this paper, issue salience was measured by the daily number of mentions of the scandal by microblogs from the public, big influencers, and commercial media. Additionally, the public attitude was measured by the mean sentiment score of microblogs per day from three groups: the public, influencers, and commercial media. A sentiment score for each post was attained from Baidu API sentiment analysis tool. The score was the probability of a positive attitude, ranging from 0 to 1.

Provincial economic capacity was measured by budgetary revenue (Lü and Landry 2014) and their economic role in the national economy (Lieberthal and Oksenberg 1988; Donaldson 2009). Specifically, a provinces' 2018 revenue was collected from the China Statistic Yearbook 2019, and a province's role in the national economy was measured by the percentage of its GDP over the national GDP.

Following Pacheco and Boushey (2014), I used two variables to measure problem severity. The first was a dummy variable capturing whether a provincial administration claimed it had purchased problematic vaccines. Such a provincial administration would face a more severe governance challenge. The second variable is the percentage of children children below 14 years of age, since children and teenagers are the primary users of DPT vaccines. The data was collected from the China Statistic Yearbook 2019.

At the individual level, officials' network with their supervisors, their characteristics, and local experience account for variation in policy adoption and implementation (Jiang and Zeng 2020; Bo 2019; Zang 1991; Huang 1999). I controlled provincial leaders' characteristics, leadership, and their network with central leaders. I used the co-working years between provincial leaders (governors and party secretaries) and Xi Jinping as the indicator of their network. Provincial governors' and party secretaries' age, education, gender [2], and tenure length in their present jurisdiction were also coded. The data was collected from governments' official websites and a database of Chinese political elites (Jiang 2018).

Model Choice

Since multiple provincial administrations responded more than once, I used Event History Analysis (EHA) for recurrent responses and a spatial model to perform a robustness check. Even though the dependent variable in a discrete-time model is a series dummy variable, it conveys the same information as the actual duration time (Petersen 1995; Yamaguchi 1991). The dependent variable not only captures whether provincial governments responded to the scandal but also when they responded.

Duration Dependence

An EHA model assumes that the hazard rate is flat across time; however, that is often inappropriate for social science data. There are several approaches to account for time dependency within discrete duration data, including temporal dummy variables, transformation, and spline functions (Box-Steffensmeier, Jones, and Alvarez 2004). Given the small size of the response data set in this study, I used natural log transformation to capture the shape of the baseline hazard.

The model is specified as follows:

$$Log(\frac{P_{it}}{1-P_{it}}) = \beta_0 + \beta_1 PolicyOrientation_i + \beta_2 NeigboringEffect_{i,t-1} + \beta_3 X_{it} + \\ + \beta_4 t + \varepsilon \qquad (1)$$

where P_{it} is the probability of the occurrence of a provincial response at day t and $1 - P_{it}$ the probability of a non-occurrence of a provincial response at day t. $PolicyOrientation_i$ is the share of a province's public health expenditure as a percentage of the total provincial budgetary expenditure. $NeigboringEffect_{it-1}$ is a variable indicating the horizontal effect of neighbors that have responded to the scandal as a percentage of all the neighbors of a focal province at time t-1. X_{it} is a vector of control variables for the central government's intervention, issue salience, public attitude, provincial conditions, leadership, and patronage network. t is a time dependence variable. I clustered standard errors by province to account for heteroskedasticity.

RESULTS

Table 1 shows the results of the EHA models with a focus on policy orientation and neighboring effect, respectively. A positive coefficient implies that a change in the independent variable led to an increase in hazard rates. In this case, the increasing hazard rate indicates the increasing chance of a response.

I tested the policy orientation hypothesis in Model 1, which includes policy orientation, vertical pressure, issue salience, public attitude, and other control variables. The results are presented in Column 1. The share of public health spending in a province's total expenditure, which is used as the indicator of policy orientation, is positively associated with response occurrence. Specifically, a one-percentage point increase in the share of health spending leads to a 64% increase in the odds that a province will respond. However, provincial capacity and a province's role in the national economy are not significantly associated with provinces' responses. The provincial governments' responses were also influenced by one indicator of governance challenges: whether or not a province had purchased a problematic vaccine. Compared to a province without problematic vaccines, a province with problematic vaccines is almost four times as likely to respond to the scandal. These results are consistent with the prior discussion about policy orientation, that policy preference shapes provincial governments' responses and economic capacity cannot guarantee governments' responsiveness unless they are willing to spend resources on a given field.

Model 2 examined neighboring effect, and the results show that a 10% response rate increase in an episode in the neighboring provinces leads to a 13% boost in the odds of such a response in a focal province. The total neighboring effects on a focal province should be interpreted case by case since some provinces have more neighbors than others. For example, in mainland China, Inner Mongolia and Shannxi each have eight neighbors. When each additional neighbor responds, the percentage of responding neighbors increases by 12.5 points, and the effect is a 17% boost in the odds of a focal government's response.

To test multiple diffusion, I placed two main independent variables together in Model 3.

Table 1: EHA Models for Provincial Responses to the 2018 Vaccine Scandal

	Model 1 Policy Orientation	Model 2 Neighboring Pressure	Model 3 Multiple Mechanisms	Model 4 Full Model	Model 5 Patronage Network
Policy Orientation					
% Public Health Expenditure	0.495**		0.642**	0.638***	1.008***
	(0.205)		(0.252)	(0.246)	(0.256)
Neighboring Effect					
Proportion of Neighbors		1.242**	1.701***	1.805***	2.223***
who responded		(0.571)	(0.571)	(0.617)	(0.675)
Vertical Pressure					
The central government's Response	-0.518	-0.984	-0.987	7.536*	7.725*
	(0.846)	(0.882)	(0.917)	(3.940)	(4.306)
Issue Salience and Public Attitude					
Log no. of Weibo	0.614***	0.619***	0.610***	0.776***	0.783***
	(0.193)	(0.195)	(0.205)	(0.258)	(0.265)
Public Attitude	0.103	0.111	0.121*	0.203**	0.206**
	(0.069)	(0.070)	(0.073)	(0.084)	(0.085)
The central government +				-0.235**	-0.242*
Public Attitude				(0.114)	(0.124)
Capacity and Provincial Factors					
Log Revenue in 2018	0.389	0.011	0.137	0.134	1.059
	(0.472)	(0.572)	(0.586)	(0.569)	(0.685)
% GDP in National GDP	0.160	0.115	0.190	0.186	0.843
	(0.143)	(0.139)	(0.167)	(0.168)	(0.141)
Log Population	-0.923**	-0.141	-1.010**	-0.964**	-2.199***
	(0.396)	(0.402)	(0.506)	(0.491)	(0.784)
Governance Challenges					
Purchased Problematic Vaccine	1.349***	1.388***	1.644***	1.634***	2.615***
	(0.398)	(0.357)	(0.471)	(0.477)	(0.623)
% Youth Population under 14yrs old	-0.072	-0.005	-0.117*	-0.113*	-0.115
	(0.061)	(0.063)	(0.070)	(0.066)	(0.094)
Duration Dependence	1.428***	1.164***	1.360***	1.285***	1.400***
	(0.398)	(0.352)	(0.385)	(0.359)	(0.370)
Patronage Network and Leadership					
Secretary-Center Ties(yrs)					-0.064
					(0.052)
Governor-Center Ties(yrs)					-0.015
					(0.117)
Party Secretary					
Tenure					-0.006
					(0.024)
Education					-0.120
					(0.239)
Age					0.069
					(0.102)
Governor					
Tenure					-0.010
					(0.025)
Education					-1.126**
					(0.459)
Age					-0.011
					(0.105)
Gender					-0.593
					(0.715)
Constant	-10.224**	-10.799**	-8.960**	-13.167***	-13.628
	(4.057)	(5.006)	(4.332)	(5.099)	(9.510)
Observations	310	310	310	310	310
Log-Likelihood	-105.27	-106.03	-101.94	-99.60	-95.48
chi2	86.67	68.39	77.38	77.59	139.03

Note: * p <0.10, ** p <0.05, *** p <0.01. Clustered standard errors at the province level are reported in the parentheses.

Policy orientation and neighboring effect are still significant, and the size of the coefficients is even bigger than in the other models. Increasing issue salience enhances the odds of a province responding to the scandal. Surprisingly, vertical pressure from the central government and online public attitude are not statistically significant. One explanation for this is that since the central government's response was induced by online public opinion, which then, in turn, strengthened issue salience and public discourse on the scandal, issue salience already accounted for the potential effect of vertical pressure. Additional analysis on the vertical effect indicates that the inclusion of the issue salience variable subsumed the effect of the central government (see Appendix B).

Provincial governments might not have the motivation to address national public attitude, especially when it does not target them specifically, since they are more likely to care about their local demands (Su and Meng 2016). However, they might have to take action when the central government requires them to be transparent and accountable. I tested this possibility by including the interaction between national public attitude and the central government's response in Model 4. The coefficient estimate for the interaction term is negative and statistically significant, indicating that negative public attitude at the national level is more likely to lead to a provincial response after the central government addresses the scandal. In other words, when the central government shifts partial responsibility for responsiveness to provinces, the increasing public outcry precipitates provincial governments' responses.

Finally, to investigate the effects of patronage network and provincial leaders' characteristics on responsiveness, I further controlled several additional variables in Model 5. Repeatedly, the results were robust to competing explanations. In a robustness check, I also used several other capacity variables, including GDP, expenditure, and tax revenues, which are usually thought to indicate compliance in governance reform, and the main results remain substantively consistent (see Appendix C).

ROBUSTNESS CHECKS

To this point, the empirical results have supported the main arguments about policy orientation and neighboring effect. However, as Figure 2 shows, the provinces that responded quickly were clustered together, while the provinces that responded slowly were also grouped together. An alternative explanation for provinces' responses might be spatial dependence. To address the spatial and temporal dynamics, I used spatiotemperal autoregression model based on Model 4 and 5, respectively.

The spatial model specification is as follows:

$$\begin{aligned} Y_{it} = \rho W y_{it} + \phi y_{it_1} + \beta_1 PolicyOrientation_i + \beta_2 NeigboringEffect_{i,t-1} \\ + \beta_3 CentralPressure_{i,t-1} + \beta_4 PublicAttitude_{it} \\ + \beta_5 IssueSalience_{it} + \beta_6 (PublicAttitude_{it} * CentralPressure_{i,t-1}) \\ + \beta_7 X_{it} + \varepsilon_{it} \end{aligned} \tag{2}$$

where *Y_it* is the dependent variable for province i at day t, y_{it_1} is a lagged dependent variable, and *Wy_it* is spatial lag. The spatial weight matrix is constructed based on the geographic distance between capitals of provinces. *X_it* is the same as equation (1) but without *CentralPressure*,*IssueSalience* and *PublicAttitude*, which controls for provincial conditions, provincial leaders' characteristics, and patronage network.

Table 2 presents results from spatiotemperal autoregression models. I first examined spatial and temporal lags in Model 4 (Column 1) and Model 5 (Column 4) without mechanism variables to check the degree of dependence. Results in Columns 2 and 5 imply that spatial dependence still exists when policy orientation and horizontal and vertical diffusion variables are included in models, but public opinion and issue salience variables are excluded. However, the effect of spatial dependence disappeared when issue salience and public opinion were included. This suggests that when an issue draws national attention, the importance of the issue rather than spatial dependence determines provincial behavior; in contrast, when the issue is

Table 2: Robustness Check with Spatiotemporal Models

	Spatiotemporal Lag b/se	Without Public Opinion b/se	With Public Opinion b/se	Spatiotemporal Lag b/se	Without Public Opinion b/se	With Public Opinion b/se
Spatial Lag	0.197**	0.159*	0.053	0.193**	0.152*	0.047
	(0.085)	(0.087)	(0.096)	(0.084)	(0.086)	(0.095)
Temporal Lag	0.280***	0.110	0.104	0.296***	0.105	0.102
	(0.081)	(0.089)	(0.090)	(0.080)	(0.088)	(0.087)
Policy Orientation						
% Public Health Expenditure		0.067***	0.067***		0.098***	0.100***
		(0.021)	(0.021)		(0.031)	(0.032)
Neighboring Effect						
Proportion of Neighbors		0.197*	0.210**		0.220**	0.233**
		(0.104)	(0.102)		(0.105)	(0.102)
Vertical Pressure						
The central government's Response		0.128**	1.062*		0.126**	1.056*
		(0.057)	(0.643)		(0.057)	(0.640)
Issue Salience and Public Attitude						
Log no. of Weibo			0.081**			0.080**
			(0.033)			(0.033)
Public Attitude			0.023***			0.023***
			(0.006)			(0.006)
The central government + Public Attitude			-0.032*			-0.031**
			(0.016)			(0.016)
Capacity and Provincial Factors						
Log Revenue in 2018	-0.016	-0.009	-0.004	0.034	0.049	0.057
	(0.059)	(0.053)	(0.053)	(0.093)	(0.082)	(0.082)
% GDP in National GDP	0.017	0.024	0.023	0.003	0.015	0.014
	(0.016)	(0.016)	(0.016)	(0.022)	(0.021)	(0.021)
Log Population	-0.003	-0.094*	-0.096*	-0.001	-0.181*	-0.189**
	(0.046)	(0.053)	(0.053)	(0.070)	(0.093)	(0.093)
Governance Challenges						
Purchased Problematic Vaccine	0.151*	0.196**	0.198**	0.185**	0.297***	0.302***
	(0.086)	(0.085)	(0.080)	(0.092)	(0.093)	(0.088)
% Youth Population under 14	0.002	-0.010	-0.010	0.012	-0.014	-0.015
	(0.006)	(0.006)	(0.007)	(0.009)	(0.012)	(0.012)
Time Dependence	0.259***	0.228***	0.219***	0.276***	0.235***	0.229***
	(0.054)	(0.056)	(0.063)	(0.054)	(0.056)	(0.061)
Patronage Network						
Secretary-Center Ties(yrs)				-0.001	-0.005	-0.005
				(0.007)	(0.008)	(0.007)
Governor-Center Ties(yrs)				0.012	-0.001	-0.002
				(0.015)	(0.015)	(0.015)
Party Secretary						
Tenure				0.001	-0.000	-0.000
				(0.004)	(0.004)	(0.004)
Age				0.003	0.011	0.012
				(0.013)	(0.013)	(0.013)
Education				-0.025	-0.001	0.000
				(0.035)	(0.036)	(0.035)
Governor						
Tenure				-0.001	0.000	0.000
				(0.003)	(0.003)	(0.003)
Age				-0.015	-0.002	-0.001
				(0.012)	(0.012)	(0.012)
Education				-0.047	-0.104**	-0.104**
				(0.047)	(0.049)	(0.048)
Gender				0.054	-0.048	-0.054
				(0.099)	(0.104)	(0.104)
Constant	-0.152	0.162	-1.107**	0.167	-0.063	-1.387
	(0.388)	(0.373)	(0.535)	(1.170)	(1.089)	(1.164)
sigma	0.350***	0.336***	0.330***	0.347***	0.332***	0.326***
	(0.018)	(0.017)	(0.016)	(0.018)	(0.016)	(0.016)
Observations	279	279	279	279	279	279

* p <0.10, ** p <0.05, *** p <0.01

not nationally salient, provinces use peers' responses as a benchmark for their responsiveness decisions. To address the concern that temporal lag could introduce bias in a short panel data, I also ran a spatial lag model and results still hold (See Appendix D).

Generally, spatial dependence was present, but only when there was no national issue salience and public attitude. More importantly, policy orientation and neighboring effect are robust to alternative specifications, including models controlling the patronage network, provincial leaders' characteristics, and spatial dependence among provincial governments.

A PAIRED CASE STUDY

To illustrate the role of policy orientation in detail, I used a paired case study of two neighboring provinces: Hubei and Hunan. Hubei was the first reported epicenter of the COVID-19 outbreak in the world. A better understanding of Hubei's performance in public health during normal times provides insights into reasons for its delay in dealing with COVID-19 cases at the early stage.

During the 2018 vaccine scandal, Hunan was one of the earliest responders and responded twice, on July 20 and 25, respectively; in contrast, Hubei was one of the last responders after 28 other provinces had already responded at least once. Table 3 shows a descriptive comparison between Huberi and Hunan at the macro level. Hubei performed better than Hunan in most indicators of "hard capacity," including GDP, tax and budget revenue, and urbanization rate.

Although Hunan has a larger population and weaker fiscal capacity than Hubei, the gap in public health expenditure per capita between these two provinces was smaller than would have been expected because of Hunan's higher percentage of public health expenditure out of its overall budget. The public health expenditure per capita in 2018 was 975.4 yuan in Hubei and 914.1 yuan in Hunan. Hubei province spent only 61 yuan more per citizen on public health than Hunan, even though its budget expenditure per capita was 1,394.67 yuan more than Hunan. In other words, the overall budget expenditure per capita in Hubei was 12.7% higher than in Hunan, which could lead us to expect that there might be a similar gap in health expenditure

Table 3: The Comparison between Hunan and Hubei

Province	Hubei	Hunan
First Response Day	July 24th	July 20th
Challenge:Problematic Vaccine	No	No
The Number of Neighbors	6	6
GDP in 2017	35,478.09	33,902.96
Revenue in 2018 (100 million)	3,307.03	2,860.68
Population in 2017 (million)	59.02	68.60
Budget Expenditure Per Capita in 2018	12,297.9	10,903.23
Health Expenditure Per Capita in 2018	975.5	914.12
Percentage of Health in Expenditure in 2018	7.93%	8.38%
Percentage of Youth	15.35%	19.48%
Urbanization Rate	60.3%	56.02%

per capita. However, the allocated health expenditure per capita was only 6.7% more. Hunan's policy orientation in public health compensated for a potential big gap in health expenditure which could be caused by fiscal capacity.

To examine whether the policy orientation of local governments is consistent with their provincial-level government, I collected the 2018 public health expenditures and local budget expenditures of the prefectural-level cities in Hubei and Hunan. Prefectural level cities are one-level-down administrative divisions below the provincial government. Through the one-level-down mechanism of the cadre management system, provincial leaders convey their policy priorities to prefectural governments, which in turn communicate them to the next level-down governments. If public health expenditure reflects policy orientation and local governments follow the orientation, we should expect a similar expenditure pattern at the sub-provincial level. A comparison showed that the mean share of health expenditure in prefectural-level cities in Hunan was higher than in Hube (see Appendix E).

This paired study suggests that policy orientation in public health was further demonstrated at the prefectural level. A policy orientation is set by a provincial government and followed by sub-provincial governments. Such a consistency through different levels of government endows the province with a better governance capacity in the orientated field.

CONCLUSION

Speaking to a rapidly growing body of literature on authoritarian governance, responsiveness, and policy diffusion, this article finds policy orientation and neighboring effect play a vital role in subnational governments' responses even after accounting for two traditional determinants, fiscal capacity and vertical pressure. Policy orientation reflects objective restraints, local challenges, and subjective governance willingness in domains. It improves a provincial government's overall governance in an orientated field through one-level-down cadre management. Moreover, unlike previous studies that either did not find neighboring effect at the provincial level or found that horizontal effect could be substituted by vertical pressure (Zhang and Zhu 2019, 2020), this paper finds that neighboring governments' responses encourage a focal provincial government to respond. Additionally, vertical coercion might not directly result from the central government's mandates. When the issue is salient enough nationwide, the mere potential of supervision from the upper-level government is enough to push subnational units to take action. However, due to multilevel governance, subnational governments do not automatically respond to the nationwide public attitude; instead, they respond to negative public sentiment when the central government signals the problem and transfers partial responsibility for responsiveness to them.

It is prudent not to overgeneralize the findings from one case, but it is worth noting that policy orientation and neighboring effect should be considered in studies of authoritarian governance. In this paper, policy orientation is captured by resource allocation, but there are other ways to measure policy orientation. For example, one alternative approach is to quantify policy orientation using governments' Five-Year plans. Future studies can also explore determinants of policy orientation from the perspective of decentralization degree, corruption, budgetary transparency, bureaucratic expertise, industrial structure, economic growth target, and leaders' preferences (Mauro 1998; Lampton 1992; Zhiyong and Sixia 2014; Meng and Su 2021; Liu et al. 2020). In terms of peer pressure, this paper takes neighboring governments as a peer group because giving responses in the scandal case did not directly affect economic growth, and governments do not need to look at their economic or political peers' behaviors to make decisions.

However, if responses directly affect economic development or involve difficult choices, peers should be redefined. Although this paper focuses on public health, future studies can examine the role of policy orientation in similar policy domains, including but not limited to environmental protection and social welfare. Governance and quick responses in these fields require intensive resources and time investment and officials' firm resolution because good governance cannot be achieved in a short time and does not contribute to officials' political achievement in a way as fast as fiscal revenue does. In addition, given that localities are more responsive to local demands, future studies could focus on the role of local public opinion on the diffusion of responsiveness and governance across subnational governments (Pacheco 2012).

Policy orientation and horizontal diffusion have significant implications. During normal times, a horizontal diffusion through institutionalized cadre management system mitigates the adverse effects of sluggish governance caused by a lack of policy orientation. In a crisis time, policy orientation and governance willingness have a more prominent effect when a quick response is required. A triggered response by peer governments might have missed the optimal timeframe for handling an unfolding crisis. For example, at the early stage of a pandemic, like COVID-19, if a government does not have the will and preparedness to respond to a potential crisis, it could escalate into an uncontrolled crisis in a shorter time. There is no time for a government to wait and adopt peers' responses. Thus, to prepare better for any future pandemic and crises in domains that require a long-term investment to produce results, policy orientation should attain more attention.

Notes

1. The data was collected by Zhiweidata. The collected microblogs included posts and forwards but not comments, which appear only under a hashtag or a post but not on personal pages. The data was collected by using the following key words: Changsheng + Faked, Changsheng + Vaccine, Changsheng + Stop production,Changsheng + Bio-technology,Changsheng + Food and Drug Administration, Zhang Ziyi + Changsheng,Shandong + Vaccine, Gao junfang, Du Weimin, King of Vaccine, Changchun Changsheng, Wuhan Biotechnology,Kangtai + Biotechnology, Wang Keqin, Jiangsu + Vaccine, Beijing + Vaccine, Vaccine Issue, Vaccine, and Kangtai Biotechnology from July 15th to August 10, 2018.

2. Party secretaries' gender is not included in models since there is no female party secretary at the provincial level.

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Appendix A: Summary and Sources of Dependent Variable

	Province	Response Day	Response Times	Source
1	Anhui	723	1	Official Website
2	Beijing	722	1	Media
3	Chongqing	718	2	Wechat
4	Chongqing	723	2	Media
5	Fujian	718	2	Wechat
6	Fujian	722	2	Media
7	Gansu	722	1	Media
8	Guangdong	722	1	Media
9	Guangxi	719	2	Wechat
10	Guangxi	724	2	Media
11	Guizhou	723	2	Media
12	Guizhou	725	2	Media
13	Hainan	717	2	Media
14	Hainan	724	2	Media
15	Hebei	721	3	Wechat
16	Hebei	722	3	Media
17	Hebei	723	3	Wechat
18	Heilongjiang	724	1	Media
19	Henan	718	2	Wechat
20	Henan	722	2	Media
21	Hubei	724	1	Official Website
22	Hunan	720	2	Weibo
23	Hunan	725	2	Media
24	Jiangsu	720	3	Wechat
25	Jiangsu	722	3	Media
26	Jiangsu	723	3	Press conference
27	Jiangxi	722	1	Media
28	Jilin	724	1	Wechat
29	Liaoning	723	1	Media
30	Inner Mongolia	723	1	Media
31	Ningxia	723	1	Media
32	Qinghai	719	2	Wechat
33	Qinghai	724	2	Official Website
34	Shaanxi	722	1	Media
35	Shandong	718	3	Wechat
36	Shandong	723	3	Wechat
37	Shandong	724	3	Official Website
38	Shanghai	716	3	Wechat
39	Shanghai	723	3	Wechat
40	Shanghai	724	3	Press conference
41	Shanxi	719	2	Official Website
42	Shanxi	725	2	Press conference
43	Sichuan	722	2	Media
44	Sichuan	723	2	Official Website
45	Tianjin	722	2	Media
46	Tianjin	724	2	Official Website
47	Xinjiang	NA	NA	NA
48	Tibet	723	1	Media
49	Yunnan	723	2	Media
50	Yunnan	724	2	Media
51	Zhejiang	722	1	Wechat

Appendix B: The Effects of Vertical Pressure, Issue Salience and Public Attitude

	Center b/se	With Control b/se	Policy Orientation b/se	Horizontal Pressure b/se	Issue Salience b/se	Public Attitude b/se	Salience + Attitude b/se	Interaction b/se
Vertical Pressure								
the central government's Response	1.485***	1.551***	1.632***	1.129***	0.513	1.639***	-0.574	7.321*
	(0.335)	(0.341)	(0.364)	(0.343)	(0.603)	(0.492)	(0.835)	(3.986)
Policy Orientation								
% Public Health Expenditure			0.884***					
			(0.205)					
Neighboring Effect								
Proportion of Neighbors				1.689***				
Who Responded				(0.616)				
Issue Salience and Public Attitude								
Log no. of Weibo					0.411**		0.627***	0.777***
					(0.206)		(0.191)	(0.242)
Public Attitude						-0.017	0.104	0.178**
						(0.063)	(0.068)	(0.076)
The central government +								-0.216*
Public Attitude								(0.114)
Capacity and Provincial Factors								
Log Revenue in 2018	0.241	0.959	1.654***	0.407	0.933	0.953	0.961	1.002
	(0.515)	(0.643)	(0.507)	(0.745)	(0.627)	(0.636)	(0.638)	(0.633)
% GDP in National GDP	0.104	-0.028	0.016	0.017	-0.030	-0.028	-0.031	-0.037
	(0.118)	(0.125)	(0.102)	(0.153)	(0.125)	(0.125)	(0.129)	(0.125)
Log Population	-0.250	-0.511	-2.390***	-0.129	-0.501	-0.507	-0.524	-0.542
	(0.337)	(0.461)	(0.549)	(0.568)	(0.455)	(0.458)	(0.457)	(0.458)
Governance Challenges								
Purchased Problematic Vaccine	1.202***	1.445***	2.156***	1.676***	1.450***	1.439***	1.491***	1.441***
	(0.293)	(0.379)	(0.473)	(0.458)	(0.378)	(0.378)	(0.393)	(0.390)
% Youth Population under 14	0.011	0.116**	-0.082	0.097	0.113**	0.116**	0.114**	0.121**
	(0.060)	(0.052)	(0.075)	(0.063)	(0.051)	(0.052)	(0.051)	(0.053)
Duration Dependence	1.416***	1.562***	1.741***	1.386***	1.324***	1.527***	1.405***	1.326***
	(0.298)	(0.311)	(0.355)	(0.285)	(0.302)	(0.365)	(0.359)	(0.341)
Patronage Network								
Secretary-Center Ties(yrs)		-0.038	-0.108***	0.007	-0.041	-0.038	-0.043	-0.043
		(0.041)	(0.038)	(0.049)	(0.040)	(0.040)	(0.041)	(0.041)
Governor-Center Ties(yrs)		0.099	-0.060	0.151	0.092	0.098	0.094	0.092
		(0.097)	(0.080)	(0.115)	(0.098)	(0.098)	(0.101)	(0.099)
Party Secretary								
Tenure		0.010	-0.002	0.013	0.009	0.010	0.009	0.007
		(0.025)	(0.017)	(0.032)	(0.025)	(0.025)	(0.026)	(0.024)
Education		-0.159	0.063	-0.310	-0.147	-0.158	-0.152	-0.153
		(0.241)	(0.155)	(0.299)	(0.238)	(0.242)	(0.244)	(0.237)
Age		0.002	0.114	-0.044	0.010	0.003	0.009	0.008
		(0.077)	(0.075)	(0.092)	(0.078)	(0.077)	(0.081)	(0.078)
Governor								
Tenure		-0.017	-0.007	-0.022	-0.016	-0.017	-0.016	-0.016
		(0.030)	(0.016)	(0.041)	(0.029)	(0.030)	(0.029)	(0.028)
Education		-0.398	-0.823***	-0.507	-0.415	-0.400	-0.415	-0.409
		(0.298)	(0.316)	(0.380)	(0.300)	(0.300)	(0.304)	(0.300)
Age		-0.120	-0.021	-0.114	-0.117	-0.120	-0.119	-0.123
		(0.075)	(0.073)	(0.092)	(0.074)	(0.075)	(0.077)	(0.078)
Gender		0.384	-0.598	0.622	0.308	0.365	0.375	0.285
		(0.768)	(0.471)	(0.993)	(0.733)	(0.759)	(0.746)	(0.725)
Constant	-4.364	-1.157	-7.206	3.024	-3.836	-0.582	-8.721	-12.061
	(3.162)	(7.843)	(6.224)	(8.952)	(7.985)	(7.874)	(8.849)	(9.040)
Observations	310	310	310	310	310	310	310	310
Log-Likelihood	-113.29	-110.76	-106.70	-107.77	-107.05	-110.68	-105.56	-103.49
chi2	66.66	110.31	91.48	101.20	139.62	133.71	127.60	156.32

* p <0.10, ** p <0.05, *** p <0.01

Appendix C: Robustness Check with Different Capacity Variables

	GDP	Expenditure	Tax
Policy Orientation			
% Public Health Expenditure	0.935***	1.169***	0.995***
	(0.244)	(0.310)	(0.254)
Neighboring Effect			
Proportion of Neighbors	2.326***	2.237***	2.216***
who responded	(0.676)	(0.664)	(0.675)
Vertical Pressure			
the central government's Response	7.761*	7.710*	7.778*
	(4.270)	(4.309)	(4.305)
Issue Salience and Public Attitude			
Log no. of Weibo	0.780***	0.790***	0.784***
	(0.265)	(0.268)	(0.265)
Public Attitude	0.205**	0.210**	0.206**
	(0.085)	(0.087)	(0.085)
the central government +	-0.243**	-0.241*	-0.243**
Public Attitude	(0.123)	(0.124)	(0.124)
Capacity and Provincial Factors			
Log GDP in 2018	1.191		
	(0.939)		
Log Expenditure in 2018		2.169*	
		(1.184)	
Log Tax Revenue			1.102
			(0.701)
% GDP in National GDP	0.107	0.109	0.054
	(0.158)	(0.113)	(0.152)
Log Population	-2.466***	-2.914**	-2.178***
	(0.893)	(1.136)	(0.786)
Governance Challenges			
Purchased Problematic Vaccine	2.526***	2.914***	2.646***
	(0.614)	(0.625)	(0.637)
% Youth Population under 14	-0.093	-0.142	-0.094
	(0.109)	(0.090)	(0.099)
Patronage Network			
Secretary-Center Ties(yrs)	-0.049	-0.055	-0.073
	(0.044)	(0.051)	(0.052)
Governor-Center Ties(yrs)	0.053	0.056	-0.022
	(0.133)	(0.121)	(0.114)
Party Secretary			
Tenure	-0.012	-0.032	-0.005
	(0.023)	(0.032)	(0.024)
Education	-0.100	-0.295	-0.107
	(0.246)	(0.244)	(0.236)
Age	0.063	0.093	0.076
	(0.108)	(0.098)	(0.100)
Governor			
Tenure	-0.006	-0.012	-0.015
	(0.025)	(0.025)	(0.027)
Education	-0.972**	-1.239***	-1.155**
	(0.416)	(0.447)	(0.492)
Age	-0.015	-0.075	-0.005
	(0.111)	(0.117)	(0.103)
Gender	-0.614	-0.396	-0.628
	(0.657)	(0.729)	(0.741)
Duration Dependence	1.391***	1.418***	1.405***
	(0.390)	(0.360)	(0.371)
Constant	-14.879	-16.435*	-14.511
	(11.082)	(9.595)	(9.378)
Observations	310	310	310
Log-Likelihood	-95.64	-95.23	-95.39
chi2	129.60	120.07	129.32

* p <0.10, ** p <0.05, *** p <0.01

Appendix D: Robustness Check with Spatial Lag Model

	Spatial Lag	Without Public Opinion	With Public Opinion	Spatial Lag	Without Public Opinion	With Public Opinion
Spatial Lag	0.242***	0.170**	0.052	0.248***	0.164*	0.048
	(0.082)	(0.086)	(0.093)	(0.081)	(0.086)	(0.093)
Policy Orientation						
% Public Health Expenditure		0.053***	0.049**		0.083***	0.080***
		(0.019)	(0.019)		(0.028)	(0.030)
Neighboring Effect						
Proportion of Neighbors		0.227**	0.209**		0.249***	0.229**
		(0.092)	(0.092)		(0.091)	(0.091)
Vertical Pressure						
The central government's Response		0.102*	1.034		0.096*	1.020
		(0.055)	(0.670)		(0.055)	(0.665)
Issue Salience and Public Attitude						
Log no. of Weibo			0.069**			0.067**
			(0.033)			(0.033)
Public Attitude			0.012**			0.012**
			(0.006)			(0.006)
the central government + Public Attitude			-0.029*			-0.029*
			(0.017)			(0.017)
Capacity and Provincial Factors						
Log Revenue in 2018	0.005	0.009	0.015	-0.007	0.051	0.062
	(0.060)	(0.056)	(0.057)	(0.081)	(0.080)	(0.082)
% GDP in National GDP	0.011	0.016	0.015	0.012	0.011	0.010
	(0.015)	(0.015)	(0.015)	(0.020)	(0.020)	(0.019)
Log Population	-0.016	-0.086*	-0.083	0.017	-0.164*	-0.168*
	(0.046)	(0.051)	(0.051)	(0.063)	(0.089)	(0.089)
Governance Challenges						
Purchased Problematic Vaccine	0.133	0.168**	0.161**		0.254***	0.247***
	(0.082)	(0.078)	(0.074)		(0.084)	(0.081)
% Youth Population under 14	0.001	-0.009	-0.008		-0.014	-0.013
	(0.005)	(0.006)	(0.006)		(0.010)	(0.011)
Time Dependence	0.125***	0.137***	0.113***	0.121***	0.142***	0.119***
	(0.031)	(0.031)	(0.034)	(0.031)	(0.031)	(0.033)
Patronage Network and Leadership						
Secretary-Center Ties(yrs)				0.000	-0.004	-0.004
				(0.006)	(0.007)	(0.007)
Governor-Center Ties(yrs)				0.008	0.002	0.001
				(0.014)	(0.014)	(0.014)
Secretary						
Tenure				0.002	-0.000	-0.000
				(0.003)	(0.004)	(0.004)
Age					0.006	0.007
					(0.012)	(0.012)
Education				-0.007	-0.002	0.002
				(0.028)	(0.033)	(0.033)
Governor						
Tenure				-0.001	0.000	0.000
				(0.003)	(0.003)	(0.003)
Age				-0.002	0.002	0.002
				(0.009)	(0.011)	(0.011)
Education				-0.004	-0.092**	-0.089**
				(0.041)	(0.044)	(0.043)
Gender				0.025	-0.040	-0.045
				(0.085)	(0.095)	(0.096)
Constant	0.028	0.212	-0.600	0.015	0.124	-0.736
	(0.342)	(0.332)	(0.493)	(0.811)	(0.980)	(1.062)
Sigma	0.343***	0.329***	0.325***	0.344***	0.325***	0.322***
	(0.018)	(0.016)	(0.016)	(0.018)	(0.016)	(0.016)
Observations	310	310	310	310	310	310

* p <0.10, ** p <0.05, *** p <0.01

Appendix E: Public Health Expenditure at Prefectural Level

	Year	Expenditure (10,000)	Public Health (10,000)	Share of Health	Source
Hunan_Perfectures		480.60	42.88	9.41	Hunan Provincial Bureau of Statistic
Changsha	2018	1,300.79	67.42	5.18	Hunan Provincial Bureau of Statistic
Zhuzhou	2018	456.28	34.89	7.65	Hunan Provincial Bureau of Statistic
Xiangtan	2018	307.47	25.10	8.16	Hunan Provincial Bureau of Statistic
Hengyang	2018	531.48	58.16	10.94	Hunan Provincial Bureau of Statistic
Shaoyang	2018	548.16	59.99	10.94	Hunan Provincial Bureau of Statistic
Yueyang	2018	531.76	49.46	9.30	Hunan Provincial Bureau of Statistic
Changde	2018	548.12	51.47	9.39	Hunan Provincial Bureau of Statistic
Zhangjiajie	2018	175.58	14.95	8.51	Hunan Provincial Bureau of Statistic
Yiyang	2018	356.34	38.17	10.71	Hunan Provincial Bureau of Statistic
Chenzhou	2018	417.30	40.86	9.79	Hunan Provincial Bureau of Statistic
Yongzhou	2018	460.81	49.90	10.83	Hunan Provincial Bureau of Statistic
Huaihua	2018	462.24	44.71	9.67	Hunan Provincial Bureau of Statistic
Loudi	2018	303.29	31.35	10.34	Hunan Provincial Bureau of Statistic
West Hunan	2018	328.80	33.88	10.30	Hunan Provincial Bureau of Statistic
Hubei_Perfectures	2018	433.24	38.98	9.23	
Wuhan	2018	1,718.62	139.64	8.12	Wuhan Bureau of Statistic
Huangshi	2018	246.61	22.00	8.92	Huangshi Bureau of Statistic
Shiyan	2018	77.90	5.40	6.94	Shiyan Bureau of Finance
Yichang	2018	503.58	44.16	8.77	YichangBureau of Statistic
Xiangyang	2018	670.97	48.54	7.24	Xiangyang Bureau of Statistic
Jingmen	2018	269.14	24.39	9.06	Jingmen Bureau of Statistic
Xiaogan	2018	309.97	35.59	11.48	Xiaogan Bureau of Statistic
Jingzhou	2018	433.18	42.90	9.90	Jingzhou Bureau of Statistic
Huanggang	2018	482.63	53.01	10.98	Huangguang Bureau of Statistic
Xianning	2018	248.34	23.88	9.62	Xianning Bureau of Statistic
Suizhou	2018	154.14	16.38	10.63	Suizhou Bureau of Statistic
Ezhou	2018	125.31	9.82	7.83	Ezhou Burea of Finance
Enshi	2018	391.76	40.99	10.46	EnshiBureau of Statistic