The Roles of Utility Districts and Institutional Embeddedness in Regional Partnerships for Climate Change Mitigation

Jayce L. Farmer
University of Nevada, Las Vegas
Jayce.Farmer@unlv.edu

Regional collaboration to address problems surrounding climate change is becoming a vital part of local government endeavors. While a growing body of research is beginning to document how coordinated governance can be used to promote environmental and climate protection policies there is still limited research that explores the roles of utility districts and multiplex policy exchanges for sustainability actions. This study applies the institutional collective action framework to explore the influences of water utility districts and repeated regional engagements for sustainability policies on municipal choices to engage in regional partnerships for climate change mitigation. An analysis of U.S. cities reveals a positive connection between utility districts and regional partnerships around climate change. Likewise, repeated policy interactions were also found to be connected to municipal choices to engage in regional policy endeavors. The results suggest that utility districts can potentially serve as centralized organizations that can facilitate interlocal collaborative efforts. The findings also speak to the importance of institutional embeddedness and its facilitation of collaborative endeavors solidified through norms of reciprocity.

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Questions of how and why local jurisdictions govern the commons have brought increased attention to the issue of fragmented institutions self-organizing to minimize common-pooled resource problems (Ostrom 1990; Feiock 2013; Feiock & Scholz 2010). Distinctive among these problems lies climate protection where local governments are faced with finding strategies to reverse or slow global warming driven by human emissions of greenhouse gases. Because regional urban systems are connected geographically, they consist of transboundary flows through networks of people and trade (Ramasawmi et al. 2018). Therefore, decisions derived through systems that are governmentally fragmented can produce collective action dilemmas as the actions of one independent jurisdiction can result in adverse policy outcomes for others (Feiock 2013).

Climate change can be framed as a collective action problem, as the actions or in-actions of one jurisdiction can have adverse impacts on others. A growing body of scholarship has examined collective action responses to climate change, environmental protection and other sustainability issues (Feiock & Sholz 2010; Yi et al. 2018; Jung 2017; Yi, Feiock & Berry 2017; Youm & Feiock 2019). However, little work has been done that makes a direct connection to the roles of utility districts, while also examining the importance of institutional embeddedness for policy issues in the facilitation of regional collective action endeavors for climate change. We address this research gap by asking: what are the factors that facilitate ICA efforts for climate change mitigation?

Using the institutional collective action (ICA) framework, we explore this question by taking a systematic approach to exploring factors that facilitate collaborative endeavors to reduce

climate change. First, there are over 5,550 special districts designated as utility providers throughout the United States (Census 2017). Of these districts, roughly 3,553 engage in public water utility operations. Public utility providers can be incentivized to facilitate regional sustainability endeavors (Homsy & Warner 2020; Homsy 2015; Curley et al. 2021). As special districts, they can serve as essential central actors that facilitate collaborative relations among fragmented units (Feiock 2013). Second, research has also found that patterns of repeated exchanges can encourage regional collaboration efforts (Andrew 2009; Thurmaier & Wood 2002; Kwon, Feiock & Bae 2012). Jurisdictions involved in a series of repeated interactions can bond to create a multiplex process of cross policy interactions. Here, trust prompted by institutional embeddedness has been shown to be vital for enabling cooperation between individual local governments.

In light of these two concepts, we investigate factors that might enable cities to participate in regional partnership efforts for climate change mitigation. Using a 2015 survey of 1,124 U.S. cities, this research examines whether utility districts and trust developed through cross-policy interactions facilitate institutional collective action for climate mitigation. The following sections explore this issue within the context of the ICA framework to articulate how these factors can encourage regional collaboration. The findings suggest that ICA can be best facilitated through institutional embeddedness arising through cross-policy interactions. Meanwhile, utility districts had a slightly lesser effect as central actors, but still suggest some importance for facilitating collaborative environmental protection efforts. These results provide theoretical and practical insight for regional partnerships designed to address environmental sustainability.

Theoretical Framework of Institutional Collective Action

The ICA framework provides a conceptual system to understand collective action dilemmas that permeate urban societies (Feiock 2013). Fragmented local units can produce market failures (Ostrom, Bish & Ostrom 1988; McGinnis 1999; Oakerson & Parks 2011) and policy inefficiencies (Feiock 2013; Lubell, Feiock & Ramirez de la Cruz 2005) as the policy choices of one entity can lead to externalities and common resource problems for others. Questions regarding why participants may choose to act collectively can be approached through a lens of incentives that magnifies the importance of costs versus the benefits. The gains of mitigating ICA dilemmas can come at a considerable cost to participants (Feiock and Scholz 2010). Self-organizing requires compromise regarding the division of benefits and costs as the short-term incentives of individual actions can override the gains of acting collectively. In short, transaction costs problems can arise that can create barriers to ICA efforts.

ICA theory proposes that jurisdictions can overcome this conundrum with the use of various mechanisms that can handle the transaction costs associated with acting collectively. For example, costly problems that incentivize participants to deviate from agreements will require institutional mechanisms of collaboration that provide stricter agreement monitoring with less autonomy for individual actors. Problems with greater complexity may require more formalized mechanisms of ICA, while less involved issues can be handled with less formal policy networks that provide individuals with greater autonomy (Feiock 2013; Feiock and Scholz 2010). For single issue problems like climate change, where issues can be addressed on a more voluntary basis, institutional collaboration can be handled by constructed networks and partnerships. Such collaborations can arise when centralized third parties such as special districts or higher-level governments facilitate relationships between participants by providing funds or incentives for actors to participate in exchanges (Feiock 2013; Mullin 2010). Problems of this nature can also

be addressed through embedded relations where actors' coordination efforts are enforced through intertwining networks of social, political and economic relationships (Feiock 2013). While the concept of ICA encompasses a variety of mechanisms designed to address various issues dependent upon their nature, scope and transaction costs, this essay focuses on the single-issue climate mitigation problem and explores the importance of centralized organizations and embedded relations in the facilitation ICA. Using this framework, we propose that centralized organizations such as utility districts and embedded cross-policy interactions between institutions can facilitate regionally coordinated activities for climate change mitigation.

Special Districts as Centralized Organizations

Even though work in the area of public owned utilities is gaining traction (Curley et al. 2021; Homsy & Warner 2020; Switzer, Wang & Hirschvogel 2020; Homsy 2015), work that focuses specifically on utility serving special districts is sparse. Special districts are often overlooked in government studies, but collectively consist of the largest number of local governments throughout the United States. Special districts or as they are often referred to as special purpose governments are local governments with specific functions and limited powers. Like general purpose governments (counties, towns and cities), these governments frequently have the ability to levy taxes, impose fees to the public and accumulate public sources of debt. However, special districts are primarily used to fill service gaps as they are created to provide a narrow scope of services that are not adequately provided by general purpose governments (Goodman & Leland 2019; Farmer 2010). Utility districts, like other special districts serve as local government units whose sole purpose is to produce and or provide a singular or a small range of utility services.

As centralized facilitators of collective action, regional and special districts have been found to positively influence collaboration. For example, Kwon, Feiock & Bae (2012) found regional organizations to be influential in sparking interlocal collaboration. Their examination revealed that regional organizations can reduce transaction costs for local governments and serve as influential tools that inform self-organizing cooperation efforts. Rodrigues, Tavares and Araújo (2012) also found evidence that inter-municipal corporations were useful for absorbing the transaction costs of interlocal collaboration efforts for Portuguese local governments. Single-purpose special districts that emphasize water utility services have been shown to engage in interlocal cooperation when faced with less stringency from state laws (Mullin 2010). Similarly, Farmer (2010) and Carr and Farmer (2011) found special districts to be key for absorbing transaction costs borne by local governments in the provision of regional services. These governmental units can internalize unconsidered impacts over a broad geographic area for specific service functions in a way that is less obtrusive than general purpose government consolidation (Feiock 2013).

Fragmented organizations will seek to forge relationships with other more centralized organizations to gain access to support and resources. Local actors seek to establish central ties to reduce the cost of brokering and monitoring multiple agreement, as well as gain access to outside ties and other resources (Andrew 2009). Works examining institutional arrangements have found that local governments are more likely to seek support from central actors such as county or state governments that can easily mobilize and mediate intergovernmental resources, information and human capital (Jung et al. 2018; Andrew 2009). Entrepreneurial behavior may motivate organizations to seek others that are sparsely connected to other actors and who can better absorb the costs of coordinating policy actions. Public utilities can be equipped with the

fiscal and technical capacity to absorb the transaction costs associated with the coordination of highly asset specific policies (Homsy 2016). Because public utilities can have a vested interest in environmental protection and climate change, they can also be fiscally and administratively motivated to promote policy actions (Kousky and Schneider 2003; Homsy 2016; Homsy and Warner 2020). With their resource capacity and policy incentives, public utilities have been found to have the adequate infrastructure to facilitate municipal cooperation and enhance the adoption of municipal sustainability policies (Curely et al. 2021; Homsy 2016).

Hypotheses 1: Cities with a water utility district within their counties will more likely engage in regional collaboration activities for climate change mitigation.

Institutional Embeddedness of Local Actors

We propose that a network of embedded social and policy relations among local units will facilitate ICA endeavors for climate change mitigation. Studies on institutional and organizational interactions have been increasingly informed by theories of social embeddedness (Feiock 2013; Andrew 2009; Putnam 1993; Axelrod 1984, Granovetter 1973). In this light, collaborative relationships are thought to be embedded in a larger network of economic, political, and social relationships (Andrew 2009). Because local government agreements often overlap activities, functions and agencies, norms of reciprocity can develop that predominates economic rationales for exchanges (Thurmaier and Wood 2002). If agreements are embedded in a system of multiple exchanges to addresses common problems, the risk of opportunistic behavior can be minimized, creating an interconnected set of preference alignments (Andrew 2009).

Multiple interactions within a dyad "signify more trust and, therefore greater chances for future exchanges" (Feiock 2013, 403). Cross-policy interactions can not only provide more

assurance between parties within agreements but provide conduits for additional agreements to address other related policy issues. General patterns of policy integration can lead to ties within complex systems at a macro-level, where exchanges are coordinated across multiple policies and functional areas (Feiock 2013). Coordination costs can be reduced as pre-established commitments with familiar partners can bring smoother resource mobilization and communication, that would otherwise be distorted (Jung et al. 2019). Direct and familiar ties provide stronger commitments that reduce the risk of defection brought forth by uncertainties regarding the outcomes of agreements.

Empirical works focusing on this issue have found multiple and repeated institutional interactions to be key for prompting local government collaboration (Andrew 2009; Thurmaier & Wood 2002; Olberding 2002). For example, Jung, Song and Park (2019) found that collaboration between familiar partners can reduce coordination costs and allow them to better mobilize collective action efforts. Andrew's (2009) assessment of local government collaborations revealed local jurisdictions to prefer common partners to provide ease in the negotiation and facilitation of information and resource exchanges. Carr, LeRoux and Shrestha (2009) demonstrated the importance of institutional social embeddedness in intergovernmental collaborative approaches to service production. Shrestha and Feiock (2009) illustrated that multiple service relationships and patterns of repeated interactions can lead to cross-policy reciprocity networks that enhance the credibility of interlocal service contracts. Other empirical works also revealed the importance of norms and trust for increasing the number and scope of interlocal cooperative activities (LeRoux, Brandenburger & Pandey 2010; Lubell et al. 2002; Lackey, Freshwater & Rupasingha 2002). Therefore, we expect that regional partnerships to

mitigate climate change will be enhanced by cross-policy interactions for other sustainability policies.

Hypothesis 2: Cities engaged in more regional collaboration activities for sustainability efforts will more likely engage in regional collaboration activities for climate change mitigation.

Data and Methods

Data and Dependent Variable

Data were drawn primarily from survey responses on regional collaborative sustainability efforts found within the International City/County Management Association (ICMA) 2015 *Survey on Local Government Sustainability Policies and Programs*. The survey was originally sent to 8,562 U.S. city and county governments with populations over 2,500. The survey response rate was 22.2%, with 1,899 local governments responding. The sample for this study consists of cities drawn from this survey and reporting financial data within the U.S. Census historical estimates for 2012 (Census Bureau 2015). This produced a sample size of 1,124 cities across 48 states.

The use of ICMA survey data may lend towards possible biased responses regarding institutional arrangements, population sizes and geographies of urban divisions. The majority of responses for this sample came from smaller jurisdictions that reside within the southeastern and midwestern regions and operate under the council-manager form of government. Additionally, this study's data were drawn from municipalities that self-reported their own sustainability activities. Urban sustainability actions are executed irregularly (Svara, Watt and Jang 2013). Therefore, cities generally have low levels of policy adoption for sustainability endeavors. The dependent variable is measured as a dichotomous indicator denoting whether a municipality engaged in a regional partnership for climate change mitigation actions. The dependent variable

is operated as 1, denoting "yes" for regional partnerships for climate change mitigation, and 0 otherwise.

As indicated in Table 1, only 16% of respondents indicated that they participated in a regional partnership for climate change mitigation. The two-sample T-test for proportions reveals a statistically significant difference between respondents answering "yes" and "no." The Shapiro-Wilk W test for normality is statistically significant, which means that we must reject the null hypothesis that the data are normally distributed. The data distribution and the low proportion of respondents reporting participation in regional partnerships for climate change mitigation both speak to our point above regarding the generally low and irregular occurrences of local government sustainability activities (Svara, Watt and Jang 2013). This may also reflect the existence of certain transaction cost barriers that might preclude choices to participate in ICA endeavors (Feiock 2013; Kwon, Bae & Feiock 2012).

Table 1 about here

Model

The dependent variable is evaluated using a mixed effects multilevel modeling technique to assess a data structure that spans across local jurisdictions, state geographic boundaries and U.S. geographic regions. This model allows for mixed effects routines that allow for nested fixed effects, while randomizing the effects across broader levels. Because the data structure consists of nested observations, multilevel modeling is used to account for the lack of independence among cities due to their shared economic, political, and policy attributes within the same state jurisdictions and within the same regional areas (Krause 2011). Consequently, we employ a mixed effects model that fixes the effects within states, while randomizing the effects across

state boundaries and then again across U.S. regions. Because the dependent variable consists of a binary outcome, we use a logit predictive modeling analysis.

Because the theoretical assumptions of our models assess choices to engage in regional partnerships, we incorporate a Bayesian approach that allows for simulated probabilities that estimate the outcomes of actors' decisions. Bayesian models rely on probability statements that use Markov chain Monte Carlo (MCMC) sampling iterations to assess the posterior distribution.[1] This allows evidence within the data to be informed by prior information to empirically approximate predictions. Theoretically, public managers operate in a way where they constantly update their beliefs and strategies based upon acquired information and experiences (Deslatte, Feiock & Wassel 2017; O'Toole & Meier 2014). In this case, the Bayesian approach allows us to generate the probability of the Bernoulli outcomes within our binary dependent variable.

Explanatory Variables

This analysis examines two key factors that impact municipal choices to engage in institutional collective action sustainability endeavors for climate change mitigation. First, this analysis uses *water utility districts in a county* to examine the effects of water utility districts as central actors. Derived from 2012 Census of Government data, this variable is measured with a dichotomous variable indicating whether a city's county area is served by at least one water utility district. While several water districts can exist within a given county area, this variable captures the availability of partners within a region that might have the fiscal and technical capacity (Homsy 2016) to facilitate ICA efforts, while being able to absorb the transaction costs of managing highly asset specific service functions. Likewise, this is not a measure of whether a municipality receives its water from a utility district, but rather whether a centralized actor that is

incentivized to promote sustainability is available to facilitate ICA efforts for climate change mitigation.

Second, this research examines the effects of the cross-policy interactions for collaborative sustainability efforts. We use the variable *regional collaboration efforts* as an additive index for regional partnerships across sustainability policy areas other than climate change mitigation for a city government. The ICMA surveyed municipalities regarding whether they engaged in regional partnerships across twelve designated sustainability related policy areas. For this analysis, we measure the total number of partnerships across sustainability policy areas, while excluding partnerships for climate change mitigation. We use this factor as a mechanism to capture repeated interactions across related policy areas. A higher value in the additive index denotes a city being more institutionally embedded with other partnering local actors for sustainability policy actions. Table 2 displays the specific sustainability policy areas used within our index. It highlights the frequency of collaborative sustainability policy efforts across policy areas and programs. The percentage values within the table display the percent of "yes" versus "no" responses for the individual categories. As shown below, the category of *Roads, public transit/bike-pedestrian* has the highest frequency of collaborative activities with 941 out of 1,124 cities responding yes for this category. Meanwhile *Climate change adaptation* had the lowest responses at 180. The median value (722) of all categories falls between *Storm water* and *Grants*.

Table 2 about here

Our model also incorporates a series of control variables that account for the effects of municipal utility capacity, intergovernmental impacts, fiscal capacity, institutional arrangements, socio-economic attributes, and geographic variations. We measure whether a city owns its own

water utility to capture its technical and fiscal capacity for utility services. For interlocal effects, we capture the per capita revenue generated from interlocal transfers from other local governments. Fiscal capacity is measured by a city's per capita revenue generated from municipal property and general sales taxes. Meanwhile socio-economic attributes are captured by the log of a city's population, the percent of the population White non-Hispanic, and its median property values. Finally, our models incorporate dummy variables that capture hierarchical variations across state boundaries and U.S. geographic regions. The operations, sources and descriptions of all explanatory variables are reported in Table 3.

Table 3 about here

Results

Tables 4 and 5 report estimates generated by the multilevel logit models.[2] For comparative purposes, Table 4 provides frequentist regression estimates, while Table 5 provides estimates from the Bayesian analysis. The outputs for both tables reveal estimated effects on municipal government choices to engage in regional partnerships for climate change mitigation. All explanatory variables are fixed within states, while allowing for random effects across state boundaries and U.S. geographic regions. The chi-square statistic in Table 4 indicates that the frequentist model as a whole is statistically significant. Table 5 reports the posterior means of the parameter distributions, the Monte Carlo standard errors and credible intervals parameter estimates with a 95% probability. Preliminary models revealed signs of high autocorrelation, which led to the use of 62,500 iterations less 12,500 burn-ins yielding an MCMC sample size of 50,000.[3] This sample size led to a chain sufficient enough to produce stable estimates within the posterior distribution with acceptable credible intervals. The coefficients in Table 4 suggest support for the predicted associations, with both of the key explanatory variables displaying

significant positive relationships with regional partnerships for climate change mitigation. Details for these results are provided in the following sections.

Table 4 about here

Table 5 about here

While the results generated by the regression estimates display interesting effects as suggested in Table 4, conventional outputs such as these can be substantively ambiguous and can provide little insight as to the contextual meanings behind the quantities of interest (King, Tomz & Wittenberg 2000). Therefore, we use the findings from Table 4 to produce post estimation results that provide the predictive marginal values as displayed in Table 6. These results place a special emphasis on the quantities of interest by providing predictive values to provide context behind municipal choices to engage in regional partnerships for climate change. While holding other variables constant, the marginal values illustrate changes in the dependent variable as the explanatory variable is changed from its minimum to its maximum value. Meanwhile, the Bayesian analysis allows us to report clear probabilistic statements about the hypotheses in question. Where the frequentist results from Table 4 rely on ambiguous coefficients meeting a statistical threshold regarding a relational direction, the Bayesian statistics in Table 5 allow us to make practical decisions regarding the sufficiency of evidence. That is, we can make clear predictions regarding the probability that a municipality will engage in a regional partnership while accounting for prior information that may lead to actors updating their choices. Therefore, Table 6 also includes interval hypothesis tests derived from the Bayesian analysis as the primary interpretation of results.[4] The interval hypothesis tests display the probability that the reported parameter means from for the key factors in Table 5 are above or below 0.

Table 6 about here

Central Actors

The regression output in Table 4 suggested a significant positive relationship between the existence of water utility districts and municipal partnerships for regional climate change mitigation endeavors. Relatedly, the marginal values in Table 6 suggest minor differences between municipalities with a water utility district within their counties and those without one when the explanatory variables are held constant. Specifically, when all municipalities are treated as if they reside within counties with water utility districts, the average prediction increases from 11% to 19%. All things being equal, this means that the average city would have a 19% chance of choosing to engage in regional partnerships for climate change if all cities were in the regional proximity of a water utility district. Meanwhile, accounting for the reality that not all cities reside within counties that have a water district, the Bayesian interval hypothesis test reveals that there is a 96% chance that the existence of a water utility district will facilitate choices for regional partnerships on climate change mitigation. This statistic lends support for *Hypothesis 1* in that there is less than a 4% chance of the model parameter falling outside of the credible interval range. That is, there is a high statistical probability that there is a real relationship between water utility districts and choices for municipal regional partnerships for climate change issues. This output suggests that water utility districts are likely to act as centralized organizations that can enable ICA endeavors between regional partners.

Institutional Embeddedness

The regression outputs in Table 4 suggest a significant positive relationship between the cities being more institutionally embedded and municipal choices to engage in regional partnerships for climate change mitigation. Table 6 produced marginal values for institutional embeddedness that suggest a sharp contrast between cities with the maximum number of

regional partnerships across other policy areas and those with no partnerships. When we assume that every city within the model engages in cross-policy partnerships for all 11 sustainability policy areas, the average predictive value goes up from less than .01% to over 55%. In other words, if all cities participated in the maximum number of cross-policy interactions for sustainability, roughly 55.6% would engage in a regional partnership for climate change mitigation. When we use the Bayesian analysis to factor in unknown prior information into the model, we find that there is a 97% probability of institutional embeddedness encouraging regional partnerships for climate change. In the frequentist model, time ordering concerns may exist between the institutional embeddedness variable and regional partnerships for climate change as both variables come from the same survey instrument and were reported at the same time. However, the Bayesian analysis accounts for this with simulations that assume that actors update their preferences as new and random information enters the model. In other words, the Bayesian Metropolis-Hastings sampling algorithms allow us to approximate predictions with informative priors and predict updated outcomes as simulated partnerships are factored into estimates.[5]

Discussion

The findings of this analysis explore two general hypotheses that connect central organizations and institutional embeddedness to ICA actions for regional climate change mitigation. The argument throughout this paper established a link between regional interlocal partnerships and the institutional structures in place that can facilitate these partnerships. In general, the findings suggest that the presence of central actors and embedded policy interactions can facilitate ICA endeavors for sustainability actions. For the current analysis, we connected the

presence of water utility districts and the number of repeated interactions across policy areas with municipal choices to engage in regional partnerships to prevent climate change.

Analyzing utility district involvement and the importance of cross-policy interactions in regional partnerships for climate change mitigation provides an opportunity to better understand the facilitators of ICA. The analysis demonstration how central actors and institutional embeddedness influence municipal choices to engage in interlocal sustainability partnerships. A key result of this analysis suggests that water utility districts can serve as institutional conduits of ICA endeavors. Meanwhile repeated policy exchanges can also lead to increases in regional efforts for sustainability actions. At the very least the findings are consistent with prior works that suggest that the presence of enabling stable institutional structures for exchanges can minimize transaction costs that can serve as obstructive barriers to ICA (Kwon, Feiock & Bae 2012; Youm and Feiock 2012; Carr, LeRoux and Shrestha 2009).

Special Districts as Facilitators of ICA

Water utility districts like other types of regional and single-purpose special districts provide services and resources over a broad geographic area for specialized functions (Feiock 2013). This can give them the technical and fiscal capacity to lend guidance and assistance to local jurisdictions for policy endeavors (Homsy 2016). Utilities are especially equipped to fulfill this role as their professional staff and special revenue generating abilities give them the abilities to not only finance policy endeavors but also provide professional expertise and technical assistance in developing strategies to execute these endeavors. The findings as illustrated above suggest that water utility districts can be key for facilitating regional partnerships. This makes sense as special districts can often serve as centralized entities that can link individual units together to engage in joint ventures (Foster 1997; Feiock 2013). These entities can reduce

transaction costs by providing stability for jurisdictions facing uncertainty that may be driven to avoid investing their own resources by seeking ties with others outside of their immediate networks.

The evidence presented here not only speaks to the importance of recognizing special districts as facilitators of ICA, but also as local government actors that can have a vested interest in facilitating collective action policy outcomes. Special districts can be viewed as alternative solutions to collective action problems, especially when jurisdictions are haunted by uncertainty. In this sense, special purpose governments can be viewed as independent third parties with specific functions designated to fit as a piece of the regional puzzle. With their own governing boards, and taxing authorities, special districts have the ability to maintain political neutrality as well as generate revenue through the region's tax base (Foster, 1997). Continually, these specified governments have the ability to provide sensitive and essential common-pooled services that otherwise are not able to be efficiently provided by other entities and cannot be regionally monitored or distributed due to inefficient economies of scale. Given this, it is important to consider the roles of special districts within the context of facilitating ICA.

Institutional Embeddedness and ICA Facilitation

The findings above also lend to our understanding of the importance of institutional embeddedness in facilitating ICA endeavors. As illustrated above, the Bayesian probability suggests that cross-policy interactions between institutions can be highly influential in motivating local governments to engage in regional partnerships for sustainability actions. This finding coincides with prior works examining ICA endeavors in that repeated reciprocal interactions, which can lead to trust can be vital for prompting regional partnerships (Carr, LeRoux & Shrestha 2009; LeRoux, Brandenburger & Pandey 2010). Increased policy

interactions across an array of sustainability policy areas, can ease interlocal exchanges for related policies pertaining to the mitigation of climate change. A series of multiplex relations across policy areas, increases the likelihood that resources, relationships and information conduits are already in place that can easily handle additional exchanges. Additionally, dense network structures will emerge to mitigate the risk of defection through highly clustered ties that facilitate a culture of reciprocity (Thurmaier & Wood 2002; Andrew 2009). In essence, this culture of reciprocity can produce social obligations that can control behaviors through interpersonal relationships and institutional norms.

Conclusion

Institutional collective action provides a way of understanding policy and governance within the context of externalities of choice within fragmented systems (Feiock 2013). This study has contributed to this area of understanding by highlighting the importance of specialized central organizations and the norms of institutional reciprocity in regional sustainability endeavors. A growing body of research highlights how facilitators of cooperative policy actions can minimize transaction costs that can obstruct ICA (Carr & Hawkins 2013; Tavares & Feiock 2018; Deslatte & Feiock 2019; Oliver 2019). Our research extends this body of work by pointing to the importance of special districts with a vested interest in sustainability policy outcomes, and the multiplex interconnections of local jurisdictions. The findings behind this research bring with them two major implications that provide practical and theoretical considerations that can further our understanding of the study and analysis of ICA.

Implications for Research

First, our research applies a Bayesian multilevel modeling approach to better understand institutional influences on ICA sustainability endeavors. The dependent variable of this analysis

reflects the choices of public actors to engage in regional partnerships. Our Bayesian technique allows us to systematically incorporate qualitative knowledge on these subjects by making probability statements on observations as new information is received (Gill 2014). In other words, this approach allows us to systematically factor in new information into the models and make predictions regarding updated choices. From a theoretical standpoint, this application is vital as public managers are consistently receiving information from their organizational environments, which requires them to have to systematically manage additional situational factors (O'Toole & Meir 2015). Therefore, as manager are faced with new and sometimes random information, they must update their policy strategies accordingly.

Issues regarding ICA require actors to constantly update their preferences to manage decisions in the face of shifting transaction costs. If transactions costs are low, collective action will be favorable for actors (Olson 1977). If transaction costs are high, then actors may choose to act independently. To add to this concept, transaction costs can also dictate the type and design of the ICA mechanism (Feiock 2013). High transaction cost issues may require formal ICA mechanisms, such as formalized contracts, regional authorities and higher-level government mandates. Meanwhile, low transaction cost issues may simply require the use of informal policy networks. The point here is that actors are faced with processing updated information to balance the cost and benefits of acting collectively. Therefore, the use of empirical models that systematically captures this information are required to capture the circumstances that drive actor's choices. Our approach lends towards this effort by modeling municipal choices for regional partnerships in the face of central acting facilitators and institutional interactions that can theoretically reduce transaction cost barriers that can obstruct collaboration efforts.

Second, this research contributes to the small body of literature that places an emphasis on special purpose governments (Foster 1997; McCabe 2000; Carr 2006; Farmer 2010; Carr & Farmer 2011; Shi 2017; Goodman 2018; Goodman & Leland 2019). The majority of the work in this area examines special districts as mechanisms to overcome service gaps and fiscal limitations, while observing them as dependent variables to answer questions regarding their proliferation. The current work on the other hand, attempted to observe special districts as a causal variable to examine the facilitation of regional governance. Unlike prior works, the current analysis did not place an emphasis on special district formation. Rather, the goal here was to examine how the existence of special districts as central actors affected municipal choice for sustainability partnerships. Using utility districts as a key explanatory observation allowed us to get a glimpse at units of governments that can be incentivized to prompt sustainability action (Homsy 2016; Homsy & Warner 2019), while having the geographic scope, political autonomy and capacity to broker joint ventures between other local jurisdictions. Additionally, these often-overlooked units of government can have a great impact on the policy actions and choices of their general purpose counterparts, with their abilities to leverage access to additional resources. Therefore, this work contributes to an understudied, but important question that investigates how special districts are utilized to overcome ICA dilemmas.

Implications for Practice

In times of economic and fiscal stress, local governments can be driven to look to strategies to find alternative means to leverage resources. The COVID-19 pandemic has often magnified these issues by presenting unprecedented challenges that require local governments to find innovative responses to novel problems. The COVID-19 pandemic has produced challenges within urban systems that transcend both the scale and function of local jurisdictions. This has

required public officials to find innovative responses to novel problems that exceed the responsibilities, functions and authority of any single entity at the local level (Ramírez de la Cruz et al. 2020). Chief among these challenges is managing the public's health and human well-being. These issues have revealed vulnerabilities and social inequities that often exist within urban systems during the onset of extreme events (Kuy et al. 2020; Ramírez de la Cruz et al. 2020).

Given these challenges local governments are still tasked with the burden of maintaining public services. Within this realm, local officials and public utility providers are looking for answers to overcome challenges brought forth by the pandemic. Questions regarding how institutional collaboration can provide solutions can be key for practitioners. While this work did not place an emphasis on issues specific to the pandemic, the findings do point to the importance of using alternative organizations and maintaining trust and reciprocity to leverage resources to overcome regional challenges. That is, policy makers can gain practical insight regarding strategies to overcoming political and fiscal limitations to bolster service provision. Public utilities can especially be key in this area, as the economic downturn caused by the pandemic has had a deleterious impact on citizens. This has resulted in officials having to collectively find ways to protect citizens from mass utility shutoffs, while protecting the health of their own employees from the virus (Switzer, Wang & Hirschvogel 2020). Current research has found collaborative efforts to be useful for jurisdictions in their responses to the pandemic (Ramírez de la Cruz et al. 2020; Switzer, Wang & Hirschvogel 2020; Deslatte, Hatch & Stokan 2020). In this light, working together from a regional standpoint has been found to enable individual jurisdictions to reduce certain transaction costs that would otherwise hinder response. Therefore,

studies that examine regional collaboration can be insightful for public managers and provide vital information that can inform policy actions.

Opportunities for Further Research

While the current study provided insight regarding the institutional levers that can facilitate regional collaborative sustainability endeavors, future work could benefit by examining the impacts and implications of individual actors. Placing an emphasis on collective action efforts from an organizational level is important. Yet, scholarly attention should not overlook the implications of the individual actor. Public entrepreneurs can be key for championing policy efforts. The personal incentives of citizens and local leaders can play a major role in decisions behind cooperative agreements (Feiock 2007). The motivations of public entrepreneurs can be linked to various collective and selective incentives that affect policy actions. In our efforts to better understand ICA endeavors, especially when pertaining to vital issues such as environmental sustainability, we should place a key emphasis on the political and administrative stakeholders that have the potential to promote or obstruct policy action.

Notes

1. As the Bayes theorem is:

$$p(B|A) = \frac{p(A|B)p(B)}{p(A)} \quad (1)$$

the posterior distribution extends from the Bayes theorem (1) to include a random parameter vector $\boldsymbol{\theta}$ given a random data vector $\boldsymbol{y}$ to become,

$$p(\theta|y) = \frac{p(y|\theta)p(\theta)}{p(y)} = \frac{f(y;\theta)\pi(\theta)}{m(y)} \quad (2)$$

2. A correlation matrix and collinearity diagnostics for variance inflation factors and tolerance were run for all independents and are available upon request.

3. Preliminary models were defaulted in STATA to 12,500 MCMC iterations with 2,500 burn-ins. Gibbs sampling algorithms were used for regression coefficients and variance components. Diagnostic trace-plots for convergence are available upon request.

4. In general, the Bayesian interval hypothesis test can be denoted with the null as:

$$P\{H_0: \theta \in (r, s)\} = p \tag{3}$$

where $\boldsymbol{r} =$ the lower bound of the interval and $\boldsymbol{s} =$ the upper bound. However, as our hypotheses anticipated distinctive relationships, in this case positive, we simply denote the probability of the null's occurrence as:

$$P\{H_0: \boldsymbol{\beta} \leq 0\} = p. \tag{4}$$

5. This analysis uses informative priors with the value σ for the factor *Regional Collaboration Efforts*, denoting 11, for its maximum value.

$$p(\theta|X) \sim N(0, \sigma^2) \tag{3}$$

For the group variance, we use the normal-inverse-gamma distribution and assume prior shape and scale parameters using STATA default values, where $\alpha = 0.01$ and $\beta = 0.01$:

$$p(\sigma^2|X) \sim Inv\Gamma(\alpha, \beta) \tag{4}$$

References

Aldag, Austin M., and Mildred Warner. 2018. "Cooperation, not Cost Savings: Explanation Duration of Shared Service Agreements." *Local Government Studies* 44(3): 350-70.

Andrew, Simon A. 2009. "Regional Integration through Contracting Networks: An Empirical Analysis of Institutional Collective Action Framework." *Urban Affairs Review* 44(3): 378-402.

Axelrod, Robert. 1984. *The Evolution of Cooperation.* New York: Basic Books.

Carr, Jered B. 2006. "Local Government Autonomy and State Reliance on Special District Governments: A Reassessment." *Political Research Quarterly* 59(3): 481-92.

Carr, Jered B., and Jayce Farmer. 2011. "Contingent Effects of Municipal and County TELs on Special District Usage in the United States." *Publius: The Journal of Federalism* 41(4): 709-33.

Carr, Jered B., Kelly LeRoux, and Manoj Shrestha. 2009. "Institutional Ties, Transaction Costs, and External Service Production." *Urban Affairs Review* 44(3): 403-27.

Curley, Cali, Nicky Harrison, Corey Kewei, and Shan Zhou. 2021. "Collaboration Mitigates Barriers of Utility Ownership on Policy Adoption: Evidence from the United States." *Journal of Environmental Planning and Management* 64(1): 124-44.

Census Bureau. 2015. "Historical Finances of Individual Governments." Historical Data. https://www.census.gov/programs-surveys/gov-finances/data/historical-data.html (accessed May 4, 2017).

Deslatte, Aaron, Megan E. Hatch, and Eric Stokan. 2020. "How Can Local Governments Address Pandemic Inequities?" *Public Administration Review* 80(5): 827-31.

Deslatte, Aaron, Richard C. Feiock, and Kathryn Wassel. 2017. "Urban Pressures and Innovations: Sustainability in the Face of Fragmentation and Inequality." *Review of Policy Research* 34(5): 700-24.

Farmer, Jayce L. 2010. "Factors Influencing Special Purpose Service Delivery among Counties." *Public Performance & Management Review* 33(4): 535-54.

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

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

Feiock, Richard C., and John T. Scholz. 2010. "Self-Organizing Governance and Institutional Collective Action Dilemmas: An Overview." In *Self-Organizing Federalism: Collaborative Mechanisms to Mitigate Institutional Collective Action*, edited by Richard. C. Feiock, and John. T. Scholz, 3-32. New York: Cambridge Univ. Press.

Foster, Kathryn A. 1997. *The Political Economy of Special-Purpose Government.* Georgetown University Press.

Gill, Jeff. 2014. *Bayesian Methods: A Social and Behavioral Sciences Approach, Vol. 20.* Boca Raton, FL: CRC Press.

Goodman, Christopher B. 2018. "Usage of Specialized Service Delivery: Evidence from Contiguous Counties." *Publius: The Journal of Federalism* 48(4): 686-708.

Goodman, Christopher B., and Suzanne M. Leland. "Do Cities and Counties Attempt to Circumvent Changes in their Autonomy by Creating Special Districts?" *The American Review of Public Administration* 49(2): 203-17.

Granovetter, Mark S. 1973. “The Strength of Weak Ties.” *American Journal of Sociology* 78(6): 1360-80.

Homsy, George C. 2016. “Powering Sustainability: Municipal Utilities and Local Government Policymaking.” *Environment and Planning C: Government and Policy* 34(6): 1076-94.

Homsy, George C., and Mildred E. Warner. 2015. “Cities and Sustainability: Polycentric Action and Multilevel Governance.” *Urban Affairs Review* 51(1): 46-73.

ICMA. 2010. “Sustainability in Local Government 2010: Full National Dataset.” https://bookstore.icma.org/sustainability-in-local-government-2010-full-national-dataset-p79.aspx (accessed May 6, 2017).

Jung, Kyujin. 2017. “Sources of Organizational Resilience for Sustainable Communities: An Institutional Collective Action Perspective.” *Sustainability* 9:1141.

Jung, Kyujin, Minsun Song, and Hyung Jun Park. 2019. “The Dynamics of an Interorganizational Emergency Management Network: Interdependent and Independent Risk Hypothesis.” *Public Administration Review* 79(2): 225-35.

Kwon, Sung-Wook, Richard C. Feiock, and Jungah Bae. 2012. “The Roles of Regional Organizations in Interlocal Resource Exchange: Complement or Substitute.” *American Review of Public Administration* 44(3): 339-57.

Krause, Rachel M. 2011. “Policy Innovation, Intergovernmental Relations, and the Adoption of Climate Protection Initiatives by U.S. Cities.” *Journal of Urban Affairs* 33(1): 45-60.

King, Gary, Michael Tomz, and Jason Wittenberg. 2000. “Making the Most of Statistical Analyses: Improving Interpretation and Presentation.” *American Journal of Political Science*: 347-61.

Kuy, S., Tsai, T., Bhatt, J. D., Chu, Q. D., Gandhi, P., Gupta, R., Hole, M. K., Hsu, B. S., Hughers, L. S., Jarvis, L., Jha, S., Annamalai, A., Kotwal, M., Sakran, J. V., Vohra, S., Henry, T. L., & Correa,

R. (2020). “Focusing on Vulnerable Populations During COVID-19.” *Academic Medicine*, 95(11), e2-e3.

Lackey, Steven Brent, David Freshwater, and Anil Rupasingha. 2002. “Factors Influencing Local Government Cooperation in Rural Areas: Evidence from the Tennessee Valley.” *Economic Development Quarterly* 16 (2): 138-54.

LeRoux, Kelly, Paul W. Brandenburger, and Sanjay K. Pandey. 2010. “Interlocal Service Cooperation in U.S. Cities: Social Network Explanation.” *Public Administration Review* 70(2): 268-78.

Lubell, Mark, Richard C. Feiock, and Ramírez de la Cruz. 2009. “Local Institutions and the Politics of Urban Growth.” *American Journal of Political Science* 53(4): 649-65.

Lubell, Mark, Mark Schneider, John Scholz, and Mihriye Mete. 2002. “Watershed Partnerships and the Emergence of Collective Action Institutions.” *American Journal of Political Science* 46(1): 48-63.

McCabe, Coyle McCabe. 2000. “Special-District Formation among the States.” *State and Local Government Review* 32(2): 121-31.

McGinnis, Michael D. 1999. *Polycentric and Local Public Economics: Readings from the Workshop in Political Theory and Policy Analysis.* Ann Arbor, MI: University of Michigan Press.

Mullin, Megan. 2010. “Special Districts versus Contracts: Complements or Substitutes?” In *Self-Organizing Federalism: Collaborative Mechanisms to Mitigate Institutional Collective Action*, edited by Richard. C. Feiock, and John. T. Scholz, 142-60. New York: Cambridge Univ. Press.

Oakerson, Ronald, and Roger Parks. 2011. "The Study of Local Public Economies: Multi-Organizational, Multi-Level Institutional Analysis and Development." *Policy Studies Journal* 39(1): 147-67.

Olberding, Julie C. 2002. "Does Regionalism Beget Regionalism? The Relationship between Norms and Regional Partnerships for Economic Development." *Public Administration Review* 62(4): 480-91.

Olson, Mancur. 1977. *The Logic of Collective Action: Public Goods and the Theory of Groups*. Cambridge, Mass: Harvard University Press, 1977 Print.

Ostrom, Elinor, Larry Schroeder, and Susan Wynne. 1993. *Institutional Incentives and Sustainable Development: Infrastructure Policies and Perspective*. Boulder, CO: Westview Press.

Ostrom, Vincent, Robert Bish, and Elinor Ostrom. 1988. *Local Government in the United States.* San Francisco, CA: ICS Press.

O'Toole Jr., Laurence J., and Kenneth J. Meier. 2014. "Public Management, Context, and Performance: In Quest of a More General Theory." *Journal of Public Administration Research & Theory* 25(1): 237-56.

Putnam, Robert. 1993. *Making Democracy Work.* Princeton, NJ: Princeton University Press.

Ramírez de la Cruz, Edgar, Eduardo Jose Grin, Pablo Sanabria-Pulido, Daniel Cravacuore, and Arturo Orellana. 2020. "The Transaction Costs of Government Responses to the COVID-19 Emergency in Latin America." *Public Administration Review* 80(4): 683-95

Rodrigues, Miguel, Antonio F. Tavares, and Filipe Araújo. 2012. "Municipal Service Delivery: The Role of Transactoin Costs in the Choice between Alternative Governance Mechanisms." *Local Government Studies* 38(5): 615-38.

Shrestha, Manoj K., and Richard C. Feiock. 2009. “Governing U.S. Metropolitan Areas: Self-Organizing and Multiplex Service Networks.” *American Politics Research* 37(5): 801-23.

Switzer, David, Weijie Wang, and Lacey Hirschvogel. 2020. “Municipal Utilities and COVID-19 Challenges, Responses, and Collaboration.” *American Review of Public Administration* 50(6-7): 57-83.

Svara, James H., Tanya C. Watt, and Hee Soun Jang. 2013. "How are US Cities Doing Sustainability? Who is Getting on the Sustainability Train, and Why?." *Cityscape*: 9-44.

Terman, Jessica N., Richard C. Feiock, and Jisun Youm. 2020. “When Collaboration is Risky Business: The Influence of Collaboration Risks on Formal and Informal Collaboration.” *American Review of Public Administration* 50(1): 33-44.

Thurmaier, Kurt, and Curtis H. Wood. 2002. “Interlocal Agreements as Overlapping Social Networks: Picket-Fence Regionalism in Metropolitan Kansas City.” *Public Administration Review* 62(5): 535-53.

Yi, Hongtao, Richard C. Feiock, and Frances S. Berry. 2017. “Overcoming Collective Action Barriers to Energy Sustainability: A Longitudinal Study of Climate Protection Accord by Local Governments.” *Renewable and Sustainable Energy Reviews* 79: 339-46.

Yi, Hongtao, Liming Suo, Ruowen Shen, Jiasheng Zhang, Anu Ramaswami, Richard C. Feiock. 2018. “Regional Governance and Institutional Collective Action for Environmental Sustainability.” *Public Administration Review* 78(4): 556-66.

Youm, Jisum, and Richard C. Feiock. 2019. “Interlocal Collaboration and Local Climate Protection.” *Local Government Studies* 45(6): 777-802.

Table 1 Regional Partnerships for Climate Change Mitigation

	Proportion	Std. Error	Z
No	0.839	0.011	
Yes	0.160	0.011	
Two-sample T-test:			
Difference	0.679***	0.015	
Under H_0		0.021	32.320
Shapiro-Wilk W test	0.991***		4.382

Note: ****p < .01*

Table 2 Sustainability Policy Areas for Regional Efforts

Policy Area	Frequency	Percent Yes	Percent No
Roads, public transit/bike-pedestrian	941	83.7	16.3
Economic development	879	78.2	21.8
Hazard mitigation/evacuation	851	75.7	24.3
Watershed	786	69.9	30.1
Land use	760	67.6	32.4
Storm water	739	65.7	34.3
Grants	705	62.7	37.3
Environmental protection	641	57.0	43.0
Affordable housing	545	48.5	51.5
Open space preservation	459	40.8	59.2
Climate change mitigation*	221	19.7	80.3
Climate change adaptation	180	16.0	84.0

**Omitted from index.*

Table 3 Description and Sources of Explanatory Variables

Variable	Mean/Prop.	Standard Deviation	Min	Max	Description	Source
Water utility district in county	0.590	0.491	0	1	Whether a water utility district is in county (0 = no; 1 = yes)	U.S. Census (2012)
Regional collaboration efforts	6.696	3.132	0	11	Number of city involvements for regional collaboration efforts across sustainability policy areas, excludes climate change mitigation.	ICMA (2015)
Municipality owns water utility	0.737	0.440	0	1	Whether city owns a water utility operation (0 = no; 1 = yes)	ICMA (2015)
Per capita interlocal transfers	0.053	0.144	0.001	1.815	Per capita transfers from other local governments.	U.S. Census (2012)
Per capita local taxes	0.622	0.536	0.001	5.620	Per capita tax revenue from municipal taxes.	U.S. Census (2012)
Council-manager	0.674	0.469	0	1	Whether city has the council-manager form of government (0 = no; 1 = yes)	ICMA (2015)
Population logged	9.722	1.256	7.750	15.150	Natural log of a city's total population.	U.S. Census (2012)
Percent White non-Hispanic	0.798	0.171	0.057	1.000	Percent of a city's population White non-Hispanic.	U.S. Census (2012)
Median property value	2.56E+05	4.94E+05	4.05E-01	9.74E+06	Median property values in a city jurisdiction.	U.S. Census (2012)

State	---	---	0	1	Dummy variables for state geographic region (individual state descriptions available upon request).	U.S. Census (2012)
Geographic region						
Midwest	0.335	0.472	0	1	Whether city is in Midwest region of U.S. (0 = no; 1 = yes)	U.S. Census (2012)
South	0.324	0.468	0	1	Whether city is in south region of U.S. (0 = no; 1 = yes)	U.S. Census (2012)
West	0.252	0.434	0	1	Whether city is in west region of U.S. (0 = no; 1 = yes)	U.S. Census (2012)

Table 4 Estimated Effects of Regional Climate Change Mitigation Partnerships

Variables	Coefficient	Standard Error
Central Organization		
Water utility district in county	0.868***	0.271
Trust and Recurring Interactions		
Regional collaboration efforts	0.835***	0.073
Controls		
Municipality owns water utility	-0.299	0.235
Per capita interlocal transfers	-0.256	0.759
Per capita local taxes	0.921***	0.192
Council-manager	0.138	0.269
Population logged	0.056	0.089
Percent White non-Hispanic	-1.133	0.692
Median property value	-1.55E-06	2.00E-07
Constant	-9.665***	1.369
Group Variance		
State constant	0.307*	0.178
U.S. geographic region constant	9.87E-38	1.51E-20
Wald chi-sq (df)	146.25(9)	
Prob > chi-sq	0.000	
N observations - Level 1	1,124	
N States - Level 2	48	
N U.S. geographic regions - Level 3	4	

Table 5 Bayesian Estimated Effects of Regional Climate Change Mitigation Partnerships

	Mean	MCSE	Equal Tailed 95% Credible Interval	
Central Organization				
Water utility district in county	0.786	0.028	0.200	1.375
Trust and Recurring Interactions				
Regional collaboration efforts	0.856	0.008	0.710	0.992
Controls				
Municipality owns water utility	-0.392	0.029	-0.903	0.119
Per capita interlocal transfers	-0.734	0.118	-2.513	1.123
Per capita local taxes	0.929	0.018	0.530	1.328
Council-manager	0.184	0.021	-0.345	0.708
Population logged	0.047	0.009	-0.141	0.214
Percent White non-Hispanic	-1.302	0.077	-2.653	-0.077
Median property value	-1.92E-07	1.50E-08	-7.13E-07	2.19E-07
Constant	-9.605	0.151	-12.344	-6.909
Variance Between Groups				
State: σ^2	0.419	0.014	0.069	1.107
Geographic region: σ^2	0.093	0.006	0.004	0.513
MCMC iterations	62,500			
Burn-in	12,500			
MCMC sample size	50,000			
N observations - Level 1	1,124			
N States - Level 2	48			
N Geographic Regions - Level 3	4			

Table 6 Predictive Marginal Values and Bayesian Interval Hypothesis Test for Climate Change Mitigation Partnerships

	Prediction	Standard Error	Z
Water utility district in county			
Minimum value (0)	0.114***	0.014	8.38
Maximum value (1)	0.189***	0.012	15.19
Bayesian interval hypothesis test	0.969	0.009	
Regional collaboration efforts			
Minimum value (0)	0.0002	0.0001	1.56
Maximum value (11)	0.555***	0.034	16.22
Bayesian interval hypothesis test	0.975	0.008	