

Regional Integration through Agreements: Does Multiplexity in Urban Service Deliveries Matter?

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Abstract

While most scholars in urban studies and public management tend to conceptualize networks as having interdependent properties---with multiple sets of organizations working together (directly or indirectly) on common problems---few explore the importance of multiplexity in these relations. Multiplexity refers to the tendency of network members to develop interorganizational ties across different sets of activities, deepening or fortifying the relationship between actors. We test the multiplexity hypothesis among 66 agencies in the area of law enforcement activities in the Orlando-Kissimmee MSA. We analyze this across five time-periods using a specialized network software called "SIENA." Our results support the claim that a network of contractual ties, captured through interlocal agreements (ILAs), reveals how localities relate to each other through more than one service area. We also found, in a service area with high asset-specificity transactions, that there is a tendency for local agencies to establish contractual ties through central actors. While we did not find evidence that agencies within municipal governments would establish ties among themselves, there is evidence that those agencies having external accreditation tend to work jointly through ILAs. This research contributes to the literature by identifying the conditions that explain movement toward regional integration through ILAs.

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The value of interlocal agreements (ILAs) varies depending upon how well ILAs are being utilized by localities to deal with intergovernmental complexity. The notion of multiplexity, or the tendency for local governments to establish contractual ties for more than one type of service, matters because most public programs and urban service provisions involve multiple parts and often overlap in functions. Shared administration is the norm among localities and their personnel. The ability to perform joint efforts effectively often requires them to establish communication and constructive interaction with others. By making connections and creating linkages throughout a range of service areas, public officials can minimize the costs of coordinating joint obligations.

While much of the current research tends to focus on the arrangements within a single policy arena, few papers explore the multiplexity of contractual ties within types of service areas--that is, the tendency for localities to enter into ILAs in one service area is also influenced by the presence of ILAs in another area. This phenomenon is important because, in the production and provision of urban services, local government actions are becoming interdependent. They are increasingly interrelated, overlapping, and interjurisdictional. The interdependency of local government actions (or inactions) highlights why localities establish a range of arrangements. Although some ILAs are unique, collectively they can give regional integration a structure, personnel, and finances.

Such relationships are evident in the activities of law enforcement agencies. Resource scarcity, or access to greater skills or capabilities elsewhere, increasingly impels law enforcement agencies and their contracting partners to form connections with each other in order

to fulfill certain needs. Some needs, though routine and predictable, cross jurisdictional boundaries and require the cooperation of different governments, or levels of government. Everyday law enforcement is an example. However, other needs may occur only infrequently, requiring specialized skill or equipment that would be only rarely used by one community but which might see regular use in aggregate. More serious law enforcement emergencies would be an example. And still other needs may be of sufficient magnitude to overwhelm the capabilities of a particular jurisdiction, and help from elsewhere is necessary. Disaster response is an example here. Law enforcement agencies make particularly good subjects for studying the character and prevalence of a variety of formal, semiformal, and informal relationships in a highly fragmented metropolitan area, because police personnel meet both routine and emergency response demands within and between communities (Andrew 2009a).

The research presented in this paper thus tackles two broad goals, one for advancing theory, and one for illuminating an important public management matter. In terms of theory, the paper addresses the significance of multiplexity in interlocal agreements. Although in the network literature, multiplexity is often referred to as a pair of relations in different activities that occurs simultaneously, we used this term loosely to explain the tendency for local governments to establish contractual ties for more than one kind of service or transactions (Shrestha and Feiock 2009). We seek to understand how multiplexity fosters the development of more regionally-integrated networks of service provision and mutual responsibility for common needs. The next part of the paper presents the question in more detail, along with analytical methods and findings. In the discussion and conclusion, we set the findings in the larger urban management context to understand regional integration.

INSTITUTIONAL COLLECTIVE ACTION, INTERLOCAL AGREEMENTS, AND THE PROVISION OF URBAN SERVICES

There are at least two dimensions to ILAs. As a legal document, ILAs would enable local agencies to operate across interjurisdictional boundaries i.e., the dispatch of rescue services, as needed, throughout an affected area. ILAs also permit local governments to set agendas for action such as planning and developing region-wide protocols on the eventuality of emergency response. Some ILAs involve exchange and monetary transfers such as payment for service agreements (see ACIR 1985; Atkins 1997; Nunn and Rosentraub 1997). Yet, in some ways, this is not the most challenging aspect of providing urban services. The other dimension is that ILAs also function as planning documents in distributing responsibilities for certain functions. In law enforcement activities and emergency management, the value of ILAs depends on how multiple agencies can resolve intergovernmental complexity and then design an institution to implement their administrative obligations.

Theories of institutional collective action (ICA) suggest that localities are dependent on each other; the dependency requires localities to mutually adjust their actions in order to effectively coordinate shared responsibilities. However, local government actions are often difficult to predict. In a world of uncertainties---where parties involved in collaborative efforts may attempt to free ride, act opportunistically, or default from their shared responsibilities---officials working for local governments must decide on the best way to safeguard their transactions. The main task for local officials is to identify, agree upon, and craft a specific type of arrangement that could effectively minimize the costs of contracting (Feiock 2009).

Depending on the type of arrangements, the ICA framework also suggests that politically independent units can adjust their behaviors according to changing circumstances. The assumption is that regional integration would allow multiple agencies across different

jurisdictions to familiarize themselves with a set of administrative norms underlying intersectoral and intergovernmental relations. The familiarity with regional norms allows localities to craft agreements that assure the continuity and predictability of ongoing efforts. At the dyadic level, ILAs signal certain expectations and guidance for specialized agencies to perform their specific tasks. As suggested by Ostrom and Ostrom (1999:113), “legally independent but functionally interdependent” units of government can customize their arrangements in order to maintain and reap the advantage of associational benefits.

Scholars in this line of research also have argued that ILAs are crucial “features of contemporary local government management” (Zeemering 2008:731). A range of ILAs can integrate independent political jurisdictions vertically and horizontally (Thurmaier and Wood 2002; Feiock 2007; 2009). These arrangements are often made in good faith and thus can enhance a sense of true metropolitan governance that fosters a regional community (Friesema 1970, 1971; Thurmaier and Wood 2002). Although the current literature acknowledges the variety of ILA (see ACIR 1985; Atkins 1997; Nunn and Rosentraub 1997; Collins 2006; Wood 2006; Andrew 2009b), the extent to which different types of ILA have been used to foster meaningful regional integration is still unclear.

Despite decades of research, scholars still disagree as to whether ILAs can contribute to a meaningful regional integration. For instance, some scholars suggest that formal and informal agreements make little difference to the level of cooperation (Frug 1999; Reynolds 2003). Local officials involved in collaborative efforts would comply with standards imposed by higher level governments because it is in their best interest to do so even if formal agreements do not exist. While some officials may perform what is required of them by virtue of their official positions; others do so because of state and federal requirements. Moreover, most ILAs are *ad hoc* or

piecemeal arrangements intended to resolve technical and localized problems rather than more general regional problems (Frug 2002). The multiplicity of formal agreements only complicates regional coordination and planning activities (Frug 2002; Reynolds 2003). It reinforces regional inequalities because, in a highly fragmented political system, some localities are reluctant to work closely with others.

Moreover, ILAs are not a panacea for all type of urban services, and some scholars highlight the difficulties of getting local governments to voluntarily enter into ILAs. Because regional problems are multifaceted and thus preclude the exercise of formal agreements, ILAs are not the only administrative tool to achieve a meaningful regional integration. In a service area that involves large capital outlay, there are considerable costs involved in negotiating appropriate terms of contracts. The transaction costs of monitoring and maintaining standards of service can also constrain the motivation to enter into an agreement (Feiock 2009). Because of local politics and the potential loss of local autonomy, it is also uncertain whether ILAs will not be challenged through a litigation process (Nicholson 2007) and state legal doctrines of non-delegation (Frug 1999; Gillette 2002; Reynolds 2003).

Recent empirical literature attests to the importance of ILAs in the provision of urban services. Some scholars have suggested that the main motivation for local governments, when utilizing ILAs, is to enhance the delivery of urban services through improved service provision while maintaining or reducing costs (Morgan and Hirlinger 1991; LeRoux and Carr 2007). ILAs have also been judged by how effective local governments can translate their activities into joint benefits-- i.e., their contributions to the local communities (Morton, Chen, and Morse 2008), individual parties to the agreement (Zeemering 2008; Taylor and Bassett 2007), and the region as a whole (Feiock 2007; 2009). While it is difficult to define potential benefits, scholars generally

agreed that some portion of the presumed benefits must have been identified by localities in order to justify their usage (Wood 2006; MacManus and Caruson 2008; Carr, LeRoux, and Shrestha 2009; Chen and Thurmaier, *forthcoming*).

The delivery of urban services through ILAs has also been evaluated when joint efforts are able to minimize the apparent social problems witnessed by the general public. Mutual aid agreements for fire and law enforcement activities, for example, can be tools to accumulate tangible resources in the preparation for disasters or emergency (Lynn 2005; McEntire and Dawson 2008). They are often not obvious for local communities but do suggest an increase in overall social welfare. In Detroit MSA, the evidence provided by LeRoux and Carr (2009) suggests that the type of interjurisdictional activities matters in local government decisions to enter into formal agreements. Services that are visible to voters and regarded as essential by elected officials are generally provided with “high status” providers; while interjurisdictional activities that offer citizens a general access to lifestyle and employment opportunities are likely be provided jointly with multiple jurisdictions.

CONTRACTUAL TIES

For the most part, ILAs constitute a set of special relations. They produce something of value. Within the context of regional integration, such special relations are often developed through repeated interactions. Carlos Brito (2001:157), for instance, refers to formal agreements as “institutional relationships” resulting from “a process of institutional aggregation of a range of dispersed and fragmented interests into an expected coherent and unified action.” Thurmaier and Wood (2002) argue that, because most ILAs are long-term, they can lead to a norm of reciprocity among local governments fostering what Wilkes (1975:7) referred to as “a tradition of cooperation.” That is, when agencies enter into formal agreements, the tendency to share

common understandings and internalize norms of cooperation is crucial in order to perform joint responsibilities.

Due to the nature of ILAs, and consistent with the ICA framework, we see contractual ties as embedded in a larger network of economic, political, and social relationships that shape collective choice. By entering into short or long term contracts, local governments establish regular and sophisticated systems of informal communications. Lynn (2005) implicitly argues that interpersonal ties embedded in the organizational and collaborative approaches are developed through mutual aid agreements². Through a string of formal agreements, local officials are provided with an arena to exchange information, discuss, and identify opportunities as a group. They bring emergency managers and public officials together in order to make crucial connections.

How would localities develop a stable set of ties through ILAs? Can a network of contractual ties be undermined? The standard arguments advanced by ICA scholars are as follows: For some interjurisdictional activities such as emergency planning, mutual aid, or fire protection and suppression, the advantage of having ILAs lies in the ability of local governments to cooperate in joint efforts. Ties that are developed over time reduce the costs of monitoring and enforcement. This is because defaulting from the contracts is costly in terms of financial and social investment already committed for rendering the services. The reputational costs and

² We note that mutual aid agreements (MAA) tend to be activated less frequently than automatic mutual aid or operational emergency assistance agreements (Lynn 2005). Automatic mutual aid agreements usually involve emergency dispatch services, or communication 911 calls. They are established by specific or specialized agencies to provide or supplement local emergencies rather than disasters. For example, law enforcement, fire or emergency medical services are automatically dispatched to emergency situations as part of the agreement. Although automatic mutual aid agreements are relatively common in routine emergencies, depending on the services to be rendered, they are “operative only when certain conditions come into existence and they remain in operation only so long as these conditions are present” (Bollens and Schmandt 1965:77).

potential threat of litigation may also prevent defections. At the regional level, localities whose common concerns and shared beliefs are endangered can provide threats of collective sanction. Group expectations lead individual officials to avoid a strategic act if their action will seriously hurt the collective's interests. So, for local officials and their agency to breach a contractual arrangement, it must consider the amount of investment necessary to rebuild their credibility if destroyed.

Local officials can share tangible resources voluntarily and build local capacities through a set of formal and informal agreements. In some law enforcement activities---where risks of non-assistance impose costs on localities during an emergency---local governments can minimize the transaction costs if the parties to the agreements establish contractual ties with other agencies that have established ILAs with each other (Andrew 2009a). Conceptualized as a regional cooperation dilemma, some forms of assistance can be expected from contracting partners even if immediate assistance might entail considerable costs to them. In this situation, where there is a multiplicity of agreements, the ability to work collectively adds greatly to the incentive to maintain commitments and assist others and thus enhancing the regional integration.

H₁: When faced with dilemmas of cooperation, the tendency for agencies to establish contractual ties with a partner of their partners is a probable condition for regional integration.

However, there are also disadvantages when establishing localized agreements with all others. During a scale disaster where affected communities and neighboring jurisdictions are inundated and unable to provide timely assistance, localized agreements may not be effective. According to David Wallace's testimony before the Committee on Homeland Security in 2005, "virtually every municipality has entered into mutual aid or inter-local agreements for first responder activities, debris etc ... However, as was seen with hurricanes Katrina and Rita, such

agreements were rendered *useless* as all municipalities in the respective target region required full deployment of their personnel and assets.” (Wallace 2005 *emphasis added*).

The experience in New Orleans reflects the importance of having agreements with other cities/metro areas that are geographically disperse. Indeed, in theory at least, contractual ties developed across a wider range of potential partners also have their advantages. By establishing connections with other outside the region, it allows localities not only to discover a broader set of possible gains, but also opportunity to reach out and take independent risks in shaping joint agreements and thus reap the advantage of accumulation of resources that are not available within a localized regional structure (Andrew 2009a). Thus, the structure of regional integration will display a sparse network structure. In other words, when there is a potential problem in coordinating the activities of multiple agencies, there is a tendency for a central actor to emerge. The underlying logic suggests that, through a self-organizing mechanism, a central actor is selected to play an important role in coordinating and reducing the problems of information asymmetry and uncertainty (Feiock 2009).

H_2 : When faced with regional coordination problems, mutual exchanges through a central actor is a probable condition for regional integration.

Multiplexity of Contractual Ties

Lacking from ICA framework and current analyses is the insight on multiplex relationships. It is important to understand the multiplexity of contractual ties within the provision of urban services. They signal how local governments might behave when crafting ILAs; they also reflect how local governments govern their transactions in order to mitigate different forms of uncertainties. Local governments entering into agreements in one service area might consider future arrangements in another area. While such actions can protect transactions

and reduce the uncertainties of contracting, the agreements also reflect quasi-market arrangements and the attempts made by local governments to sustain joint efforts in the provisions of public services (McGinnis 1999).

While there are many factors that can contribute to the motivations of localities to establish multiplexity of contractual ties, the most cited reason is perhaps resource scarcity. Within the law enforcement activities, scholars in emergency management have argued that localities are often not able to attend to their own needs, sometimes during routine conditions, and certainly during disasters. Mitchell (1996) contends that when it comes to disaster response and recovery, partnerships of all sorts are particularly well-suited owing to the fact that the very structure of the U.S federal system depends on both cooperation and partnerships to enable coordination when power is distributed. Aside from the Emergency Management Assistance Compact (EMAC) or other regional institutions, the usage of ILAs preserves the political rectitude of local control while leveraging the resources of a larger geographic or jurisdictional scope. Thus, the multiplexity of contractual ties is a way for local agencies to navigate the perpetual tension between centralization and devolution.

Shrestha and Feiock (2009) propose an alternative explanation. Using the game theoretical language, they suggest that local agencies exchange information in a multiplex environment in order to develop strategies for actions. Because the payoff in one action arena is dependent on another, actors can narrow down their strategies in order to achieve some desirable outcomes. While this logic is consistent with the problems of regional cooperation, it does beg the question on how local actors might balance the decisions and actions of competing preferences. There is no obvious answer to this issue, but we know local agencies do establish a

variety of arrangements across different types of services; and we can only assume such arrangements exist in order to frame a set of acceptable routine strategies.

H₃: When agencies attempt to sustain joint efforts, multiplexity is a probable condition for regional integration.

However, multiplexity of contractual ties needs not be present in regional integration. The relative costs of contracting need to be internalized by local agencies. They can be high when agencies participate in multiple agreements across a range of activities. When local agencies are relatively self-reliant and joint activities are not crucial to meet their constituents' demand, then the costs of not participating in the joint activities are relatively reduced. In such circumstance, if local agencies were to participate, the temptation to free ride on the efforts of others may be higher. However, when activities are highly interrelated---the success of one activity is dependence upon the success of another---the interdependency would entail high transaction costs if other parties to the agreement cannot meet their joint obligations and thus leading to disruptions of exchanges that are costly to all. In this situation, multiplexity is a not the factor that contributes to regional integration.

RESEARCH DESIGN

In this paper we examine the extent to which multiplexity facilitates regional integration. The main task is to determine whether a configuration of bilateral agreements in one service area, which we refer to as contractual ties, is also aligned with the pattern of contractual ties for another. For example, we are interested in the changing patterns of contractual ties among agencies in two service areas: formalized agreements related to recurring and episodic activities in law enforcement. These activities present different types of risks associated with contracting. For example, most law enforcement activities produce positive externalities and they are highly

diverse-- i.e., ranging from recurring public safety activities (e.g., standard police patrol, crime prevention, and crowd control) to episodic events such as emergencies and disaster events (e.g., evacuation planning or mutual aid responses).

We characterized routine or “recurring activities” as a set of transactions involving daily operation of public safety. The activities are generally geographical and service specific in the sense that the outcomes of these activities are relatively easy to identify but involve highly specialized investment. Brown and Potoski (2003) referred to such services as having a high asset-specificity dimension. According to various state statutes related to intergovernmental coordination in Florida, most routine or recurring transactions can be formalized through contracts or interlocal service agreements. On the other hand, we characterized “episodic activities” as rare events that often cut across political boundaries. While most episodic activities can be formalized through mutual aid agreements, they might also be crafted as joint planning agreements especially for activities related to mitigation, preparedness, response, and recovery, the classic “four phases” of disaster. One of the main features is that outcomes of these activities are not easily defined or translated into legally binding contracts. Brown and Potoski (2003) referred to the episodic activities as having service measurability difficulties.

Brown and Potoski’s procedures for the characterization of goods and services have been used extensively in the urban literature (Carr, LeRoux, and Shrestha 2009; Andrew 2009a). To capture these dimensions for law enforcement activities, we modified the procedures by first identifying the key services based on the ILA Reports (discussed further below), and then conducted a survey to classify their main characteristics among independent experts in emergency management and practitioners. We did this among 18 responders in the Dallas - Fort Worth Metropolitan area. Fourteen categories were identified from the ILA Reports. Based on

the responders' perception, we then characterized the fourteen categories as either having high asset specific or service measurability difficulties. Following Brown and Potoski, this was done by using the mean rating procedure. That is, a service category having an "above the mean score" is characterized as having high asset specificity (i.e., above mean score = 3.43) or service measurability difficulties (i.e., above mean score = 2.77).

DATA

We examine a range of ILAs based on information contain in the Interlocal Service Delivery Reports. The data were compiled by the Florida Department of Community Affairs (FDCA), which is based on information reported by counties in Florida with greater than 100,000 population. Although the actual services covered by the agreements were broadly categorized by reporting jurisdictions, they do provide enough insight on the extent to which ILAs have been used by municipal and county governments, and special districts. In general, the number of ILAs has been largely in the areas of public safety. Other functional areas include education, sanitary sewer, solid waste, drainage, potable water, parks and recreation, and transportation facilities. The ILA Reports also contain information about the effective and expiration dates of the agreements, those involved in an agreement, and the types of services being rendered through specific agreement.

We limit our analysis to the four largest counties in the Orlando-Kissimmee MSA i.e., Lake, Osceola, Orange, and Seminole. Although limiting our analysis to only these counties has its disadvantages, it allows us to control for geographical variation and the tendency of local agencies to establish agreements with those located within their adjacent boundaries. The metropolitan area is highly fragmented and thus makes it an appropriate venue to test the general proposition that contractual ties are interconnected across service areas. Based on the ILA

Reports, we identified the patterns of ILAs among 66 agencies that have agreements on law enforcement activities in the metropolitan area (Table 1). Although geographical fixity may limit localities' ability to choose their contracting partners, we note that contracting partners varies. Specialized agencies at the state and federal levels played an important part in regional integration (24 percent). We also found formal agreements, though infrequently reported, being established by local governments with nonprofits and special districts (12 percent) suggesting an overlapping regional integration span across multiple levels.

---TABLE 1 about here---

We identified the dyadic relations among 66 agencies based on the presence of bilateral agreements. We coded them as a dummy variable. For example, we coded an entry of 1 when actors i and j have reported a bilateral agreement, and 0 if both actors have no agreement. Although the agreements we identified are not exhaustive, we note that most local agencies entered into at least one formal agreement. Because of the reporting procedures, the ILA Reports also allow us to cross-check whether reporting jurisdictions have established an agreement. Although this is not an ideal procedure, it does minimize potential missing data we encountered when coding for the presence of agreements between two agencies. Multilateral agreements are excluded in the final analysis.

To capture the dynamic of contractual ties, we have divided the changing patterns of these agreements into five time-periods i.e., $t_1 = 1986-1989$, $t_2 = 1990-1993$, $t_3 = 1994-1997$, $t_4 = 1998-2000$, and $t_5 = 2001-2003$. The time-periods reflect the major events that had occurred at the state and federal levels i.e., natural and man-made disasters as well as changes in the state

and national policies regarding emergency management. For each time-period, symmetrical matrices for the same set of actors were coded for both characteristics of law enforcement activities which yield ten separate square matrices. The dyadic relations were coded according to the following criteria: (i) whether or not two agencies have new agreements, and (ii) whether they have dissolved or maintained their agreements. The latter criterion was observed based on the length of an agreement.

Because the final analysis requires a gradual change in the number of ties between two consecutive time-periods (see Snijders, van de Bunt and Steglich, forthcoming), we explored our data further. For example, we examined the growth or change in network structures between periods 1 and 2 and so on in order to determine whether the observed changes are gradual. As proposed by Snijders et al., we cross-checked the amount of change in contractual ties between a pair of time-periods by $N_{11} / (N_{10} + N_{11})$, where N_{11} is the number of ties presents in two time-periods, N_{10} is the number of ties that were broken between the time-periods. As a rough guide, the proportions higher than 0.6 are desirable, the proportions that fall between 0.3 and 0.6 are regarded as acceptable.

Table 2 summarizes the proportions of change in the number of ties between subsequent observations. Note that during the last two periods i.e., t_4 and t_5 , the proportion of change is slightly lower than 0.3. The changes between these periods can be explained by the number of new ties (N_{01}). Among the 66 agencies involved in interjurisdictional activities in the metropolitan area, there has been a general increase in the number of new agreements. This is not a surprise. Given the events of September 11 and the general movement toward a coordinated response to disasters, there has been a strong emphasis by state and federal governments for agencies to establish collaborative planning through interlocal agreements.

---TABLE 2 about here---

METHODS OF ANALYSIS

We managed our data³ based on observed longitudinal networks, which requires the analysis to be conducted using stochastic actor-based models (see Snijders 2005; Snijders *et al.*, 2007). The analysis is conducted using the network software SIENA, “Simulation Investigation for Empirical Network Analysis.” At a most general level, SIENA analyzes the factors that explain the observed network dynamics. The analysis is formulated in terms of transition probabilities in the consecutive periods, with the first observed network being conditioned upon the previous process. SIENA uses a method of moment to evaluate the changing patterns of network structures⁵. In the traditional language of inference statistics, SIENA analyzes the “dependent variable” as the tendency for contractual ties to change between time-periods. In this paper, the contractual ties for asset-specificity dimension take on a role as the dependent variable.

Changing Dyadic Covariate Effect: To empirically test the general proposition that contractual ties for law enforcement activities are associated with the dimension of service

³ Network analysis is the appropriate way to examine the multiplexity of relational effects of contractual ties across goods and services. While in a cross sectional network dataset, Quadratic Assignment Procedure (QAP) and Exponential Random Graph Models (ERGM) have been used by urban scholars (LeRoux and Carr, 2009; Shrestha and Feiock 2009); for data on observed longitudinal networks, stochastic actor-based models or Simulation Investigation for Empirical Network Analysis (SIENA)--as suggested by Snijders--have been applied to bilateral agreements (Andrew 2009a, 2009b).

⁵ SIENA estimates factors that explain the changes in contractual ties--the frequency by which an actor has the opportunity to make a decision over a period of time (Steglich et al., 2006). The changing structures can be interpreted as the outcome of a Markov process (Snijders, van de Bunt and Steglich, *forthcoming*). To obtain a test of the relative parameter value and significance level, SIENA not only accounts for the potential random effects (i.e., possible ties) but also conditions the estimation based on the original network structure. Depending upon the specification of a model, SIENA calculates the rate parameter (called “rho”) to indicate the formation of contractual ties i.e., the speed in which actors have the opportunity to establish (or not establish) mutual exchanges between two time-periods.

measurability difficulties (i.e., whether it has an effect on the formation of contractual ties in asset-specificity activities), we specified SIENA to include a variable called “changing dyadic covariate.” We also control for other potential structural effects (discussed below). The dyadic covariate for service measurability difficulties describes the presence of contractual ties established by any pair of actors at time t . The changing dyadic covariate effect takes into account four consecutive time-periods: t_1, t_2, t_3 , and t_4 . A positive parameter for changing dyadic covariate effects highlights the tendency for contractual ties in one service area is also present in another.

Network Structure Effects: Because some agreements tend to be established between those who are geographically close to each other (Shrestha, 2009), and consistent with the previous findings on the formation of contract networking (Andrew 2009a; 2009b), we control for two effects of network structure: triad-closure and betweenness effects. The triad-closure effect reflects a network structure that captures the preference of an actor to form sub-groups with partners of their partners. For example, if actor i had entered into an agreement with actor j , the tendency for actor i to establish tie with actor h is probable if actor h already established a tie with actor j . The triad-closure effect can be formalized as follows: $s_{il}(x) = \sum_{j < h} x_{ij} x_{jh} x_{hi}$. A large and positive coefficient parameter for the number of triad-closure effect in relation to the other structural effects would suggest that agencies establishing contractual ties with each other share similar behavioral expectations (see Snijders *et al.*, 2007)..

On the other hand, the betweenness effect reflects the preference of actors to enter into contractual ties indirectly through an intermediary. For example, if actors h and i already established a bilateral tie, the betweenness effect suggests actor i is acting as an intermediary if it establishes a tie with actor j . The betweenness effect emphasizes non-redundancy connections

between three actors in the sense that actors h and j are linked indirectly through actor i . The betweenness effect is formalized as $s_{i2}(x) = \sum_{j,h} x_{hi} x_{ij} (1 - x_{hj})$ (see Snijders *et al.*, 2007). A large and positive coefficient parameter for the betweenness effect in relations to other network effects would suggest a tendency for agencies to establish contractual ties indirectly with other actors through a central actor.

Covariate and homophily effects: We control for two general characteristics of the agencies in our data set: (i) the type of agencies, which is coded as 1, if they are at the municipality level, otherwise 0; and (ii) whether local law enforcement agencies have been accredited by the Commission on Accreditation for Law Enforcement Agencies, Inc., (CALEA), which is coded as a dummy variable. We also control for the homophily effect, which provides insight into the behavior of agencies when choosing their contracting partners. For example, to what extent do ties tend to occur between agencies having similar characteristics? Specifically, we test whether (i) agencies in municipal governments are more likely to establish contractual ties among themselves rather than other type of agencies, and (2) whether contractual ties are likely to be established among law enforcement agencies that are accredited by CALEA. A positive value of the coefficient translates into growing utility for actors creating links with other actors with similar positions (Snijders *et al.* 2007). It implies that actors prefer ties to others with similar preferences (on the variable in question) and thus contributing to the network-autocorrelation of that variable.

RESULTS

Earlier research made a strong assertion that regional integration can be achieved through ILAs; and that, the characteristics of goods and services matter because transaction costs

mediated through different service areas can provide clues to the types of risks associated with contracting (Brown and Potoski 2003). We make the distinction for law enforcement activities according to two broad dimensions---asset-specificity and service measurability, where the former is assigned a role as the dependent variable. The primary aim is to examine whether a set of contractual ties, where outcomes of joint activities are difficult to specify in advance, has an impact on activities that involve high asset specificity investment.

The results of our final analysis are summarized in Table 3. The convergence diagnosis produced t-statistics $<.0$, indicating no convergence problems (results not shown here). The tendency for agencies to change contractual ties between the specified time-periods is represented by the rate parameter (ρ). The rate parameters are all positive and significant. The results suggest, in the service areas associated with asset specificity transactions, agencies having agreements in the Orlando-Kissimmee MSA have a tendency to establish contractual ties. The rate of change is somewhat higher for the last time-period, $t_{4,5}$, which is mostly driven by the presence of new ties. While the rate parameters capture the amount of changes that have occurred over time, they also provide a diagnostic test to determine whether those changes occurred at a reasonable amount of small changes in order to come up with a global dynamic that resembles the observed network. We continue by analyzing the results under the current model specification.

-----TABLE 3 about here-----

The argument for multiplexity is intriguing because for years scholars in emergency management have argued that localities are often not able to attend to their own needs,

sometimes during routine conditions, and certainly during disasters. Through ILAs, localities can gain access to tangible and intangible resources not immediately available to them; they can establish shared understandings and internalize norms of cooperation through a multiplex of relationships. While it is also possible that local agencies would not find it advantageous to participate in multiple types of joint activities, policy makers have consistently argued for localities and their agencies to establish arrangements that can sustain joint efforts.

Our results provide evidence from the Orlando-Kissimmee MSA that law enforcement activities, when entering into a string of contractual ties, generally have overlapping relationships with each other. The results highlight how agencies involved in activities related to service-measurability difficulties also have relationships in activities related to high asset-specificity investment. The parameter estimate (β) of 0.85 is positive and statistically significant. The result supports the hypothesis that multiplexity is a probable condition for regional integration when agencies attempt to sustain joint efforts.

To what extent does this structure exist in other metropolitan regions? Several empirical studies (Shrestha and Feiock 2009; LeRoux and Carr 2009)⁶ can cast some light on the subject. LeRoux and Carr (2009) found, within the systems-maintenance functions, a moderate level of correlation between the patterns of ILAs in watershed treatment and waste water treatment activities (Pearson's $r = 0.285$). And, within the lifestyle function, a slightly higher correlation is observed between patterns of ILAs in the public safety and the park and recreation activities (Pearson's $r = 0.357$). There is also evidence to suggest that mutual exchanges exist through ILAs; and that, such exchanges are not limited to a single service function. For example, in Pinellas County, Florida, a study conducted by Shrestha and Feiock (2009) points to a positive

⁶ These studies utilized the Quadratic Assignment Procedure technique.

correlation between buyers and suppliers matrix (Pearson's $r = 0.485$), suggesting that risks associated with contracts in one service area can be mitigated if these contracts are dependent on a broader set of contractual relationships.

At the sub-region level, whether the conditions for regional integration are driven by a closely-knit structure or sparsely-connected network, it has also been shown to depend on the dimensions of urban services (Andrew 2009a). For example, LeRoux and Carr (2009) found the patterns of ILAs for systems-maintenance functions (such as watershed treatment and waste water treatment) to have a high score on network density; when compared with the lifestyle functions (such as park and recreation and economic development activities), the patterns of ILAs display a somewhat lower network density score. While this study suggests the patterns of contractual ties are relatively sparse, the analysis is limited to only one time point.

Our results provide an additional boost to the current findings. Over time, the formation of contractual ties for activities related to asset-specificity has a positive parameter estimate for the betweenness effect ($\beta = 0.479$). The fact that the betweenness effect is positive and statistically significant suggests regional integration is driven by agencies' efforts to enter into contractual ties with central actors. For this particular service area, there is no evidence to support the notion that regional integration is based on the attraction of closely-knit contractual ties, which has a negative parameter estimate ($\beta = -1.99$). At the conventional level of significance, the triad-closure effect is not statistically significant. These results support the H_2 hypothesis that mutual exchanges through a central actor are probable conditions for regional integration.

However, forming a contractual tie is not without its cost. The density effect, though as a variable it is not substantively interesting, suggests the regional integration based on

H_2 hypothesis yields a negative payoff for the agencies. That is, if a network structure consists of three actors i.e., actors h , i , and j ; and actors h and j are linked indirectly to each other through a central actor i at the consecutive time period, our results suggest the central actor would be burdened because the cost of forming a tie ($\beta = -1.99$) is higher than the benefit of being the central actor ($\beta = 0.479$). There are several possible explanations for this phenomenon: First, by entering into arrangements with a central agency, actors h and j can be made better off because the central actor's services are less likely to be in demand by others when some emergency strikes. Second, actor i has to internalize the costs of being the central actor and must have the capacity as well as the willingness to perform the function. Although in this analysis we did not determine the central actors, based on other empirical studies, the likely candidates are most probably agencies in the larger jurisdictions or county governments (Waugh 1994).

In the bottom rows of Table 3, the results for the homophily effects produce mixed conclusions. An agency in municipal governments tends to establish contractual ties with those that are dissimilar to itself ($\beta = -0.726$); while an agency that is accredited by CALEA tends to prefer establishing ties with other agencies with similar status ($\beta = 0.743$). The latter presumably is motivated by similar preferences for standards of services, suggesting similarity in preferences in terms of professionalism that can enhance regional integration. The former is motivated to spread the risks of contracting by having arrangements with multiple types of agencies ranging from county, state, and federal agencies to special districts and nonprofit organizations.

DISCUSSION AND CONCLUSION

The multiplexity of contractual ties in the provision of urban services matters. The notion helps us to understand the operational complexity of regional integration. Evidence from the

Orlando-Kissimmee MSA for law enforcement activities supports the claim that individual agencies, when entering into a string of contractual ties, generally have overlapping relationships with each other. We also found, in a service area with high asset-specificity transactions, that there is a tendency for local agencies to establish contractual ties through central actors. Although we did not find evidence that agencies within municipal governments would establish ties among themselves, our findings suggest that those agencies having external accreditation prefer to work jointly with each other.

The wider implication of this analysis is important in part due to its normative significance. Some scholars (Frug 2002) contend that the usage of ILAs complicates regional planning and encourages urban sprawl. Because of the complexity of the urban problems, ILAs do not offer practical solutions despite overlapping arrangements that exist across multiple service areas. The usage of ILAs only exacerbates social and economic inequality across a region because the standards of provisions and the quality of urban services are not provided uniformly across a region. The normative assertion is that strategic action of localities undermines rather than enhances regional integration. However, others disagreed (see Feiock 2009). Although some localities may reluctantly enter into ILAs if providers in other sectors are available, others played active roles in joint efforts through ILAs suggesting that disparities in the provision of services are driven by local capacities, political institutions, and the ability to choose contracting partners. The normative argument suggests that localities in a fragmented region will collectively benefit from the competitive nature of the provision of public goods.

This paper contributes to the debate by examining the extent to which ILAs have been used by localities to provide urban services and thus, explaining how ILAs play a part in shaping an integrated regional structure. We conclude that, although strategic acts among localities are

often observed in some instances, localities have other reasons for participating in ILAs. First, the notion of multiplexity suggests that contractual arrangements across the region are interrelated and that regional cooperation exists simultaneously across different urban services. Localities' experiences and familiarity with ILAs breed future ILAs, even though their actions might translate into formal agreements with different agencies. Moreover, entering into contracts for multiple types of services involves lower monitoring costs compared to a single contract for a single transaction.

Second, potential rewards such as receiving external grants and minimizing operational costs are powerful incentives to enter into ILAs. Moreover, strongly emphasized through state and federal policies, the existence of ILAs symbolizes interlocal or interorganizational cooperation and may be crucial for receiving state or federal grants. Even though such grants may include technical or technological improvements (such as communication interpolation, specialized equipment, or search and rescue), they reflect how localities can tackle larger and wider substantive problems through ILAs. Third, ILAs also provide localities with access to tangible resources. Although some arrangements are geographical and policy specific, taken together, ILAs provide dual functions: They can influence localities' decisions on their choice of contracting partners and induce future cooperation. Since regional integration involves arrangements across multiple service areas, when used as administrative tools for gaining access to additional resources and receiving external funding, ILAs allow localities to set aside disagreements on certain policy areas but participate in others.

Of course, in reality, efforts to integrate the region through ILAs are far more complicated. Even if localities are able to enter into agreements with all others in the region, there is no guarantee that such regional integration is a better structure compared to a structure

when localities are only involved in some agreements with a few localities. For instance, regional integration can also give rise to conflict. This is especially acute when the efforts of individual localities to achieve their own goals interfere with or thwart the efforts of others to pursue their own ends. Under a variety of circumstances, multiplex relationships can generate collective-action problems in the sense that independent localities frequently suffer joint losses as a result of conflict. Here, a highly integrated structure can become a region-wide concern whenever localities find themselves engaged in interdependent decision-making that impinges on the welfare of the others. As pointed out by Ostrom (1990), the higher the level of interdependence, the more pervasive and complex collective-action problems are, and the greater the demand for consensus needed to resolve joint concerns.

Future research should ask whether multiplexity is prevalent in other metropolitan areas. Is it possible that ILAs in other services may prevail less often if mandated by state or federal governments? Do local institutions affect the tendency to enter into agreements? Local ordinance and statutory requirements, if too restrictive, may also affect local government decisions to enter into ILAs. Much of the current research on intergovernmental transfers can enhance our understanding on this issue but empirical research has been lacking and tends to focus on the distribution of intergovernmental transfers for public expenditure. Instead of treating such transfers as proxy to regional integration, perhaps more productive research would be on the extent to which they might explain the tendency for localities to explore opportunities through ILAs.

Qualitative research continues to play a crucial role in understanding the nature of ILAs. Our assumption about localities and their agencies' behaviors must be examined and refined through interviews or participatory observation during the crafting of the agreement as well as

the implementation of the agreements. Qualitative research can provide the context in which these agreements are established. For example, in cases when local officials are working closely with others in separate jurisdictions, they may not realize the nature of their contacts is formalized through an agreement. While a new agreement is easily identified by local officials, their working relationships established through previous agreements may be less obvious. Qualitative research can serve to improve our quantitative analyses, especially when dealing with panel or longitudinal data.

Overall, in the provision of urban services, this study has challenged scholars to consider the importance of regional integration through ILAs. Our analysis is consistent with findings in other studies. LeRoux and Carr (2009), for example, found evidence to suggest that patterns of ILAs are associated with urban service functions. Shrestha and Feiock (2009) found empirical evidence of mutual exchange that exists between local governments when entering into ILAs and that such exchange is not limited to a single service function. Together these studies bring to mind the notion that regional integration can be studied systematically by examining the different types of urban services. Failure to consider the distinction between characteristics of goods and services can have a serious analytical consequence on theories of regional integration: While in some services areas localities are more active than others in their engagement, in other service areas this is less evident. But, the latter need not mean regional integration is lacking.

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Table 1. Type of Organizations, Frequency (Percentage)

Type of Organization	Frequency (%)
Federal	8 (12)
State	8 (12)
Regional	3 (4.5)
County	8 (12)
Municipality	31 (47)
Special District	5 (7.6)
Nonprofits	3 (4.5)
Total	66 (100)

Table 2. Contractual Tie Changes between Subsequent Observations

	New Tie (N_{01})	Broken Tie (N_{10})	Maintained Tie (N_{11})	Proportion of change
<i>Contractual ties related to activities with measurability difficulties</i>				
$t_1 - t_2$	7	2	9	0.82
$t_2 - t_3$	16	7	23	0.77
$t_3 - t_4$	17	13	30	0.69
$t_4 - t_5$	31	20	6	0.23
<i>Contractual ties related to activities with asset-specificity transactions</i>				
$t_1 - t_2$	5	2	10	0.83
$t_2 - t_3$	8	9	6	0.40
$t_3 - t_4$	12	8	6	0.42
$t_4 - t_5$	26	13	5	0.27

Table 3. Parameter Estimates and Standard Errors

	Estimate	Standard Error
<i>Activities with High Asset Specificity</i>		
Rate Parameter (rho) $t_{1,2}$	0.564	0.226
Rate Parameter (rho) $t_{2,3}$	1.573	0.482
Rate Parameter (rho) $t_{3,4}$	1.953	0.618
Rate Parameter (rho) $t_{4,5}$	6.828	3.222
<i>Changing Dyadic Covariate Effect:</i>		
Activities with Measurability difficulties	0.850**	0.264
<i>Network Structure Effects:</i>		
Density	-1.991**	0.144
Triad-closure Effect	-2.185	2.452
Betweenness Effect	0.479**	0.095
<i>Constant Covariate Effects:</i>		
Municipal Agency	0.917	0.486
Accredited Law Enforcement Agency	0.257	0.227
<i>Homophily Effects:</i>		
Municipal Agency Similarity	-0.726*	0.355
Accredited Law Enforcement Agency Similarity	0.743*	0.345

Notes: Stochastic approximation algorithm is based on 2452 total iterations, the parameter estimates based on 1452 iterations, basic rate parameters as well as the convergence diagnostics, covariate and derivative matrices based on 1000 iterations; level of significance: * $p < 0.05$; ** $p < 0.001$