

Structure and Performance of Collaborative Local Governments' Service Delivery Network in Korea: Two Mode and Multi-level Approach

Hyung Jun Park
Associate Professor
Department of Public Administration
SungKyunKwan University
Seoul, Korea
hjpark72@skku.ac.kr

In Won Lee
Assistant Professor
Department of Public Administration
University of Seoul
Seoul, Korea
in1lee@uos.ac.kr

&
Youngmi Lee
Assistant Professor
Department of Public Administration
Gyonggi University
Suwon-si, Korea
ymlee@Gyonggi.ac.kr

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Introduction

Local governments are often confronted with numerous policy problems that transcend their jurisdictional boundaries. Despite the potential benefits from competition, innovation, and a wider array of policy choices, fragmentation in policy making and service delivery among multiple governmental entities imposes inefficiency due to diseconomies of scale, negative externalities, and duplication of similar policies. The complexity of these policy problems requires transjurisdictional solutions in order to effectively manage regional problems (LeRoux et al., 2010). Intergovernmental collaboration through formal and informal policy networks, contracts, agreements and partnerships provide mechanisms to help address fragmented authority and overcome collective action dilemmas in metropolitan areas. Among many alternative mechanisms, voluntary agreements (ILA: Interlocal Agreements) on collaborative service delivery emerge from a dynamic social process in order to provide a self-organizing governance mechanism that can reduce provision costs and increase benefits to participants (Agranoff and McGuire, 2002; Andrew, 2008; Sherestha, 2008). One of the most important strength of voluntary agreements is its flexibility, which allows local governments to effectively manage spillover effects and achieve economies of scale. Local governments can create self-organizing and tailor-made institutions, which both governs participants and facilitate their policy needs while they retain their local autonomy.

While an increasing number of studies in urban and metropolitan governance has illustrated the importance of emergence and management of these voluntary agreement on collaborative service delivery (Agranoff and McGuire, 2002; Isett and Provan, 2005;

Frederickson and Smith, 2003; Thurmaier and Wood 2002), only recently, scholars have begun to systematically recognize the renewed role of voluntary agreements as a system of networks binding fragmented local governments together (LeRoux et al., 2010; Feiock and Scholz, 2010). Voluntary agreement on collaborative service delivery facilitates multilateral coordination and cooperation in overlapping the webs of interlocal agreements (Savitch and Vogel, 2000), and provides a building block for developing trust and social capitals among local governments (Feiock, 2007; Frederickson, 1999; Thurmaier and Wood, 2002).

Despite these recent developments in collaborative service delivery as alternative governance mechanisms, a systematic understanding of how decisions and interactions of local jurisdiction shape the overall outlook of collaboration, i.e., network configuration, has been quite insufficient (LeRoux et al., 2010). This is in part because there is a distinct lack of systematic evidence in the literature to support theories developed in this venue. To date, the existing empirical research on social networks and interlocal service delivery is far from integrating the theoretical developments with the formal social network analysis. Only recently, a number of studies based on formal social network analysis have investigated the emergence and maintenance of collaborative service delivery networks in multiple policy arenas (Andrew, 2008; Sherestha, 2008; Lubell et al., 2002). However, even this literature tends to neglect the influence of the network environment (i.e., service delivery projects shared and their collaboration partners) in which local governments are embedded by focusing only on the interaction among local governments (actor-to-actor relationships: 1-mode network). Rather, the complexity of the collaborative service delivery process can be better understood only when we consider them in the aspect of not merely relationships among local governments but also relationships in

association with projects for service delivery which they share (2-mode network).¹

This study aims to address this oversight in the literature by analyzing not only the service delivery network among local jurisdictions based on actor-to-actor relationships (1-mode) but also the influence of affiliation in which local governments and their relationships are embedded. By employing social network analysis techniques, this study explores how network structures of interlocal collaboration in service delivery occur in terms of relationships among actors (local government), ties (interlocal agreements), and the second network mode (shared projects), and further investigates how network affiliation, the position of individual local governments in clusters, affects the performance of individual project. More specifically, the primary purpose of this paper is the following two: first, it is to classify the network actors and shared projects among them (2-mode network information) into several clusters based on a simulation method. We consider these clusters as network affiliations² which actors (local governments) and the performance of shared projects are influenced by. Second, it is to investigate how network affiliations identified affect the project performance, i.e., the performance of individual interlocal projects in service delivery, along with the characteristics of both projects, itself, and participating local governments.

In doing so, we are expected to add contributions to the literature in two ways: first, our

¹ While 1-mode network data generally represents only ties created among network actors, 2-mode network data adds another mode by providing additional information on affiliation such as co-membership. In doing so, 2-mode network data generally describes the context of relationship in a richer manner in that ties between network actors through their affiliation are thought to be conduits through which network actors influence each other. See Borgatti and Everett (1997) for more discussion.

² In this research, network affiliations do not refer to the sub-groups which is given exogenously such as legal, jurisdictional, and institutional boundaries. Rather, it is supposed to be determined by network process, itself. Simulation method allows us to detect the emergence of affiliation out of local governments and their shared projects. This constructs upper level influence (environments) built by informal/formal projects that local jurisdictions (actors) participate in. This study attempts to explore collaboration among local jurisdictions at a micro-level (project-level) as well as network environments which local governments are embedded in, at an upper-level (network affiliation or cluster-level).

work will provide a better understanding of the nature of interlocal collaboration and its context by employing 2-mode information for analysis. We believe that considering interlocal agreement for collaborative service delivery based on 2-mode data, i.e., relationships among local jurisdictions (one mode) through shared projects among them (another mode) is generally a better way of probing the network process in reality. Second, the network process is often something more than decisions and interactions among individual network actors. Likewise, the success of individual collaboration projects is not determined solely by the characteristics of project, itself. By focusing on the role of environmental aspect of network (network affiliation) which is created endogenously by network process, itself, our analysis attempts to take the influence of network affiliation (upper-level influence) on the performance of individual project more seriously

Interlocal Agreement for Collaborative Service Delivery: Social Network Perspective

Service delivery networks based on interlocal agreement have been recognized as an effective and efficient way of delivering public service among local jurisdictions (LeRoux et al., 2010). Social network theories provide a basis for explaining how collaboration in a competitive environment may be of benefit to collaborators and reduce transaction costs of collaboration (Feiock and Scholz, 2010, Lubell et al., 2002).

In the study of urban politics, the mode of traditional service delivery has focused on the service provision by regional or central governmental authorities (Zimmerman, 1974). This approach may mitigate the collective action problems by eliminating independent authorities, yet the costs of doing so are substantially high. In addition, public service delivery by a centralized authority creates uncertainties regarding the overlapping roles and functions between

levels of government. This implies that the public service provision by a single service provider has been gradually eroded in each U.S. state (Andrew, 2008), and the local governments have searched for better solutions to provide public services for their residents.

The collaborative ways of jointly providing public services at the regional level have diversely been developed and widely adopted. Feiock and Scholz (2010) identify the range of collaborative approaches among jurisdictions: formal/informal policy networks, interlocal agreements, regional partnerships, contracts, etc. They argue that the diverse collaborative mechanisms can solve institutional collective action problems and, furthermore, promote the quality of interlocal service delivery. The research of institutional collective action suggests that local jurisdictions, which are informally or formally networked, are more likely to collaborate for local public service delivery (Feiock and Scholz, 2010; Feiock, 2010).

In fact, the networked relationship among local jurisdictions have been found to play critical roles in coordinating decisions and actions among decentralized policy actors in several governmental services and public policy arenas (Provan and Milward, 1995; Meier and O'Toole, 2002; Schneider et al. 2003). In particular, service delivery networks forge links among individual government entities and non-profit organizations based on interlocal agreements, joint ventures, and service contracts. This alternative governance mechanism allows the participating units to preserve local autonomy while providing a formalized institution for resolving externalities and other issues of concern to the parties. Service delivery networks link governments in legally binding agreements; yet, they emerge to address a variety of issues during the process.

Multi-level Social Networks

Social network theory views that all actors are embedded within, and thus are shaped by the patterns of relational ties they have to others (Wasserman and Faust, 1994). Social network theory suggests that this pattern of relational ties constructs an actor's social environment, which often facilitates or constrains actors' opportunities and decisions. In the service delivery context, local governments can be understood as actors embedded within a network environment. The magnitude and quality of network ties that a local government maintains with others are critical elements to decide the service capacity of local governments and thus, the quality of service provided. In addition, network ties are considered to create benefits in the form of social capital (LeRoux et al., 2010). Based on community-level studies, Coleman (1990) and Putnam (1993) respectively verified that the structures and norms of social networks create social capital. Coleman (1988) defined social capital as "intangible resources such as social norms, obligations, and trust that facilitate collective action."

Due to the fact that socially networked jurisdictions have been more likely to pursue collective outcomes instead of outputs by competition, recent research has started to explore the collective action of local governments as collaborative alternatives to the centralized public service delivery mechanism (Feiock, 2013).

On the other hand, the governments or authorities collaborate not only with other actors at the horizontal level, but also with those who are at the vertical level. In fact, the study of social network applying the network approach has mainly focused on the horizontal relationships across actors at the same level: friendships, kinships, partnerships, etc. The study of urban politics state that local governments are often directly influenced by other actors within a geographically defined area, playing as the frontline actors in managing local administrative or political issues (Schneider et al., 2003). However, the study of interlocal relations has also

emphasized the crucial role of the vertical structure of American federalism (Waugh, 1994; Rubin & Barbee, 1985): e.g., county governments have played an important role in public service delivery (Andrew, 2008).

In the provision of public services, such as public transportation (e.g., regional fare system), social infrastructure (e.g., roads, highway, railways, etc.), and waste disposal (e.g., food waste, garbage collection, etc.), cities have considerably relied on county governments primarily because they are administratively and politically closer than state and federal governments in terms of receiving financial and technical support (Andrew, 2008). County governments generally have a greater ability to organize the benefits of economies of scope and a broader perspective to respond to regional issues.

In addition, the policy adoption process or performance measurement system in local jurisdictions has been influenced by the upper level of governments where the jurisdictions are nested, especially given the hierarchical relationships in American federalism (Hsieh, 2012). Consequently, local actors' policy decision process is largely influenced by diverse actors existing at the horizontal and vertical boundaries (Schneider et al., 2003). This implies that the provision of public service should be understood in the context of vertical and horizontal relationships because cities, counties or even higher level governments closely rely on each other.

In this regard, this study focuses on not only service delivery networks among local jurisdictions but also on the role of network environment where local actors are nested. In particular, this study takes a different approach in terms of defining upper-level network environment: while other researches simply view counties, states, and metropolitan areas as upper-level environment, which is legally or institutionally determined, it focuses on more implicit environmental aspect of network (network affiliation) which is created endogenously by

network process, itself.³ In particular, the relationships among actors within a same sub-group or their previous experiences to share projects is expected to build trust among the participants in the collaborative service delivery, and furthermore, improve project performance via collective action.

Network Performance (Project Performance) and Network Environment

Network performance is the core concept that captures the broad array of outcomes which actors acquire from participating in network activities, including collaboration and coordination. Network performance is measured by either the degree of improved performance of individuals, organizations, programs or policies (O'Toole and Meier, 2004), or by a much simpler indication based on the reported levels of success (Shrestha, 2012; Torenlid and Akkerman, 2012) from network activities.

Most network research studying the network behavior at the actor level demonstrates the value of an actor's network activity in promoting its success by facilitating direct access to the resources from various partners (Shrestha, 2012; Agranoff and McGuire, 2003; Lubell and Fulton, 2007). For instance, O'Toole and Meier (2004) found that a school superintendent's interactions with a variety of actors in the district's environment, particularly both internal and external actors, (e.g., school board members, local business leaders, other school superintendents, state legislators, and the education agency) increase school performance. Other literature also conveyed an actor's networking behavior as a critical predictor of policy or program outcomes in

³ As mentioned earlier, our perspective is that the performance of a collaborative service delivery project is influenced by the characteristics of its network affiliation (to which clusters a local government or a project belong) as well as the attributes of a project or a local government, itself. In particular, this study views this network affiliation as upper-level network environment. Simulation approach allows us to detect several clusters out of 2-mode network data in this study.

the realm of economic development, environmental protection, and public funds (Agranoff and McGuire, 2003; Lubell and Fulton, 2007; Berardo, 2009; Shresta, 2012).

Network performance, measured by outcomes from participating in network activities, is generally affected not only by the characteristics of both network actors (local governments) and public service, itself (shared projects), but also by the upper-level network environments (network affiliation). In particular, considering network environments as social structures which either constrain or facilitate the action and decision of individuals or organizations, the impact of network environments in which actors are embedded becomes an even more important factor. Here, network environment is considered as the social artifact in which actors are embedded in pursue of organizational or policy success by strategically outreaching to their internal and external network partners. It is either defined exogenously by legal and formal relationships or determined endogenously in a more self-organizing and tentative manner. Scholars have consistently found that networking with the external environment matters for organizational outcomes (Hicklin et al., 2008; Meier and O'Toole, 2003; O'Toole and Meier, 2004).

In this vein, this study attempts to investigate the impact of network environments⁴, along with the influence of characteristics of local governments and shared projects, on project performance. In doing so, this study takes a unique approach in that it identifies more contextual network clusters based on the 2-mode network analysis and investigate the influence of those network clusters on network performance. In other words, this study focuses more on the invisible and substantive conglomeration of network actors and its impact on network

⁴ Once again, the concept of network environment reflects that the sustainability or success of a single local jurisdiction or a single collaborative project is generally influenced by where a local jurisdiction or a collaborative project is located in the web of complex networked relationships. In this study, network environment is defined by network sub-groups (clusters) which each local jurisdiction and collaborative project belong to. The characteristics of network sub-groups, especially social capital among them, affect the performance of network actors and policy projects.

performance, rather than simply using a more visible distinction based on formal, legal, and jurisdictional delineation, such as county, state, region, and metropolitan area, as the network environment

Hypotheses I: Project-level

Based on the literature discussed in the previous section, this study provides a number of testable hypotheses, which assume the influence of both characteristics of collaborative projects (*Hypotheses I*) and attributes of upper-level network affiliation (*Hypotheses II*). First, the number of participating jurisdictions is believed to have two contrasting effects on network performance: service delivery networks generally aim to achieve economies of scale by increasing their membership, which leads to the overall success of network participants (*'economies of scale' argument*). However, too many participants tend to incur a great deal of transaction costs, especially in coordinating actions and decisions of network actors (*'transaction costs' argument*). For many service delivery arenas, local governments in Korea operate as a “boundary spanner” (Agranoff and McGuire, 2003), to address diseconomies of scale, negative externalities, duplication of similar policies, and so on. These various goals can be achieved by generally expanding network participants.

(H₁) The increase in the number of participating governments is more likely to demonstrate higher network performance.

The existence of a central authority is also believed to have two contrasting effects on the emergence and sustainability of networks: on the one hand, the central authority sometimes plays a critical role in coordinating actions and decisions of network actors and in constructing a threshold for important events and innovation. For example, federal programs are found to play a

positive role in developing a new form of cooperative governance in environmental policy (Schneider et al. 2002). On the other hand, the central authority generally acts against the network processes based on a more voluntary and self-organizing way of problem-solving (Kwon and Feiock, 2010). Regarding the success of programs and policy projects, local governments in Korea have a long-lasting tradition to depend more heavily on the central government in the aspect of finance and legality. Therefore, this study assumes that the assistance of a central government generally promotes network performance.

(H₂) The existence of central government is more likely to lead to higher network performance.

Both past collaboration experience and repeated interactions with each other also can act as social capitals which significantly facilitate the adoption of new collaborative projects and promote its performance by providing mechanisms that mitigate credible commitment problems. A tradition of a collaborative approach among local jurisdictions is more likely to foster new collaborative strategies (Olberding, 2002; Grell and Gappert, 1993). Social capital theorists argue that cooperative norms, which are the product of repeated interactions, are converted into social capital and cumulated social capital, in turn, makes collaborative work in other areas easier (Ostrom and Ahn, 2002; Ostrom, 2000; Putnam, 2000). In so doing, social capital lessens the transaction cost and institutional friction, which allow participants to overcome social dilemmas by making every participant's decision public and predictable. In this regard, a highly-clustered network generally has the ability to enhance the stability of collaborative structures. This study also views that past experience promotes the performance of current service delivery projects.

(H₃) The experience of previous collaboration on one or more policy arenas is more likely to produce higher network performance.

The amount of physical resources devoted to collaborative service delivery, such as length of preparation, number of public employees, public officials dispatched to partner governments, degree of fiscal independence, the existence of institutional and legal support for collaboration, and so on, is expected to generally promote the quality of service and, thus, its network performance.

(H₄) Various types of resources devoted to collaborative service delivery are more likely to demonstrate higher network performance.

Participation of various stakeholders from multiple sectors can provide the potential to improve collaborative service delivery by redirecting the information and resources available. Homogeneous membership sometimes prevents the network actors from exploiting all the social relations surrounding them. Instead, an entrepreneur who plays a leading role explores a broader set of possible gains from other stakeholders and provides useful information to coordinate each player's decision and its consequence (Burt, 2005). More often than not, actors from the private sector bridge "structural holes" in the collaborative network process for public service delivery. This study supposes that the participation of the private sector in service delivery network generally enhances the quality of network performance.

(H₅) The increase in the portion of private sector participation in collaborative projects is more likely to lead to network performance.

Hypotheses II: Network Environment-level

Network performance is influenced not only by the characteristics of network participants and shared projects, but also by the attributes of network environments (network affiliations) in which the actors are embedded. In other words, the success of a certain program in public service

delivery is also heavily dependent upon the characteristics of networked partners and the level of cohesiveness at the sub-group level. Social capital theorists argue that a “closed” social clustering provides problem-solving mechanisms that overcome the credible commitment dilemma in collective action situations (Putnam, 1995; Coleman, 1988; Ostrom, 2000). This strongly-clustered sub-group tends to reduce the cost of monitoring because of overlapping information that circulates in the network regarding each other’s behavior; further, it helps construct trust, shared norms, and social capital. In particular, reciprocity, reputation, communication, and trust are the most fundamental values which enable potential collaborators to build a tightly-clustered network for collaborative service delivery. This study assumes that communication and mutual trust, important aspects of social capitals among co-members in a network cluster, are positively associated with higher network performance.

(H₆) The higher quality of communication at the network environment level, i.e., among participating local governments in the same sub-group, is more likely to demonstrate higher network performance.

(H₇) The higher level of mutual trust at the network level, i.e., among participating local governments in the same network affiliation, is more likely to produce higher network performance.

Empirical Model

In order to test the hypotheses proposed, an empirical analysis constructs a model, which includes five predictors as individual level (level-1) variables and two predictors as group-level (level-2) variables. In particular, both quality of communication among the participating local governments within a sub-group (network environment) and the level of mutual trust within a

sub-group are included as predictors at the group level (level-2). Individual-level (Level-1) predictors are supposed to be centered on the group mean, whereas group-level (level-2) predictors are centered on the grand mean. The final model, which combines both project level (level-1) and network environment level (level-2), are as follows:

The local government-level model (Level-1):

$$\log\left(\frac{p_{ij}}{1-p_{ij}}\right) = \eta_{ij} = \beta_{0j} + \beta_{1j}(NLG_{ij}) + \beta_{2j}(CTG_{ij}) + \beta_{3j}(PCE_{ij}) + \beta_{4j}(FIS_{ij}) + \beta_{5j}(PVP_{ij}) + \gamma_{ij}$$

The group-level model (Level-2):

$$\beta_{0j} = \gamma_{00} + \gamma_{01} \times (Communication_j) + \gamma_{02} \times (Trust_j) + u_{0j}$$

$$\beta_{1j} = \gamma_{10}$$

$$\beta_{2j} = \gamma_{20}$$

$$\beta_{3j} = \gamma_{30}$$

$$\beta_{4j} = \gamma_{40}$$

$$\beta_{5j} = \gamma_{50}$$

, where

NLG: Number of Local Government
 CTG: Central Government
 PCE: Previous Collaborative Experience
 FIS: Fiscal Independence
 PVP: Private Sector Portion

Communication: Quality of Communication
 Trust: Level of Mutual Trust

Data and Methods

Data

Our base data is comprised of a mix of archives of intergovernmental service delivery project documents and face-to-face interviews collected in 2008. At the pre-interview stage, we searched for intergovernmental service delivery projects from document archives and collected basic information on these projects identified. This information contains an exhaustive list of intergovernmental service delivery projects implemented collectively by municipalities in the year of 2008. This stage identified a total of 228 different service projects with a participation of 200 municipalities in Korea. Collaborative service projects generally include various services, which can be categorized into 12 distinctive areas; waste disposal, social infrastructure, such as roads, bridges, and highways, regional economic development, R&D and education, water resource and environment management, emergency management, public transportation, etc. (see Table 1 for detailed information on each category).

Subsequently, we contacted the project managers in the corresponding governments and conducted face-to-face interviews, inquiring a set of survey-type information regarding a collaborative project for service delivery, including the number of participating governments, the role of the central government, detailed information on agreement, procedures and legal specifications, community support, level of trust, intensity of collaboration, evaluation on project performance (network performance), and so on. As a result, we were able to gain more information complementing our initial archival searches. Finally, this process constructs information on 353 collaborative service delivery projects used for analysis in this study.⁵

⁵ Archival search originally identified a total of 228 collaborative projects conducted by 200 municipalities. Since most of local governments are engaged in more than one projects, the number of collaborative service projects we interviewed and examined is far greater than 200 or 228. We collected detailed information on collaborative

Therefore, the unit of analysis in this study is each individual collaborative service delivery project and the dependent variable is the project’s performance reported by the responding project manager.

(Table 1 about here)

Methods

To test the hypotheses, we employed two analytical techniques of the social network analysis. First, for the purpose of identifying the sub-group clusters out of the overall network structures of collaboration in this study, we attempted to classify both network actors and shared projects (2-mode network information) into several clusters based on a simulation method. These groups of network actors and projects were identified by using a simple hill-climbing algorithm embedded in *Kliquefinder* software (Frank, 1995; Frank et al., 2008).⁶

service delivery projects from an individual project’s perspective, not from a individual local government’s perspective. Thus, the number of collaborative service projects is 353. The final sample for analysis is 314 after dropping missing observation for variables used.

⁶ The basic idea on which *Kliquefinder* is dependent is to formally identify the cohesive sub-groups by maximizing the ratio of network activities within the same groups to the network activities across different groups. First, the odds ratio is defined as:

$$(AD/BC) = \frac{\text{Shared project within group} \times \text{Non-shared project in other groups}}{\text{Shared in other groups} \times \text{Non-shared project in group}}$$

Where,

		Participation in Event	
		No $y_{ij}=0$	Yes $y_{ij}=1$
Venue Membership	Different 0	A	B
	Same 1	C	D

Second, in order to test how the network environment, i.e., network affiliation represented as clusters, affects project performance (network performance), in the form of improvement of mutual benefits among network actors⁷, we employed a multi-level logistic regression analysis, which is also known as the Hierarchical Generalized Linear Model (HGLM) analysis. In doing so, this study investigates the effect of the network environment at the group level on network performance, while still testing the effects of other intrinsic characteristics of shared projects at the individual level. In this analysis, employing the HGLM is more appropriate than the HLM, because the dependent variable, network performance, is coded as a dichotomous variable -- whether the intergovernmental service delivery improves the mutual benefits of participating governments or not. The HGLM may help capture the random effects at the upper-level (network environments) to handle with the problem of correlated residual errors (Raudenbush & Bryk, 2002). The lower-level (individual projects) and upper-level (network environments) data are analyzed using the HLM6 software (Raudenbush, Bryk, & Congdon, 2004).

Variables

Second, the simple hill-climbing algorithm provides parameters, which maximize the odds ratio defined above. In doing so, this method neither has to pre-specify the number of clusters nor has to interpret multiple solutions. Therefore, it can generate the Monte Carlo distribution of the odds ratio to test for evidence of clustering.

⁷ This research utilizes *whether the intergovernmental service delivery improves the mutual benefits of participating governments or not* as its dependent variable, network performance. In fact, network performance seems to be difficult to define. However, as mentioned earlier, it is generally conceptualized as either the degree of improved performance of individuals, organizations, programs or policies (O'Toole and Meier, 2004), or a much simpler indication based on the reported levels of success from network activities (Shrestha, 2012; Torenvlied and Akkerman, 2012). In this vein, we do not use more concrete forms of measurement on project performance. Rather, we believe that our measurement sufficiently captures the essence of 'network performance' concept.

In the second stage of analysis, we included variables which capture both the characteristics of shared projects among local governments (level-1) and network environments (level-2). Table 2 summarizes the descriptive statistics of the variables used in this study.

(Table 2 about here)

First of all, the dependent variable, network performance, is coded as a dichotomous variable. The original interview asked project managers to evaluate the performance of service delivery project, *whether the collaborative project improves mutual interests among the participating governments*, on a 1-5 scale (1: does not improve at all, 2: generally does not improve, 3: just about the same, 4: improves fairly, 5: improves significantly). We coded this as 0 if a respondent does not think there has been an improvement on mutual interests (1-3) and 1, otherwise (4-5).⁸

For level-1 variables, the *number of participating local governments* represents the actual number of local governments participating in the collaborative projects, identified by both archival search and interview with project managers. *Existence of central government* is the number of central agencies which participate in the projects as a coordinator, a regulator or just one of the members. While most of the observations have either a 0 or 1 value, it ranges from 0 to 8. *Past collaboration experience* captures whether a responding government has a previous collaborative relationship with its counterparts for other service delivery projects. *Length of preparation* represents the actual time spent for the initiation of the project, in terms of months. *Number of public employees* is the total number of public employees assigned to work on the project. *Public officials dispatched* captures the number of public officials assigned to work at

⁸ We believe that utilizing this variable as it is, 1-5 scale. However, HLM6 software, which is developed to analyze scaled variables, provides technical procedure only for dichotomous variable at this point. Hopefully, we can benefit from employing multi-level ordered logit/probit analysis, once the technique is to be developed.

partner governments. *Fiscal independence* represents the ratio of revenues from the local government's own sources to total revenues in percentage terms. *Institutional support from local government* is the number of documents to legally and institutionally support collaborative service delivery projects. *Portion of private sector* captures the degree of financial resources for which the private sector accounts in percentage terms.

For level-2 variables, we used the mean value of each sub-group identified by *Kliquefinder* in each variable category. The interview originally asked a respondent to report both the quality of communication and the level of mutual trust among participating governments on a 1-5 scale. Then, we calculated the average value of each variable among members who belong to a same sub-group (network affiliation), which can be considered as a group-level evaluation on communication and trust for collaborative service delivery projects. Therefore, projects and local governments which belong to the same cluster are supposed to have the same scores for communication and mutual trust.

Results

Cohesive Subgroups Analysis

Kliquefinder software provides network visualization, primarily focusing on its clustering pattern of network actors and shared projects. For example, Figure 1 demonstrates the overall collaborative network structure for the economic development policy. Black diamonds represent municipalities and the colored circles represent collaborative economic development projects shared by two or more local governments. We also assigned a number for both local governments (1-200) and shared projects (20001-20237). This identifies a total of seven sub-groups in various policy arenas, which are represented by each colored group of actors and

shared projects. Each cluster identified is simulated by *Kliquefinder* and turns out to be statistically significant at the 0.001 level. Figure 1 also provides several implications regarding its clustering pattern.⁹

(Figure 1 about here)

First, clustering is likely to occur among municipalities which share their jurisdictional boundaries. Not only geographical proximity, but also the historical and cultural background, encourages them to engage in shared projects more frequently and easily, particularly in the context of policy-making in Korea. Therefore, social capital theorists' argument, that repeated interactions among actors generally promote the likelihood of collaboration, is confirmed.

Second, economic development collaboration across groups, i.e., collaboration transcending the regional boundaries, is strictly limited to projects related to tourism. Despite the rapid and profound growth in communication technology and transportation, other economic development activities, including co-marketing, innovation, joint ventures, and so on, are still geographically bounded and dependent. This matched well with the aforementioned effect of geographical proximity.

Third, the province has historically played numerous critical roles in formulating regional and local service delivery and policy-making under the two-tiered local autonomy system in Korea. The key role of the provincial government is not surprisingly different in this study. From our analysis, provincial governments have turned out to play a leading role in collaboratively pursuing tourism promotion, business and research belt establishment, free trade zone development, joint ventures, regional and international fairs, and so on.

⁹ The main purpose of this paper is not to find the clustering patterns in one or more policy domain, which may require more formal analysis. In this section, we simply attempt to provide contextual interpretation on the findings from this stage of analysis by focusing on economic development area.

Fourth, the Seoul metropolitan area (Seoul, Gyeonggi, and Incheon), which accounts for more than 50% of both population and economy of the nation, is not the major part of the seven distinctive clusters for collaboration. Only Gyeonggi province appears in this visualization; yet, it is not heavily engaged in collaborative service delivery. This is, in part, because collaboration among municipalities in this area does not transcend its regional boundary. Because the local governments in this area can easily find potential partners who share similar economic agenda, are resource dependent and aim to achieve economies of scale, their relationship is quite self-sufficient and moreover, their effort to connect to others is usually confined to their immediate neighbors.

Fifth, unlike its conventional belief, Kangwon province is located in the most central position in this overall network structure. More specifically, Kangwon province has links across groups more than it does within the groups. This finding has two contrasting implications: on the one hand, Kangwon province is likely to play a bridging and a central role in service delivery and policy-making. This includes collecting and distributing critical information in collaborative economic development and coordinating important actions and decisions among the participating governments. Therefore, their hidden role is much greater than our traditional expectation. On the other hand, Kangwon province does not have sufficient resources for independent development projects. Thus, it is destined to actively explore the extensive sets of strategies and possibilities outside its jurisdictional boundary.

These findings from collaborative networks for economic development could also be applied to the overall collaborative structures in the multiple service delivery arenas, as presented in Figure 2, while it is much complicated to find some patterns of the grouping process. However, more importantly, *Kliquefinder* ultimately identifies 24 distinctive groups of actors and shared

projects in 12 service delivery categories. Each clusters identified is simulated by *Kliquefinder* and also turns out to be statistically significant at the 0.001 level. These identified groups (clusters) are used as the distinctive upper-level network environment in which local governments are embedded for collaborative service delivery. This procedure provides the base for multi-level analysis, which investigates the effect of upper-level network environment on network performance, along with the effects of other intrinsic characteristics of network actors and projects (level-1).

(Figure 2 about here)

Multi-level Analysis (Hierarchical Generalized Linear Model Analysis)

Prior to proceeding to the HGLM (Hierarchical Generalized Linear Model) analysis, we conduct a logistic regression analysis in order to test hypotheses 1 through 5 regarding the effects of intrinsic attributes of network actors and shared projects without controlling for upper-level effects. The results in Table 3 generally confirm hypotheses 1, 3, and 5. In terms of the number of participating jurisdictions, service delivery networks generally turn out to pursue economies of scale by increasing their membership (H_1). Previous collaborative experience is also an important predictor of enhancing the performance of current service delivery projects (H_3). The portion of the private sector is also positively related to the network performance, which confirms the complementing role of the private sector working as an entrepreneur who explores a broader set of possible gains outside the networks (H_5).

(Table 3 about here)

Contrary to our hypothesis, H_2 , the participation of the central government turns out to undermine the network performance. As discussed earlier, the central government may either

facilitate or crowd out the network activities, which are based on a more horizontal, voluntary, and self-organizing process of problem-solving. Considering the dominant role of the Korean central government in steering most of the policy projects, we initially presuppose that the central government promotes collaborative network activities and their performance. However, the central government and its agency, in fact, may prevent the emergence and maintenance of voluntary collaborative service delivery projects by making the local governments to more depend financially and legally on the central government. This finding needs to be explored more in depth, whether it can be generalizable to other contexts, especially in the U.S. The hypothesis on physical resource devoted to collaborative service delivery is not confirmed in this analysis (H_4). Only *the number of officials dispatched* is related to the network performance, but in a negative way. The variables in this category need to be further refined and investigated in future studies.

The results of the HGLM analysis in Table 4 suggest that the location of network environments in the overall structures of collaborative network play a pivotal role in shaping the context of collaboration and thus, affect the performance of network in which local governments and shared projects are embedded. Since we do not have any theory-based assumptions on the interaction between level-1 variables and level-2 variables, our model supposes that only intercept β_{0j} captures the group (level-2)-specific characteristics. The results on level-2 variables are statistically significant, suggesting that the difference in level-2 variables among groups (clusters) generates meaningful difference in network performance.

In particular, both the overall quality of communication (H_6) and the level of mutual trust (H_7) among participating governments turn out to be positively associated with network performance, suggesting that both the greater quality of communication and greater level of

mutual trust at the network environment level have the tendency to improve network performance.

The multi-level analysis still tests the hypotheses on the effects of level-1 variables, while controlling for the effects of the network environment level. Regarding the effects of level-1 variables, the results from HGLM analysis are not significantly different from those from logistic regression. In particular, the results demonstrated that the hypotheses on both the number of local governments (H_1) and the role of the central government (H_2) are still validated. In other words, collaborative service delivery networks emerge in order to seek for gains from economies of scale, and the existence of the central government may tend to crowd out the voluntary and self-organizing network activities.

Conclusion

While an increasing number of studies in public policy and management has illustrated the importance of emergence and management of voluntary networks on collaborative service delivery (Agranoff and McGuire, 2002; Isett and Provan, 2005; Frederickson and Smith, 2003; Thurmaier and Wood 2002), a systematic understanding of how decisions and interactions of local jurisdictions shape the overall network configuration has still been insufficient. Very few studies in the literature go beyond simply describing the overall network and its properties, and provide systematic evidence to support the theories developed in this venue.

This study attempts to address this oversight with the literature in two ways: first, by utilizing the 2-mode network data, it considers collaborative service delivery networks as relationships from the perspective of not only the network actors (local jurisdictions), but also the events (shared projects). This allows us to better understand the network process in the

collaborative service delivery. Second, in order to examine how the network environment, i.e., location in clusters, identified from cohesive sub-group analysis affects network performance, in the form of improvement of mutual benefits among network actors, we employed a multi-level logistic regression, HGLM, analysis.

Cohesive sub-group analysis in the first stage identifies 24 distinctive groups of actors and shared projects in 12 service delivery categories. This procedure provides the base for multi-level analysis, which investigates the effect of upper-level network environments on network performance, along with the effects of other intrinsic characteristics of network actors and projects. Multi-level analysis demonstrates that collaborative service delivery networks are found to pursue economies of scale by increasing their membership. Collaborative experience from previous project tends to enhance the performance of current service delivery projects. Participation of the private sector may provide entrepreneurial leadership, ensuring a broader set of potential benefits outside current relationships.

More importantly, the position of local governance in the overall structures of collaborative network is proven to play a critical role in shaping the context of collaboration and thus, affecting the performance of the network to which local governments belong. In particular, both the overall quality of communication and the level of mutual trust within a subgroup, consisting of a substantive collaborative cluster, tend to improve network performance in the context of collaborative service delivery networks.

Findings from this study are expected to be easily generalizable to cases in other countries. However, some of them are unique phenomena regarding the patterns of collaborative service delivery networks in Korea. Future research should focus on comparing the similarities and differences in other network settings by adopting similar empirical approaches. It should also

focus on developing better models and measures to capture the effect of the network environment other than the quality of communication and level of mutual trust.

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Table 1 Type of Collaborative Intergovernmental Projects

	Category	Examples of Service
1	Waste disposal	Food waste, Toxic waste, dump site, garbage collection
2	Sewer system	Sewer system
3	Social infrastructures	Roads, bridges, highways, railways
4	Public facilities	Welfare centers, museums, libraries, medical centers
5	Regional economic development	Tourism, co-marketing, innovation, joint ventures
6	R&D and education	Research, urban development planning, labor training
7	International goodwill	Cultural exchange, educational exchange
8	Water and environment management	Clean water management, fishery management
9	Local and regional events	Local and regional festival
10	General administration	Jurisdictional boundary, personnel management
11	Emergency management	Fire, anti-terrorism, wildfire
12	Public transportation	Regional fare system, payment system development

Figure 2 Collaborative Intergovernmental Networks

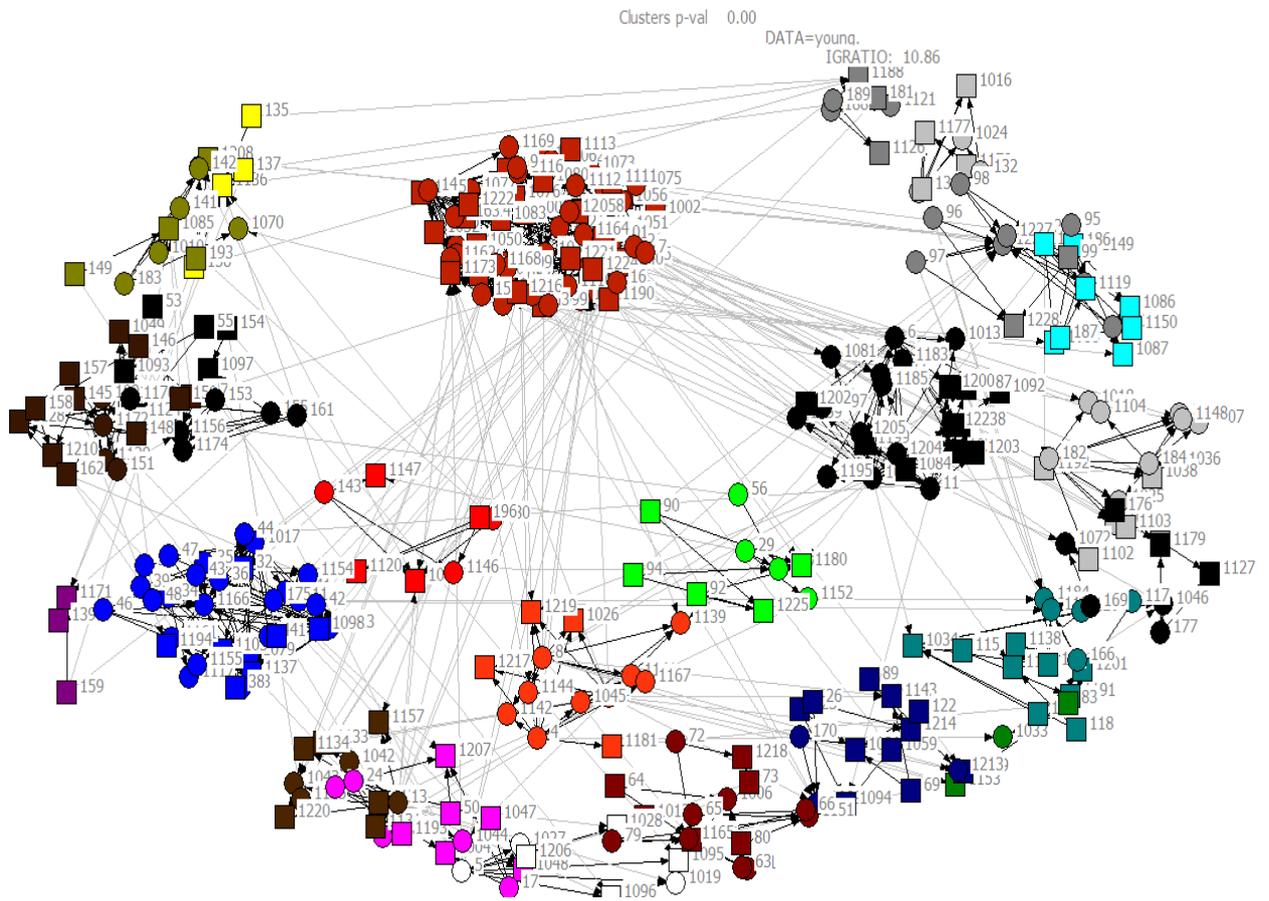


Table 2 Descriptive Statistics (Level 1 and Level 2)

	Variables	N	Mean	S.D.	Min	Max
Dependent variable	Performance	314	0.75	0.43	0	1
Level 1	Number of local governments	314	4.49	3.81	2	19
	Existence of Central Government	314	1.17	1.85	0	8
	Past Collaboration Experience	314	18.33	15.42	1	46
	Fiscal Independence	314	41.55	22.90	9.17	91.43
	Portion of Private Sectors	314	4.48	14.40	0	76
Level 2	Quality of Communication	19	3.69	0.25	3.31	4.20
	Level of Mutual Trust	19	3.90	0.19	3.43	4.10

Table 3 Results of Logit Analysis

H	Variables	Coefficients (s.e)
H ₁	Number of Jurisdictions	0.142*** (0.053)
H ₂	Existence of Central Government	-0.185** (0.073)
H ₃	Past Collaboration Experience	0.017* (0.010)
H ₄	Length of Preparation	-0.006 (0.008)
	Number of Public Employees	0.002 (0.003)
	Public Officials Dispatched	-0.026* (0.013)
	Fiscal Independence	0.001 (0.006)
	Institutional Support from Local Govt.	-0.126 (0.082)
H ₅	Portion of Private Sector	0.020* (0.013)
H ₆	Quality of Communication	-----
H ₇	Level of Mutual Trust	-----
	Constant	0.625 (0.387)
	Number of Observations	353

-LR χ^2 (9) is 27.83 and Prob > χ^2 is 0.0010

-Pseudo R² is 0.0702

-* significant at the 10% level, ** significant at the 5%, *** significant at the 1%

Table 4 Results of Multi-level Analysis

Fixed Effects	Coefficient	SE	Odds-ratio
For Intercept, B ₀			
Intercept, G ₀₀	1.131***	0.154	3.100
Communication, G ₀₁	0.577	0.862	1.780
Trust, G ₀₂	0.827	1.141	2.286
For # of Local Gov, B ₁			
Intercept, G ₁₀	0.128**	0.054	1.137
For Previous Collaborative Experience, B ₂			
Intercept, G ₂₀	0.012	0.011	1.012
For Private Portion, B ₃			
Intercept, G ₃₀	0.006	0.010	1.001
For Central Government, B ₄			
Intercept, G ₄₀	-0.213**	0.072	0.808
For Fiscal Independence, B ₅			
Intercept, G ₅₀	0.002	0.006	1.002
Random Effect	Variance	df	χ^2
Intercept, U ₀	0.027	16	11.915

- †p≤0.1, *p≤0.05, **p≤0.01, ***p≤0.001.