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Collaborative Activity and Partnerships in Response to Problem Severity: The case of Sea Level Rise in US Cities

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Abstract:

The absence of federal strategies in the United States for climate change adaptation leaves state and city governments with broad discretion to undertake relevant measures. Yet cities may be unable to adapt to climate change without external assistance, particularly in states where the state leadership has not recognized the need to provide political and financial support to lower governments. Collaboration allows cities to pool resources and work across boundaries to ameliorate significant problems. Drawing from the extant literature on collaborative governance, we investigate the effect of threat severity on collaborative effort of municipal governments to prepare for rising seas. The analysis uses survey data from 2017 inquiring US municipal governments about their collaboration activities with other cities, nonprofits, and businesses in response to sea level rise. The findings indicate that the threat level does not only affect the type of collaborative activity of cities, but also the choice of collaborative partners. Specifically, the evidence in the context of sea level rise shows that cities respond to increased risk by seeking partnership with more types of actors, with preference for those less similar to them.

Keywords: Collaborative governance, horizontal collaboration, local governments, climate change adaptation

INTRODUCTION

Public organizations face increasingly complex public problems—which, in certain instances, can be classified "wicked," borrowing terminology from Rittel and Webber (1973)—that are both hard to define and ameliorate. Complex public problems, such as climate change, typically do not have simple definitions or easily implementable solutions, and their consequences often cross local government, state, and even national boundaries (Emerson & Nabatchi, 2015). Thus, it is burdensome for single organizations to design and implement administrative solutions alone (Kettl, 2002). At the same time, these issues affect multiple stakeholders that are not limited to public sector, including citizens, businesses, and institutions of higher learning. In effect, public managers have increasingly engaged in cross-sectoral collaboration to address complex problems and deliver public services. Collaborative skills have become essential for public administrators to keep pace with the growing multitude of actors involved in policymaking and implementation processes (McGuire & Silvia, 2010).

Prior literature indicates that the size of the public problem at hand is an important factor for organizations when deciding whether to collaborate (Feiock, 2008; McGuire & Silvia, 2010), especially when tasked with ameliorating wicked problems (Bryson, Crosby, & Stone, 2006; Emerson, Nabatchi, & Balogh, 2012; Emerson & Nabatchi, 2015). Larger issues may not only require higher fixed costs, but other resources, such as expertise, information, and an overall increase of capacity—which collaboration can help achieve (Steinacker, 2010). While producing results through collaboration is difficult and time-consuming (Kelman, Hong, & Turbitt, 2012; Mitchell, O'Leary, & Gerard, 2015), collaboration can yield a number of positive outcomes, including trust building (Lubell, 2005; Thomson, Perry, & Miller, 2008; Varda & Retrum, 2015), mutual learning (Ansell & Gash, 2008; Leach, Weible, Vince, Siddiki, & Calanni, 2013), and

improved organizational outcomes (Kalesnikaite, 2018; Kelman et al., 2012; Scott, 2015, 16; Ulibarri, 2015). Yet, the extant literature has scarcely addressed how the severity of the public issue affects collaborative strategies in the context of wicked public problems.

The present study focuses on climate change adaptation—more specifically, sea level rise preparedness—to investigate the link between problem severity and collaborative strategies of local governments. Sea level rise adaptation at the local levels presents an intriguing case to study local government horizontal collaboration. In 2010, about 40% of the US population, roughly 123 million people lived in densely-populated coastal areas, with a projected increase of 8% by 2020 (NOAA, n.d.). Even with immediate and significant climate change mitigation action, a long-term sea level rise commitment is irreversible due to slow oceans' response to changes in greenhouse gas (GhG) emissions (Wigley, 2005). Sea level rise has been associated with numerous adverse effects, including increased flooding and permanent inundation of certain areas, loss of plant and animal species, contamination of drinking water, beach erosion, and others. In effect, to prepare for sea level rise, and to pay for resulting damage, communities in the US are expected to face significant economic costs (Fu, Song, Sun, & Peng, 2016).

Currently, the US lacks a comprehensive federal strategy for sea level rise preparedness in all three adaptation areas—protection, accommodation, and retreat (Gornitz, 2013; Nicholls & Cazenave, 2010)—which has left state and local governments with broad discretion to undertake adaptation measures. Because solutions to sea level rise are very site-specific and there is no single one-size-fits-all approach (Bassett & Shandas, 2010; Hamin, Gurran, & Emlinger, 2014; Lyles, Berke, & Heiman-Overstreet, 2017), adaptation is typically viewed as a local issue. However, local jurisdictions face a range of constraints to successful adaptation, including insufficient funding, qualified staff, and technical resources. Given that local governments are

highly interdependent with each other when it comes to experiencing adverse effects of sea level rise, including failure to adapt, it should create a fertile ground to pursue collaboration as means to overcome deficiencies in capacity and undertake adaptation action.

The study seeks to contribute to at least two bodies of literature. First, by studying the effect of problem severity on collaborative activity and partner types, the study sheds light on horizontal voluntary collaboration at the local level of government that is not limited to the public sector. Second, it broadens our understanding of public management strategies that local governments utilize to address climate change adaption challenges. This line of research has received very limited attention in previous works on adaptation (Berke & Lyles, 2013), with much of the prior literature focusing on climate change adaptation trends, barriers to successful adaptation, and the quality of local climate change adaptation plans.

The rest of the paper proceeds as follows. The next section defines collaborative governance, focusing on horizontal collaboration. Then we discuss the importance of problem severity in collaborative activity and partner selection and present study hypotheses. The following section describes the data and operationalization of the main concepts. Next, we analyze the results of the estimations and discuss their implications. The last section concludes and outlines possible avenues for future research.

HORIZONTAL COLLABORATION: ACTIVITIES AND PARTNER SELECTION

We utilize a broad definition of collaboration as a process of crafting inter-organizational solutions to problems that cannot be tackled by a single jurisdiction alone (Agranoff & McGuire, 2003; Kettl, 2006; McGuire, 2006; O'Leary, Gerard, & Blomgren Bingham, 2006). Collaboration can be further classified as vertical or horizontal. According to Agranoff and McGuire (2003), vertical collaboration refers to organizations that work together to ameliorate

public issues at different levels of government, while in horizontal collaboration "players are local and represent multiple interests within the community" (p. 21). This type of collaboration may arise voluntarily as an effort to seek mutual benefits between partners that are not limited to the public sector. As such, horizontal collaboration can involve public and various non-governmental actors (Mitchell et al., 2015) and include both formal and informal interactions and agreements (Emerson et al., 2012; Gazley, 2008; Thomson & Perry, 2006). In the present study, we focus on horizontal voluntary collaboration of cities with actors from public, nonprofit, and private sectors.

Horizontal Collaboration Activity as a Strategic Policy Choice

By definition, collaboration occurs when organizations are unable to effectively achieve results on their own (Agranoff & McGuire, 2003; Kettl, 2006; McGuire, 2006; O'Leary et al., 2006). Interdependence arises when organizations are unable to adequately accomplish their goals (Emerson & Nabatchi, 2015). From the perspective of the resource dependency theory, interdependence concerns strategies that organizations use to adapt to their environments when resources are scarce (Pfeffer & Salancik, 2003). In an effort to survive, organizations may seek collaboration as a necessity (Emerson & Nabatchi, 2015), especially when a lack of available resources to deliver public services is apparent (Feiock, 2013; Klijn & Koppenjan, 2000). The need to collaborate becomes more evident when public problem severity increases, requiring significant resources (Steinacker, 2010), thus it has been argued that the likelihood of collaboration will be influenced by the size of the issue at hand (Feiock, 2008).

Prior research demonstrates the link between problem severity (Hughes, Miller Runfola, & Cormier, 2018; Mullin & Rubado, 2017; Kwon & Bailey, 2019) or public official perceptions of severity (Lee & Hughes, 2017) and policy responses to public issues in the context of local

governments. Consequentially, collaboration can be viewed as a strategic policy choice to ameliorate public issues. It can thus be expected that when dealing with complex problems that require extensive resources, public organizations will engage in collaborative activities that are likely to yield benefits (Emerson & Nabatchi, 2015).

The literature on types of collaborative activities across different policy areas is scarce. Agranoff's (2007) typology of public management networks by function sheds light on the types of activities that partners may undertake in an effort to collectively solve issues. We borrow three types – informational, developmental, and action – in the present study. Informational networks refer to collaborative interactions when organizations exchange information about the issue and potential solutions. This is an important starting point in collaboration, given that various resources are likely to be held by multiple players (Agranoff & McGuire, 2003; Klijn & Koppenjan, 2000). Core activities of developmental networks include learning about the issue while developing partner capacity. The two latter types do not include any direct implementation or public service delivery. Finally, action networks are focused on implementing collaborative actions and delivering public services (Agranoff, 2007). It can be expected that organizations may move from informational to action activities in a sequential way, thus the three types of activities represent a continuum.

In line with prior studies, we envision problem severity to influence the choice to seek out collaboration partners (Emerson & Nabatchi, 2015; McGuire & Silvia, 2010). Assuming the three activities discussed above unfold in a sequential (albeit not mutually exclusive) way, we expect the types of activities (informational, developmental, and action) to vary as a function of problem severity. In other words, a more severe problem should prompt a higher stage of activity. These types of collaborative activities also reflect the stages of sea level rise

preparedness, in line with the typology by Lee and Hughes (2017), which involve (1) understanding the risks and impacts of climate change; (2) assessing options and developing plans to adapt to climate change, and (3) employ resources to implement climate change adaptation actions. Thus, we formulate the following expectation:

> *Hypothesis 1: Greater problem severity will be associated with higher stages of collaborative activity*.

Collaborative Partner Selection and Organizational Homophily

One of the potential benefits of collaboration is access to various resources, such as better information and expertise (Bryson et al., 2006; Emerson & Nabatchi, 2015) that may be spread out across different actors (Kapucu, 2006; Klijn & Koppenjan, 2000). While the literature on collaborative partner selection is still emerging, scholars have found that access to resources is an important feature in a prospective partner (Calanni, Siddiki, Weible, & Leach, 2015; Silvia, 2018), as posited by the resource dependency theory (Pfeffer & Salancik, 2003). Different types of organizations (public, nonprofit, and private) may possess unique resources. Thus, involvement of multiple types of organizations can help public organizations achieve comparative advantage by tapping sector-specific resources and benefits (Andrews & Entwistle, 2010; O'Regan & Oster, 2000). According to Agranoff and McGuire (2003), "Cities seek out a collaborative player for a specific purpose and for a certain type or types of resources; each player may play a strategic role for the city" (p. 120), suggesting that public organizations are deliberate when picking their partners—selecting those with resources that could help them achieve organizational goals and create public value.

Within horizontal collaboration, public-public action may be undertaken to establish economies of scale and help avoid duplication of efforts, improving the efficiency of service delivery (Feiock, 2013; Mitchell et al., 2015). Transjurisdictional solutions are especially

desirable when tackling wicked problems, such as poverty or terrorism (Kettl, 2006), where the consequences often cross local government, state, and even national boundaries (Emerson & Nabatchi, 2015). At the local level, public organizations may join forces to advocate for more action from higher levels of the government and make a stronger case for more resources if the public issue at hand is pressing. According to Gazley and Brudney (2007, p. 399), "[g]overnments principally appear to offer their nonprofit partner financial resources, whereas nonprofit organizations offer specialized expertise beyond the scope of the government". This type of an expertise can enrich public organization's understanding of the perspective of disadvantaged individuals that nonprofit organizations serve, as well as the broader community as a whole (Andrews & Entwistle, 2010). Public-nonprofit collaboration is common, and public funds "represent a substantial source of revenue for nonprofit organizations" (Gazley, 2008, p. 141). Finally, public-private collaboration can help public organizations utilize competencies that the private sector possesses (Entwistle & Martin, 2005). For instance, private organizations can potentially help public organizations realize efficiency gains (Andrews & Entwistle, 2010) through increased competition and the ability to capture economies of scale (Andrews & Entwistle, 2015). As Van Ham and Koppenjan (2001) write, "[f]or public parties, the involvement of private parties is desirable because on the one hand they operate more efficiently than public organizations but also because they possess the market experience and innovative creativity which public parties often lack" (p. 597). This can be particularly advantageous when public organizations require finding innovative solutions to wicked problems, especially those that are highly context-dependent.

In regard to climate change adaptation, public organizations face numerous resource constraints related to funding, qualified staff, time (Hamin et al., 2014; Measham et al., 2011;

Mozumder, Flugman, & Randhir, 2011) and access to better information for decision-making (Bedsworth & Hanak, 2010; Berke & Lyles, 2013; Hamin et al., 2014; Measham et al., 2011). Such constraints provide a fertile ground for collaboration with different types of actors, helping public organizations pool resources that are unique to other sectors. Thus, we formulate the following expectation:

> *Hypothesis 2: Greater problem severity will be associated with more types of collaborative partners.*

Scholars have argued that organizational similarity, or homophily, influences collaboration, whereas organizations are more likely to work with others that are similar to them (Feiock, 2013; Lee, Lee, & Feiock, 2012). In line with the institutional collective action (ICA) framework, homophily plays an important role in collective action decisions, because it helps uncover potential partner preferences, given that similar actors tend to have more closely aligned preferences (Feiock, 2013). In effect, similarity of actors helps decrease transaction costs associated with collaboration. It has thus been argued that organizations would seek to work with those of similar type, that is, public-public type of collaboration (though, see Lee et al., 2012). Prior research concluded that organizations tend to partner with actors that resemble them in terms of political alignment (Gerber, Henry, & Lubell, 2013; Lee, 2016; Song, Park, & Jung, 2018), geographical proximity (Lee, 2016), and the demographics of populations served (Gerber et al., 2013; Lee, 2016).

Admittedly, empirical evidence on organizational homophily is scarce, as most research to date focuses on public-public collaboration (Lee, 2016; Song et al., 2018). Previous studies assessed the importance of homophily in more routine functions of local governments, such as economic development efforts, but not in the context of wicked problems. Since collaboration occurs in an attempt to secure needed resources often unique to different sectors, under a

condition of a severe public issue, we can expect the opposite—organizational heterophily. In other words, public organizations will rather seek to collaborate with organizations dissimilar to them out of necessity. Thus, the extent of the public problem will affect partner selection in terms of increasing organizational homophily. For instance, when faced with routine activities, public organizations will be likely to collaborate with other public organizations (as it is the case with economic development), yet more complex and unfamiliar policy issues require a different approach, that is, collaboration with more dissimilar types of organizations, such as nonprofits and businesses in order to ameliorate the issue. In effect, we formulate the following expectation:

> *Hypothesis 3: Greater problem severity will be associated with collaboration with organizations that are of a different organization types.*

DATA AND METHOD

To test the hypotheses, we utilize survey data collected in 2017 from government officials in US municipalities threatened by sea level rise. The sample of cities for the survey was selected based data from Climate Central, a nonprofit organization involved in climate science research and public outreach. Climate Central compares city elevation, population, and projected sea level rise to calculate the risk across jurisdictions in the US. To obtain a sample of cities of varying exposure to sea level rise risk, we sent the survey to cities with populations of 10,000 or more residents, where at least one percent of residents will be locked in below the projected high tide line of 2050. In other words, assuming there will be no significant cuts to GhG emissions in the immediate future, one percent or more of residents across sample cities will be exposed to flooding and permanent inundation of city areas by 2050.

This selection yielded a sample of 341 cities in 20 US states.[1] The survey questions inquired city governments about their vulnerabilities to climate change as well as collaborative activities they undertook to adapt to rising sea levels. Out of 341 cities, 140 returned complete and usable responses, yielding a response rate of 41%. Besides survey data, the study uses data from city government websites, Climate Central, Georgetown Climate Center, Politico, and the US Census Bureau.

Dependent Variables

There are three dependent variables of interest in this study. The first dependent variable, *Collaborative Activity Stage*, corresponds to the stage of collaborative activity of the city for sea level rise adaptation. Following Gazley (2010), the survey asked city governments to identify which collaborative activities they were involved in with partners to prepare for sea level rise in the last three years (*sharing information on best practices, advocacy to higher levels of government, sharing workspace, sharing volunteers, joint staff recruitment, joint volunteer recruitment, joint program development, joint service delivery, and joint application for grants*). We group these activities according to their function (Agranoff, 2007) into three categories. Informational activities form the first stage (*sharing information on best practices)*. The second stage consists of developmental activities (*advocacy to higher levels of government, sharing workspace, sharing volunteers, joint staff recruitment, joint volunteer recruitment)*. And finally, the third stage includes action activities (*joint program development, joint service delivery, and joint application for grants). Collaborative Activity Stage* was coded as 0 if cities reported no collaborative activity for sea level rise (*n*=37), 1 for informational activity (*n*=18), 2 for at least

[1] The cities surveyed are located in the following states: Alabama, California, Connecticut, Delaware, Florida, Georgia, Louisiana, Maine, Maryland, Massachusetts, Mississippi, New Jersey, New York, North Carolina, Pennsylvania, Rhode Island, South Carolina, Texas, Virginia, and Washington.

one developmental activity (n=17), and 3 for at least one action activity (n=68). Table 1 presents descriptive statistics for all variables used in the analyses. Variable operationalization and sources are presented in the Appendix.

[Table 1 About Here]

The second dependent variable, *Collaborative Partner Types*, represents the number of different types of collaborative partners that the city governments have engaged with in preparation for sea level rise. The survey queried city governments about the partners, with whom they are working to mitigate sea level rise risks. The question focused on horizontal collaboration, meaning joint activities with other public actors, and or with nonprofit and private organizations. The variable (*Collaborative Partner Type*) captures the number of types of partners that city governments reported, including public, nonprofit, and private. The values of the variable range from 0 when a city has no involvement with any type of partner (n=37) to 3 (collaboration with all three types of partners). In our sample, 47 cities reported involvement with one type of partner, 34 with two, and 22 cities were partnering with all three types.

Finally, the third dependent variable, *Organizational Homophily*, accounts for the extent to which the city governments collaborated with dissimilar organizations in terms of organization type (ownership), including public (high homophily), nonprofit (low homophily), and private (heterophily). *Organizational Homophily* takes on a value of 0 for cities with no collaboration (n=37), 1 if a city partnered only with other cities (n=38), 2 if a city collaborated with nonprofits (n=39), and 3 if a city reported joint activities with private organizations (n=26).

Main Explanatory Variables

As discussed above, we expect the threat level to influence the number of types of partners, with whom city governments collaborate as well as the stage of collaborative activity

for sea level rise preparedness (informational, developmental, or action). Problem severity serves as the main explanatory variable in this study and is operationalized as the percentage of city's homes affected by sea level rise by 2050, under a medium sea level rise scenario with a mild flood averaging once a year (*Threat to Homes*). In other words, assuming no dramatic climate change mitigation efforts to curb GhG emissions in the near future, the *Threat to Homes* variable captures city homes that will be exposed to sea level rise by 2050. In our sample, the minimum value of *Threat to Homes* is 0 percent, while the highest is 46.1 percent.

Control Variables

In order to account for alternative explanations that can affect city collaboration for sea level rise preparedness, we include in the models two sets of control variables. The first group of controls seeks to capture city-level collaborative capacity and includes three variables – *City Manager*, *Budget Expenditure*, and *State Plan*. The variable *City Manager* is coded as 1 if the city is of council-manager form of government, and 0 otherwise. This form of government is expected to be positively associated with the dependent variables for two reasons. First, council-manager form of government allows for greater isolation from special interests (Bae & Feiock, 2012). Second, city managers are actively involved in professional networks and information sharing (Hawkins, Krause, Feiock, & Curley, 2016), leading these cities to be more actively engaged in collaborative efforts and a variety of partners. Because collaborative public problem solving requires time and financial resources (Ansell & Gash, 2008; Leach & Sabatier, 2005; Ulibarri, 2015), we include in the models the variable *Budget Expenditure*, measured as city resources per capita in 2016. Finally, the variable *State Plan* accounts for state-level climate change adaptation planning, measured as 1 if the city is located in a state with a climate change plan, and 0 otherwise. We expect that cities in states with no dedicated plans will be more likely

to collaborate due to a lack of financial and technical resources from higher levels of government (Kalesnikaite, 2018).

The second set of controls captures city demographic and socio-economic characteristics, including *City Population*, *Population Growth*, *Democratic Vote*, and *Median Household Income*. Larger cities may present themselves as more attractive partners to other public and non-state organizations, being more likely to become early adopters of innovative solutions to public problems (Shipan & Volden, 2008). Alternatively, smaller cities may be incentivized to collaborate with various partners in order to access more resources and increase efficiency of adaptation (Feiock, 2013). The variable *City Population* captures city's population in 2016. Because the distribution of the variable is skewed, we take the natural logarithm. *Population Growth* is operationalized as the percentage increase in city's population from 2010 to 2016. Cities experiencing population growth face more pressure to act in response to sea level rise, as more residents may be exposed to climate change threats. We also control for political orientation of city governments. Given that public organizations are tasked with addressing a variety of public issues, some issues take priority over others. While governments certainly act on some issues to serve specific constituency and for re-election purposes, public interest in certain issues, such as climate change, may help move such issues up on the government agenda (Krause, 2010). Prior research has shown that climate change action is more likely in cities with higher percent residents voting for the Democratic Party candidates (Hultquist, Wood, & Romsdahl, 2017; Zahran, Brody, Vedlitz, Grover, & Miller, 2008). The variable *Democratic Vote* reflect the percentage of votes in the county casted for the Democratic Party in the 2016 Presidential Election. Finally, we also include a measure to account for city median household income in 2016, expressed in thousands.

Estimation Routine

To test our hypotheses, we estimate a series of ordered logit models, given the ordered nature of our three dependent variables: each variable has four realizations, ranging from 0 to 3. To account for the lack of independence among cities within the same state, we clustered the observations at the state level. In order to ensure that the estimated effect of problem severity (our threat variable) does not reflect other factors, we include a set of control variables as previously described. Our analysis presents coefficient estimates but we also offer interpretation of our findings in terms of marginal effects.

RESULTS AND DISCUSSION

Table 2 reports the results from the estimations. In all three models, the effect of threat on the city collaborative efforts is positive and statistically significant. The empirical analysis, by and large, supports the expectation that problem severity is a major predictor of the behavior of city governments in situation of rising sea levels. We elaborate on each of the models below.

[Table 2 About Here]

Model 1 examines the change in collaborative activity of cities in response increasing problem severity (Hypothesis1). The threat variable is positive and significant at the five percent, indicating that higher levels of risks are associated with higher degree of collaborative activity. As expected, the response of cities to sea level rise unfolds in stages: information activities are associated with lower levels of threat, whereas cities are more likely to get engaged in developmental and action activities when the threat level goes up. In other words, as the problem exacerbates, the cities deepen their collaborative efforts. Specifically, the data show that when the threat to homes increases one percent, the probability of achieving the highest stage of

collaborative activity (the action stage) increases by almost 1.2 percent, while the probability of having no collaboration decreases by 0.9 percent. We also note that the collaborative activity of cities follows a rational pattern and evolves with the level of threat. Stated differently, city governments are rational players who adjust the level of collaborative efforts depending on the risk they face.

Model 2 seeks to predict the effect of problem severity on the choice of collaborative partner. Based on the resource dependence theory, we hypothesize that cities would seek partners when they lack resources to tackle a problem on their own (Hypothesis 2). Moreover, organizations from different sectors possess unique resources that can be pooled in a collaborative effort. Nonprofits are sought as partners for their issue-specific expertise and contextual knowledge. Being subject of market forces, businesses are best at finding efficient and innovative solutions to issues. Given that organizations from different sectors can bring unique benefits to the table, we expect that the need for different types of partners will increase as problem severity goes up. The data support that expectation. The coefficient of the threat variable is positive and statistically significant at the one percent level. To interpret, for each percent increase in threat to homes, the probability of seeking the largest number of collaborative partners (3 in our context) goes up by almost 0.6 percent, while the probability of non-collaboration decreases by 0.9 percent.

Model 3 tests the effect of problem severity on organizational homophily of collaborative arrangements. Prior research has established that homophily can decrease transaction costs as similar actors tend to share similar preferences. This is especially true when cities engage with other cities in more traditional activities with well-defined dimensions. Yet, when issues and solutions are less clearly understood and the level of risk goes up, the importance of

organizational heterophily would increase (Hypothesis 3). The estimations provide evidence for such an effect. The coefficient on our main variable of interest—the estimate of threat level—is positive and significant at the one percent level. In other words, for each percent increase in threat to homes, the probability of partnering with businesses (outcome 3) increases by 0.6 percent, while the probability of partnering with other cities (outcome 1) decrease by 0.3 percent.

Moving to the control variables, we note that cities in counties that vote for Democratic candidates are more likely to get engaged in collaborative activities and seek partners to address climate change issues. Consistent with the expectations, the coefficient is positive and significant at the one percent in all three models, indicating a strong issue divide along party lines. Population growth is also significantly associated with the three dependent variables in the models. The negative coefficient suggests that population growth poses other, presumably more immediate, challenges that take the attention of public officials away from long-term issues such as climate change. As expected, more populous cities are more likely to seek collaboration on sea level rise issues because they have a larger proportion of affected residents. Finally, as expected, the data show that cities within states with no state plans on climate change are more likely to collaborate compared to cities in states with such plans.

To sum, the data offer strong support for all three hypotheses. Problem severity does affect the way cities pursue horizontal collaboration in the context of sea level rise, a rather complex problem with no clear definition and solutions. The coefficients of the threat to homes variable in all models are positive and statistically significant (at $p<0.05$ and $p<0.01$). Specifically, our analysis shows that when the threat of sea level rise goes up, the cities become more likely to engage in higher level of collaborative activities, to seek more different types of partners, and to reach out to parties that are less similar to them. These findings suggest that city

governments behave as rational actors who organize their response in a strategic and predictable way, even to wicked problem such as sea level rise. Admittedly, wicked problems differ in terms of the immediate danger they pose. The sea level does not happen overnight. Maybe the long-term nature of this problem has permitted the US city governments to be strategic and to adjust their collaborative efforts as a function of the risk they are facing at the moment.

CONCLUSION

This study sought to understand whether and how the problem severity affects the collaborative endeavor of US municipal governments in the context of sea level rise. Sea level rise is often referred to as a wicked problem that has no simple definition or clear solution across different contexts. Based on the collaborative governance literature, we developed three hypotheses about the effect of the level of threat on cities' collaborative behavior. The first hypothesis referred to the stage of collaborative activities. Specifically, we expected that cities that face higher levels of threat would respond with higher level of collaborative activities. The next two hypotheses addressed the choice of partner for collaboration. Given that public problems such as sea-level rise are new and there is no one clear long-term solution, we anticipated that cities would behave in a strategic way and use collaboration to bring different perspectives to the table. Thus, we hypothesized that the increased risk of sea level rise would prompt cities to seek different types of partners and also increase the probability of collaborating with dissimilar organizations. In other words, in the context of wicked problems, cities would behave just the opposite of what they would do when collaborating in routine activities, such as economic development. The literature has already established that in economic development activities cities choose as partners similar organizations who share similar preferences, that is,

other city governments. Yet, the uncertainty and lack of clear solutions that characterize wicked problems increases the value of disparate outlooks and makes cities alter their usual behavior.

To test our hypotheses, we utilized survey data explicitly collected for this study as well as publicly available data from multiple sources. Our study population included all US cities with 10,000 residents or more, where at least one percent of residents will be locked in below the projected high tide line of 2050. The final sample used for the analyses consisted of 140 vulnerable cities across 20 states.

The data offered strong support for all three hypotheses. The results show that the response of cities to sea level rise is not random, but rather unfolds in stages, where higher levels of threat correspond to higher stage of collaborative activities. Such systematic behavior does not always characterize the response of municipal governments to pressing public problems. While not all problems are the same—and some require governments to act rapidly, such as responding to a financial crisis—we speculate that the slow evolution of sea level rise in response to global climate change allowed city governments to better plan their strategies. Even more, our analysis demonstrates that cities act strategically in choosing partners, who can help them tackle the problem efficiently. The estimations indicate that higher levels of threat motivate city governments to look for different types of partners, who can bring unique slants to the problem solution. Found in uncharted waters, governments realize the need to bring along partners who are less similar to them and serve different goals and follow different preferences. According to the data, higher threat levels prompt municipal governments to increasingly engage with less similar partners, that is, nonprofits and businesses, and less with other cities.

Our findings have at least three implications. The first implication is related to how governments act in response to pressing issues. By and large, the evidence presented here

suggests that cities are rational players, who adjust the level of their collaborative effort, depending on the severity of the problem they face. The second implication concerns the motivation behind the choice of collaborative partners. Given the issue at hand, horizontal collaboration of city governments can be oriented toward more organizational homophily or just the opposite—toward more organizational heterophily. Regular and more predictable issues trigger collaboration with similar partners, such as other cities who have similar preferences and share similar goals. The motivation is different, when the issues are more obscure, less predictable and highly contextual, i.e., solutions might not be portable from one location to another. In this case, governments tend to seek less similar partners who can offer perspectives they do not have themselves and which can complement their perspective. The third implication from our analysis speaks to political realms in the country. There is a strong party divide on policy issues. While the Republican Party has an ownership on issues such as gun rights, the Democratic Party owns the climate change issue. Although sea level rise will affect everyone, its close affiliation with the climate change issue, serve to either mobilize or paralyze governments' collaborative effort. Our data clearly show that cities in more liberal counties tend to put greater effort to collaborate in order to ameliorate the consequences from rising seas.

We close with some insights for future research based on the limitations of the present study. First, our survey only inquired about the types of partners sought by cities. Future studies can elaborate on how the problem severity might affect the extent and magnitude of collaboration with different types of partners. Second, scholars could also test whether various partners tend to get involved in different collaborative activities. Currently, we lack such information. Third, this study used quantitative analysis to examine the effect of problem severity on collaborative endeavors of cities vulnerable to sea level rise. Future work might drill

down to the level of individual city managers in order to better understand the decision-making processes and causal mechanisms behind the inferences registered in this analysis.

Table 1. Variable Descriptive Statistics

Variable	Mean	St. Dev.	Min.	Max.
Collaborative Stage	1.829	1.286	0	3
Collaborative Partner Types	1.293	1.028	0	3
Organizational Homophily	1.386	1.07	0	3
Threat to Homes	4.701	8.272	0	46.1
City Manager	0.743	0.439	0	1
Population Growth	7.075	5.526	-2.7	31.5
State Plan	0.85	0.358	0	1
Income	59.544	22.921	18.134	143.01
Democratic Vote	55.35	15.331	19.6	85.5
Budget Expenditure	1989.236	1402.894	490.49	6548.93
City Population (log)	10.686	1.148	9.221	14.265

Table 2. Predicting the Effect of Problem Severity on the Collaborative Effort of Cities

Independent Variables	**Model 1**		**Model 2**		**Model 3**	
	B	Odds Ratios	B	Odds Ratios	B	Odds Ratios
Threat to Homes	0.011**	1.041**	0.053***	1.054***	0.049***	1.051***
	(0.018)	(0.019)	(0.017)	(0.019)	(0.018)	(0.019)
City Manager	0.51	1.666	0.676	1.967	0.754*	2.126*
	(0.493)	(0.821)	(0.462)	(0.908)	(0.407)	(0.866)
Population Growth	-0.082***	0.921***	-0.092***	0.911***	-0.099***	0.905***
	(0.021)	(0.019)	(0.026)	(0.024)	(0.026)	(0.024)
State Plan	-1.03*	0.357*	-1.46***	0.232***	-1.518***	0.219***
	(0.598)	(0.213)	(0.548)	(0.127)	(0.531)	(0.116)
Income	-0.001	0.999	0.007*	1.007*	0.009*	1.009*
	(0.007)	(0.007)	(0.003)	(0.004)	(0.005)	(0.005)
Democratic Vote	0.045***	1.046***	0.03***	1.031***	0.0283***	1.029***
	(0.011)	(0.011)	(0.009)	(0.01)	(0.008)	(0.008)
Budget Expenditure			0.001	1.001	0.001	1.001
			(0.001)	(0.001)	(0.001)	(0.001)
City Population (log)	0.181	1.199	0.236**	1.3**	0.21**	1.23**
	(0.124)	(0.149)	(0.1)	(0.129)	(0.1)	(0.117)
Log Pseudolikelihood	-158.8		-170.02		-173.85	
Threshold I	3.232		2.359		2.428	
Threshold II	3.944		3.044		3.847	
Threshold III	3.542		3.603		5.434	
Wald chi2	144.94***		118.78***		166.86***	
Observations	140		140		140	

Note: The dependent variables in the models are as follows: *Collaborative Activity Stage* (Model 1), *Collaborative Partner Types* (Model 2), and *Organizational Homophily* (Model 3). Robust standard errors clustered by state in parentheses

***p<0.01, **p<0.05, *p.<0.1

Appendix

	Variable name	Operationalization
Dependent Variables	Collaborative Activity Stage	The stage of collaborative activity in city preparedness for sea level rise: 0= no collaboration; 1= informational stage; 2 =developmental stage; 3=action stage. *Source*: Survey
	Collaborative Partner Types	The number of different types of actors (public, nonprofit, and private) that the city collaborates with for sea level rise preparedness: 0=no collaboration; 1=collaboration with one type of partner; 2=collaboration with two types of partners; 3 =collaboration with all three types of partners. *Source*: Survey.
	Organizational Homophily	The level of organizational homophily in city collaboration for sea level rise, coded as 0 for no collaboration, 1 – collaboration only with public organizations; 2 – at least some collaboration with nonprofit organizations; 3 – at least some collaboration with private organizations. Source: Survey.
Independent Variables	Threat to Homes	Percentage of homes in the city that will be threatened by sea level rise by 2050 under a moderate sea level rise scenario with a mild flood that averages once a year. Source: Climate Central.
Control Variables	City Manager	A categorical variable, measured as 1 if the city has the council-manager form of government. Source: City government websites.
	Population Growth	Percentage increase in city population from 2010 to 2016. Source: US Census Bureau.
	State Plan	A categorical variable, measured as 1 if the city is located in a state with a climate change adaptation plan, and 0 otherwise. Source: Georgetown Climate Center.
	Income	Median city household income in thousands in 2016. Source: US Census Bureau.
	Democratic Vote	Percentage voters in the county that voted for the Democratic Party candidate in the 2016 Presidential Election. Source: Politico.
	Budget Expenditure	City budget expenditures per capita in 2016. Source: City government budget documents.
	City Population (log)	Natural logarithm of city population. Source: US Census Bureau.

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