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Regional Integration Through Contracting Networks

An Empirical Analysis of Institutional Collection Action Framework

Simon A. Andrew
University of North Texas, Denton

This article advances two general hypotheses, bonding and bridging, to explain the process by which local governments decide whether to enter into contracts. The characteristics of goods and services are important factors in these decisions. In high asset-specificity transactions, the bridging hypothesis predicts local governments will establish ties with only a few "high status" actors, whereas in transactions for services with measurement difficulties, the bonding hypothesis predicts local governments will establish ties with partners of their existing partners to pool resources and reduce commitment risks. The general hypotheses are tested using agreements for law enforcement activities linking 66 actors in the Orlando-Kissimmee metropolitan area during five time periods (i.e., between 1986 and 2003). Using simulation investigation network analysis (SIENA) techniques, this study finds strong statistical support for these hypotheses.

Keywords: *regional integration; network analysis; institutional collective action; law enforcement; interjurisdictional agreement*

While much has been written about regional governance, few scholars have explored how interjurisdictional agreements are used by local governments to foster meaningful regional integration (Friesema 1970, 1971; Sonenblum, Kirlin, and Ries 1977; ACIR 1985; Hirlinger and Morgan 1991; Thurmaier and Wood 2002). One perspective argues that interjurisdictional agreements play only a minor role. They are ad hoc or piecemeal arrangements intended to resolve technical and localized problems rather than more general regional problems (Frug 2002). According to this perspective, the various types of agreements only complicate coordination and regional planning activities and reinforce inequalities, thus contributing to the structural imbalances among metropolitan governments (Frug 2002; Reynolds 2003). The solution is a centralized political unit that can produce

and coordinate services across an entire region (Yates 1978; Rusk 1993; Mitchell-Weaver, Miller, and Deal 2000; Frug 2002; Reynolds 2003).

However, this regionalist approach is contested by urban scholars who advance voluntary agreements as one alternative to a consolidated or regional authority (Ostrom, Tiebout, and Warren 1961; Oakerson 2004; Ostrom, Bish, and Ostrom 1988; Carr and Feiock 2004; Feiock 2004, 2007). The extensive use of interjurisdictional agreements can integrate independent political jurisdictions vertically and horizontally without a centralized authority. Various forms of agreements provide an intangible boost to regional integration because the arrangements are usually made in good faith, and thus, enhance a sense of true metropolitan governance that fosters a regional community (Friesema 1970, 1971; Thurmaier and Wood 2002).

Although there has been great interest in the ideas of decentralized mechanisms (Feiock and Scholz n.d.), the deficiency of current literature is that it does not advance a model of governance that specifies the mechanisms by which regional integration occurs through interjurisdictional agreements. It also does not provide an adequate working model to illustrate how interjurisdictional agreements—which constitute a configuration of contractual ties—emerge, evolve, and integrate regional service delivery. This article confronts these issues by focusing on factors explaining interdependencies among governmental units using network analysis. It extends the institutional collective action (ICA) framework by examining how local governments organize their contractual relations over time.

This article builds upon the ICA perspective on the formation of contractual ties according to the transaction risks associated with specific kinds of goods and services (Feiock and Scholz n.d.; Andrew 2007). Following Brown and Potoski (2003), two kinds of risks are identified: measurability and asset-specificity problems. The ICA framework uses the logic of transaction cost analysis, but it extends this approach in a new direction by arguing that contractual relationships are embedded in a larger network of economic, political, and social relationships that shape collective choice. Moving the analysis beyond two actors and using multiple-actor analysis to explain regional integration, the critical element of ICA is how localities maintain their contractual ties over time (Feiock 2007).

One prediction is that risks of opportunism associated with asset-specificity problems will lead local governments to selectively enter into agreements with only a few “high status” actors. Here, a sparse network structure emerges to explain the importance of information transfers, innovation, and competitive exchanges, since localities with different interests and resources negotiate with others to maximize their control over desired transactions. On

the other hand, in the face of complexity and uncertainty and when outcomes of agreements are difficult to specify in advance, local governments would enter into agreements with partners of their current partners to mitigate credible commitment problems. A close-knit structure akin to overlapping ties is important in such transactions because it encourages actors to cultivate their own reputations and signal expectations that they will take each other's interests into account (Andrew 2007; Shrestha 2007).

Interjurisdictional agreements in the provision of law enforcement activities provide an ideal arena to test these predictions. Although the primary purpose of law enforcement is to deal with crime prevention and investigations, the bulk of activities also involve secondary purposes not directly related to crime (Ostrom, Parks, and Whitaker 1973; Carr and LeRoux 2005). Law enforcement activities are highly diverse, ranging from recurring and routine public safety activities (e.g., standard police patrol, educational programs, enforcement of sanitation and licensing regulations, control of crowds) to civilian defense and disaster duties during episodic events (e.g., evacuations planning, mutual-aid responses and recovery efforts). While some routine activities can be provided with or by other jurisdictions through legal arrangements, episodic activities require the combined efforts of disparate agencies across organizational and jurisdictional boundaries.

This article examines the formation of contractual ties associated with different goods and services for public safety agreements involving 66 agencies in the Orlando–Kissimmee metropolitan area during five time periods (i.e., between 1986 and 2003). The contractual perspective is applied to test how service characteristics and existing network structures shape partner choices using simulation investigation network analysis (SIENA) techniques (Snijders 2005; Snijders et al. 2007; Steglich, Snijders, and West 2006). The results provide strong statistical support for the general propositions that the characteristics of goods and services influence the formation of contractual ties.

Interjurisdictional Agreements, Law Enforcement, and the Transaction Costs of Contracting

The theory of transaction costs argues that when recurring activities involve a relatively high degree of asset specificity, an organization would prefer to produce services in-house rather than through the market (Williamson 1975, 1985). The main argument emphasizes potential problems of "hold-up" in which negotiating parties choose internal production rather

than the market when faced with the threats to accept terms that are less favorable after investments have been made in rendering the services (Klein, Crawford, and Alchian 1978). One solution is to work collaboratively through common or joint ownership of the asset. In this situation, a long-term contract can be crafted as a satisfactory answer to the possible problems of asset specificity (Williamson 1983; Coase 1998).

In the context of local government contracting, depending on the types of agreements adopted, formal arrangements are most important in highly asset-specific relations, especially in transactions involving some forms of exchange for payments, revenue sharing, or permanent transfers of total responsibility to another governmental unit (ACIR 1985; Atkins 1997; FLCIR 2001). To avoid the risks involved in a highly asset-specific transaction, legally binding contracts can be crafted, but at the same time, local governments would be selective of their partners since routine activities involving such transactions are susceptible to local politics and future disputes. We argue that in the public-good market, high degrees of frequency and mutual dependency associated with asset-specific transactions seem to support rather than hinder ongoing cooperation across jurisdictional boundaries.

While formal agreements can be used to safeguard routine transactions, certain agreements may be appropriate for activities that are highly complex. For instance, in the provision of simple and routine activities involving law enforcement agencies, local officials may perform what is required of them since the costs of detecting such behaviors often involve less time and effort. However, when activities are complex and require agencies to work collaboratively across multiple jurisdictions, coordination costs increase; thus, local governments would prefer to enter into flexible or nonbinding agreements such as mutual-aid agreement, memoranda of understanding, or memoranda of agreement (Andrew 2007).

Local governments are drawn to voluntary interjurisdictional agreements because they allow them to take advantage of accumulated resources, to better coordinate planned efforts, and to spread the risks associated with emergencies. In addition to enjoying the advantages of economies of scale, local governments are in a better position to cope with emergencies when they can pool resources through mutual-aid agreements (McEntire and Dawson 2007; Nicholson 2007). When emergency conditions require law enforcement agencies to render aid outside their jurisdiction, mutual-aid agreements would authorize them to have the same powers, duties, rights, privileges, and immunities as if the employee were performing duties inside the employee's jurisdiction. The agreement also allows specialized agencies to provide assistance beyond their political boundaries, enables assisting

jurisdictions to request reimbursement for the actual costs of providing mutual aid, and allows them to coordinate their collective efforts.

Caught between rising demand for urban services and declining local government capacity, local governments often find that entrance into interjurisdictional agreements is complicated or constrained by local politics. Depending on the nature of services to be rendered, formal agreements may be costly political and administrative acts compared to other equally feasible forms of arrangements (Brown and Potoski 2003; Scholz and Feiock 2007). It is uncertain whether the agreements will be challenged through a litigation process (Reynolds 2003; Nicholson 2007) and state legal doctrines of nondelegation (Gillette 2001). There are also bargaining costs when negotiating appropriate provisions to obtain capital outlay for large projects. There are monitoring and legal costs for maintaining standards of service provisions across multiple jurisdictions. The problem of lock-up and loss of control over the provision of services can also make governments reluctant to enter into an agreement (Cooper 2003).

These impediments can be magnified by substantive disagreements among local officials, especially over the nature of the problem and the best strategies to resolve and organize complex activities. For instance, local governments incur significant coordination costs because there is no clear set of quantitative measures as an appropriate standard of services performance. Although a flexible arrangement can be used to resolve policy incompatibility, the challenge for local governments is how to accommodate policy differences in the presence of measurability problems without having to resort to less flexible and more rigid contracts. Although complex activities can always be produced in-house, the nature of some law enforcement activities and available resources often prevents localities from providing the services independently.

Can Contractual Ties Mitigate Asset Specificity and Measurability Problems?

For the ICA framework, the importance of interjurisdictional agreements lies in the formalization of local governments' special relations. They are manifested as contractual ties crucial for regional integration. Moreover, because most agreements overlap multiple activities and specialized agencies, they can lead to a "norm of reciprocity" among local governments (Thurmaier and Wood 2002). This is important because if agreements are embedded in a rich social context in which information and opportunities

are exchanged and common problems are discussed, the risk of opportunistic behavior can be reduced and a cohesive set of preferences can be aligned (MacCaulay 1963; Shapiro, Sheppard, and Cheraski 1992; Jones, Hesterly, and Borgatti 1997).

Much can be learned about interjurisdictional agreements using network analysis. A string of agreements can represent a configuration of contractual ties, which provides intangible social benefits for law enforcement officials who interact preferentially with others. Lynn (2005), for example, suggests that interpersonal ties embedded in the organizational and collaborative approaches developed through mutual-aid agreements "bring together key decision makers who can share information and intelligence. It is through this sharing from multiple agencies that line officers, investigators and analysts are most likely to make the essential connection" (Lynn 2005, vii).

But partner selection can become complicated, depending upon the nature of contracted goods and services (Brown and Potoski 2003). For instance, an empirical study that examined the formation of restrictive and adaptive contracts found a general tendency for local governments to choose partners of their partners to reduce the risks of opportunism (Andrew 2007). Although there is no evidence to suggest that different agreements would lead to different forms of network structures, the study highlights the importance of highly clustered regional structures.

Studies by Shrestha (2005, 2007) suggest that local government decisions to enter into payment-for-service agreements are influenced by uncertainties posed by service-specific exchanges. Buyers may seek popular providers and establish reciprocal ties to secure reliable supplies. Although these findings are consistent with the predictions that local governments will adopt self-organizing governance structure, neither study has examined how the transaction costs associated with different characteristics of goods and services might influence the dynamic evolution of contractual ties over time.

Bonding Hypothesis

According to the bonding hypothesis, in the presence of uncertainty and complexity of interjurisdictional activities, a highly dense network structure will emerge over time as local governments attempt to mitigate the problems of shirking (Coleman 1988; Gulati 1995; Lin 2001; Scholz and Feiock 2007). The logic of the arguments is as follows: Crafting an agreement for activities whose outcomes are difficult to measure presents dilemmas for local governments. Although flexible arrangements such as mutual-aid

agreements, memoranda of understanding, or memoranda of agreement can be established, they usually do not specify the exact processes and outcomes of the transactions. These present institutional collective-action dilemmas in the sense that these transactions make noncompliance costly to enforce legally. The arrangements are usually nonobligatory and insufficient to curb the problems of discretion. A greater risk of shirking exists because when contracting partners cannot determine the standard requirements spelled out in their arrangements, it is difficult and costly to monitor the behaviors of contracting partners. To constrain such opportunistic behaviors in the presence of transaction complexity and ambiguity, threats of collective sanction can be devised through a highly clustered configuration of ties.

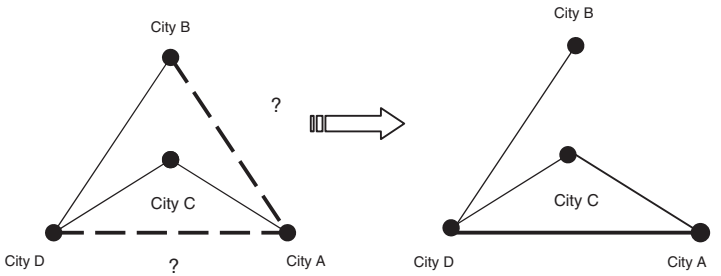
A highly clustered network structure is also advantageous to local governments. It reflects the importance of associational benefits in cohesive subgroups. It creates social obligations that can control the behaviors of localities and their officials because any actions taken or not taken are easily made public (Coleman 1988). According to Thurmaier and Wood (2002), because formal agreements are embedded in personal relations, a clustered network of contractual ties, developed through ongoing interactions between officials, emphasizes the benefits of interpersonal knowledge and institutional norms. When participating in joint activities in which outcomes are difficult to specify in advance, localities and their officials have an incentive to cooperate to preserve their reputation.

In transactions that involve measurability problems, we hypothesize that local governments prefer to be part of a cohesive subgroup. They enter into contracts with partners of their partners to mitigate the problems of discretion and shirking. They gain the benefits of being part of cohesive subgroups when they can pool their resources. Figure 1 predicts with whom a local government would establish contractual ties in the presence of measurability problems: When deciding whether to enter into an agreement with either City B or City D, City A would rather establish a mutual agreement with City D. In other words, City D is preferable because it is the partner of City C, with which City A already has an agreement.

Bridging Hypothesis

For interjurisdictional activities that have relatively high asset specificity, we anticipate sparsely connected ties to emerge. According to the bridging hypothesis (Granovetter 1973; Burt 1993; Lin 2001), a sparse network captures a configuration of network ties that is dominated by a few

Figure 1
City A Considering Whether to Form a Tie Either with City B or City D at t_1



Note: The bonding hypothesis predicts City A will mutually form a tie with City D at t_2.

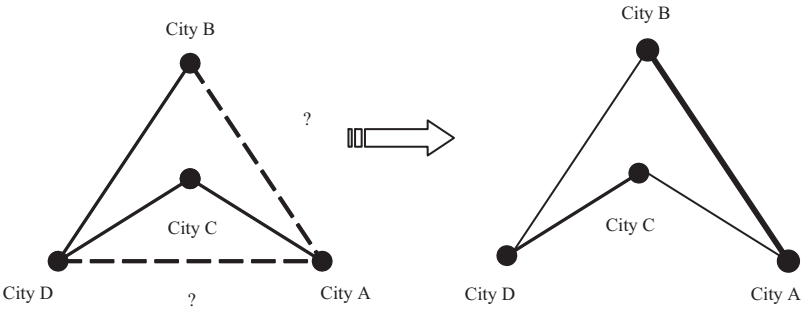
highly centralized actors; the peripheral actors are either directly tied to the core members or act independently. A sparse structure not only suggests evidence of entrepreneurial behavior but also the importance of competition among localities.

Establishing contractual ties with central actors is important for local governments to reduce the costs of crafting and monitoring multiple agreements with other localities independently. For example, localities prefer to avoid investing their own resources in the provision of public safety; instead, given the opportunity, they would free ride on the efforts of higher-level governments. According to Waugh (1994), cities are highly dependent on county governments because they are politically and administratively closer to state and federal governments for receiving resources and technical assistance.

On the other hand, municipalities are less likely to enter into direct arrangements with other municipalities because of local politics and policy incompatibilities. The conventional wisdom suggests that municipalities are highly competitive with each other (Ostrom, Parks, and Whitaker 1973). Although they often share similar concerns, their attempts to improve conditions are impeded by administrative turf battles, local politics, and past experiences. In asset-specificity transactions such as police patrol and vehicle maintenance, municipal governments may fear the threats of lock-up and loss of local autonomy, staff, and funding to other municipalities more than they would with higher-level governments.

County governments, for example, are more able to act as mediators to intermunicipality policy goals and policy preferences. They generally have

Figure 2
City A Considering Whether to Form a Tie Either with City B or City D at t_1



Note: The bridging hypothesis predicts City A will mutually form a tie with City B at t_2.

a larger geographical base, a greater ability to reap the benefits of economies of scope, and a broader perspective to respond to regional emergency needs (Rubin and Barbee 1985; Waugh 1994; Benton 2002).

According to the bridging hypothesis, in the asset-specificity dilemma, local governments are more likely to choose their contracting partners strategically. However, agreements are frequently incomplete and costly to enforce, so localities may choose to produce the services in-house or contract with other providers. Their ability to choose among alternative service providers induces competition and provides the deterrent mechanism to curb the opportunistic behaviors of a central actor. We hypothesize that a local government faced with asset-specificity transactions will take advantage of market competition and higher-level government resources by selecting a contract partner who has directly established contractual ties with other jurisdictions. Figure 2 predicts with whom a local government would establish contractual ties in the presence of asset-specificity problems: When deciding whether to establish a contractual tie with City B or City D, City A would choose City B.

Research Design and Data

The motivation for local governments to enter into an agreement is explored by first classifying activities of the agreements according to their

asset specificity and service-measurement difficulty (Brown and Potoski 2003). The former refers to contractual ties established by local governments for routine activities for which the outcomes are relatively easy to identify but that involve highly specialized investment, such as crime prevention and investigation, police patrol, and vehicle maintenance. The latter refers to contractual ties for activities for which outcomes are relatively difficult to measure in advance, especially for activities related to episodic events such as planning and developing emergency response protocol and mutual fire- and disaster-aid agreement.

We analyze the different types of law enforcement activities based on information in *Interlocal Service Delivery Reports*.[1] The classification was based on the following procedures: First, we identified a list of goods and services based on previous empirical studies, that is, a list of goods and services developed by various International City/County Management Association (ICMA) surveys on local governments' contracting-out decisions and the empirical studies conducted by Brown and Potoski (2003). Second, we identified the types of goods and services in each agreement that closely match the list. From each agreement, we identified 14 major types of goods and services related to public safety. Third, we categorized our list of goods and services against Brown and Potoski's classifications and then determined whether they demonstrated high asset specificity or high service-measurability problems. The characterization of goods and services covers a range of overlapping activities.

The analysis is limited to contractual arrangements in the Orlando–Kissimmee metropolitan area, which consists of Lake, Osceola, Orange, and Seminole counties. The types of contractual arrangements vary from interlocal service agreements to contract and lease agreements, from memoranda of understanding and mutual-aid agreements to an informal "gentlemen's handshake" and letters of agreement. The categories of goods and services included in the agreements are summarized and presented in Table 1.

Although studying a single metropolitan area has its limitations for generalization, there are several advantages. It controls for geographical variation and provides an opportunity to study regional integration in-depth. For instance, given the geographical position of Orlando–Kissimmee, the area typically received an influx of evacuees from the coastal regions during disasters and attracted criminal activities such as international drug-trafficking and money-laundering organizations. Regional governance in the Orlando–Kissimmee metropolitan statistical area (MSA) is also highly fragmented. Besides specialized local agencies, law enforcement activities in the region also involved multiple state agencies (such as Florida's

Table 1
Characteristics of Goods and Services, but Categories and Number of Agreements

High Service Measurability	High Asset Specificity
Mutual assistant/disaster relief (64)	Police/Fire/EMS communications (22)
Fire protection/prevention (5)	Educational/training programs (15)
Planning/standard procedures (21)	Emergency medical services (4)
Technical studies/assistants (6)	Prisons/jails (0)
Operation of building/shelters (26)	Vehicle fleet maintenance (1)
	Law enforcement/police patrol (11)
	Crime prevention/investigation (8)
	Licensing equipment/software (0)
	Billing and financial transfers (25)

Division of Emergency Management, the Florida Department of Law Enforcement, and the Florida Highway Patrol) and federal government agencies before the formation of the Department of Homeland Security (such as the U.S. Secret Service, U.S. Food and Drug Administration, and U.S. Customs Service).[2] As reported by Orange County's Interlocal Agreement Report, local governments also established agreements with regional authorities and special districts (such as the Greater Orlando Aviation Authority and independent school districts).

To examine the pattern of contractual ties across time, the time periods were selected based on criteria that reflect nondrastic changes in the number of ties over time:[3] t_1 = 1986–1989, t_2 = 1990–1993, t_3 = 1994–1997, t_4 = 1998–2000, and t_5 = 2001–2003. These time periods also reflect major events in Florida, such as Hurricane Andrew in 1992, and national events such as the New York and the Pentagon terrorist attacks in 2001. In the mid-1980s, the state introduced the Growth Management Act, which "had a significant impact" on interlocal coordination, that is, agreements related to mutually maintained traffic corridors, police and fire protections, and mitigation strategies (FLCIR 2001).

Because there were several ways local governments could extend their agreements over time, the observation periods were coded according to (1) the moment local governments entered into an agreement, (2) the moment they dissolved or terminated an agreement, and (3) the length of time they extended or maintained joint agreement. Information on contractual ties was then transformed into square matrices at five points in time with four observation moments. The changes in contractual ties for the pooled data set are summarized in Table 2, which summarizes the changes of ties as time

Table 2
Contractual Tie Changes Between Subsequent Observations

	No Tie 0→0	New Tie 0→1	Broken Tie 1→0	Maintained Tie 1→1
Activities with measurability difficulties				
$t_1 - t_2$	2,130	7	2	9
$t_2 - t_3$	2,116	16	7	23
$t_3 - t_4$	2,106	17	13	30
$t_4 - t_5$	2,088	31	20	6
Activities with asset-specificity transactions				
$t_1 - t_2$	2,128	5	2	10
$t_2 - t_3$	2,122	8	9	6
$t_3 - t_4$	2,119	12	8	6
$t_4 - t_5$	2,101	26	13	5

progresses (0s → 1s and 1s→ 0s), the continuation of existing ties (1s→1s), and absence of a contractual tie during the same periods (0s→0s).

Simply counting the number of changes in the structures for each observation period would not account for such changes because local actors could also establish random links with other actors in the network. As the number of actors in a network gets larger, the number of possible ties also increases dramatically (Steglich et al. 2006). The question, then, is why the observed ties that formed a network structure emerged from the rather larger set of other possible ties (Snijder 2005; Steglich et al. 2006).

Formulating Network Effects

Following the basic network analysis approach, a network space for Orlando–Kissimmee metropolitan area can be represented as a square matrix reporting contractual arrangements among 66 actors. The entry *i, j* equals 0 if actor *i* has no contractual ties with actor *j*, and it can equal 1 to indicate the presence of contractual relationships. The matrix focuses on the mutual dependence between multiple bilateral agreements. Each measure of network structure corresponds to the network space that contains the number of possible ties. This was conducted using the SIENA software, which estimates models of network evolution based on what Snijders (2005) calls the "actor-oriented model" (see appendix).

To test whether the bonding or bridging hypothesis can explain the general patterns of regional integration and the association of these patterns with particular kinds of goods and services, we use the "transitivity triad effect" and the "number of distance two effect" (Snijders et al. 2007). These network effects represent aspects of the hypothesized network structures and are the functions expected to affect the formation of contractual ties regionally.

Transitivity triad effect. The transitive triad effect is defined formally as $s_{i1}(x) = \sum_{j<h} x_{ij}\, x_{jh}\, x_{hi}$. The equation captures the preference for being part of cohesive subgroups and measures the total number of triplet relationships, that is, a preference for actor i to enter into agreements with the partners of its partners (Figure 1). According to the bonding hypothesis, in transactions in which the outcomes of activities are difficult to measure, the effect will be positive and larger than other network effects. The positive coefficient parameter in relation to the other structural effects would suggest that local governments share similar behavioral expectations to resolve risks of shirking and reap the advantages of resource accumulation.

Number of geodesic distance-2 effects. The number of distance-2 effects captures the preference of actors to establish indirect contractual ties through an intermediary actor. The network measure is denoted by $s_{i2}(x) = \#\{jx_{ij} = 0, \max(x_{ih}\, x_{hj}) > 0\}$. The network effect emphasizes nonredundancy links in that actors i and j will be indirectly connected through actor h at a sociometric distance-2. According to the bridging hypothesis, the effect will be large and positive in relation to other network effects in activities with high asset-specificity characteristics (Figure 2). The parameter estimate suggests that local governments are more likely to choose their contracting partners strategically and take advantage of market competition to curb the problems of opportunistic behaviors caused by "contractual trap" or "lock-up."

Covariate effects. Two actor-dependent covariate effects are included in the model: (1) the importance of level of government, in which municipality is coded as 1 whereas higher-level governments are treated as the benchmark, and (2) the importance of professionalism, which is indicated by accreditation of the law enforcement agency (i.e., by the Commission on Accreditation for Law Enforcement Agencies, Inc., [CALEA]). Both variables have been coded as dummy variables and treated as control variables.

Homophily effect. The homophily hypothesis argues that local governments will establish contractual ties with similar others. But the theoretical and empirical evidence in the field has been mixed (Dye et al. 1963; Schneider 1987; Andrew 2007). Based on the homophily hypothesis, we test whether (1) contractual ties are more likely to be formed among local governments rather than with other forms of political institutions, such as counties, states, or federal government, and (2) whether contractual ties are likely to be established among local governments whose law enforcement agencies are accredited by CALEA. While the former tests for homophily effects among political units, the latter evaluates the homophily effects among professionalized law enforcement agencies. A negative parameter would suggest a preference to enter into contract with dissimilar others and an indicator of diversity and expansion of cooperation.

Results and Analysis

The final results of estimation are presented in Table 3. The rate parameters (rho) are all positive and significant, which indicates the formation of contractual ties that underwent a reasonable number of small changes to come up with a global dynamic that resembles the observed network (under the current model specification). The convergence diagnosis produced *t*-statistics less than 0.3, indicating no convergence problems (Snijders et al. 2007). Models 1 and 3 in Table 3 show the results of the baseline models. The parameter estimated for degree in the network objective function is negative, which is always the case in empirical application using SIENA (Steglich, Snijders, and West 2006). The negative sign suggests that the existence of a tie with another actor is costly unless other network properties can compensate for these costs.

The rest of this section compares the results of two separate network spaces—that is, activities with service measurability (Model 2) and asset-specificity problems (Model 4)—by first interpreting the effects of network structures followed by the control variables.

In Model 2, the formation of contractual ties for activities with service-measurability problems has a higher parameter estimate for the bonding effect ($\beta = 0.590$) than for the bridging effect ($\beta = 0.333$). Both parameter estimates are positive and statistically significant. The fact that the bonding effect is positive and greater than the bridging effect suggests a dense structure is driven by the greater attraction for a locality to establish ties with other local governments that have already established ties with each

Table 3
Parameter Estimates and Standard Errors

	Activities with Measurability Problems		Activities with Asset-Specificity Transactions	
	Model 1	Model 2	Model 3	Model 4
Rate Parameter (rho) $t_{1,2}$	0.783***	0.833***	0.5392***	0.537***
	(0.288)	(0.313)	(0.215)	(0.217)
Rate Parameter (rho) $t_{2,3}$	2.229***	2.589***	1.474***	1.507***
	(0.646)	(0.795)	(0.412)	(0.478)
Rate Parameter (rho) $t_{3,4}$	2.526***	2.963***	1.807***	1.875***
	(0.596)	(0.743)	(0.521)	(0.536)
Rate Parameter (rho) $t_{4,5}$	5.783***	7.679***	5.486***	5.829***
	(1.635)	(3.335)	(2.113)	(2.309)
Network structure effects:				
Degree	–1.687***	–1.840***	–1.765***	–1.941***
	(0.095)	(0.103)	(0.102)	(0.130)
Bonding	0.712***	0.590**	–1.423***	–1.507***
	(0.238)	(0.193)	(0.024)	(0.022)
Bridging	0.368***	0.333***	0.478***	0.493***
	(0.055)	(0.072)	(0.092)	(0.094)
Constant covariate effects:				
Municipal government	—	1.517	—	0.959
		(0.918)		(0.531)
Accredited law enforcement agency	—	0.343	—	0.356
		(0.184)		(0.215)
Homophily effects:				
Municipal government similarity	—	–0.724	—	–0.734*
		(0.624)		(0.363)
Accredited law enforcement agency similarity	—	0.373**	—	0.814**
		(0.164)		(0.319)

Note: Standard errors within parentheses.
*$p < .05$; **$p < .01$; ***$p < .001$.

other. The interpretation of the parameter estimates is somewhat complex because both coefficients must be adjusted to account for the costs of contracting, that is, the degree or number of ties established by localities (Snijders et al. 2007).

For example, in activities with service-measurability problems, the coefficient for the degree effect is negative and significant, which reflects the costs of establishing and maintaining a contractual tie ($\beta = –1.840$). Simply entering into an agreement with another agency does not necessarily produce benefits; other structural effects may be necessary to minimize the

basic costs of contracting. Following the calculations presented by Snijders, the objective function for the contractual ties is illustrated below:

$$f_i(x) = \sum_j (-1.840\, x_{ij} + 0.590\, x_{ij}\, x_{jh}\, x_{hi} + 0.333 \max_h (x_{ih}\, x_{hj})).$$

The objective function can be substantively interpreted as follows. Let us take Figure 1 as an example: Taking into account the bridging effect with the baseline value of –1.840, City A would yield a 0.590 utility if it were to establish a contractual tie with City D (on condition that City D agreed to the proposed new tie). If City A were to consider contractual relations with an isolated city, say City B, and City B agreed, then City A would receive benefits of only 0.333. However, establishing contractual ties is not costless. Given the objective function above, the cost to a locality that enters into a contract is –0.840. Thus, establishing a contractual relation that forms either network structure would not be sufficient to offset the contracting cost. If this is the case, how can we tell which localized network effect is more important in explaining the dynamic process of observed contractual ties?

Table 4 shows how the coefficients of network structures from Table 3 are used to calculate the costs of contracting. One possible explanation is this: If City A were to consider whether to enter into an agreement either with City B or City D, the objective function suggests that City A would prefer City D because the cost of contracting for both parties is less than the cost of an agreement with City B (–2.757 and –3.014, respectively). What the analysis shows is that the dynamics of contractual ties for activities with service-measurability problems continue to favor densely connected ties to minimize the initial costs of contracting.

In Model 4 of Table 3, the objective function for activities with asset-specificity is illustrated as follows:

$$f_i(x) = \sum_j (-1.941\, x_{ij} + 1.507\, x_{ij}\, x_{jh}\, x_{hi} + 0.493 \max_h (x_{ih}\, x_{hj})).$$

The dynamic process of contractual ties in the presence of high asset-specificity transactions can be explained by the importance of competition and partner selection. For instance, the results show a positive parameter estimate for the bridging effect ($\beta = 0.493$) compared to the negative bonding effect ($\beta = -1.507$); both estimates are statistically significant. Based on Table 4 results, the costs of establishing a contractual tie with City D (–4.896) will be greater than establishing a contractual tie with City B (–2.896) but not sufficient to offset the initial contracting costs of –1.448. The results

Table 4
Costs to City A when Considering a Contracting Partner

	Number of Network Structures			
	Degree	Bonding	Bridging	Contracting Costs
Initial network space for City A: activities with service-measurability problems	1	0	1	–1.507
Tie with City B	2	0	2	–3.014
Tie with City D	2	1	1	–2.757
Initial network space for City A: activities with asset-specificity transactions	1	0	1	–1.448
Tie with City B	2	0	2	–2.896
Tie with City D	2	1	1	–4.896

Note: The results in this table show how the coefficients of network structures from Table 3 are used to calculate the cost of contracting. The estimated cost is calculated from the objective functions and then applied to a scenario presented in Figures 1 and 2 (in main text). Here, City A is presented with an option to consider an agreement either with City D or City B. In each case, the additional cost of entering into a new contractual tie with either city is subtracted from the benefits. For instance, in the contract networks with measurability problems, the initial cost of contracting to City A is $-1.840(1) + 0.590(0) + 0.333(1) = -1.507$, while in activities having asset-specificity problems, the initial cost of contracting is $-1.941(1) - 1.507(0) + 0.493(1) = -1.448$.

suggest that local actors, given the choice of contracting partners, prefer to establish indirect ties through an intermediary actor to reduce the costs of contracting. In asset-specificity transactions, a contractual tie between City A and City D produces larger negative utility and can be regarded as highly undesirable.

Two actor-dependent covariate effects were included in Models 2 and 4. Although we hypothesized that municipal governments might have an effect on the formation of contractual ties, there is no evidence to support this assertion. For instance, the effect of political institutions (e.g., municipal government) on the formation of contractual ties moves in the anticipated direction but yields no statistical significance. A similar conclusion can be reached with the importance of professionalism as indicated by law enforcement agency accreditation by CALEA.

The empirical findings for homophily hypotheses produced mixed results. On one hand, contractual ties are likely to be established among local governments whose law enforcement agencies are accredited by

CALEA, and on the other hand, they are less likely to be formed among municipal governments. While the former is supported by the empirical finding for both types of activities ($\beta = 0.373$ for activities with measurability problems and $\beta = 0.814$ for asset-specificity transactions), the latter is only supported for asset-specificity transactions ($\beta = -0.734$). In the current analysis, it is difficult to determine with whom municipal governments would establish contracts; nevertheless, we can conclude that municipal governments are less likely to direct activities with asset-specificity transactions with other municipalities. Based on this result and earlier theoretical arguments, we find that municipal governments tend to establish ties with county governments to reduce the administrative costs of having to deal directly with state and federal governments' requirements.

Discussion and Conclusion

Regional integration manifests itself in many forms, so it is critical to understand the dilemmas local governments encountered when attempting to cooperate. Depending upon the goods and services to be shared or delivered, the dilemmas arise given local government actors' choice of actions (i.e., whether to enter into agreement or not) and their partner choice (i.e., with whom to establish contractual ties). When examined in this light, regional integration is revealed as an evolving process. Decisions about entering into a contract are predicated on the success of previous interactions, the behavior of current partners, and expectations for the future.

Our findings highlight two general implications to understand institutional collective-action dilemmas: First, regional integration based on self-organizing governance suggests the importance of preferential attachment, and second, generalization about self-organizing structure must be carefully qualified, as the formation depends on the transactional cost of goods and services.

In a highly fragmented metropolitan area such as the Orlando–Kissimmee MSA, law enforcement agencies interacted preferentially through agreements with other agencies at multiple levels. Such interactions created a self-enforcing cluster of contractual ties as a means of reinforcing cooperative behaviors. This appears to be supported by the pattern of contractual ties in activities that are complex and outcomes that are not easily determined in advance (such as mitigation planning and evacuation exercises, first-responder agreements, and emergency and mutual-aid agreements).

Local agencies operating in a highly connected structure can enhance localized regional integration in spite of the apparent temptation to shirk.

Aside from associational benefits such as reputation, interpersonal knowledge, and institutional norms, there are several practical advantages to a highly clustered network. Law enforcement agencies can share technical resources and coordinate complex activities according to local policy preferences. Through informal communication and availability of shared resources, they can increase the region's capacities to cope with emergency. The direct value of contractual ties, according to Nicholson (2007, 246), is that they "multiply available resources."

However, law enforcement agencies tend to avoid having clustered structure in activities with asset-specific transactions. Exclusion through a central actor is advantageous in the sense that it expands rather than localizes regional integration. Although sparsely connected ties are often viewed negatively, they are desirable in asset-specific transactions because specialization and the advantages of competition make the avoidance of duplication and redundancy especially important. For example, routine activities such as standard police patrol, educational programs, enforcement of sanitation and licensing regulations, special investigation units, and task forces require formal agreements among a range of specialized law enforcement agencies, from state and federal governments to regional authorities and special districts. Competition and specialization encourage entrepreneurial behaviors in the sense that local governments must diversify their contracting partners that are dissimilar to themselves.

However, the evidence also suggests that regional integration can be influenced by local government preferences to establish ties with similar localities that have accredited law enforcement agencies. In fact, this phenomenon occurs in both types of transactions. Although the homophily hypothesis is supported, the analysis did not account for the time periods in which local law enforcement agencies were awarded their accreditation. Consequently, it is difficult to determine whether local government preferences to enter into contracts with similar accredited agencies occurred because of a high level of professionalism or whether the professionalism was a result of cooperation. Hypotheses about the role of homophily require further investigation.

Scholars in urban studies have speculated for years on the importance of networks but have fallen short in predicting the types of structures that are likely to emerge (Thurmaier and Wood 2002). This study is an attempt to test two general hypotheses, bonding and bridging, according to the ICA framework and draw implications about the type of control mechanisms

that can enhance a particular configuration of ties, and thus, regional integration. But the study is limited in a number of respects. The ICA framework can be extended conceptually and empirically by refining the classification of goods and services, focusing on multilateral agreements as well as the geographical proximity of localities.

Another direction of future research is the question of whether local government's choice of contract partners in one service area influences the choice of contract partners in other service areas. Interdependency has the potential to reduce the likelihood and magnitude of conflicts across the metropolitan area, and thus, produce an integrated governance structure (Feiock and Scholz n.d.). Another important question is how the evolutionary process of partner selection influences performance. Performance and choice of contracting partners are interrelated in the sense that the success in implementing contracts in one activity depends upon the success of another. Interdependency would entail high transaction costs if parties to the agreement were to act opportunistically, leading to disruptions of exchanges that are costly to all. How contractual ties are purposely developed across multiple service areas as a deterrent to opportunistic behaviors is not well understood, and therefore, is worthy of future research.

We have only considered simple behavioral rules influencing the formation of regional integration—local governments either enter into agreements or they do not. Our description of the formation of regional integration is equally simplistic with only two network structure effects. However, these parsimonious models of regional integration generate considerable complexity. While our results provide interesting findings on the formation of contractual ties according to the transaction costs that are mediated through different types of goods and services, the results also highlight new and counterintuitive consequences to studying institutional collective action: Contractual ties are not merely ad hoc or piecemeal arrangements, since they have implications for local governments' future actions and inactions.

Appendix

Actor-oriented Model

According to the "actor-oriented" model, "the objective function of actor *i* is the value attached by this actor to the network configuration **x**" (Snijders 2005, 15). For a nondirected network, a unilateral initiative and reciprocal confirmation model comes close to the analysis we have in mind. This model implies that mutual agreement

(continued)

Appendix (continued)

between two actors is required for a contractual tie to exist. It is comparable to the rate function in a directed model (Snijders et al. 2007). Given a particular configuration of ties $\boldsymbol{x}$, actors i and j can consider jointly whether to establish or terminate their ties. This change may depend upon the rate at which each actor gets the opportunity for changing its ties (Snijders 2005).

Following Snijders (2005, 19), the objective function for actor i is represented as a weighted sum dependent on a parameter $\beta = (\beta_1, \ldots, \beta_L)$,

$$f_i(\beta, x) = \sum_{k=1}^{L} \beta_k s_{ik}(x)$$

The weights β_k are statistical parameters indicating the strength of the corresponding network effect $s_{ik}(\boldsymbol{x})$, controlling for all other effects in the model. The models estimated the factors that can explain the changes in contractual ties—the frequency at which an actor has the opportunity to make a decision during a period of time (Steglich, Snijders, and West 2006).

While individual network effects in the model suggest tendencies for actors to enter into contractual ties, SIENA can also test the homophily hypothesis by creating a "covariate-related similarity" measure. The measure has higher values when the similarity of the attribute between actor i and its counterparts grows:

$$x_{ij}(\mathrm{sim}^{v}_{ij} - \mathrm{sim}^{v}),$$

where v is the variable in question, x_{ij} represents the existence of the link between i and j, sim^{v}_{ij} is the similarity in the value of the variable between i and j on a 0–1 scale, and sim^{v} is the mean of all similarity scores.

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, contributes to the network-autocorrelation of that variable.

SIENA estimates the model based on a method of moment, implemented as a continuous-time Markov chain Monte Carlo simulation (MCMC) (Snijders 2005; Snijders et al. 2007; Steglich, Snijders, and West 2006). A three-phase stochastic approximation algorithm is used to approximate the solution of the moment equation. The first of these phases calculates a covariance matrix for the estimation algorithm. Phase two simulates the choice process based on the starting values, compares the resultant simulated network with the observed second period network, and adjusts values to reduce differences between the observed and the simulated data. The third and last phase uses simulations to determine the frequency distribution of errors in prediction, which then are used to calculate the standard errors for the final parameter values. The program simulates the process 1,000 times by default.

Notes

1. In 2002, the Florida Legislature established a requirement for all counties with populations of more than 100,000, and the municipalities and special districts within those counties, to submit an inventory of their existing and proposed interlocal service delivery agreements. The various reports contained information related to (1) the types of agreements, (2) the effective date and expiration dates of the agreements, (3) the number and composition of actors involved, and (4) the nature of goods and services being rendered.

2. In March 2003, the U.S. Customs Service became the U.S. Customs and Border Protection, an agency of the Department of Homeland Security.

3. SIENA does not require constant length for time units.

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Simon A. Andrew is an assistant professor at the Department of Public Administration, University of North Texas. His work focuses on local governance, intergovernmental and interorganizational service collaboration, and policy network analysis. This research is partly funded by the Paul Volcker Scholar Junior Scholar Research Grant and the DeVoe L. Moore Center.