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Within the shadow of hierarchy: The role of hierarchical interventions in environmental collaborative governance

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Abstract

Existing literature often analyzes the effects of horizontal relationships on collaborative governance, though some scholars have started to recognize the **role of hierarchical interventions**. This paper identifies two poorly examined areas of study. First, there is a lack of empirical studies to understand the diverse impacts of hierarchical interventions on collaborative governance. Second, there is little deliberation on how existing horizontal relationships can moderate the effects that hierarchical interventions have on collaborative governance. This paper utilizes environmental collaboration data from the Yangtze River Delta region in China to estimate the impacts of hierarchical interventions on collaborative arrangements and the contextual effects of horizontal relationships. We find that hierarchical interventions, such as top-down regulations and performance evaluation, enhance the formalization of collaborative arrangements. Additionally, horizontal relationships derived from past experiences can moderate the effects of hierarchical interventions, notwithstanding such effects vary among different interventions.

1 | INTRODUCTION

The past three decades saw an increase in collaborative actions to resolve “wicked problems,” which could not be tackled by any single organization due to their cross-institutional and cross-sectoral boundary nature. Initially, the concept of “collaboration” focuses more on multiparty co-labor efforts and intends to solve public problems and provide services by stimulating

resource sharing, mutual interdependence and joint actions (Gray, 1985; Keast et al., 2007; Margerum, 2011; Thomson et al., 2009). Collaboration practices can adopt various governance modes, usually categorized along a continuum of stakeholder participation (Moore & Koontz, 2003), which range from agency-based mandated collaborations to stakeholder-based voluntary decisions (McNamara et al., 2020).

Lately, an increasing number of scholars have turned to the concept of “collaborative governance,” which focuses more on “the processes and structures ... that enable people constructively across the boundaries of public agencies, levels of government, and/or public, private, and civic spheres” (Emerson et al., 2012). Collaborative governance is a collective decision-making process that is representative, consensus-oriented, and deliberative. It is commonly regarded as the replacement of adversarial and managerial modes of collaboration (Ansell & Gash, 2008). Specifically, some scholars view collaborative governance as a voluntary mechanism rather than a mandate, determined by past collaborative experiences, belief homophily, and resource dependency (Wagner et al., 2020). In other words, the influencing factors of a collective decision-making process are mostly focused on horizontal relationships and interactions among actors (Ansell et al., 2020; Brass, 2012; Calanni et al., 2015; Choi & Robertson, 2019; Esteve et al., 2013).

Yet, existing literature also admits that the formation and operation of collaborative efforts often occur within a “shadow of hierarchy”, in which mutually dependent yet operationally autonomous actors interact through conflict-ridden negotiations, facilitate self-regulated policymaking, and contribute to the production of ‘public value’ in a broad sense (Sørensen & Torfing, 2009). When self-initiated collaborations fail either due to lack of trust, unpleasant previous collaboration experiences, or value and interest divergence among participants, mandates such as regulations, financial funds, or special organization may push collaborations to start (Ansell & Gash, 2008; Rodríguez et al., 2007; Saz-Carranza et al., 2016). For example, governmental actors can adopt a set of collaborative tools to initiate and support inter-organizational collaborations, hence acting as leaders and encouragers (Scott & Thomas, 2017). More generally, a superior’s mandate can steer a network through bringing different actors around the table, mobilizing participants to move collaboration forward, and enhancing system stability (Mu et al., 2019; Torfing & Sørensen, 2014).

Mandates, however, may become obstacles to collaboration. Inappropriate interventions are likely to activate a series of tensions that, if taken as a whole, make mandated activities oscillate between the search for group integration and the need to maintain actors’ autonomy. The challenge lies in the degree of autonomy given to actors. When there are excessive hierarchical interventions that straightjacket a collaboration, actors’ willingness to participate in joint problem solving and consensus building will be greatly reduced (Mosely & James, 2008).

Recent literature tries to integrate mandates into the collaborative governance model to avoid constraints brought by such exogenous interventions. Ansell and Gash (2018) argue that collaborative platforms impose vertical intermediations and provide resources and political authority for local collaborations. The network governance literature also attunes to the importance of mandates by proposing network metagovernance to describe how a state can manage the collaborative network (Klijn et al., 2008; Sørensen & Torfing, 2009). Appropriate mandates stimulate learning among participants to form long-term collaborative mechanisms (Brummel et al., 2010). In sum, collaborative governance literature sets the institutional framework for governments to participate, and yet ‘take a step back’ in order to create room for actors to operate with a degree of autonomy. The superordinate actor employs hierarchical interventions in form of regulations to initiate collaboration networks and define the scope of membership,

evaluations to gauge actors' performances in terms of goal achievement, and finally direct management or participation to achieve conflict reconciliation and resource mobilization (Ansell & Gash, 2008, 2018; Emerson & Nabatchi, 2015; Scott & Thomas, 2017; Sørensen & Torfing, 2009).

It is worth noting that most existing literature concerns deciphering the separate effects of horizontal relationships (between actors) and hierarchical interventions (from the superior to the actors) on the collaborative process (Ansell & Gash, 2018; Calanni et al., 2015; Emerson & Nabatchi, 2015; Esteve et al. 2013; Mosely & James 2008; Rodríguez et al. 2007; Sørensen & Torfing, 2009; Scott & Thomas, 2017). We identify two poorly examined areas of study in current research. First, there is a lack of empirical studies to understand the diverse impacts of hierarchical interventions on the formation of collaborative governance. Second, there is little deliberation on how existing horizontal relationships interact with effects of hierarchical interventions. This research attempts to shed light on these lacunae by exploring the following two questions:

1. How do hierarchical interventions affect local collaborative governance?
2. How do different horizontal relationships among participants influence the impacts of hierarchical interventions on collaborative governance?

This research references cases of collaborative governance in China, specifically where local governments engage in collective decision-making to solve regional environmental pollution dilemmas. Though many scholars have explored the local-local and central-local collaborations in this region (Economy, 2011; Mertha, 2011), more attention has been paid to campaign-style collaborations or collaborative implementations (Mu et al., 2019; Wang et al., 2021; Zhan et al., 2014). Though there are few discussions focusing on collaborative governance (Yi et al., 2018), in practice, multiple forms of environmental collaborative arrangements have emerged over the last decade, ranging from informal forums, workshops, regular joint meetings, and joint policy documents. With diverse forms of hierarchical interventions and horizontal relationships present in the Chinese environmental protection arena, we find that the data suitably encompasses the variety needed to explore the diverse effects of the aforementioned factors.

Given that a hierarchical structure is embedded within collaborative relationships and the consensus-oriented, collective, and cooperative culture is hard to cultivate, this paper agrees with previous discussions that hierarchical interventions should be an integral part of collaborative governance. This paper contributes to the literature by empirically analyzing the role of hierarchical interventions and their interactive impacts with existing horizontal relationships in the formation of collaborative governance.

The remainder of this paper is organized as follows: Section 2 reviews the existing literature and offers our theoretical framework; Section 3 introduces the research design and data; Section 4 describes the method of analysis and shows the results of the empirical findings; Section 5 discusses the regression results; and Section 6 presents the conclusions and policy implications.

2 | HIERARCHICAL INTERVENTIONS, HORIZONTAL RELATIONSHIPS, AND COLLABORATIVE ARRANGEMENTS

Collaborative governance, as a general framework, is “an umbrella term for myriad cross-boundary, multi-institutional arrangements” (Emerson & Nabatchi, 2015, p8). In practice,

various forms of collaborative arrangements emerge, all of which cultivate cooperative spirit and promote collective decision-making. This includes intergovernmental and interstate arrangements, interagency work, public-private partnerships, co-management, adaptive management systems, and local multistakeholder collaboratives (Emerson & Nabatchi, 2015). In this paper, we observe collaborative governance among local governments, or otherwise known as intergovernmental arrangements, for solving complex “wicked” problems. Detailed theoretical framework (as shown in Figure 1) is illustrated at the end of this section.

2.1 | The role of hierarchical interventions in collaborative arrangements

We define hierarchical interventions as the deliberate attempts led or encouraged by superordinate governments to promote collaborative processes and sustain participants' interactions in intergovernmental arrangements. In general, superior interventions exist in all bureaucratic systems, but their incentives and effects differ (Moseley & James, 2008; Rodríguez et al., 2007). In China, local officials would be more likely to accept hierarchical interventions as they are accountable for and rely on superiors for evaluation and promotion (Xu, 2011), while local officials in western countries tend to accept superiors' interventions due to legislative or financial obligations (Taylor & Schweitzer, 2005; Wright, 1974).

In the context of Chinese environmental collaboration, superiors adopt three methods to impose interventions to local governments: regulations, performance evaluation, and coordinative involvement. Their influencing mechanisms are as follows.

First, superordinates have legitimacy and authority to promulgate regulations as coercive instruments that guide processes of local collaborative governance. For example, the State Council of China launched the “Action Plan for Air Pollution Control” in 2013 and clearly demanded local governments in Yangtze River Delta region to set up collaborative mechanisms to reduce air pollution. Regulations, action plans and other policies with clear superior guidance over local collaboration function well especially during the collaboration network's formation stage (Chen et al., 2021; Mu et al., 2019). [Correction added on 21 January 2022, after first online publication: Reference citation, Chen et al., 2021, has been corrected in the preceded sentence.] During the initial phase, coercive tools can serve as institutional designs targeting at the formation of collaborative arrangement, which define the scope of membership, underline stakeholders' responsibilities and provide clear deadlines for policy outputs (Ansell & Gash, 2018). Policy guidelines would greatly benefit collective decisions by identifying and incorporating relevant personnel and resources required to achieve the program goals (Ansell & Gash, 2012; McGuire & Silvia, 2009). Coercive instruments designed by the higher-level government also provide the legitimacy and credibility for joint decisions at the local level (Taylor & Schweitzer, 2005).

Second, superiors can set up performance evaluation tools to initiate and encourage local collaborative arrangements. Such an administrative tool is key to getting things done in a collaborative setting (Thomson & Perry, 2006). Performance evaluation guarantees stakeholders' commitment to collaboration efforts by reshaping their incentives and creating strong interdependencies among actors, which effectively helps to overcome moral hazard and prevent rent-seeking behaviors (Miller, 2000; North, 1993). In China, performance evaluation is often used as a tool to enforce existing policies. Since performance is usually designed to be directly related to official promotion, local officials are more likely to be held accountable or dismissed for poor

performance (Mei & Margret, 2014). Superior governments, thus, could pose performance evaluation over targets, such as air quality improvement goals, to stimulate local collaborative activities. In western countries, higher-level governments usually allocate funds to reward local actors for their accomplishments based on performances (Moseley & James, 2008). Monitoring, on the other hand, is particularly effective in situations involving joint decision-making; despite the numerous challenges, local actors tend to build up trust, share common wills, and share resources under superior monitoring (Thomson & Perry, 2006).

Third, superiors can directly involve themselves in the collaborative process as essential leaders through leveraging on their authority to create higher consistency in decision-making. Additionally, superordinates can act as conveners to initiate collaborative governance, and also encouragers of the collaborative processes by providing knowledge that fosters learning and belief changes among stakeholders (Scott & Thomas, 2017). In China, superiors are naturally suitable as ‘relationship managers’ or ‘boundary spanners’ as they have political and administrative authority to mediate conflicts, urge interdepartmental consensus building, and allocate essential recourses to reduce heterogeneity that may hinder collaboration intentions (Ansell & Gash, 2018; Klijn et al., 2008). In essence, superiors serve as ‘honest brokers’ in mediating disputes, facilitating the construction of shared values, and nurturing relationships between stakeholders. Therefore, superiors’ coordinative involvements enhance the development of collaborative processes.

Therefore, we have following hypotheses:

Hypothesis H1a. *Local governments are more likely to form collaborative arrangements if superiors utilize coercive instruments such as regulations.*

Hypothesis H1b. *Local governments are more likely to form collaborative arrangements if superiors set performance evaluation.*

Hypothesis H1c. *Local governments are more likely to form collaborative arrangements if superiors are directly involved in the collaborative process.*

2.2 | The moderating effect of horizontal relationships on hierarchical interventions

Besides a direct influence, we also assume that an indirect or moderating effect of hierarchical interventions on collaborative arrangements exists. Even when higher-level governments utilize hierarchical interventions to influence local governments, there is no guarantee that local actors will put in substantial efforts and commitment into collaborative arrangements. Indeed, existing literature has addressed situations where collaborations fail to be formed or sustained even with strong hierarchical interventions (Emerson & Nabatchi, 2015; Mosely & James, 2008; Rodríguez et al., 2007). Researchers attribute this failure to the lack of existing horizontal interactions at a local level (Lubell et al., 2002). In this paper, we employ the term “horizontal relationships” to describe collaborative arrangements driven by voluntary motivations, mainly in contrast to the term “hierarchical interventions” that describes collaborative arrangements led or encouraged by superordinates. Referencing findings from existing literature, horizontal relationships are initiated and maintained by trust, reciprocity, and interdependence derived from participants’ prior interactions and relations (Ansell et al., 2020; Brass, 2012; Calanni et al., 2015; Choi & Robertson, 2019; Esteve et al., 2013). We argue that hierarchical pressures cannot be standalone

in encouraging collaborative arrangements. Their impacts are moderated by horizontal relationships at the local level, which are represented by social capital, trust, and reciprocity among participants.

Attributes of the community, that is, all relevant aspects of social and cultural context within an arrangement, such as trust, reciprocity, common understanding, are contextual factors for collective arrangement (McGinnis, 2011). Existing set of collaborative mechanisms influence the rate of participation in new collaborations (Feoick, 2013), and thus there is a relationship between centralized solutions and voluntary efforts within any collaborative process (Kwon et al., 2014; Lubell et al., 2002). We argue that existing horizontal relationships, such as past collaborative experiences, tend to enhance the effects of hierarchical interventions on collaborative arrangements in two ways. First, the effects of hierarchical interventions might be limited without horizontal relationships as participants' interactions and resource sharing could hardly be imposed by superordinates (Emerson & Nabatchi, 2015). Conversely, horizontal relationships provide basis (i.e., constant interactions among participants) for interdependence and enhance reciprocal perceptions, which make collaboration feasible under superiors' mandates. Second, since collaborative activities are time-consuming and resource-intensive, participants' resistance to collaborate is at times so high that hierarchical interventions themselves are insufficient to support the highly ambitious goals. Existing horizontal relationships, meanwhile, offer information and prove the credibility of collaborators, hence significantly reducing transaction costs. These help local actors to avoid unnecessary use of resources and focus instead on the fulfillment of the superiors' mandate.

With horizontal relationships as the foundation for collaborative governance, hierarchical interventions can have a more promising effect. We envision that participants can collaborate better through making use of their connectedness from past experiences. The hypothesis of the moderating effect of horizontal relationship is formulated as:

Hypothesis H2. *The positive effects of superior regulations, performance evaluation and coordinative involvement on collaborative arrangements will be strengthened if past collaborative experiences exist among participants.*

3 | RESEARCH DESIGN AND DATA COLLECTION

3.1 | Environmental collaborative arrangements in the Yangtze River Delta

We selected the Yangtze River Delta as our case study for three main reasons: First, it is a mega metropolitan region consisting of one municipality (Shanghai, directly administrated under the central government) and three provinces (Zhejiang, Jiangsu, and Anhui). Located along the watershed, it becomes difficult to hold any jurisdiction accountable when the region encounters adverse environmental conditions such as air and water pollution. Collaborative governance, thus, becomes a possible solution in response to environmental degradation.

Second, we observed intergovernmental collaborative arrangements encompassing both horizontal relationships and hierarchical interventions in the region since 2008. The first collaborative arrangement for environmental protection was carried out voluntarily in 2008 when Shanghai, Zhejiang, and Jiangsu signed "The Agreement of Environmental Protection Collaboration in the Yangtze River Delta" (Hexun, 2008). Besides that, the central government has

Hierarchy/Bureaucracy

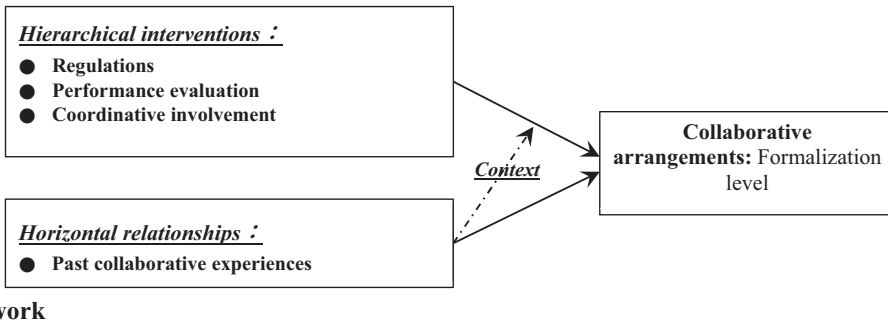


FIGURE 1 Theoretical framework of the role of hierarchical interventions in collaborative. [Correction added on 7 January 2022, after first online publication: The word “arrangements” at the bottom of the figure 1 has been deleted in this version.]

also mandated or imposed joint arrangements. For example, the State Council launched the “Action Plan for Air Pollution Control” that demanded local governments in Yangtze River Delta to set up collaborative mechanisms to reduce air pollution. Under this mandate, the collaborative mechanism of air pollution control in the Yangtze River Delta region was formed in early 2014.

Third, the region has a long history of economic collaborations, which was dated back to the 1990s, with institutionalized inter-local collaborative arrangements. In 1992, 15 cities in the region voluntarily set up a regular meeting mechanism to promote joint research, smooth reform of state-owned enterprises, and enhance joint tourism (Shanghai Municipal People's Government Cooperation and Exchange Office, 2015). Collaborative culture has thus formed in the region, with accumulated trust among local governments. Since 2005, secretaries of the Provincial Party Committee and governors have held annual meetings in the Yangtze River Delta to enhance collaboration in industrial and technology development via joint policy design. When dealing with environmental degradation, local governments in the Yangtze River Delta extended their existing collaborative mechanisms to the environmental area.

Therefore, this region serves as a good example to observe different types of collaborative arrangements under both horizontal relationships and hierarchical interventions.

3.2 | Data sources and collection

The unit of analysis of this research is collaborative arrangements that record cross-boundary, cross-sectoral, and multi-institutional decision-making processes under the collaborative governance framework. We searched for collaboration information via full-text news reports from various sources, including official websites of local environmental departments, micro-blogs of local environmental departments, and local daily newspapers. To ensure the reliability and integrity of the collaboration reports, we cross-checked our sources and utilized multiple sources to complement the content of each collaborative arrangement.¹ The data covers arrangements occurring within four municipalities/provinces from 2008 to 2018.

Data collection process started with keywords identification. We used different Chinese terms related to collaborative arrangements in our search, such as *hezuo* (collaboration), *xiezuo* (collaboration), *lianxi* (joint meeting), *xieyi* (agreement), *liandong* (joint action), *lianhe* (joint action), and *kuajie* (cross-boundary). The search rule among these items is “OR,” which means that news reports covering any of these keywords would be extracted. During the data cleanup process, we removed repetitive reports, reports without essential information about collaborative processes, reports of resource sharing rather than collective decision-making, and reports of collaborations outside the Yangtze River Delta region. Finally, we obtained 122 collaborative arrangements in the region, of which 13 are informal forums or workshops, 35 are regular joint meetings, 49 are formal collaborative agreements, and 25 are joint policy documents (as shown in Table 1).²

We then set up a codebook for content analysis, which includes detailed definitions and measurements of dependent and independent variables (please refer to Table A1). The reliability of measurements is ensured via three approaches: First, the original coding theme was established after a thorough reading of all news reports. Thereafter, two independent coders each coded 50 arrangements to deliberate on the original coding theme. One coder coded all the documents three times, while following the coding theme, and calculated Cohen's kappa to test for internal reliability. The coder then discussed any ambiguity that arose with the other coder to reach a unanimous decision. Finally, a random sample (30% of the documents) was drawn out to ensure internal reliability.

Additionally, we referenced *China City Statistical Yearbook* as the information source for control variables, such as economic and environmental indicators, sulfur dioxide (SO₂) emissions, industrial wastewater discharge, and GDP per capita.

3.3 | Dependent variable

Literature provides no consensus on what may serve as the most suitable measurement for collaborative governance. Scholars have adopted diverse measurements, such as formalization level of collaborative arrangements (Johns et al., 2006; Yi et al., 2018), perceived quality of collaborative processes or outcomes (Lubell, 2004; Ulibarri, 2015), and objective collaborative performance such as environmental quality (Chen et al., 2021; Scott, 2015). We understand that each measurement has its strengths and shortcomings, and have decided to choose the formalization level of collaborative arrangements as our measurement. Each collaborative arrangement has a certain degree of formalization, which represents the structured arrangements for the development and implementation of joint activities using shared resources (Emerson & Nabatchi, 2015). Formalization level of collaborative arrangements is related to participants' commitment to collaboration. Scholars have argued that formal arrangements, as compared to informal ones, have higher demand for resource inputs. The former requires participants to

TABLE 1 Distribution of collaborative arrangements in the Yangtze River Delta region

	Informal arrangements		Formal arrangements		Total
	Forums/workshops	Regular joint meetings	Agreements	Joint policy documents	
Provincial Level	13 (11%)	35 (29%)	49 (40%)	25 (20%)	122 (100%)

commit in an effectual manner, which will enhance the collaboration outcome to some extent (Feoick, 2013; Hill & Lynn, 2003; Nylén, 2007). To explain, as compared to informal arrangements, formal arrangements usually comprise of carefully devised plans such as an illustration of collaborative goals, timetable, and specific governance structures. These would require participants to put in substantially more efforts and resources, which would represent a higher level of and sustained commitment by participants. Therefore, we believe that level of formalization would, to a great extent, serve as a meaningful proxy to the depth of collaborative governance by measuring the extent of commitment by participants.

Governments in China adopt different formats in presenting their collaborative commitment. In our data, we observed formats such as forums, workshops, regular joint/working meetings, agreements, and policies. We are cognizant of the cultural nuances in gauging formalization levels. Hence, to most accurately distinguish different levels of formalization for these collaborative arrangements, we interviewed 10 government officials and asked them to rank these arrangements by the level of formalization.³ Henceforth, we re-grouped collaborative arrangements into informal arrangements (i.e., forums/workshops and regular joint meetings), coding them as “0”, and formal arrangements (i.e., agreements and joint policy documents), coding them as “1”.⁴

3.4 | Independent variables

Our research contains three groups of independent variables: hierarchical interventions, horizontal relationships, and control variables.

3.4.1 | Hierarchical interventions

Regulations

We use regulations to measure hierarchical interventions from higher-level governments (superiors) that require local governments to set up collaborative mechanisms. Regulations are government-led strategies that convey and direct collaborative governance initiatives. For instance, the State Council issued the “Action Plan for Air Pollution Control” in 2013, clearly directing the Beijing-Tianjin-Hebei region and surrounding areas, and the Yangtze River Delta region to establish collaborative governance for air pollution control. We coded the variable of “regulations” as “1” if there exist coercive policy tools for collaborative governance.

Performance evaluation

Higher-level governments can design specific administrative performance goals and corresponding evaluations to guide local actors and indirectly push for collaborative governance. An air quality goal, for example, does not stimulate local governments' collaborations directly, but rather indirectly reshapes the motivation of local governments to collaborate in order to reach the new standard. In 2014, to execute the “Action Plan for Air Pollution Control,” the Chinese State Council launched an evaluation plan for air pollution control detailing specific criteria, goals, as well as evaluation indicators for each criterion (The State Council, 2014). The performance evaluation is then conducted by a higher-level government's administrative entities, such as those under the Ministry of Environmental Protection.

Besides administrative evaluation, the Chinese government also deploys the tool of political evaluation, which is closely attached to cadre promotion, to facilitate policy goal achievement. In China, the Communist Party of China manages the top-down cadre promotion system, and uses performance evaluation, rotation, and turnover to incentivize local officials (Li & Zhou, 2005). Therefore, political evaluation becomes a powerful instrument for higher-level governments to induce local officials to follow its lead (Xu, 2011). For instance, in 2016, the central government upgraded environmental protection from a purely administrative task to a “Party and Government Shared Responsibility”. This move can be understood as wielding political and party authority to further enforce environmental governance. From then on, local environmental performance is not only assessed by the higher-level administrative department but also by the higher-level party committee. Comparing to administrative evaluation, political evaluation presents a stronger pressure and incentive over local officials. This paper distinguishes different levels of pressure as administrative and political evaluations. We coded “performance evaluation” as “1” if administrative evaluation is used and “2” if political evaluation is adopted.

Coordinative involvement

The third way of providing hierarchical assistance is through superiors' coordination, wherein superior leaders act as facilitators to delimitate conflicts and/or provide additional resources during local collaborative governance processes. For example, top leaders, such as the secretary of the Provincial Party Committee or the governor, can be present in collaborative activities to show their support and to coordinate interdepartmental conflicts on site. They can also provide essential resources such as funds and necessary personnel to reduce potential obstacles in collaboration. In this way, higher-level governments do not necessarily involve themselves formally as actors in collaborative processes, but as brokers or mediators with authority to facilitate and oversee collaborations. We coded the variable of “coordinative involvement” as “1” if the secretary of the Provincial Party Committee or the governor is involved in the collaborative arrangement.

3.4.2 | Horizontal relationships

Past collaborative experiences

In this research, we focus only on the dimension of past collaborations in horizontal relationships. We identify past collaborations on the same issue of environmental protection, which we believe could generate more mutual trust, reciprocity, and interdependence among local actors in later collaborations. We coded the variable of “past collaborative experiences” as “1” if past collaborations exist, including mechanisms like leading group, regular meeting, or joint institution.⁵

3.4.3 | Control variables

Heterogeneity

We consider heterogeneity, which describes the dissimilarity of political and social status among participants from three aspects, that is, environmental pollution levels, the diversity of participants, and the administrative ranks of collaborating actors. First, we include two measures for “heterogeneity of environmental pollution levels”, namely coefficient of variation⁶ for sulfur dioxide (SO₂) emission per capita and industrial wastewater discharge per capita. Second, we consider “actor heterogeneity” through measuring the diversity of professional

departments within the Chinese administrative system, such as the environmental protection, water, and transport sector. Hence, this variable is computed by counting the number of professional departments. Third, “administrative heterogeneity” refers to the administrative rank difference among collaborators. With regards to the Chinese administrative system, the people’s provincial government has higher authority, especially in personnel and financial management. Thus, they have higher administrative authority than professional departments at provincial level (i.e., the bureau of environmental protection). When the collaboration is initiated by provincial governments, we coded the variable of “administrative rank” as “1”.

4 | FINDINGS

As the dependent variable is binary, we adopted a probit regression model as follows:

$$P(Y_i = 1|X_1, X_2, \dots, X_k) = \varphi(\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_k X_k)$$

Our results are presented firstly through a descriptive analysis and secondly though the results of probit model.

4.1 | Descriptive statistics

As mentioned, we have 122 reported collaborative arrangements at the provincial level in the Yangtze River Delta region. Though we realized that using secondary content as data would limit us in what reporters have recorded, we still identified two main takeaways from the collaborative arrangements in the region (as shown in Table 2).⁷ [Correction added on 21 January 2022, after first online publication: Table 3 citation has been replaced with Table 2 in the pre-ceded sentence.]

TABLE 2 Variables and descriptive statistics

Variables				Mean	SD	Scale
Dependent variable	Formalization levels of collaborative arrangements			0.60	0.49	0 or 1
Independent variables	Hierarchical interventions	Regulations		0.62	0.49	0 or 1
		Performance evaluation		1.02	0.79	0–2
		Coordinative involvement		0.12	0.33	0 or 1
	Horizontal relationships	Past collaborative experiences		0.72	0.45	0 or 1
Control variables	Heterogeneity	Environmental pollution (CV)	Industrial wastewater	0.33	0.18	0.03–0.89
			SO ₂ emissions	0.24	0.07	0.01–0.45
		Actors		3.18	4.07	0–14
		Administrative ranks		0.35	0.48	0 or 1

TABLE 3 Regression results: The effects of hierarchical interventions and horizontal relationships on the formalization level of collaborative arrangements

	Model 1		Model 2		Model 3		Model 4		
	Coef.	SD	Coef.	SD	Coef.	SD	Coef.	SD	
Hierarchical intervention	Regulations	0.12	0.51	1.85***	0.48	1.40***	0.69	1.40**	0.69
	Performance evaluation	0.76**	0.33	0.90***	0.25	5.27***	1.08	5.23***	1.08
	Coordinative involvement	1.55***	0.53	1.52***	0.57	1.58***	0.60	-0.24	0.58
Horizontal relationship	Past collaborative experiences	-0.52	0.39	0.40	0.52	0.44	0.54	0.44	0.54
Interaction of hierarchical & horizontal	Regulations * Collaborative experiences	—	—	-2.39***	0.76	-1.77***	0.58	-1.77***	0.58
	Evaluation * Collaborative experiences	—	—	—	—	-4.48***	0.96	-4.44***	0.96
	Coordination * Collaborative experiences	—	—	—	—	—	—	1.82**	0.92
Control variables	Heterogeneity	1.47	2.73	0.07	3.10	0.37	2.98	0.37	2.97
	SO ₂								
	Wastewater discharge	0.67	0.84	1.21	1.12	1.27	1.14	1.27	1.14
	Actors	-0.20***	0.07	-0.21**	0.08	-0.21**	0.09	-0.21**	0.09
Administrative ranks		1.32**	0.63	1.49**	0.68	1.44**	0.65	1.44**	0.65
	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effect									
Cons_	0.06	0.23	-0.37	0.27	-0.47	0.29	-0.47	0.29	0.29
R ²	0.2521		0.3163		0.3239		0.3239		
N	122		122		122		122		122

Bold values indicate coefficients that are statistically significant.

Note: * $p < .1$, ** $p < .05$, *** $p < .01$.

[Correction added on 21 January 2022, after first online publication: The table entry has been corrected to improve clarity.]

First, unsurprisingly, we observe a huge number of hierarchical interventions, mainly in the form of top-down regulations, performance evaluation or both. More than half of the collaborative arrangements (62.30%) are initiated under superior governments' clear requirements. Nearly 70% of collaborative arrangements are conducted under performance evaluation, including performance goals designed by higher-level environmental departments, and the principle of "Party and Government Shared Responsibility." Our descriptive statistics also reveal that superiors (i.e., the secretary of the Provincial Party Committee or the provincial governor) did show up in 15 collaborations—particularly in the working meetings, accounting for 12.30% of the total cases—to coordinate joint decision-making processes and offer essential support. Although coordinative involvement only accounts for a small number of collaborative arrangements, it still demonstrates the unique way China conducts hierarchical interventions.

Second, environmental collaborations in the Yangtze River Delta region reflect a network of strong horizontal relationships. In 72.13% of the cases, participants had past collaborative experiences and had formed collaborative mechanisms such as leading groups, regular meetings, and/or joint institutions in response to environmental degradation. As expected, descriptive statistics reflect the homogeneity of environmental pollution among provinces or cities, with a mean of 0.33 for industrial wastewater discharge and 0.24 for SO₂ emissions. Statistics also show that on average, 3.18 professional departments are involved in one collaborative arrangement, and 35.25% of arrangements are initiated by the people's provincial government rather than by professional departments. [Correction added on 21 January 2022, after first online publication: The Table 2 citation has been removed from the preceded sentence.]

4.2 | Regression results and findings

Table 3 presents the probit regression results, which verify most of the hypotheses but also revealed several surprising findings.

We estimated four models. The first one presents the impacts of hierarchical interventions and horizontal relationships on formalization levels of collaborative arrangements. Model 2–4 measure the moderating effects of horizontal relationships by adding the interaction with regulations, performance evaluation and coordinative involvement sequentially. The model results are robust for most variables across model specifications. Therefore, we rely on the Model 4 as our basis for interpretation.

We first note the significance of hierarchical interventions, specifically regulations and performance evaluation. We have previously hypothesized that hierarchical interventions act as conveners, encouragers, and coordinators to enhance local governments' willingness to choose formal arrangements. The coefficients of regulations and performance evaluation are positive and statistically significant. Therefore, the regression results support Hypothesis H1a, H1b, and show that local governments would be more likely to build formal collaboration when superior governments utilize regulations or performance evaluation. Moreover, our results also find that the tool of performance evaluation plays a stronger role than the tool of regulations in forming formal arrangements.

Second, even though there is no significant effect of past collaborative experiences on formalization levels of collaborative arrangements, they do moderate the impacts of hierarchical interventions to some extent. The results show that the moderating effects of horizontal relationships on hierarchical interventions differ. Hypothesis H2 does not stand with regulations or performance evaluation, suggesting that when provincial governments have past collaborative

experiences, they are instead more likely to engage in informal arrangements. However, the moderating effect of collaborative experiences on coordinative involvement is statistically positive and significant. This implies that with a foundation of horizontal relationships, local participants are more likely to choose formal settings if their superiors attend collaborative activities in person.

With regards to the control variables, environmental heterogeneity does not show statistically significant impacts, but actor heterogeneity matters significantly. The regression results show that the diversity of professional departments relates negatively to the level of formalization. Moreover, collaborations initiated by provincial governments tend to end up in formal arrangements than that initiated by professional departments.

5 | DISCUSSION

In general, different forms of hierarchical interventions have diverse effects on collaborative arrangements. The statistically significant factors, regulations, and performance evaluation, indicate that during the process of collaboration, higher-level governments do have hands on the wheel by initiating, engaging, and even monitoring the decision-making processes. When higher-level governments design performance evaluation with strict goals, local governments are more likely to initiate formal collaborative arrangements to demonstrate their high levels of commitment. Regulations are less significant as compared to performance evaluation because evaluation brings more trust and reciprocity to local actors. Participants present willingness to collaborate only if others demonstrate the same level of willingness (Thomson & Perry, 2006). This “I will if you will” mentality reflects a tit-for-tat reciprocity to supplement mutual trust in repeated interactions. The Zhejiang Province water department director regarded performance evaluation as a “fair dealing” message to local officials. When criterion of evaluation is standardized, it is less likely for any actor to betray others. Local actors, thus, are more likely to develop long-term formal commitment and form “psychological contracts” based on institutionalized evaluation-oriented interventions. For regulations, especially those without performance evaluation, local participants tend to hold a “wait-to-see” attitude to figure out the real commitment level of their partners and how to deal with potential rent-seeking behaviors.

With horizontal relationships as collaborative basis, the factor of past collaborative experiences is statistically significant in moderating the effects of diverse hierarchical interventions. Specifically, past experiences negatively moderate the effects of regulations and performance evaluation on the formalization level of collaborative arrangements. It is worth noting that formalized arrangements generally require more input in terms of personnel, resources, and other facilities. When facing the superiors’ requirements in terms of regulations or performance evaluation, local participants tend to combine the requirements with existing collaborative mechanisms, which imply lower costs of essential resources, as well as lower bargaining and negotiation efforts (Nylén, 2007). Therefore, local governments could work towards the problem based on existing collaborative arrangements, instead of building new formal arrangements, to achieve collaborative goals.

Additionally, the moderating effect of past experiences on coordinative involvement is statistically significant and positive. This result confirms existing literature and affirms superiors’ roles as conveners, encouragers, and coordinators to facilitate collaborative governance by convening collaborations, maintaining their integrity, managing conflicts, arbitrating exchanges between stakeholders, and identifying value-creating opportunities (Ansell & Gash, 2012, 2018).

In an interview with the director of regional collaboration division at the Ministry of Environmental Protection, he mentioned that when local actors find it hard to reach the target, superiors would directly attend the collaborative activities to coordinate participants' conflicts and facilitate the collaborative process. Through supplementing essential financial and manpower resources, superiors push for initiating formalized collaboration to some extent. Once the disputes and conflicts among stakeholders have been resolved by the superior, local actors with past collaborative experiences, are more likely to initiate formal arrangements. This paper also calls for further research, especially qualitative studies, to value-add on how horizontal relationships moderate the effects of diverse hierarchical interventions, specifically in explaining the influencing mechanisms.

Furthermore, we find that the heterogeneity of functional departments negatively relates to the level of formalization. Echoing existing literature, diversity among functional departments makes it harder to reach consensus on resource allocation and leads to conflicts among participants when initiating formal arrangements (Feoick, 2013). Our results also show that the involvement of the provincial government could increase the formalization level of collaborative arrangements. Against the backdrop of a fragmented administrative system, the provincial government is responsible for the distribution of resources within its jurisdiction. Thus, its attendance in collaborative activities could help to resolve conflicts among related departments and offer essential resources for formalized arrangements.

6 | CONCLUSIONS AND POLICY IMPLICATIONS

In recent literature, scholars have begun to differentiate the concept of collaborative governance from collaboration (Ansell & Gash, 2008; Emerson et al., 2012). This trend has greatly influenced the discussion of mandates in collaboration. With reaching collaborative goals as the highest priority, collaborations may adopt multiple governance modes, including both consensus oriented collective decision-making process and one-person decision mandate mode (McNamara et al., 2020). Yet, if we regard collaborative governance as collective decision-making processes, which are representative, consensus-oriented, and deliberative at their core, we need to reconsider how mandates impact the decision-making mechanisms given that hierarchical structure still remains in most cases.

This paper, therefore, tries to shed light on how hierarchical interventions impact collaborative governance and interact with existing horizontal relationships. The contribution lies as follows. We closely monitor the literature trends, trying to highlight collaborative governance as a long-last institutional framework and emphasize the importance of deliberative consensus making. Mandate factors, therefore, have to fit into this context. This paper divides superior interventions into three categories: order of collaboration formation via regulations, mandate of target setting with performance evaluation, and involvement as coordinators. It is worth noting that hierarchical interventions play important roles in collaborative decisions in many countries, regardless of the political system a country adopts (Ansell & Gash, 2018; Chen et al., 2021; Emerson & Nabatchi, 2015; Mu et al., 2019; Saz-Carranza et al., 2016; Torfing & Sørensen, 2014). Variance in the effects of hierarchical interventions, however, exists depending on the context of the country, the extent of interventions used and the methods of interventions employed. Although this paper adopts data in China, we believe that the impacts and influential mechanisms of hierarchical interventions on collaborative governance could be mirrored in western countries.

In this paper, we utilize the environmental collaboration data from the Yangtze River Delta region, investigating the effects of different hierarchical interventions on the formalization level of collaborative arrangements and illustrating how horizontal relationships moderate the impacts of hierarchical interventions. Consistent with existing literature, these results verify that mandates can initiate collaborations and make participants engage in joint decision-making or resource sharing (Mosely & James, 2008; Rodríguez et al., 2007). Yet, its influence wavers when local actors have collaborative experiences. Even in face of superior mandates, local players tend to lean towards building informal collaborative arrangements when they have previous collaborative experiences.

Similar findings appear with target setting by the superiors through performance evaluation. When local actors have no prior collaborative experiences, performance evaluation greatly motivates actors to establish formal arrangements; however, when local actors have prior experiences, the incentives to build formal arrangements remain to a much lesser extent. Additionally, when superiors are directly involved in collaborative activities, their influence only appears when prior collaborative experiences exist.

The above findings indicate the significant role of existing collaborative experiences. In an authoritarian state like China, it does not have an impact on collaboration formality by itself, and yet, it moderates how hierarchical interventions may impact collaborative governance in various ways. Further analysis is required to better understand the detailed mechanisms through which hierarchical interventions operate and how they influence collaborative processes together with horizontal relationships.

In the context of China's policy design, this research suggests potential changes to top-down management in the future. Owing to a highly centralized political system, Chinese local governments rely on hierarchical interventions to solve administrative challenges, including obstacles in collaborative actions. However, given that under different conditions, hierarchical interventions could either improve the effectiveness of collaboration or impede collaborative arrangements, more thoughts should be put into designing intervention tools. Additionally, the local context where hierarchical interventions are employed matters for collaborative governance. It is thus necessary for superiors to be acquainted with both the benefits and drawbacks of hierarchical interventions, and to design tools accordingly to fit the local context.

Limitation exists mainly with our data source. Using secondary data of media report and government website makes this study highly reliant on what have been reported, which might be different from what really happened. This could be improved by checking with multiple sources, as we have done in the paper. Yet, better data source includes on-site interviews, questionnaires as well as government documents. The research team will try to refine our data in the future research. Also, this paper adopts formalization levels of collaborative arrangements as the proxy of the dependent variable. We believe that future research can consider other measurements of collaborative arrangements and even include results such as self-reported collaboration frequency, implemented actions and objective environmental performance.

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CONFLICT OF INTEREST

The authors whose names are listed above certify that they have no affiliations with or involvement in any organization or entity with any financial interest (such as honoraria; educational grants; participation in speakers' bureaus; membership, employment, consultancies, stock ownership, or other equity interest; and expert testimony or patent-licensing arrangements), or non-financial interest (such as personal or professional relationships, affiliations, knowledge or beliefs) in the subject matter or materials discussed in this manuscript.

DATA AVAILABILITY

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

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ENDNOTES

- ¹ We searched for the same collaborative arrangement in different sources, including official websites of local environmental departments, micro-blogs of local environmental departments, and local daily newspapers, to supplement the content of each collaborative arrangement.
- ² The “Regulations of the People’s Republic of China on the Openness of Government Information”, which came into effect in May 2008, provides a basis for us to obtain intergovernmental collaborative governance data since 2008. Although there are some missing data in the early years, this regulation enriched our sample size to the greatest extent. Additionally, it is almost impossible to gather collaborative information via questionnaire in such a region over a long period of time. Thus, open data source from the official websites seems to be the most feasible way to collect collaborative information for the past more than ten years.
- ³ From September to October 2017, 10 governmental officials were interviewed, including seven men and three women aged 28 to 45. Their working departments range from central ministries and local governments in Beijing, Shanxi, Shandong, Zhejiang and Jiangsu provinces. Each interview lasted 45 to 60 minutes, mainly to understand the different levels of formalization for collaborative arrangements.
- ⁴ When one collaborative arrangement included two or more types of arrangement, we coded the dependent variable as the most formal one. For instance, in April 2015, Shanghai, Zhejiang, Jiangsu, and Anhui held the fourth regular meeting of the Yangtze River Delta Regional Air Pollution Control Group in Hangzhou and jointly formulated the policy of “The Action Plan Environmental Protection of High Pollution Vehicles in Yangtze River Delta Region”. In this case, the regular meeting should be coded as 0 while the joint policy should be coded as 1, so we chose the highest level of formalization and coded this action as 1. Additionally, we coded the final arrangement rather than the processes of collaboration. For example, before signing the agreement, the participants will usually hold several meetings to negotiate the details of the agreement, such as the goals, timetable, governance structure and role clarification. In this case, we only count the final agreement and coded it as 1. Sometimes, the final result of collaborative arrangement tends to be informal forums/workshops or regular joint meetings, and so we coded this action as 0.
- ⁵ It is worth noting that we distinguished the coding of past collaborative experiences and collaborative arrangements through the time sequence based on the same database. For instance, in April 2009, the environmental protection agencies of Shanghai, Zhejiang and Jiangsu attended the joint conference on environmental protection collaboration in Yangtze River Delta Region and signed the work plan for 2009. Before this conference, in December 2008, these agencies had already held a joint meeting on the same topic for environmental protection and formed the collaborative mechanism of regular joint meeting. In this case, we regard the experiences

in 2008 as past experiences for the collaborative arrangement in 2009, and hence the variable of past experiences for 2009 would be coded as “1”.

⁶ Coefficient of variation equals standard deviation for indicator A divided by the mean of indicator A among participants in the collaborative arrangement.

⁷ Content analysis of media reports or documents has become a widely used method to collect and analyze data, especially for the governmental behaviors in China (Chen et al., 2019; Yi et al., 2018). Although we realized that using secondary content as data would limit us with what reporters have recorded, we tried to make it up in two ways. Firstly, we searched for collaboration-related official reports from various sources, including official websites of local environmental departments, micro-blogs of local environmental departments, and local daily newspapers. In that sense, we could utilize multiple sources to complement the content of each collaborative arrangement and ensure the integrity and reliability of the reports through triangular verification. Secondly, if there were any missing information while coding the data, we would contact the related governments to obtain or verify relevant information via either on-site interviews or governmental document records.

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APPENDIX A.

TABLE A1 Variables specifications, measurements, and data sources

	Variables	Definition	Subvariables	Measurements	Data source
Dependent variable	Formalization levels of collaborative arrangements	The structured arrangements for the development and implementation of joint activities using shared resources.		Informal forums/workshops and regular joint meetings as 0, formal agreements and joint policy documents as 1.	News reports
Independent variables	Hierarchical interventions	The deliberate attempts led or encouraged by superordinate governments to promote collaborative processes and sustain participants' interactions.	Regulations	Coded as 1 if the higher-level government creates coercive mandates, regulations, for collaborative governance.	News reports
			Performance evaluation	Coded as 1 if administrative evaluation is used and 2 if political evaluation is adopted.	
			Coordinative involvement	Coded as 1 if the secretary of the Provincial Party Committee or the governor is directly involved in the collaborative arrangement.	
Control variables	Horizontal relationships	Determinants driven by voluntary motivations, such as participants' trust, reciprocity, and interdependence triggered by their existing interactions and relations.	Past collaborative experiences	Coded as 1 if a collaborative mechanism that indicates past collaboration exists, such as a leading group, regular meeting, or joint institution.	
	Heterogeneity	The dissimilarity of environmental and social status among participants.	Environmental pollution Industrial wastewater SO ₂ emissions	Coefficient of variation for industrial wastewater discharge per capita among involved actors.	China City Statistical Yearbook

(Continues)

TABLE A1 (Continued)

Variables	Definition	Subvariables	Measurements	Data source
			Coefficient of variation for sulfur dioxide (SO ₂) emission per capita among involved actors.	
		Actors	The number of professional departments, such as the environmental protection sector, the water sector, the transport sector, and others.	News reports
		Administrative rank	Coded as 1 if the collaboration is initiated by provincial governments.	