LINCOLN INSTITUTE
OF LAND POLICY

Regional Governance and Institutional Collective Action for Environmental Sustainability in China

Working Paper WP16RF1

Richard C. Feiock
Florida State University

September 2016

Abstract

Over the past decade, Chinese local governments have adopted numerous innovations to address pressing social, economic, and environmental concerns. Realizing the limitations of unilateral actions, local governments increasingly rely on inter-local collaborations to address these issues at a regional level. Nevertheless, the theoretical and empirical study of regional collaborations in China has lagged behind practice. This research begins to fill this lacuna through a systematic investigation of the types of collaboration agreements employed to deal with regional environmental problems, and how and when they are applied. Following an overview of inter-local collaboration in China, the institutional collective action (ICA) framework is introduced and modified for the Chinese context. Three separate empirical analyses then apply this modified framework to describe and explain the forms of inter-local collaboration.

The first empirical analysis focuses on the multi-level influences on inter-city collaboration in China. It examines how cities' characteristics and provincial involvements influence city governments' decision to join inter-local collaborative agreements. The results demonstrate that both provincial-level and city-level demand and supply factors influence the number of collaboration agreements that a city joins. In the second empirical analysis, three in-depth case analyses provide example of the different mechanisms of inter-local cooperation agreements. These cases are drawn from three different regions of China. The third set of empirical analyses focuses on the emergence and intuitional forms of environmental collaboration agreements and investigates how the nature of the problem situation, the interests of affected actors, and existing relationships and institutions shape the design of inter-local collaboration agreements.

The conclusion reaffirms the usefulness of the ICA framework for understanding inter-local collaborations in China. The analyses presented here suggest that informal and formal agreements are sometimes less than voluntary in China. If local actors enter into agreements because they feel strong pressure to conform to the expectations of the national or provincial government, or they anticipate that a less desirable alternative will be imposed if they do not collaborate with neighboring governments, it constitutes self-constraint. It is anticipated that future research will further investigate these issues.

Keywords: collaboration agreements, China, local governance, institutional collective action

About the Author

Richard C. Feiock is the Jerry Collins Eminent Scholar Chair and Director of the Local Governance Research Laboratory in the Askew School of Public Administration at Florida State University. He serves as Editor of *Pubic Administration Review*. His current NSF funded research is focused on local governance, networks, and urban sustainability.

Askew School of Public Administration and Policy
Florida State University
113 Collegiate Way
Tallahassee FL 32306-2250

Acknowledgements

Professor Hongtao Yi of Ohio State University and doctoral student Ruowen Shen of Florida State University were valuable contributors to this project and assisted with the conceptual development, statistical analysis, and more. The assistance of Jiashang Zhang, Liming Suo, and the Lincoln Institute staff are gratefully acknowledged.

Table of Contents

List of Tables

List of Figures

Regional Governance and Institutional Collective Action for Environmental Sustainability in China

Introduction

In China, environmental pollution and the need to address issues and tradeoffs between economic development and environmental quality are rising concerns at all levels of government. Local governments address regional governance of environmental issues in different ways within and across regions. Until very recently there has been limited theoretical attention to the possible roles that decentralized self-organizing mechanisms for regional governance might play in China. In particular, the role of voluntary agreements as solutions to collective action dilemmas in local governance has not received attention.

This report provides an inquiry into the mechanisms for collaboration among local governments in China for dealing with issues of environmental sustainability. It then empirically investigates different mechanisms of cooperation among local authorities to provide integrated solutions for environmental issues. Doing so improves understanding of the characteristics of local and regional governance across cities in China, the mechanisms available to integrate environmental actions, and cities' choices to participate in these agreements.

Although we investigate local collaboration throughout China, four regions are examined in depth: the Beijing- Tianjin-Hebei Region, the Pearl River Delta, the Yangtze River Delta and the Chengdu Plain Economic Zone. Empirical analyses of the emergence and institutional forms of environmental collaborations in each of these regions reveal how the problem situation, the interests of affected actors, and existing relationships and institutions, shape inter-local collaborations. Based on content analysis of media reports we identify inter-local agreements and explain variation in scope and formality by testing hypotheses derived from the institutional collective action framework.

Drawing from the Institutional Collective Action (ICA) framework (Feiock 2009 and 2013; Feiock and Scholz 2010), collaboration choices are accounted for in terms of the transaction costs and collaboration risks associated with centralization and decentralization of local governance. Based on this conceptual framework, theoretical propositions rooted in historical, cultural, and institutional differences across China are derived to explain patterns of local governance and to inform future study.

Over the past decade, Chinese local governments adopted numerous innovations to address the pressing social, economic, and environmental concerns. Cities have increasingly relied on inter-local collaborations rather than individualistic actions to address regional environmental protection, infrastructure construction, economic development, and disaster response issues. Although inter-local collaborations have been adopted widely by Chinese local governments, theoretical understandings of the motivations to do so and the collaboration mechanisms employed are conspicuously absent in extant research.

The past two decades have witnessed global shifts in how governments deal with complex regional problems such as pollution and climate protection. This movement has emphasized collaborative governance and the empowerment of government entities at the local level to manage environmental problems. As early as 1987, the Brundtland Commission's report identified city governments as important actors capable of encouraging sustainable development (WCED 1987). In the decades that followed, increasing numbers of local governments around the world have committed to policies and programs that collaboratively address these grand challenges.

This approach is increasingly evident in China. Driven by the growth of economy, government decentralization, participatory politics, and intensive social and environmental issues, Chinese local governments have adopted numerous innovations to address social and environmental problems. Given the limitations of unilateral policy actions, collaborations among local governments are regarded as viable instruments to address social problems within a regional boundary (Yang and Peng 2009). Inter-local collaborations are widely applied to address regional environmental protection, infrastructure construction, economic development, and disaster response. These inter-local networks formed by local government are often designed to complement trans-national networks, to alleviate social problems (Bulkeley and Bestill 2003).

Inter-local collaboration brings together stakeholders from various fields as well as multiple local governments to integrate diverse values and hold everyone responsible for successful collaboration (Ma 2010; Yang and Wang 2013). In major regions of inter-local collaboration in China, such as Beijing-Tianjin-Hebei Metropolitan Region, Yangtze River Delta, Pan Pearl River Delta, Mid-China region, Chengdu Plain, inter-local collaborations have been widely adopted (Ye 2009). Nevertheless, we know little about what motivates the choices of local governments to participate in these agreements, about the specific collaboration mechanisms they choose, or how these agreements operate in practice.

Why Do Chinese Local Governments Engage Inter-Local Collaboration?

Given China's historical, geographical, and demographic development, government administration and authority has traditionally been confined to independent jurisdictions conforming to a Weberian concept of an “ideal type” bureaucracy (Weber 1922) with large organizations producing non-market goods and services (Downs 1965). Trends of citizen mobility, globalization, and advances in information technology have prompted changes in the organization of administrative structure away from Weberianism to more decentralized governance arrangements. This is evident in the central government no longer holding the role of exclusive service provider for many public services. Instead, local governments produce a diverse package of public goods. The Tiebout model of a market for public goods (Tiebout 1956), originally developed in a western context, provides a descriptive account for some of these trends. Tiebout argued that diseconomies of scale in providing a specific package of public services determines the optimal community size. Citizens’ residential choices will lead them to favor moving to a government that provides the public goods and services they want at a lower cost than in alternative communities. Even large individual cities find mechanisms for collaboration among neighboring governments attractive for the provision of those services that are produced most efficiently at a large scale.

Although a multitude of factors contributes to the shift toward decentralization of government in China, four particularly salient factors appear to be social problem complexity, social capital accumulation, resource complementarity, and the environmental sustainability movement.

One trigger for collaboration is increasing social problem complexity, and the negative externalities they can produce (Krane and Lu 2010). When change in one jurisdiction negatively influences neighboring jurisdictions, collective action is needed to address the problems. Qian and Weingast (1996) indicate government decentralization plays a significant role in facilitating inter-local collaboration development in China, making top-down governance less relevant.

Social capital accumulation is also closely linked to administrative collaboration. Resilience, defined by Randolph (2004) as capacity to absorb disturbances when faced with disasters or major changes, is a key ingredient of civil community. Social capital is the collective value of social networks, trust, and reciprocity that arises from these relationships among individuals and organizations (Putnam 2000). Inter-local collaboration accumulates social capital by establishing ties between communities that integrate different values, and create shared capacities that can be relied upon in times of distress. Thus, social capital can be both a cause and consequence of inter-local collaborations.

Inter-local collaboration in China initially targeted economic development. The emphasis on economic development in urban areas, however, produced an economic imbalance among different regions and urban areas within regions. Natural resources and human capital are highly clustered geographically within regions. Economic imbalance exacerbates differences of city capacities for education, technology, and urban planning, etc. Yang and Peng (2009) argue that the importance of inter-local collaboration lies in exchange of resources and administrative authority, such as joint supervision of air and water quality. Resource complementarity makes exchanges among local governments mutually beneficial. Lei, Li, and Chen (2006) indicate city capacity difference is a critical trigger for inter-local collaboration. Resource complementarity thus becomes one critical purpose of inter-local collaboration.

Environmental damage and pollution have been a byproduct of industrialization and rapid economic progress, and in many regions of China the environment has deteriorated rapidly. Pollution and greenhouse gas emissions extend across jurisdiction boundaries to adversely affect neighboring populations. All affected parties can benefit from collective environmental efforts to address these problems. Concomitantly, inter-local collaboration shifted its focus to deal more with issues of environmental sustainability in China. There is general agreement that achieving the next level of environmental improvement and sustainable communities will depend not only on the mandates of central government, but also on the actions of local communities, industries, non-profit organizations, and others working together (Randolph 2004).

Within this social ecological system, the natural environment, organizations, and people mutually influence each other. When more community stakeholders engage inter-local collaboration, it can promote learning, develop shared capital, and build both community and eco-system resilience (Wendolleck and Taffee 2000). Inter-local collaboration is easier said than done. Significant barriers confront inter-local collaboration efforts because self-interest and competition can make voluntary collaboration difficult. Institutional and structural barriers, such

as conflicting goals and values or problems with collaborative management, are also barriers. Transaction costs are also among the many barriers that can prevent local authorities from reaching coordinated decisions. Changing institutions impose information costs, enforcement costs, and negotiation costs on participants (Shepsle 1989). Finally, if local actors perceive that inter-local collaboration will fail to resolve the dilemma, it creates collaboration risk and collective action is difficult to sustain (Feiock 2013).

Overview

This report begins to fill the lacuna in understanding local governments' participation in regional collaboration agreements and the types of agreements they select. A systematic investigation of specific mechanisms identifies how and when they are applied to deal with regional environmental problems. Local governments in China address the regional governance of environmental issues in different ways within and across regions. Until very recently, theoretical attention to the possible roles that decentralized self-organizing mechanisms might play has been neglected, and in particular, the role of voluntary agreements as solutions to collective action dilemmas in local governance that might integrate local environmental decisions.

The analysis proceeds in four stages. The following section elaborates the ICA framework and modifies it to fit the Chinese context. This modified framework is then applied to inform three empirical analyses. The first analysis examines multi-level influences on inter-city collaboration in China. It investigates how cities' characteristics and provincial involvements influence city governments' decision to join inter-local collaborative agreements. Interactions between city governments, local communities, and province leaders are identified in order to better understand the decision-making processes relied on to solve environmental issues in seven regions of China.

In the second empirical analysis, three case studies are conducted to add to our understanding of the dynamics of collaborative mechanisms for inter-local collaboration in the context of China. These cases draw upon the ICA framework as a theoretical lens to view the structures patterns and participants in these collaboration efforts. In-depth case analyses investigate different mechanisms of inter-local cooperation agreements in each case, and the extent to which the mechanisms provide integrated solutions for environmental problems in the region. They identify the characteristics of local and regional governance across cities in China and the choices between different mechanisms to integrate environmental actions of local authorities for the Beijing-Tianjin-Hebei Region, the Pearl River Delta, Yangtze River and the Chengdu Plain Economic Zone.

The third set of empirical analyses focuses on the emergence and forms of environmental collaboration agreements. It investigates how the nature of the problem situation, the interests of affected actors, and existing relationships and institutions shape the design of inter-local collaboration agreements. Based on content analysis of media reports, all inter-local agreements are identified. Variation among these agreements in their authoritativeness is assessed to test hypotheses derived from the ICA framework. In this analysis, policy and administrative choices are accounted for in terms of the transaction costs and collaboration risks associated with centralization and decentralization of local governance (Feiock 2009 and 2013; Feiock and Scholz 2010). Drawing on examples from four regions, this framework classifies urban

integration institutions based on the type of integration mechanism: political authority, contracts, or social embeddedness. Based on this classification, theoretical propositions rooted in historical, cultural, and institutional differences across China are derived to explain patterns of local governance that can inform future research.

Institutional Collective Action Framework

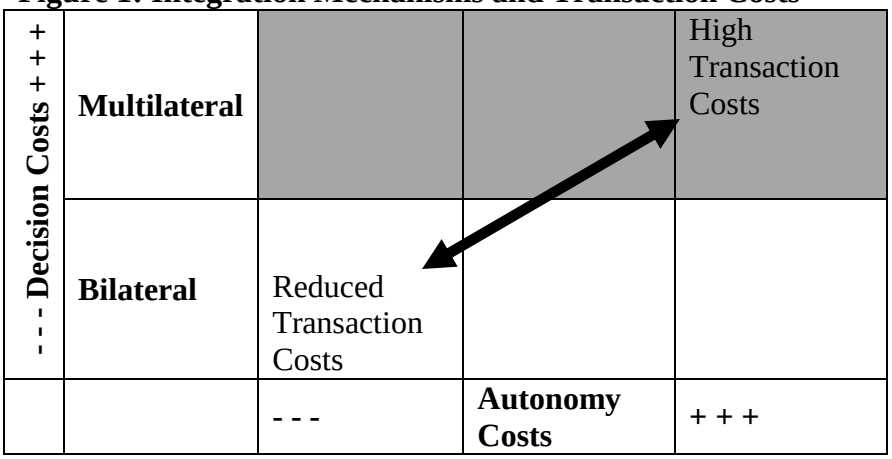
An institutional collective action (ICA) dilemma is a situation in which two or more cities or authorities in a region make individual decisions leading to collective choices that are inferior to what would be obtained if they acted together in a more integrated or coordinated manner (Feiock 2007; 2013). There are numerous examples of these dilemmas. Governments coordinate to provide solid waste collection services to their residents, the decision of where to locate a wastewater treatment facility within an urban area, or managing a watershed shared by several population centers are just a few illustrations of ICA dilemmas. Although the nature of the environmental problems faced by local governments in China share some similarity, regional collaborations in response to these problems have been remarkably different in China from those in the U.S. Extending the ICA framework to capture the range of self-organizing and imposed regional governance alternatives in the Chinese context provides examples of voluntary solutions for organizing joint action.

ICA problems arise directly from the fragmentation of local authority for provision of public services in urban areas, and from situations in which different levels of governments regulate or exploit a range of services or resources (Feiock 2013). Policy objectives pursued by organizations at different levels often overlap, leading to decisions by governments at one level that impact functions carried out by governments at other levels. Feiock (2007) argues that multi-government collaboration can produce coordinated actions through a system of regional governance. Two fundamental research questions the ICA framework seeks to answer are: what mechanisms can local actors use to resolve collective action dilemmas they face and what factors account for the specific types of mechanisms they choose?

The ICA framework extends the theories of collective action among individuals to composite actors in a community such as local governments. Citizens demand goods and services at multiple scales and at various levels of quantity and quality. By introducing the characteristics of alternative collaborative mechanisms and by explaining how these mechanisms are adopted or imposed, the framework describes how a multitude of public goods and services can be efficiently produced and provided at different scales.

A transaction occurs when a good or service is transferred across a technologically separable interface (Williamson 1996). Transaction cost analysis provides an economic perspective for explaining barriers that prevent authorities from reaching coordinated decisions. New institutions can reduce transaction cost associated with uncertainty, but they can also produce other transaction costs (North 1990). In general, transaction costs are reduced by formal and informal institutional arrangements, which strengthen the provision of information and reduce obstacles to bargaining. Political institutions affect the success of inter-local cooperation because they shape the structure of incentives faced by government officials.

Figure 1: Integration Mechanisms and Transaction Costs



In the U.S. context, the ICA framework categorizes inter-local collaboration along two dimensions. The horizontal axis examines the extent to which the collaborative mechanisms are enforced. It explores whether the mechanism is imposed by political authority, or relies on formal contract or agreement, or relational embeddedness to imposed exchanges. The vertical axis shows variations of mechanism emcompassiveness in terms of the number of collaborators ranging from bilateral agreements on to multilateral relationships requiring involvement by a larger number of actors. The cells in the right-hand column describe collaborative mechanisms imposed on local actors by a higher authority. Higher-level institutions have the authority to broaden the geographic or functional jurisdiction and scope to "internalize" the externalities caused by fragmented authority. Collaborative risks and transaction costs rise to the right and upward. While the underlying dimensions of complexity and enforcement authority apply somewhat universally across countries and cultural contexts, the specific collaboration instruments in figure 1 were developed in the U.S. context. The following sections build upon the ICA framework and extend it in the Chinese context with a focus on specific collaboration instruments and the mechanisms through which they are enforced.

Some of the factors that help explain the success and failure of territorial reforms over the past century also may contribute to explain the differences in the adoption of self-organizing solutions for collective action dilemmas. The modified ICA framework provides a three-fold contribution to better understand: 1) the variety of ICA dilemmas in regional environmental governance; 2) the types of agreements enacted or adopted to overcome these dilemmas; and 3) the complex configuration of local, provincial, and central government actions to address complex ICA dilemmas. Economies of scale strengthen incentives for inter-municipal cooperation, but collaborations can also produce better management of common-pool resources, positive externalities, and impose constraints to discourage free-riding behavior in the delivery of public goods.

If each local authority pursues its self-interest based on short-term interests, less than efficient collective outcomes result (Feiock 2007; 2013). The imposition of authoritative mechanisms by the central government or provincial government can lead to more integrated decision-making, but at the cost of a loss of community control over local policy and the ability to structure agreements to meet specific and sometimes unique local needs. In order to overcome the ICA

dilemma, local government officials must consider the expected regional benefits such as management of common-pool resources, positive and negative externalities, and the costs of the policy in terms of service and loss of autonomy. For example, the transfer of local powers and responsibilities for service provision to a provincial government, or to a regional agency may produce economies of scale and improve technical efficiency, but may also generate loss of control and reduced accountability to local residents.

Voluntary collaboration among agencies and authorities occurs even in highly centralized systems, often through informal networks among local officials (Feiock and Scholz 2010). The incentives for voluntary cooperation vary depending on the nature of the problems to be handled, the geographic configuration of local governments, the number of participants involved in the solution, the availability of public entrepreneurs to promote the solution, and the statutory framework for local government cooperation (Feiock 2004; 2007; 2009; Feiock and Carr 2001; Post 2004). One of the challenges in extending the framework to a Chinese context is to account for how different national institutional contexts structure the configuration and the preferences of the actors, the selection of the tasks for collective action, and the arrangements available to solve collective action dilemmas.

In Asia, the rational design of regional governance systems in the second half of the 20th century favored large-scale mergers of local units on the grounds of technical efficiency. Mergers are anticipated to lower the cost per unit of output (economies of scale) and the average cost of producing more than one product or service (economies of scope). The gains in technical efficiency allowed by large-scale mergers were seen as decisive in the decisions to expand the welfare state, fast pace urbanization, and functional decentralization. However, large-scale mergers sacrifice allocative efficiency because centralized authorities or merged governments are less able to adjust service provision to local preferences (Dowding and Feiock 2012). Collaborative arrangements developed have emerged to accommodate preference diversity at the local level. Their great advantage is that they can be tailored to each good or service and adapted to each particular context, thereby avoiding irreversible solutions such as fusions/mergers.

City Choices to Participate In Collaborative Agreements

In the 1990s, with the rise of the Pearl River Delta collaborative region, regional collaboration became a new form of governance entity in China (Suo 2014). Collaboration among local governments is now believed to be one of the policy instruments available to address social problems within a regional boundary (Yang and Peng 2009). Examples of specific policy issues that require or benefit from regional collaboration include environmental protection, infrastructure establishment, economic development, and public crisis and emergency (Ma 2010; Yang and Wang 2013). Collaborative arrangements have been most prominent in dealing with environmental issues. Pollution, particularly of air and water, expands beyond jurisdiction boundaries, making collective actions from all affected parties necessary.

Inter-local Collaboration Regions

Municipal governments have the right to exercise unified leadership over the work of the districts, cities, counties, townships and towns and exercise unified administration over the economic, social, and cultural affairs in areas under their respective jurisdictions; but there are formal and informal constraints on this power. Some municipalities are directly under the central government. Beijing, Tianjin, Shanghai, and Chongqing are under direct central government control. There is much formal and informal communication among local officials within the municipalities.

Recent work calls attention to the status or position of a city with regard to its administrative level and how it shapes interactions with other cities (Suo 2014; Yi et al. 2015). Suo (2014) indicates that differences in administrative level among collaboration participants are important because large gaps in administrative level produce asymmetries of influence that have the potential to make collaboration efforts more difficult. Yi et al. (2015) argue that either additional incentives or more restrictive mechanisms are needed to produce successful collective action in the face of large differences in administrative levels.

Diverse factors may account for inter-local collaborations. Given the historical, geographical, and demographic characteristics of China, traditional government administration has been confined to independent jurisdictions. The movement away from dependence on a Weberian hierarchy has been accelerated by the complexity of problems and the presence of negative externalities (Krane and Lu 2010). The essence underlying inter-local collaboration is to exchange administrative authority (Yang and Peng 2009), through innovations such as joint supervision on water quality, economic and human resource exchange, or complementary action and coordination of development planning between collaborative cities.

Several other factors have also been linked to local governments' collaborative behavior. Sun (2013) identifies geographic proximity, regional economic development, and historical and cultural factors as influencing inter-local collaborations. Lei, Li, and Chen (2006) indicate economic development imbalance offers opportunities to facilitate inter-local collaboration. Suo (2014) also observes this imbalance in the development of the Beijing-Tianjin-Hebei Metropolitan Region. Yang and Chen (2004) suggest globalization, marketization, and informatization expand social problems beyond local boundaries to neighboring jurisdictions. As a result, inter-local collaborative administration becomes, in effect, an administrative alternative. Qian and Weingast (1996) indicate government decentralization facilitates collaboration by aligning the incentives of local governments. Finally, collaboration results simply because the scope of many problems such as environment pollution is far beyond the capacity of any one local government to deal with.

Taxonomy of Integration Mechanisms

Yang (2011) differentiates vertical, horizontal, and diagonal agreements. A vertical agreement is between central and local governments or provincial and municipal governments. A horizontal agreement is between governments in the same administrative level, such as, interprovincial, inter-municipality, inter-county, and interagency agreements. A diagonal agreement is between

governments in different administrative levels and in different regions. Yang also notes the differences between inter-governmental agreements are less formal than contracts. Inter-governmental agreements seek collaboration but do not alter or delegate authority. The principal participants are governments and public agencies and emphasize voluntary adoption. Because inter-local agreements are policy documents, rather than legal documents, their effects depend on trust and reciprocity among participating government leaders rather than legal enforcement.

Ma (2010) indicates regional collaborative development is a long-term and complicated process. It needs continuous adaptation and revision. Yang and Peng (2009) further suggest that the design of collaboration agreements is critical in order to maintain effective collaborative relationships with fair distribution of benefits. Chen (2005) also suggests establishing an accountable performance measurement system, emphasizing the concept of collaborative administration in crafting the optimal set of collaborative policies. In addition, inter-local collaboration needs formal, bureaucratic, and contractual management, as well as public participation and reciprocity relationship between government and the public (Ma 2010).

Building from this context, a taxonomy of governance arrangements specific to China is advanced to classify the dominant mechanisms to solve collective action dilemmas. The classification in figure 2 is based on the horizontal axis of figure 1, since collaboration agreements typically involve three or more governments.

The three mechanisms to integrate decision-making are informal agreements, formal agreements, and imposed authority (Feiock 2013). The first two are decentralized governance mechanisms involving self-organization by local government units in order to overcome collective action dilemmas. Informal agreements are often not written agreements. Even when they are, they are not legally binding on the parties; instead, their enforcement is based on norms of trust, reciprocity, and reputation resulting from long-term interaction between actors that elicits credible commitments from the institutional actors involved in the exchange.

Formal agreements and contracts have legal standing, but are voluntary in nature so they can be adopted in many situations. Some formal agreements delegate authority. A new entity with delegated functional authority can then perform certain activities on behalf of the local governments that created it.

Figure 2: Regional Integration Agreement Types

Partnerships and less formal agreements	**Formal written Agreements**	**Imposed Authority**
- - -	**Autonomy Costs**	+ + +

Imposed authority is a centralized solution designed by a higher-level authority to direct the actions of local units and internalize ICA dilemmas (Feiock 2013). Inter-local collaboration has

become an alternative regional collaboration practice by delivering public functions through horizontally linked organizations.

Before examining the choice of what form collaboration takes, we first investigate which local governments participate in environmental agreements, regardless of the form of the agreement. Cities are the first units of analysis. The multilevel models reported in the next section include both city and regional level influence on participation.

Multi-Level Influences on Inter-City Collaboration in China

The analyses reported in this section investigate factors including city characteristics and provincial involvement that may influence city governments' decision to join an inter-local collaborative agreement. We seek to identify the interactions between city governments, local communities, and provinces to better understand the decision-making processes to solve environmental issues across seven regions: the Beijing-Tianjin-Hebei Region, Pearl River Delta, Yangtze River Delta, Chengdu Plain Economic Zone, Pan-Pearl River Delta, Chengyu Economic Zone, and Pan Yangtze River Delta.

The inter-local collaborations examined here bring together stakeholders from various fields as well as different cities, holding everyone responsible for successful collaboration. However, from the collective action perspective (Olson 1965), it might be seen as irrational for local government to voluntarily commit to address regional and/or national environment problems if they can free ride on the efforts of others. Even though one city reduces local emissions, if neighboring cities do not, the overall level of emissions would not change significantly (Zahran et al. 2008). Furthermore, collective benefits obtained from climate protection are non-excludable (Olson 1965), thus, it is hard to ensure each city would contribute.

This problem is overcome in practice because inter-local agreements can operate as an institutional constraint on free riding behavior (Ostrom 1999). According to the ICA framework, inter-local agreement forms, and the willingness of local governments to participate in them, are accounted for in terms of the transaction costs and collaboration risks (Feiock 2009; 2013; Feiock and Scholz 2010). The analysis aggregates our entire range of agreements ranging from informal and formal agreements to collaboration organized or imposed by higher-level governments in order to identify what factors explain variations of the number of inter-local agreements that cities engage in.

Differences among regions are accounted for in multi-level theoretical explanations rooted in economic, environmental, and institutional characteristics among cities. Variation in the number of agreements that a city joins is accounted for statistically by salient characteristics of local government and communities, as well as the provincial government it is located in. We then apply the political market framework to inter-local collaboration in China through multi-level analysis on the characteristics of local government and communities, as well as provincial governments. The research design and data sources are presented to inform how we empirically test the hypotheses developed from the framework. After reporting the results from statistical analysis, we discuss their theoretical and policy implications in the concluding discussions.

Conceptual Framework

Inter-local agreements both frame and constrain governmental action. In a political market, city government decisions to engage in inter-local collaboration are conceptualized as the outcome of exchange between government policy suppliers and community policy demanders. Political institutions that provide the venue for local decision-making mediate this exchange (Lubell, Feiock, and Ramirez de la Cruz 2005; 2009).

Community preferences are based in constituency demographics, such as education and socioeconomic status, as well as by the mobilization of businesses and supportive environmental groups. Local government determines the benefits and transaction costs to local officials according to different programs and strategies. Thus, the political outcome of local government actions is represented as an equilibrium resulting from the interaction between community and local interest demands and policy supplied by government officials (Alston 1996; Feiock 2002).

Previous studies investigate city governments alone or combine multiple levels together in a single-level analysis, which produces aggregation bias. Such an approach fails to consider the fact that a variable may have different meanings and effects at different organizational levels (Raudenbush and Bryk 2002). The analyses in this section fill this gap by using nested data to estimate hierarchical linear models of the factors that influence local governments' collaboration choices.

Hypothesis and Variables

City Factors

Previous empirical studies suggest that differences in governmental forms lead to differences in decision processes and policy outputs (Bae and Feiock 2013; Clingermayer and Feiock 2001; Daley, Sharp, and Bae 2013; DeSantis and Renner 1994; Lineberry and Fowler 1967; Lubell, Feiock, and Ramirez de la Cruz 2009; Sharp, Daley, and Lynch 2010). In the context of China, there is an administrative hierarchy in cities' political status (Ye 2009). Directly controlled municipalities, such as Beijing and Shanghai, have higher capacity in policy-making and stronger political authority, compared with prefecture level cities. Capital cities in each province, such as Guangzhou in Guangdong province and Hangzhou in Zhejiang province, also have more political authority than prefectural cities. Cities with higher administrative status have abundant resources, reflected in higher GDP, more schools and hospitals, and comprehensive social services provisions. Cities with a lower administrative level tend to be more dependent on higher-level cities for obtaining resources. Their relationship with higher-level cities is to reduce dependence (Pfeffer and Salancik 1978).

$\boldsymbol{H_1}$: Cities with a higher administrative level engage in more inter-local agreements.

Community characteristics may be influential in several ways. Social or economic interests in the community articulate demand, which could influence local governments' decisions to enter into inter-local agreements (Feiock 2007; Feiock et al. 2013). Residents' demographics such as population and economic status are also considered as civic capacity indices (Lubell, Feiock, and

Handy 2009; Lubell, Feiock, and Ramirez de la Cruz 2009; Zahran et al. 2008). Based on previous work, city population and changes in growth are linked to city conditions and needs for development (Feiock 2002; 2007; 2013). The fiscal status implies city capacity to fund its policies and programs and city flexibility on the expenditure for its innovative priorities (Hanna 2005; Krause 2011).

H_2: Cities with greater population size engage in more inter-local agreements.

H_3: Cities with higher GDP per capita engage in more inter-local agreements.

Demand is also generated as a response to the nature or severity of the problem (Feiock et al. 2013). In response to tradeoffs between economic development and environmental pollution, social interests in the community articulate demand for a better environment. Moreover, as environmental pollution in one city influences its neighbors, cities with higher environmental vulnerability would be more likely to engage in inter-local agreement to address the problem collaboratively.

H_4: Cites experiencing more severe environmental problems engage more in inter-local agreements.

Regional Factors

Homogeneous problems and conditions across local governments within a region signals potential common interests and shared policy issues (Dye et al. 1963; Foster 1998). Local governments facing similar environmental problems are more likely to understand each other's situations and better trust each other. In this situation, formal agreements may be less necessary for reducing uncertainty and transaction costs. Moreover, a homogeneous situation among governments within a region also means less resource dependence between cities. A collaborative relationship may be advantageous in terms of resource exchange. When local governments experience more heterogeneous environmental problem situations, lack of shared interests and knowledge produce higher collaboration risk for participating actors (Feiock 2013). Institutions are needed to mitigate the collective action dilemma, and collaborations are preferred to obtain resources from others. A similar logic applies to the expected impact of heterogeneity in economic conditions among cities. Higher heterogeneity among cities in their economic status increases resource inter-dependency and makes participatory actors willing to establish a stable relationship.

H_5: Cities in regions with heterogeneous environmental problem situations will engage in more inter-local agreements for its cities.

H_6: Cities in regions with heterogeneous economic situations will engage in more inter-local agreements for its cities.

The involvement of provincial governments would be more likely to impose institutional constraints on city governments. Since the involvement of provincial governments may indicate more diverse interests and stakeholder values involved in the interaction. As the policy network

becomes more diverse in its participants, there is greater need for institutional enforcement (Kwon, Feiock, and Bae 2014). Moreover, provincial governments can engage collaboration directly utilizing their legal authority to establish inter-relationships among local actors.

$\boldsymbol{H_7}$: Cities engage in more inter-local agreements when provincial governments are involved.

Research Design and Data

Both city and provincial level factors together are hypothesized to influence city engagement in inter-local agreements. To empirically test the hypotheses, we analyze city level decisions to join inter-local agreements by local governments with multi-level data collected for five regions in China and the cities located within these regions. Using *city* as the unit of analysis, we calculate measures corresponding to each city involved in any inter-local agreement. In the following subsections, we present the approach used for coding inter-local agreements, the methods for measuring variables, and the sources for additional data.

Data Sources and Data Collection

Data were collected from two major sources. First, we calculated the number of agreements the city joined based on media reports. Thus, our measure includes all agreements whether formal, informal, or imposed. Then, data was added from the China City Statistical Yearbook, an annual statistical publication that comprehensively covers key social-economic indicators of cities. The measures include sulfur dioxide emission, GDP, and population data. Additional coding detail is presented in the section on collaboration agreement choice, which disaggregates agreements into three types.

Because of the limited access to official contractual agreement documents, agreement information was collected from China Digital Newspaper, which archives full text news reports for most mainstream local media for all Chinese cities in the last two decades. By using "*hezuo*" (cooperation), "*xieyi*" (agreement), "*quyumingcheng*" (name of district), and "*huanjingbaohu*" (environment protection) as the key words, media reports from China Digital Newspaper were searched from 2009 to 2015. Duplicate information on the same collaborative activity but reported by different news reports was combined as a single observation. In total, information on 647 agreements across the five collaborative regions was collected. Data were coded by calculating how many agreements a city joined to use city as the unit of analysis. Agreement counts for 259 city level cases were calculated for the analysis.

In March 2011, the principle of the standing committee of the state council passed the Sichuan-Chongqing (Cheng-Yu) economic zone regional planning, to accelerate the economic development of the Chengyu Economic Area, effectively promoting regional integration development. Chengyu Economic zone includes 31 districts and counties in Chongqing Municipality and 15 cities in Sichuan Province. Thus, according to the time period and participatory actors, the original Chengdu Plain was split into Chengyu Economic Zone and inner Chengdu plain. The Chengyu Economic zone becomes the sixth region. In 1982, the Chinese government set up the Shanghai Economic Area. Besides Shanghai, four cities in Jiangsu and five cities in Zhejiang were included. In 1992, a 14-city cooperative joint meeting

was launched. Besides the previous 10 cities, the members included Nanjing, Zhenjiang, Yangzhou in Jiangsu, and Zhoushan in Zhejiang. In 1997, the regular joint meeting resulted in the establishment of the Yangtze River Delta Economic Coordination Association, which included a new member, Taizhou in Jiangsu in that year. In 2003, Taizhou in Zhejiang also joined the association. In 2010, the association accepted six new members after a six-year observation and review, including Yancheng and Huai'an in Jiangsu, Jinhua and Quzhou in Zhejiang, and Ma'anshan and Hefei in Anhui. The total number of cities in the Yangtze River Delta Economic Coordination Association is now 22. To account for this growth and change of the Yangtze River Delta, cities in Anhui Province were coded as the seventh region.

Dependent Variable

The dependent variable records the number of inter-local agreements each city joined. The three main categories of inter-local agreements were classified from the media reports. Informal agreement captures all kinds of informal collaboration and communications (e.g., leader visit, forum, and other activities). A formal agreement records that an official agreement signed by participatory cities/institutions have been set up to facilitate the collaboration, and regular meetings have been held among cities. Imposed authority indicates that some higher level of authorities, such as leaders and agencies at provincial and national governments, directly require cities to collaborate and impose a collaborative arrangement. The dependent variable is the sum of three forms of agreement joined by each city from 2009 to 2015.

Independent Variables

Four of the eight independent variables are measured at the city level (level-1). *Population* and *GDP* measure the community demand characteristics. The measure is an average of the population and GDP per capita for each city in seven regions from 2009 to 2015. An average of *SO2 emission* measures environmental problem severity in each city from 2009 to 2015. City administrative level measures local government structure and level of authority in the Communist Party hierarchy. This concept is operationalized with an ordinal variable ranging from the prefecture level cities to the capital city of a province to a directly controlled city.

Three independent variables are measured at the regional level (level-2). Two variables measure heterogeneity of problem situations. The *heterogeneity of environmental problem situation* among cities measures dissimilarity among cities' environmental circumstances. The measure is a coefficient of variation (CV) for sulfur dioxide emissions for involved cities (CV= standard deviation for sulfur dioxide emissions for cities involved in the agreement divided by mean sulfur dioxide emissions). The data is collected from China City Statistical Yearbook. Similarly, the *heterogeneity of economic problem situation* among cities is measured as CV of gross domestic product (GDP) for cities involved in the agreement. *Direct involvement of provincial government* measures the extent to which provincial government engage inter-local collaborations. We mainly focus on the direct involvement by provincial government, which refers to the provincial leaders attend and participate in the city collaboration agreement, or release orders that require collaboration between cities. We count how many times provincial governments were directly involved in the collaboration between cities in each region, and then calculate the percentage of province direct involvement in cities to the direct involvement in all

regions. A fourth measure is a control for the number of cities within the collaborative region. Data sources and measures are presented in table 1.

Table 1: Data Sources and Measures

Variables	Measures	Predicted relationship	Data Sources
Level-1			
Population	Average of total number of population in each city from 2009 to 2015	Positive	China City Statistical Yearbook
GDP	Average of GDP Per capita in each city from 2009 to 2015	Positive	China City Statistical Yearbook
Hierarchies in city political status	Ordinal variable; Count the administrative levels of participatory cities	Positive	Local media report and official agreement documents
SO2 emission	Average of SO2 emission in each city from 2009 to 2015	Positive	Local media report and official agreement documents
Level-2			
Heterogeneity of environmental problem situation	Coefficient of variation of sulfur dioxide emissions for cities involved in the agreement	Positive	China City Statistical Yearbook
Heterogeneity of economic problem situation	Coefficient of variation of Gross Domestic Product for cities involved in the agreement	Positive	China City Statistical Yearbook
Direct Involvement of provincial government	Percentage of provincial government direct involvement in each region to the direct involvement in all regions;	Positive	Local media report and official agreement documents
Number of cities in each region	Ordinal variable; Count the total number of city covered by each region	Control	China City Statistical Yearbook

Method of Analysis

Hierarchical linear models (HLMs) are applied to estimate the frequency of city engagement in inter-local agreements. HLM is particularly appropriate for data collected from multiple nested levels. It identifies factors that account for city government decisions by including factors at the city and provincial level into a single comprehensive model (Steenbergen and Jones 2002). In the local government context, city government decisions vary both within and between regions. Because cities within the same region will share similar experiences, not taking into account this nested structure may result in misestimated results (Raudenbush and Bryk 2002). Hierarchical linear models also take into account the separate effects of similar variables by including the relationships between variables in separate models (Raudenbush and Bryk 2002). The descriptive statistics for variables in the model are reported in table 2.

Table 2: Level-1 & 2 Variable Descriptive Statistics

City-level Descriptive Statistics

Variable name	N	Mean	SD	Min.	Max.
City Administrative Level	236	2.13	0.42	1.00	4.00
Number of agreement	236	14.72	24.79	0.00	237.00
Population	236	489.15	362.15	74.00	3317.00
GDP	236	43015.03	33713.71	10053.00	180214.00
SO2 Emission	236	58403.34	62696.16	3074.00	540767.00

Provincial Level Descriptive Statistics

Variable name	N	Mean	SD	Min.	Max.
Economic Heterogeneity	7	0.64	0.18	0.45	0.94
Environment Heterogeneity	7	0.94	0.38	0.64	1.69
Provincial Government Involvement	7	0.14	0.18	0.00	0.54
Number of city in each region	7	37	22.30	14	78

Results

The model estimates presented in table 3 reveals that both demand and supply factors in the political market can influence local collaboration decisions. The first result to note is the strong support for the impact of city administrative level on the number of agreements a city joined.

The coefficient is positive and statistically significant at the 0.01 level. The significance of the city administrative level suggests that cities with a higher administrative level in the communist party may control more resources, which enhances their capacity to collaborate with other cities. Moreover, table 3 also reports the significance of the impact on GDP per capita on the number of agreements the city joined, which suggests affluent communities will be more likely to join inter-local agreements. However, the coefficient for SO2 emissions is negative, implying that environmental problem severity does not necessarily induce local governments to join more inter-local agreements. The negative coefficient suggests that economic growth remains the dominant motivation for local collaboration, even in the area of environmental sustainability.

At the regional level, heterogeneity of economic conditions did not influence the number of inter-local agreements a city joined. This suggests that common economic conditions throughout regions may not be a key driver in deciding the number of agreements cities engage in. However, we do find a negative impact of heterogeneity of environment conditions within regions on the number of agreements cities joined, which is consistent with the impact of city SO2 emission on the number agreements. The coefficient is negative and statistically significant at the 0.10 level indicating that a more homogeneous environment provides better pre-condition for inter-local collaboration between cities. The negative significance of environmental heterogeneity and insignificance of economic heterogeneity jointly suggest that shared environmental problems, not shared economic position, makes cities more willing to collaborate with each other. Moreover, we find support for the impact of provincial government direct involvement in deciding the number of agreements. The more provincial government engages in the inter-local collaboration, the more agreements cites join.

Table 3: Hierarchical Linear Model

Variables	Coefficient	Standard Errors	Predicted Relationship
City level			
Population	0.006622	0.006211	+
GDP	0.000224***	0.000052	+
SO2 emission	-0.000112***	0.000033	+
City administrative levels	23.339774***	4.469041	+
Region level			
Heterogeneity of environmental problem situation	-18.658375*	7.577706	+
Heterogeneity of economic situation	-2.465221	6.659184	+
Direct involvement of provincial government	20.531814*	7.717401	+
Number of cities in each region	-0.075543	0.105804	Control

Notes: *p<0.10; **p<0.05; ***p<0.01. (two-tailed)

Summary and Discussion

Based upon the data collected from these seven collaborative regions in China, multi-level demand and supply factors derived from a political market framework were estimated. Tests of

the hypotheses demonstrate that cites with a higher administrative level and healthier fiscal condition are likely to join more inter-local agreements. Moreover, when provincial government participates in local collaboration, more cities within a province join agreements. However, local environment problems do not contribute to the increasing number of inter-local agreements.

Several potentially important research implications flow from these findings. The value of multilevel analysis for the study of inter-local collaboration is clearly demonstrated using *city* as the unit of analysis. Construction of a nested structure allows tests of the influence of provincial factors as well as city characteristics and conditions on variation in the number of environmental agreements a city joined. This first systematic investigation of the political market framework beyond North America and Europe context extends the framework to regional collaboration in China and the empirical findings contribute to expanding the scope and generalizability of the political market framework.

Multi-level factors that influence city government's decision to join inter-local agreements. The analysis finds that Chinese cities are more willing to collaborate with each other when the environment and economic situation within the region is more homogeneous. This indicates that lower transaction cost and collaboration risks allow cities to choose partners based upon shared knowledge and beliefs. Nevertheless, cities' decisions to join agreements may not be entirely voluntary if participants believe collaboration will be imposed if it does not happen voluntarily.

Case Studies of the Three Agreement Types

Inter-local collaboration in China was initially introduced to spur economic development. Natural resources and human capital tend to be highly clustered geographically across regions. Economic imbalances among and within different regions often translate into variations in city capacity with respect to education, technology, and urban planning. For instance, Beijing and Hebei are located next to each other, but have significant differences in economic development, human capital, societal infrastructure and industrial structures. Beijing benefits from its high urbanization rate and developed economy, but suffers from over-population, traffic congestion, and air and water pollution. Hebei is gifted with a large geographic area, seaports, a rich natural environment, and a potential for tourism. However, its lower urbanization rate, reliance on traditional industry, poor social services and infrastructure development limit future development. Resource dependence theory (Pfeffer and Salancik 1978) suggests that no organization is self-sufficient since each needs resources that it does not control and must acquire those resources by interacting with external groups or organizations that do control them. The interdependent relationship formed between Beijing and Hebei complements and benefits cities in the area. Resource complementarity promotes exchange and interdependence of resources and administrative capacities (Yang and Peng 2009).

When problems in one jurisdiction spillover into neighboring communities, collective action is necessary to address the issues. Industrialization and rapid economic progress can reduce quality of life and damage natural environments. Commentators agree that achieving the next wave of environmental improvement and sustainable communities may not only require mandates of the central government but also collective actions of local governments, communities, industries,

non-profits, and other organizations working together (Yi 2014). However, top-down governance is still effective in China and the central government remains the major decision maker. Provincial governments are also extensively involved in the inter-local government decision-making process by suggesting, encouraging, or on occasion mandating city governments to collaborate with each other (Lin 2009).

Mechanisms for Mitigation of ICA Dilemmas in China

As discussed in section two, ICA problems that arise directly from the fragmentation of local authority sometimes require collaborative mechanisms enforced by higher political authority, instead of formal or informal agreement among the affected parties. In order to capture the full extent of cities collaborative engagements it is necessary to include formal, informal, and imposed agreements and differentiate the factors related to the use of each agreement type. The three case examples describe the actors, problems, and processes involved and relate them back to the theoretical taxonomy.

We draw upon the theoretical lens of the Institutional Collective Action framework to examine the structure components processes and processes involved in collaboration. After we compare the types of agreements used to mitigate ICA dilemmas in China with those employed in the West, we examine each of the three mechanisms in detail through case analysis of specific agreements that provide exemplars.

Inter-Local Collaboration in China and the West

Over the last decade, inter-local collaboration has been a central focus of public administration research and administrative practice in North America and Europe. Although the popularity of particular integration mechanisms varies across countries (Tavares and Feiock 2014), they easily fit into the ICA taxonomy based on complexity and local autonomy. Inter-local collaboration is on the rise in China but its forms appear fundamentally different, as they are built on the foundation of the authoritarian political structure. Ye (2009) compares inter-local collaborations among U.S. and Chinese cities and notes a lag of more than a decade in the wide use of collaborative agreements in China. Instead, top-down consolidation was employed to provide efficient delivery of public services on a regional basis by setting up accountability structures and eliminating duplicated service units (Leland and Thurmaier 2000). Inter-local collaboration has now become an alternative regional governance practice by delivering public functions through horizontally linked organizations.

China, whose administrative style is typically characterized as hierarchical and top-down, did not prioritize the importance of regional development until the late 1970s. The central government, as the major decision maker, was extensively involved in regional government decision making. Even now, the central government plays a significant role in the inter-local collaboration decision-making process. This is in sharp contrast to the U.S., where local communities serve as major players in the policy-making process, leaving a very limited role for federal government.

Acknowledging the differences in political structure, community values and cultural traditions between the U.S. and China, how can we extend the ICA framework to the Chinese context? The

typology of the ICA framework is in fact well suited for the Chinese context as was demonstrated by figure 2. Before empirical testing of hypotheses regarding what accounts for the use of the specific forms of agreement, we provide descriptive case analyses that systematically examine examples of each agreement type. The cases are drawn from four regions: the Beijing-Tianjin-Hebei Metropolitan Region, the Yangtze River Delta, the Pearl River Delta, and the Chengdu Plain. The historic, economic, and political conditions and decision-making processes for each region are briefly described.

Compared with the United States, inter-local collaboration in China developed in the context of low governmental fragmentation and a much more centralized political structure. As noted, three types of inter-local collaboration mechanisms are typical in China: formal collaboration, informal collaboration, and imposed collaboration. The case studies conducted for each type of collaboration mechanism examine the dynamics and mechanisms of inter-local collaboration within a single setting (Eisenhardt 1989). This multiple case study approach offers comparable descriptions of inter-local collaboration in the Chinese context (Yin 1984).

Mechanism One: Formal Collaborative Innovation

A formal collaborative mechanism indicates a collaborative relationship between cities through a formal agreement. "Formal" is used to indicate the existence of a written legally binding document. Yang (2011) argues that inter-local agreements become the institutional support for inter-local collaboration. The three types of agreements defined by Yang (2011) are often formalized. A vertical agreement is a policy commitment between central and local governments or provincial and municipal governments. Horizontal agreements are signed by governments at the same political level, such as, inter-provincial, inter-municipal, inter-county, and inter-agency agreements. Diagonal agreements are signed between governments at different political levels and in different regions. Formal inter-governmental agreements often facilitate inter-city collaboration and win-win outcomes through exchange or delegation of authority. The principal participants are governments and public agencies.

Among the collected collaborative agreements in this study, 81 formal collaborative agreements were signed in the Beijing-Tianjin-Hebei metropolitan region, 58 signed in the Pearl River Delta region, 66 in the Yangtze River delta and 43 in the Chengdu Plain. Various goals are covered in these formal agreements ranging from air pollution control and economic development, to urban planning and social services.

Case Examples of Formal Collaboration Agreements in Practice

<u>Environmental Protection Integration Plan of the Pearl River Delta (2009 – 2020)</u>

The Pearl River Delta Region is located in southern China with an area of 56,000 square kilometers. Neighboring with Hong Kong, Macau, and the South Asian countries, it is also known as the "south gate of China." Nine cities are very active in the Pearl River Delta, including Guangzhou, Shenzhen, Zhuhai, Dongguan, Zhongshan, Foshan, Huizhou, Jiangmen, and Zhaoqing. Having benefited from economic liberalization policies in the late 1970s, foreign direct investments are concentrated in the region. The Pearl River Delta has emerged as one of

China's leading economic regions. It has a population of about 60 million and the GDP per capita reaches up to $15,000.

According to LaSalle (2010), as a leading manufacturing center, the Pearl River Delta's share in global production is as high as 60 percent in certain industries. Manufacturing in the Pearl River Delta originally centered on the production of labor-intensive goods such as clothing, toys and garments. Since 1985, industrialists from Hong Kong have relocated to the Pearl River Delta, which accelerated a shift of industrial production towards light industrial manufacturing, such as electrical equipment, components, and plastics. The famous FoxCom Technology Group has been in Shenzhen since 1999. In the early 1990s, the Pearl River Delta entered a new phase of heavy industrial development in petrochemical, energy, steel, and automotive industries. The growing affluence of residents has helped fuel the demand for services such as education, recreation, travel, and telecommunications.

Although the Pearl River Delta has enjoyed significant economic advancement over the past 30 years, the growth has generally been recognized as being unsustainable over the longer term, from both environmental and economic perspectives. Unlike in the Beijing-Tianjin-Hebei area, inter-local collaborations in this area are confined within the geographic boundary of Guangdong province. Up to roughly 40 percent of the air pollution in the Pearl River Delta is caused by manufacturing of goods and associated transportation and power generation activities (LaSalle 2010). The central government and local governments realized the impact of these environmental issues very early on. However, lack of collaborative leadership and vicious competition between cities caused repetitive investment and resource waste, which rendered a symbolic collaboration in this region.

During the past three decades, the tradeoff between economic development and environment pollution became increasingly intense in the Pearl River Delta. Local governments under pressure to reform and innovate searched for an effective way to solve the environment problems. Inter-local agreements have emerged as an "innovative governance arrangement" and one of the important "features of contemporary local government management" (Zeemering 2008). Inter-local collaboration targeted at environmental sustainability has become an important policy tool. The "Environmental Protection Integration Plan of the Pearl River Delta 2009-2020" is the first agreement with a focus on inter-local environment protection.

Collaborative Innovations in the Pearl River Delta

Water issues pose critical environmental challenges to the Pearl River Delta in the forms of river pollution, poor city drainage system design, and severe pollution in the water system. Air pollution, such as ozone-rich air, acid rain, and smog adversely influence citizens' life in the region. Significant differences exist between cities, and between urban and rural areas in terms of environmental monitoring, administrative capacity, and environmental infrastructure planning, hindering the integrated development of the Pearl River Delta.

In response, local governments recognized the importance and necessity of inter-local collaboration and institutional innovation. The "Environmental Protection Integration Plan of the Pearl River Delta 2009-2020" establishes eight co-management systems to collaboratively

address environment protection in this area, including drainage system improvement, air pollution control system, an ecological security system, an industrial environment adjustment system, social infrastructure co-management, and an environment monitoring system.

The "Environmental Protection Integration Plan of the Pearl River Delta 2009-2020" created a collaborative environmental inspection and evaluation system, which is innovative in its institutional design. Specifically, it encourages strategic planning for inter-local collaboration and information sharing on pollutant programs and construction. The plan requires periodic pollution evaluation of pollutant production and emissions for some important industries. It is expected to establish an industrial threshold for the entrance into the market and to set up standards for organizational management.

The Plan encourages cities within the Pearl River Delta Region to seek collaboration with Hong Kong and Macau. For instance, the Plan suggests strengthening the air pollution monitoring system by adding $PM_{2.5}$ and O_3 monitors and increasing the number of air quality network sensors within the region, with Macau included in the network. Collaborating with Hong Kong, Guangdong encourages HK-based Corporations to adopt clean production programs.

Mechanism Two: Informal Collaborative Innovation

A simple way to differentiate between formal and informal collaboration is that formal collaboration is more likely established in a written agreement. Informal agreements are widely adopted as an innovative mechanism to ensure effective collaborative governance. The systematic media search undertaken for this research identified 59 instances of informal collaborative activity in the Pearl River Delta, 166 in the Beijing-Tianjin-Hebei region, 60 in the Yangtze River Delta, and 24 in the Chengdu Plain. To present a comprehensive picture of informal local collaboration in China, two cases of inter-local collaboration selected from the Chengdu Plain and Yangtze River Delta region are discussed below.

Case Examples of Informal Collaboration in Practice

<u>Chengdu, Deyang, and Mianyang Integrated Collaboration</u>

The first case of informal collaboration is taken from the Chengdu, Deyang, and Mianyang Integrated Collaboration. Situated in western inner China, the Chengdu Plain is contained within Sichuan province. Located between Mount Longquan and Mount Longmen, Chengdu Plain is rich in water resources, mineral resources, and nutrient soil for grain growth. Chengdu Plain is an important agricultural region and manufacturing center in the western part of China.

Cities in this region, have actively sought collaborative opportunities with neighboring cities to develop the economy. In March 2011, the regional plan on the establishment of the Chengyu economic zone was approved by the State Executive Council to encourage collaborative development in Western China. The Chengyu economic zone covers 15 cities in the Sichuan province and 29 districts in the Chongqing municipality.

The total area of the Cheng-Yu economic zone is 206,000 square kilometers, with a population of 98.407 million and a per capita GDP of $2,470. Since it is located on a low-lying plain with humid and rainy weather, Chengdu Plain suffers severe air pollution. Eight cities within the Chengdu Plain signed a regional environmental protection agreement early in 2010. Compared to the Beijing-Tianjin-Hebei Metropolitan Region, the Chengdu Plain is very distant from the central government. Similarities in cultural values and frequent interactions between the cities in the Sichuan Province enables high level of mutual trust among the cities. An informal inter-local collaboration mechanism has emerged as the dominant form of collaboration.

Cities in the Chengdu Plain regularly explore opportunities for informal collaboration. On April 24, 2014, the director of the Department of Transportation in Mianyang visited Deyang Department of Transportation and discussed the planning and development of an integrated transportation system. An investment plan to expand the highway and expressway networks was on the table. The city of Deyang is establishing its own integrated transportation system with a plan to connect neighboring cities and provinces in western part of China.

Integrated transportation paves the way for inter-local collaboration in other public service areas, such as industrial development, technological innovation, and social services. To facilitate industrial development, local government officials in Mianyang actively interact with neighboring cities and provinces by sharing information in economic forums and business conferences, and inviting business leaders from neighboring cities and provinces to Mianyang for Scientific Technology Exhibitions and other events. To spur business development, Mianyang government encourages local enterprises to set up branches in neighboring cities. A large-scale wholesale market is under construction, which will facilitate market sharing and exchanges between collaborative cities. In the area of social service delivery, the Mianyang government has committed to increasing job opportunities by sharing educational resources with Ziyang city and Suining city.

Integrated Tourism Development in Yangtze River Delta

The second informal collaboration case is Integrated Tourism Development in Yangtze River Delta. Shanghai is the central municipality of this region in terms of its political authority and economic status. At present, the Yangtze River Delta Region contains up to 30 participating cities, which are collaborating on transportation integration, technological advancement, energy development, and environmental protection. The ICA framework predicts that a formal collaborative mechanism is more effective when dealing with a larger number of collaborators (Feiock and Scholz 2010). Cities in this region rely heavily on formal agreement as an instrument for inter-local collaboration, somewhat consistent with the ICA prediction.

However, since cities in the Yangtze River delta are geographically close to each other, local governments have developed a collaborative regional economy by sharing tourism resources. A written agreement is typically absent in such collaborative arrangements. Instead, there is an implicit understanding about sharing tourism resources between the cities in the Yangtze River Delta; cities jointly develop a tourism marketing strategy on advertisements and promotions.

Mechanism Three: Imposed Collaborative Innovation

The direct involvement of a higher level of government differentiates imposed collaboration from formal collaboration. Most imposed collaborations have written agreements, which bind two or more public authorities together for service delivery. In an imposed collaborative relationship, the higher-level authority is directly involved through provision of financial support, specification of project goals or release of direct orders. As Ye (2009) demonstrates, the Chinese central government is extensively involved in inter-local government decision-making. The Chinese central government sometimes mandates specific city governments to collaborate with each other. The media search for collaboration data uncovered eight instances of imposed collaborations in the Beijing-Tianjin-Hebei region, three in the Chengdu Plain, four in the Yangtze River Delta and one in the Pearl River Delta.

Case Examples of Imposed Collaboration in Practice

Outline of Beijing-Tianjin-Hebei Collaborative Development Plan

The Beijing-Tianjin-Hebei Metropolitan Region is located in Northeastern China. Cities from three major political entities, namely Beijing Municipality, Tianjin Municipality, and Hebei Province, are actively engaged in inter-local collaboration in this region. The Chinese central government is located in Beijing, which is the political center and an important industrial base in China. The city of Beijing, as the capital of China, is positioned at the top of the political hierarchy of cities. Other collaborative participants in this region are positioned at lower political ranks, with Tianjin and Hebei playing secondary roles. Small differences in political and economic capacity between collaborators is believed to facilitate successful inter-local collaboration. Thus, when collective action occurs between governance entities with substantially different administrative levels, additional incentives or restrictions may be needed.

In addition, significant differences in economic development, population distribution, societal infrastructure, and industrial structures characterize the Beijing, Tianjin, and Hebei region. Zhu (2015) provides a summary of the major advantages and disadvantages of Beijing, Tianjin, and Hebei. By 2014, the population size in Beijing was about 21 million, with an urbanization rate of 86.4 percent and a GDP per capita of $16,278. Service industries are the primary economic sector. However, over-population, traffic congestion, and air and water pollution are its major problems. Tianjin is famous for its seaports and maritime transportation, technological development, and manufacturing. However, over-emphasis on industrial development and the lack of natural resources have limited Tianjin's development. Hebei is blessed with a large geographic area, seaports, and potential for tourism. However, the low urbanization rate, reliance on traditional industry, poor social services, and under-developed infrastructure significantly hindered Hebei's competitiveness relative to Beijing and Tianjin.

Since the Beijing-Tianjin-Hebei Metropolitan Region is closer to the central government than the other region studies, inter-local collaborations in this area are subject to greater influence from the central government. Central government interventions range from policy and financial support to direct supervision and monitoring. Therefore, an imposed inter-local collaboration

mechanism is the dominant form of collaboration among local government since it is easier to achieve and monitor in this region.

On February 26, 2014, President Xi Jinping highlighted the significance of the Beijing-Tianjin-Hebei (Jing-Jin-Ji) collaboration. In December 2014, the Jing-Jin-Ji collaboration became a national strategic plan. Four months later, "The Outline of the Jing-Jin-Ji Collaborative Development Plan" was approved.

According to Zhu's analysis (2015) of Beijing, Tianjin, and Hebei, the three entities are complementary to each other as each has its own advantages and disadvantages. Beijing needs to release part of its urban functions. The industrial structure in Tianjin needs to be transformed. Hebei needs to absorb human, intellectual, and social capital to speed up urbanization and economic development. Severe air pollution in the Beijing-Tianjin-Hebei region raises citizens' awareness of air quality improvement and environmental sustainability. In 2013, seven out of the ten cities with the poorest air quality in China were located in the Beijing-Tianjin-Hebei area. The Plan requires the three entities to focus on green energy research and strengthen the air pollution monitoring system. The top-down nature of the imposed collaboration in Beijing-Tianjin-Hebei region is unique compared to formal and informal agreements observed in other cases.

Summary and Discussion

These cases illustrate the potential of the ICA framework for understanding the design and selection of collaboration agreements among local governments in China. The empirical cases contribute to the study of inter-local collaboration in China by showcasing the unique case of imposed collaboration, a phenomenon with Chinese characteristics. In the western context, collaboration typically indicates that the parties involved are acting voluntarily. The cases presented here demonstrate that imposed collaboration can also be an effective collaborative governance tool.

In practice, inter-local collaboration is an innovative practice adopted by Chinese local governments. Local governments need to learn how to better take advantage of each other's potential, and strategically plan and develop for the region as a whole. It needs to be acknowledged that inter-local collaboration is still an experiment in China. Despite the fact that many policy areas are included in inter-local collaboration, social equity issues, especially environmental justice problems, need to be considered within the inter-local collaboration plans.

The multiple cases described here explore three mechanisms of inter-local collaboration applying a qualitative approach that is complementary to the quantitative studies. It also provides the foundation for developing and testing theories. The final analysis builds from these cases while employing large sample statistical techniques to explain choices among the three collaborative mechanisms.

Collaboration Agreement Mechanism Choice

In Asia, the rational design of regional governance systems in the second half of the 20th century favored large-scale mergers on the grounds of technical efficiency (Park 2015). Mergers lower the cost per unit of output and the average cost of producing more than one product or service (Tavares and Feiock 2014). However, large-scale mergers sacrifice allocative efficiency because centralized authorities or merged governments are less able to adjust service provision to local conditions and preferences (Dowding and Feiock 2012). To overcome this drawback, collaborative arrangements have emerged to accommodate preference diversity at the local level (Brown, Gong, and Jing 2012; Jing and Chen 2012; Wang and Yin 2013). Their great advantage is that they can be tailored to each good or service and adapted to each particular context, thereby avoiding irreversible solutions. The ICA framework clarifies the trade-offs between technical and allocative efficiency, encompasses the variable geography of regional governance across Asia, and helps understand choices of alternative governance arrangements as evidenced by the design of collaboration agreements.

Integration Mechanisms and Institutional Scope

We earlier classified the integration systems as defined by the modified ICA mechanisms in figure 2. The horizontal axis displays these mechanisms to integrate decision-making: informal agreements, contractual agreements, and imposed authority (Feiock 2013). The first two are decentralized governance mechanisms involving self-organization by local government units in order to overcome horizontal collective action dilemmas. Informal agreements rely on norms of trust, reciprocity, and reputation resulting from long-term interaction between actors to elicit credible commitment from the institutional actors involved in the exchange.

Formal agreements and contractual agreements are voluntary in nature and can be adopted in many situations involving externalities as long as the transaction costs are kept low. Under delegated/imposed authority, the local government units agree to set up a standing organization to which they delegate functional authority to perform certain activities on behalf of the local governments. Imposed authority is a centralized solution designed by a higher-level authority to direct the actions of local units and internalize ICA dilemmas (Feiock 2013).

To study mechanism choices, we were are able to collect a comprehensive dataset of 564 inter-local agreements on environmental sustainability in four regions (Beijing-Tianjin-Hebei, Pearl River Delta, Yangtze River Delta, and Sichuan Plain Economic Zone) in China. We find a substantial number of empirical cases corresponding to each of the three integration mechanisms identified by the modified ICA framework. Within each region, local governments engaged in collaborative governance by hosting informal meetings, by signing informal agreements and/or under the guidance of imposed authorities. Building from the case analyses parented in the previous section, we draw testable hypotheses on the motivations for the selection of specific integration mechanisms, which guide empirical testing of ICA mechanisms design in China.

Integration Mechanisms in China

The cities participating in inter-local environmental agreements are drawn from four regions. The Beijing-Tianjin-Hebei Metropolitan Region is the political and economic center, and one of the most seriously polluted areas in China. Pearl River Delta Region is one of the most developed regions in China, but with severe environment problems as well. The Yangtze River Delta region is the largest region among the four inter-local collaboration regions. It occupies 2.1 percent of the national land area, but contributes to about 21 percent of the national GDP. The Chengdu Plain is located in western inner China, with a concentrated population and fast growing economy.

There are multiple reasons for selecting cities from these four regions. First, the four regions represent cities in China geographically (north, east, south and west) and the total GDP of the four regions account for 40 percent of China's total GDP in 2015. Second, environmental sustainability is a common concern for all four regions. Third, cities in the four regions are engaged in diverse collaboration activities in pursuing environmental sustainability.

Community characteristics are considered important influences on local governments' decision to enter into inter-local agreements. Similar to collective action situations among individuals, homogeneity across local governments signals potential common interests and shared policy problems (Dye et al. 1963; Foster 1998; Feiock 2007). For public officials who are the bargaining agents for their governments, knowledge about their counterparts in other jurisdictions who are faced with similar environmental problems provides better understanding of their preferences and political motivations (Post 2004). Local governments facing similar environmental problems are more likely to trust each other. In this situation, informal agreements are enough to ensure commitment from all parties with homogeneous environmental conditions to engage in collective action. Local governments prefer an informal mechanism with lower autonomy cost and compliance cost, but only if the informal mechanism ensures desirable collective action outcomes.

When local governments are highly heterogeneous the problems they face include lack of knowledge, lack of trust, and high collaboration risks in making substantial commitment to the agreement. Formal enforcement mechanisms are needed to reduce uncertainty in the collaboration among partners. The same logic applies to the expected impact of homogeneity in economic conditions among cities. Higher homogeneity among cities in their economic status reduces transaction costs of reaching agreement and thus facilitates their commitment to informal agreement (Lee, Feiock, and Lee 2012).

$\boldsymbol{H_8}$: Local officials with heterogeneous environmental problem situations will choose more formal collaboration mechanisms.

$\boldsymbol{H_9}$: Local officials with heterogeneous economic situations will choose more formal collaboration mechanisms.

The greater the number of actors involved, the more complex and uncertain the collective decisions. Actor homogeneity is also important for the selection of ICA integration mechanisms.

Homogeneous actors require less authoritative enforcement mechanisms (Lee, Feiock, and Lee 2012). The number of participants is one indicator of homogeneity and complexity. The greater the number of actors, the more likely it is that more formal and authoritative agreements will be needed.

H_{10a}: The greater the number of actors involved in the agreement, the more formal the agreement.

Heterogeneity among actors also arises from the types of actors involved. In the absence of national and provincial governments, decisions involve only local governments that often constitute a more homogeneous group that may be more likely to engage in informal agreements. The involvement of national and provincial governments introduces two conditions that create a need for more formal agreement or even imposed authority. First, the involvement of national and provincial governments indicates a more diverse set of actors in the negotiation of inter-local agreement. So, formal contract mechanisms will be needed to ensure enforcement (Kwon, Feiock, and Bae 2012). The second effect comes from the fact that national and provincial governments are simply higher-level government and they have the legal authority to impose integration mechanisms on local governments.

H_{10b}: More formal mechanisms are chosen when national and/or provincial governments are involved.

The complexity of a contractual relationship is a critical determinant of the type of agreement collectively selected by the local governments. According to transaction cost economics, asset specificity and measurability of goods are two dimensions of transaction cost, which are barriers to collection action. Measurement difficulties increase search costs and make coordination of joint action difficult. In addition, measurement problems hinder monitoring and enforcement. Effective monitoring requires quantitative measures of what counts as an appropriate level of activity by a service provider or the extent to which the services achieve their desired impacts (Deakin 1996). Service metering is the degree of difficulty in metering or monitoring the quantity and/or quality of output or benefits of a service (Williamson 1985).

Measurement is more difficult as the number of issues covered in an inter-local agreement increases. A simple inter-local agreement may cover only environmental sustainability related collaborations. A complex contract may involve comprehensive collaboration between/among local entities, covering a wide range of policy issues, including environmental sustainability, economic development, transportation, and health care. A single-issue agreement is easier to measure, monitor, and enforce, and thus could be sustained under an informal agreement, in which entities maintain high autonomy. A multiple issue agreement is much harder to measure its goals, priorities and success, and formal contracts (formal agreement and imposed authority) are needed to ensure the enforcement of the ICA.

H_{11}: More formal mechanisms are chosen when multiple issues are involved.

As discussed earlier, Chinese cities are not equal with regard to their political status in the administrative hierarchy (Ye 2009). Directly controlled municipalities, such as Beijing and

Shanghai, have high autonomy in policymaking and strong political connections to the central government. Capital cities in each province, such as Chengdu or Nanjing, also have more political authority than normal cities. When cities with equal administrative status are involved in an agreement, given the lack of existing mechanisms for enforcement, they will opt for imposed authority or formal agreement to avoid defections from their partners. However, it will be a different scenario when cities with different administrative levels are engaged in inter-local agreement. Cities with higher administrative status have great advantage in the political bargaining with lowly ranked cities, and can always resort to imposed authority or formal agreement as a last solution. In such cases, informal mechanism is sufficient to ensure successful compliance with the inter-local agreement, and thus will be selected. The simple presence of cities with higher administrative status might prevent lower ranked cities from defecting from informal agreement, making formal agreement and imposed authority less necessary for agreement enforcement.

H_{12}: The greater the range of administrative status of the cities involved, the less formal the agreement.

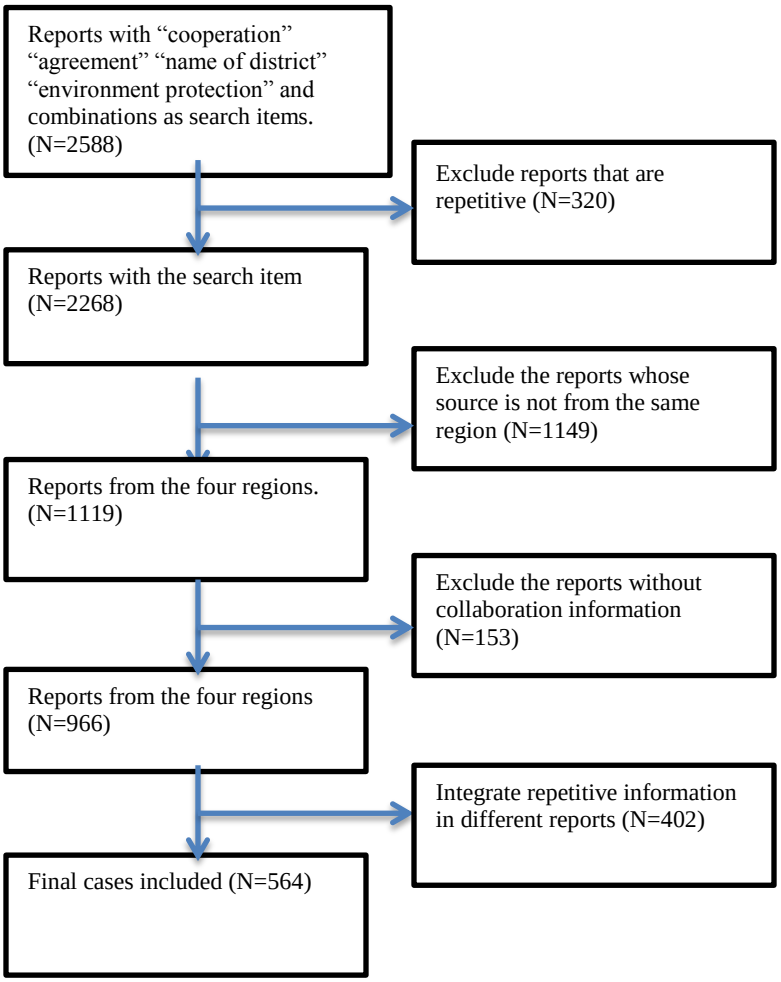
Research Design and Data

To empirically test the above hypotheses, we analyze ICA integration mechanism choices among local governments with data from cities in four regions in China. Using inter-local agreement as the unit of analysis, we collect data and calculate measures corresponding to the actors involved in each inter-local agreement. In the following subsections, we present the approach used for coding the inter-local agreements, the methods for measuring variables, and the sources for additional data.

Data were derived from two major sources. The first is the China City Statistical Yearbook, an annual statistical publication that comprehensively covers key social-economic indicators of cities, from which sulfur dioxide and GDP data were collected. The second data source is China Digital Newspaper, which archives full text news reports for most mainstream local media for all cities over the last two decades.

In order to find all the relevant news on cross-city collaboration, we took several steps in the data collection process (see figure 3). As earlier described, we first identified all the media reports that cover collaboration in their texts. The search rule among the search items was "AND". That is, a media report that mentions all the search items was considered as a qualified data source. The search was conducted region by region, which led to 2,588 media reports. The second step was to remove repetitive news items (N=320) derived from different combinations of search items. After that, the source of the media reports were examined and those with sources not from the same region were excluded (N=1,149).

Figure 3: Coding Process for Media Reports



Following the search process, we excluded 153 reports that contained no information on collaboration. The number of media reports totaled 966, of which 326 (34 percent) are from Beijing-Tianjin-Hebei, 215 (22 percent) from Yangtze River, 151 (16 percent) from Pearl River Delta, and 152 (16 percent) from the Chengdu Plain.

Based upon the 966 media reports, the next step is to integrate repeated information on the same collaborative activity but reported by different news reports. Some media reports are duplicated and including duplicated reports on the same collaborative activity would bias results. For instance, establishing a formal collaborative relationship between two cities by signing agreements would be repeatedly reported by local media in different cities involved in collaboration. Also, as the unit of analysis of this paper is agreement rather than media report, integrating repetitive media report is needed to collect comprehensive information on the inter-local agreements. Information integration is conducted by two independent researchers. Five hundred sixty four cases are collected and cleaned for our final analysis. Among these cases, 247 cases are in Beijing-Tianjin-Hebei region, of which 166 are informal collaborative agreements,

73 are formal agreement, and eight are imposed by higher level of authority. There are 126 cases in Yangtze River region, of which, 60 cases are informal collaboration, 62 are formal collaborative agreements, and four are imposed by higher authority. One hundred twenty three cases are collected in Pearl River Delta region, of which, 66 are informal collaborative agreements, 56 formal, and one is imposed by authority. Sixty-eight cases are collected from the Chengdu Plain, of which 25 cases are informal agreement, 40 are formal, and three are imposed by authority.

Coding

The codebook includes the following information: media report identification, problem situation, and agreement characteristics for each inter-local agreement. The coded information constitutes the majority of our dependent and independent variables in this study. Two independent coders double-blind coded the same documents. The Cohen's Kappa test for internal reliability supported the reliability of the coding. After all reports were independently coded, discussions among the coders resolved any disagreement in the coding process. The investigators randomly sampled 20 percent of the coded agreements and recoded them as an additional check for internal reliability.

Dependent Variable

The dependent variable captures the authoritativeness of the agreement enforcement mechanism. We use the modified ICA framework to code three categories of the ICA mitigation mechanisms from the media reports. The least authoritative is an "informal mechanism," which captures all kinds of informal communication (e.g., leader visit, forum, and other activities). A "formal mechanism" designates that official agreements between cities has been signed, institutions have been set up to facilitate the collaboration, and regular meetings have been held among cities. The most extreme form in terms of formal authority is "imposed authority," indicating that some higher level of authority, such as leaders and agencies at provincial and national government, require cities to collaborate and impose a collaborative arrangement. This dependent variable is ordinal, moving from informal agreements that impose the least constraints on local autonomy to formal agreements that are more authoritative to imposed agreements that provide no local autonomy. In addition, ordinal logistic regression will be employed as the modeling strategy to estimate the empirical models.

Independent Variable

As in the earlier analyses, heterogeneity of environment conditions among cities is included to measure dissimilarity among cities' environment circumstances. The variable is measured as a coefficient of variation (CV) for sulfur dioxide emissions for cities involved in the agreement collected from China City Statistical Yearbook. Similarly, the heterogeneity of economic conditions among cities is measured as coefficient of variation of gross domestic product for cities involved in the agreement.

Additional explanatory variables are included to measure agreement characteristics. A binary variable is included to capture the involvement of national or provincial government. The

variable is coded as "1" if either national or provincial government is involved in the agreement and "0" otherwise. The involvement of administrative departments is measured as the number of departments involved in the agreement. The other two variables are capturing the scope of collaboration and hierarchies in the agreements. The scope of collaboration is measured by counting total number of participating cities. Hierarchy in agreements is measured by counting the maximum difference of administrative levels of participating cities. These data were collected from local media reports and official agreement documents.

Three binary variables are included to capture contract characteristics. The first variable identifies if the agreement covers single function or multiple functions. We code multiple function agreements as "1", and single function agreements as "0". The data is collected from media reports and official agreement documents. A second binary variable captures whether the agreement is multilateral or bilateral. A third measures whether the agreement specifically targets air pollution problems. Table 4 presents the data sources and measures.

Table 4: Data Sources and Measures

Variables	**Measures**	**Predicted relationship**	**Data Sources**
Heterogeneity of environmental problem situation	Coefficient of variation of sulfur dioxide emissions for cities involved in the agreement	Positive	China City Statistical Yearbook
Heterogeneity of economic problem situation	Coefficient of variation of Gross Domestic Product for cities involved in the agreement	Positive	China City Statistical Yearbook
Involvement of national or provincial government	Binary Variable 1, national/provincial government involvement; 0, without involvement	Positive	Local media report and official agreement documents
Scope of collaboration	Total number of participatory policy actors	Positive	Local media report and official agreement documents
Contract complexity: function	Binary Variable 1, contract with multiple functions; 0, contract with single function	Positive	Local media report and official agreement documents
Hierarchies in agreements	Maximum difference of administrative levels of participatory cities	Negative	Local media report and official agreement documents

Number of parties in the agreement	Binary Variable 1, multilateral contract ; 0, bilateral contract	Control	Local media report and official agreement documents
Involvement of bureaucratic agencies	Number of bureaucratic agencies involved	Control	Local media report and official agreement documents
Agreement on air pollution	Binary Variable 1, air pollution related agreement ; 0, otherwise	Control	Local media report and official agreement documents

Results

The dependent variable follows an ordinal sequence along the dimension of autonomy cost, with an informal mechanism imposing the least, formal agreement moderate, and imposed authority the greatest loss of autonomy (see figure 2), thus ordinal logistic regression models are estimated. The model can be presented as a latent variable model (Long and Freese 2006). Defining y^* as a latent variable ranging from $-\infty$ to ∞, the *structural model* can be presented as:

$$y^*_I = \mathbf{x}_i\beta + \varepsilon_i$$

The continuous latent variable y^*_i can be treated as the propensity for local governments to form imposed authority to enforce ICA. The *measurement model* for the ordinal outcome divides y^*_i into three categories in this study.

$$y_i = 3 \text{ if } \tau m-1 \leq y^*_i < \tau m, \quad \text{for } m = 1 \text{ to } 3$$

This means, $y_i = 1$ (informal mechanism) if $\tau_0 = -\infty \leq y^*_i < \tau_1$; , $y_i = 2$ (formal agreement) if $\tau_1 \leq y^*_i < \tau_{2;}$, $y_i = 3$ (imposed authority) if $\tau_2 \leq y^*_i < \tau_3 = -\infty$. The model is estimated using maximum likelihood algorithms.

The model estimates are presented in table 5. Year fixed effects and region fixed effects are included. The first result to note is the insignificance of environmental problem heterogeneity. Policy arenas where local actors have heterogeneous environmental problem situation were hypothesized to be more likely to collectively resort to more formal mechanisms. The insignificance of this variable could indicate that environmental conditions may not be key factors in determining the forms of agreements. However, we do find strong support for the impact of heterogeneity of economic conditions on a city's choice of agreement type. The coefficient is positive and statistically significant at the 0.05 level. The significance of economic heterogeneity and insignificance of environmental heterogeneity jointly indicate that sustainable economic growth is still the dominant motivation for local collaboration, even in the area of environmental sustainability.

The second set of hypotheses tested cover the actor characteristic hypotheses. First, it was hypothesized that the involvement of national/provincial governments leads to more formal

agreements with less autonomy. The results indicate strong support for the role of national and provincial governments. The coefficient is positive and statistically significant at the 0.05 level, indicating that national and provincial governments' participation works to formalize the agreement among participants to ensured sustained regional collaboration.

Table 5: Ordinal Logistic Regression Results

Variables	Coefficient	Standard Errors	Predicted Relationship
Heterogeneity of environmental problem situation	0.280	0.399	+
Heterogeneity of economic problem situation	1.092**	0.517	+
Involvement of national or provincial government	0.611**	0.277	+
Number of policy actors	0.053*	0.030	+
Contract complexity: function	0.313	0.228	+
Hierarchies in agreements	-1.004***	0.260	-
Number of parties in the contract	0.150	0.228	Control
Involvement of bureaucratic agencies	0.108*	0.063	Control
Agreement on air pollution	0.100	0.313	Control
Year fixed effect	Yes		
Region fixed effect	Yes		
Observations	530		
Log-likelihood	-398.317		

Notes: *p<0.10; **p<0.05; ***p<0.01. (two-tailed)

It was also hypothesized that the greater the number of local policy actors, the more they choose imposed authority over informal agreement. The coefficient for this variable is positive and statistically significant, supporting this hypothesis.

The next hypothesis tested is the contract complexity hypothesis, which predicts that single-issue agreements are more likely to be informal in comparison to agreements covering multiple policy issues. As shown in table 5, the coefficient for this variable is statistically insignificant at the 0.05 level, even though its sign is consistent with the hypothesis.

The final hypothesis predicts that differences among administrative status levels of participating cities are negatively related to the choice on imposed authority type of agreement. The result lends strong support for this hypothesis, with the coefficient negative and statistically significant at the 0.01 level. This means that the greater differentiation power and administrative status among cities leads them to choose more informal agreements. This is consistent with the ideas that the presence of cities with higher administrative status provides a self-enforcement mechanism that allows the low transaction cost informal mechanism to be sufficient to ensure collaboration.

As for the control variables, the number of parties in the inter-local agreement is statistically insignificant. We also do not find statistical significance for the coefficient of whether the agreement is specifically about air pollution. The involvement of bureaucratic agencies in the contract is positively related to the choice of imposed authority type of integration mechanism, indicating that more agency level commitment will lead to more formal collaborations.

Discussion

In China, many local governments have undertaken collective actions to address environmental sustainability, by sharing informal agreements, signing formal agreements, and accepting imposed authority. This research theorizes and investigates different mechanisms of cooperation among local authorities in China and what accounts for their use. The results add new insight to the choices collectively made by cities among different mechanisms to integrate environmental collective actions of local authorities, with cases collected from the Beijing-Tianjin-Hebei Region, the Pearl River Delta, Yangtze River and the Chengdu Plain Economic Zones.

This analysis contributes to the literatures on regional collaboration, local governance, and interjurisdictional agreements by focusing on the choice of agreement type. Using agreement as the unit of analysis, this study focuses on how participating governments collectively choose among informal agreement, formal agreement, and imposed authority as integration mechanisms. The results indicate that involvement of national or provincial government, a higher number of policy actors, heterogeneity of economic conditions, and involvement of administrative departments are positively related to choices of more formal and authoritative agreements. We also find that greater difference among participant cities' in their administrative levels is negatively associated with choices of a more formal agreement.

Conclusion

Environmental problems call for collaborative approaches to addressing collective needs. Inter-local collaboration has become a prominent policy tool for local government in China to address environment issues. Inter-local agreements constitute institutions to restrict actors' behaviors and reduce collaboration risk. Our modified taxonomy of collaborative agreements based on the institutional collective action framework fits the observed agreements identified here. In the context of China, committing to an informal agreement, signing a formal agreement, and accepting imposed authority are the three prominent types of institutional collective action.

Local governments in China address the regional governance of environmental issues in different ways within and across regions. Until very recently theoretical attention to the possible roles that decentralized self-organizing mechanisms for regional governance might play in China has been neglected, in particular, the role of voluntary agreements as solutions to collective action dilemmas in local governance that might integrate local environmental decisions.

This research takes an important step to fill the lacuna in our understanding local governments' participation in regional collaboration agreements and the types of agreements they select. We accomplish this though systematic investigation of specific mechanisms and identification of

how and when they are applied to deal with regional environmental problems. After elaborating and modifying the ICA framework to better fit the Chinese context, we applied the modified framework to inform three empirical analyses. The first empirical analysis focuses on multi-level influences on inter-city collaboration in China. It examined how cities' characteristics and provincial involvement influence city governments' decisions made to join inter-local collaborative agreements. Interactions between city governments, local communities, and provinces on environmental issues were identified in seven regions of China. The empirical analysis presented here identifies multi-level influences on city decisions to join collaboration agreements and their collective choices of agreement type.

Local level collaboration in China is more complex than in the U.S. because cities decisions to join agreements may not be entirely voluntary even though imposed collaborations are applied less often than informal and formal agreements. Informal and formal agreements may be less than entirely voluntary if local actors enter into them because they feel strong pressure to conform to the expectations of the national or provincial government or they anticipate that a less desirable alternative may be imposed on them if they do not voluntarily collaborate with neighboring governments. Thus, they impose self-constraint. The results of both quantitative analyses found that provincial involvement stimulates agreements, including voluntary ones. When provincial government is involved in the collaboration in any way, it may be in a position to impose the terms of the agreement.

This idea of self-constraint and enforcement is similar to the "shadow of law" hypothesis in the law and economics literature, which posits that agreement will be reached within the established rules even when legal proceedings have not been started (McCabe and Feiock 2005; Mnookin and Kornhauser 1979). The empirical analyses reported here indicate that the administrative status of a city, or the range of status differences within the agreement, are important explanatory variables. If high status actors with strong party connections are involved, others might participate because they fear those actors may seek an imposed solution if collaboration fails. The simple presence of cities with higher administrative status may prevent lower ranked cities from defecting from informal agreement, making formal agreement and imposed authority less necessary for agreement enforcement.

This study represents the first systematic investigation of the ICA framework beyond the North America and Europe context. Perry (2016) calls for global public administration knowledge grounded in middle-range theories. This research report answers that call. The extension of the ICA framework to regional collaboration in China, along with the empirical findings, contribute to expanding the scope and generalizability of this theoretical framework as well as contributing to a better understanding local governance in China.

The path blazed by this research has the potential to lead to many new insights about local governance in China generally and collaboration in particular. Future studies of inter-local collaboration in China need to first focus on theory development by further extending the framework advanced here in ways that will produce hypotheses that are testable through both qualitative and quantitative analysis.

References

Andersen, J. and Pierre, J. 2010. "Exploring the Strategic Region: Rationality, Context, and Institutional Collective Action." *Urban Affairs Review* 46(2): 218-240.

Andrew, S. 2009. "Recent Developments in the Study of Interjurisdictional Agreements: An Overview and Assessment." *State & Local Government Review* 41(2): 133-142.

Andrew, S. and Kendra, J. 2012. "An Adaptive Governance Approach to Providing Disaster Behavioral Services." *Disasters: The Journal of Disaster Studies, Policy and Management* 36(3): 514-532.

Brown, T., Ting Gong, Y., and Jing, Y. 2012. "Collaborative Governance in Mainland China and Hong Kong: Introductory Essay." *International Public Management Journal* 15(4): 393-404.

Carr, J., Gerber, E., and Lupher, E. 2009. "Local Fiscal Capacity and Inter-Governmental Contracting: Horizontal and Vertical Cooperation in Michigan." In *Sustaining Michigan: Metropolitan Policies and Strategies,* ed. Richard, J., Adelaja, A. and Sands, S. East Lansing, MI: Michigan State University Press.

Carr, J. and Feiock, R. 2004. *City-County Consolidation and its Alternatives: Reshaping the Local Government Landscape*. ME Sharpe.

Chen, B., Suo, L., and Ma, J. 2015. "A Network Approach to Interprovincial Agreements A Study of Pan Pearl River Delta in China." *State and Local Government Review* doi: 0160323X15610384.

Chen, G., Li, G., and Lei, X. 2006. *Research Reports on Cooperation and Development in Pan-Pearl River Delta Region: Assessment and Analysis of Pan-Pearl River Delta Regional Economic and Social Development.* Social Science Literature Press.

Chen, R. 2005. "On the Institutional Innovation in Regional Public Management." *Journal of Sun Yatsen University* 45(5): General No. 197.

Chen, Y. and Thurmaier, K. 2009. "Interlocal Agreements as Collaborations An Empirical Investigation of Impetuses, Norms, and Success." *The American Review of Public Administration* 39(5): 536-552.

Deakin, N. 1996. "The Devils in the Detail: Some Reflections on Contracting for Social Care by Voluntary Organizations." *Social Policy & Administration* 30(1): 20-38.

Dowding, K. and Feiock, R. 2012. "Intralocal Competition and Cooperation." In *The Oxford Handbook of Urban Politics.* Ed. Karen Mossberger, Susan E Clarke, and Peter John. New York, NY: Oxford University Press.

Dye, T., Leibman, C., Williams, O., and Herman, H. 1963. "Differentiation and Cooperation in a Metropolitan Area." *Midwest Journal of Political Science* 145-155.

Eisenhardt, K. 1989. "Building Theories from Case Study Research." *Academy of management review* 14, no. 4 (1989): 532-550.

Feiock, R. 2004. *Metropolitan Governance: Conflict, Competition, and Cooperation.* Georgetown University Press.

Feiock, R. 2007. "Rational Choice and Regional Governance." *Journal of Urban Affairs* 29(1): 47-63.

Feiock, R. 2009. "Metropolitan Governance and Institutional Collective Action." *Urban Affairs Review* 44(3): 356-377.

Feiock, R. 2013. "The Institutional Collective Action Framework." *Policy Studies Journal* 41(3): 397-425.

Feiock. R. and Carr, J. 2001. "Incentives, Entrepreneurs, and Boundary Change: A Collective Action Framework." *Urban Affairs Review* 36(3): 382-405.

Feiock, R. and Scholz, J. 2010. "Self-Organizing Governance of Institutional Collective Action Dilemmas." In *Self-Organizing Federalism: Collaborative Mechanisms to Mitigate Institutional Collective Action Dilemmas* ed. Feiock, R. and Scholz, J. Cambridge, MA: Cambridge University Press.

Hawkins, C. 2010. "Competition and Cooperation: Local Government Joint Ventures for Economic Development." *Journal of Urban Affairs* 32(2): 253-275.

Jing, Y. and Chen, B. 2012. "Is Competitive Contracting Really Competitive? Exploring Government–Nonprofit Collaboration in China." *International Public Management Journal* 15(4): 405-428.

Jing, Y. and Savas, E. 2009. "Managing Collaborative Service Delivery: Comparing China and the United States." *Public Administration Review* 69(s1): S101-S107.

LaSalle, J. 2010. "China Pearl River Delta – Moving Up the Value Chain." Last modified November 3, 2010. http://www.joneslanglasalle.com.cn/china/en-gb/Research/Moving_Up_Value_Chain_Eng_Final.pdf

Koontz, T. 2004. *Collaborative Environmental Management: What Roles for Government?* Resources for the Future.

Krane, D. and Lu, Z. 2010. "The Attractions and Challenges of Collaborative Public Management." In *Fourth International Conference on Public Management in the 21st Century: Opportunities and Challenges. (Shanghai, China: SDX Joint Publishing Co.,*

2010).

Krause, R., Feiock, R., and Hawkins, C. 2013. "Pressure, Capacity and Institutions: Explaining the Administrative Organization of Sustainability within Local Governance."

Kwon, S. and Feiock, R. 2010. "Overcoming the Barriers to Cooperation: Intergovernmental Service Agreements." *Public Administration Review* 70(6): 876-884.

Kwon, S., Feiock, R., and Bae, J. 2014. "The Roles of Regional Organizations for Interlocal Resource Exchange: Complement or Substitute?" *The American Review of Public Administration* 44(3): 339-357.

Lee, I., Feiock, R., and Lee, Y. 2012. "Competitors and Cooperators: A Micro- Level Analysis of Regional Economic Development Collaboration Networks." Public Administration Review 72(2): 253-262.

Lei, X., Li, G., and Chen, G. 2006. "Assessment and Analysis of Pan-Pearl River Delta Regional Economic and Social Development." In *Research Reports on Cooperation and Development in Pan-Pearl River Delta Region*. ed. Liang, Q. Beijing: Social Science Literature Press, 81– 120.

Leland, S. and Thurmaier, K. 2000. "Metropolitan Consolidation Success: Returning to the Roots of Local Government Reform." *Public Administration Quarterly* 202-222.

LeRoux, K. and Carr, J. 2007. "Explaining Local Government Cooperation on Public Works Evidence from Michigan." *Public Works Management & Policy* 12(1): 344-358.

Long, S. and Freese, J. 2006. *Regression Models for Categorical Dependent Variables Using Stata*. Stata press.

Lynn, P. 2005. *Mutual Aid: Multijurisdictional Partnerships for Meeting Regional Threats*. Washington, DC: U.S. Department of Justice, Office of Justice Programs, Bureau of Justice Assistance.

Ma, H. 2010. "Models of the Jing-Jin-Ji Regional Governance." *Beijing Administrative College Journal* 6: 7-11.

McCabe, B. and Feiock, R. 2005. "Nested Levels of Institutions State Rules and City Property Taxes." *Urban Affairs Review* 40(5): 634-654.

Mnookin, R. and Kornhauser, L. 1979. "Bargaining in the Shadow of the Law: The Case of Divorce." *Yale Law Journal* 950-997.

Nicholson, W. 2007. "Legal Issues." In *Emergency Management: Principal and Practice for Local Government*. ed. William Waugh and Kathleen Tierney (2nd Edition) ICMA Press.

North, Douglass C. 1990. *Institutions, institutional change and economic performance.* Cambridge: Cambridge University Press.

Ostrom, E. 1990. *Governing the commons: The evolution of institutions for collective action*. Cambridge University Press.

Ostrom, E. 2009. *Understanding institutional diversity*. Princeton University Press.

Park, H. 2015. "Inter-local Collaborative Service Mechanism and Regional Governance in Asia: An Institutional Collective Action Framework" Paper presented at *European Consortium for Political Research General Conference*, Montreal, Canada, August 26-29, 2015.

Perry, James L. 2016. "Building Global Public Administration Knowledge." *Public Administration Review* 76:3 DOI: 10.1111/puar.12588.

Post, S. 2004. "Metropolitan Area Governance and Institutional Collective Action." *Metropolitan governance: Conflict, competition, and cooperation* 67-92.

Qian, Y. and Weingast, B. 1996. "China's Transition to Markets: Market-Preserving Federalism, Chinese Style." *The Journal of Policy Reform* 1(2): 149-185.

Randolph, J. 2004. *Environmental Land Use Planning and Management*. Island Press.

Shepsle, K. 1989. "Studying Institutions Some Lessons from the Rational Choice Approach." *Journal of theoretical politics* 1(2): 131-147.

Shrestha, M. and Feiock, R. 2009. "Governing US Metropolitan Areas Self-Organizing and Multiplex Service Networks." *American Politics Research* 37(5): 801-823.

Sun, B. 2013. "On the Factors and Mechanisms of Cooperation among the Local Governments in China." *Nankai Journal* 2: 23-30.

Suo, L., Yang, F., and Liu, J. 2013. "Cross-Sector Policy Network and Regional Governance: An Analysis of Inter-Local Collaboration in China." *Chinese Public Administration* 1: 39-43.

Tavares, A. 2010. "The Formation of Regional Councils of Governments: A Transaction Costs Theory of Collaboration." Working Paper, *NEAPP Center for Research on Public Policy and Administration*, Universidade do Minho, Portugal.

Tavares, A. and Feiock, R. 2014. "Intermunicipal Cooperation and Regional Governance in Europe: An Institutional Collective Action Framework" Paper Presented at *the Annual Meeting for the European Consortium for Political Research*, Glasgow, Scotland, September 3–6, 2014.

Thurner, P. 2010. "Enhancing Vertical and Horizontal Self-Organization: Harnessing Informal Networks to Integrate Policies within and between Governments in the European Union." In *Self-organizing Federalism*. Ed. Feiock, R. and Scholz, J. Cambridge, MA: Cambridge University Press.

Tiebout, C. 1956. "A Pure Theory of Local Expenditures." *The Journal of Political Economy* 416-424.

Weber, M. 1922. "1978." *Economy and Society: An Outline of Interpretive Sociology* 2

Williamson, O. 1985. *The Economic Institutions of Capitalism*. Simon and Schuster.

Williamson, O. 1996. *The Mechanisms of Governance*. Oxford University Press.

Wondolleck, J. and Yaffee, S. 2000. *Making Collaboration Work: Lessons from Innovation in Natural Resource Management*. Island Press.

Yan, L. and Wang, W. 2013. "Literature on Intergovernmental Cooperative Governance: A Perspective of Regional Public Crisis." *Political Studies:* 12-14.

Yang, A. 2011. "Intergovernmental Agreements in Regional Collaboration: Concepts and Classification." *Chinese Public Administration 6: 100-104.*

Yang, A. and Chen, R. 2004. "From Regional Administration to Regional Public Administration: A Comparative Analysis of Changing Governance." *Social Sciences in Jianxi* 11: 23-31.

Yang, L. and Peng, Y. 2009. "Understanding China's Local Government Collaboration: A Perspective of Administrative Authority Concession." *Political Studies* 4: 61-66.

Ye, L. 2009. "Regional Government and Governance in China and the United States." *Public Administration Review* 69(s1): S116-S121.

Yin, R. 2013. *Case Study Research: Design and Methods*. Sage Publications.

Zeemering, E. 2008. "Governing Interlocal Cooperation: City Council Interests and the Implications for Public Management." *Public Administration Review* 68(4): 731-741.

Zhu, E. 2015. "Encouraging Beijing-Tianjin-Hebei Integrated Development." Presentation at *Beijing Electronic Industry Cadre School*, Beijing, China, July 13, 2015.