Nonprofit Sector Size and the Breadth of Local Government Climate Actions:

Exploring the Moderating Role of Collaboration

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Abstract: Existing studies often use the association between sector sizes to test the supplementary and complementary models of government-nonprofit relations, assuming that one mode of government-nonprofit relations dominates a policy subsector. We challenge this assumption and propose that the relationship between nonprofit sector size and the breadth of local government policy actions depends on their level of collaboration. Situated in the context of urban climate governance and drawing information from a national survey of U.S. local government climate actions, we test this modified model and find a statistically significant moderation effect of collaboration. However, contrary to our proposed hypotheses, our findings suggest that a positive association between the number of environmental nonprofits and governmental climate actions exists when the level of government-nonprofit collaboration is low to moderate. We posit that the adversarial lens of government-nonprofit relations and the cost of collaboration are key to understanding these surprising findings.

Keywords: government-nonprofit relations, climate change, environmental nonprofits, collaboration

Interactions and collaborations between the government and nonprofit sectors have been a key concern in nonprofit studies and public management. Built on Weisbrod's (1977) government failure theory and Salamon's (1987) interdependence theory, Young's (2000) supplementary and complementary modes of government-nonprofit relations are among the most tested frameworks by recent empirical studies. The supplementary mode predicts a negative association between the sizes of the government and nonprofit sectors while the complementary mode posits a positive association. While many empirical studies have followed Young's initial framework, there is mixed evidence about whether the supplementary or complementary mode dominates government-nonprofit relations. According to a recent meta-analysis of the existing literature (Lu & Xu, 2018), there is generally a weak and sometimes statistically insignificant positive association between the sizes of the two sectors. In other words, the field still lacks consistent evidence regarding these two competing models. Moreover, the supplementary and complementary modes tend to weigh differently in various policy subsectors (Cheng, 2019a; Grasse et al., 2021; Lecy & Van Slyke, 2013; Matsunaga et al., 2004).

In this article, we propose a more accurate reading of the supplementary and complementary modes of government-nonprofit relations as a means to reconcile competing evidence. Instead of using the association of sector sizes to directly test the two models, we propose that the association between the sizes of the two sectors depends on how collaborative the government and nonprofit sectors are in any respective policy subsector. We define collaboration as the process of creating multiorganizational or multisectoral arrangements to solve problems that are not easily solved by a single organization or sector (McGuire, 2003). By merging data on the size of the local environmental nonprofit sector with data from a national survey of city

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administrators, we empirically test this contingency model of government-nonprofit relations in the context of municipal climate actions where environmental nonprofits and city governments may choose to collaborate or to work independently on these critical issues.

This article makes several theoretical and empirical contributions to the existing literature. First, Despite the significance of the climate crisis and critical roles nonprofits play in urban climate governance, there are few empirical studies that explicitly examine the relationship between the nonprofit sector and what governments do to tackle climate change (Gazley, 2019; Kagan & Dodge, 2022). Moreover, as climate change becomes increasingly politicized at the US federal level, thus challenging the prospect of unified national or international governmental actions (Jaffe, 2017), local governments and nonprofit organizations are increasingly highlighted as key actors who offer a ground-up approach to addressing the climate problem (Bulkeley, 2013; Hughes, 2020). Our study begins to fill these gaps of knowledge by adapting one of the most widely used frameworks in voluntary and nonprofit studies to the understanding of urban climate governance.

Second, there is an assumption in existing studies that the mere presence of environmental nonprofits in a community may automatically increase local governments' climate actions (Portney & Cuttler, 2010; Sharp et al., 2011). In other words, the nonprofit sector is often regarded as part of the civic capacity necessary for the implementation of climate policies (Brandtner, 2022). By developing a contingent model of local governments' climate actions based on the nature of the relationship between the government and nonprofits, we contribute to

a better understanding of how their interactions may stimulate or suppress local governments'
climate protection initiatives.

Finally, while Young's (2000) supplementary and complementary models of government-
nonprofit relations have been used extensively by scholars and policymakers, the common
association of certain policy subsectors with particular modes of government-nonprofit relations
can pose a serious empirical limitation. For example, human services are often examined via the
complementary lens (Salamon & Toepler, 2015) while arts and culture nonprofits are often
assessed via the supplementary lens (Kim, 2015). By focusing on the policy field of urban
climate governance, for which there is little expectation about the dominant form of government-
nonprofit interaction (Bies et al., 2013), we are able to integrate the nature of the relationship
into Young's framework based on the nature of the relationship, without being hampered by *a
priori* sector-wide assumptions about the type of relationship likely to dominate.

**A Brief Review of the Classic Supplementary-Complementary Models of Government-
Nonprofit Relations**

Understanding the diverse ways that nonprofits and the government interact is a key theme in
nonprofit and voluntary studies. For example, Najam (2000) uses the differences in the
combinations of policy strategies and goals to characterize government-nonprofit relations
according to the four Cs: cooperation, co-optation, complementarity, and confrontation.
Brinkerhoff (2002) employs organizational identity and mutuality to distinguish different forms
of government-nonprofit partnerships. While these frameworks are widely used in public and

nonprofit management research, Young's (2000) supplementary-complementary-adversarial

framework is still regarded as the most comprehensive and widely used framework to understand

the dynamics of government-nonprofit interactions. Compared with the aforementioned

frameworks, Young's has several unique advantages. First, it is easier to test empirically than

Najam's (2000) framework, which depends on an assessment of whether the goals of public and

nonprofit actors are similar or different. Compared to the model offered by Brikerhoff (2002),

Young's framework does not assume that the government and nonprofits only work in

partnerships, and therefore captures a wider range of government-nonprofit relations. Given

these advantages, we have selected Young's (2000) supplementary-complementary models of

government-nonprofit relations as a basis for this article.

In the classic supplementary model, governments and nonprofits are expected to operate in

different market niches (Smith & Grønbjerg, 2006). The demand heterogeneity thesis (Weisbrod,

1977) sets the foundation for the supplementary model. According to this thesis, government

services are driven by the demand of the median voter, whereas nonprofits are created to serve

the demand that is not being met by the government. Therefore, as the government takes on more

responsibility in one service area, nonprofits would take less, and vice versa. Empirically, we

would expect that a larger nonprofit sector is associated with fewer governmental activities in a

policy subsector. There is some empirical support for the supplementary model. For example,

Cheng (2019a) found that as park-supporting charities increase their spending in a city, the level

of public spending on parks and recreation services decreases over time.

In contrast, the complementary model of government-nonprofit relations suggests that the nonprofit sector operates in close partnership with the government in service provision and delivery. Salamon (1987; 1995) pioneered this line of inquiry by discovering an enduring pattern of government-nonprofit collaboration around welfare services. According to the complementary view, the government provides funding to nonprofits to deliver public services. Therefore, we would expect a positive correlation between governmental and nonprofit activities in a service subsector. Multiple empirical studies have validated this prediction from the complementary model. As one example, Lecy and Van Lyke (2013) found that compared to private donations, government funding is a stronger predictor of nonprofit density.

While the supplementary and complementary models of government-nonprofit relations offer alternative explanations for how the two sectors interact, in certain circumstances, a third model is also relevant. Young's (2000) adversarial model points to nonprofits as using policy advocacy and grassroots organizing to push the government to take action. This perspective is most aligned with the understanding of the role of the nonprofit sector as a key civil society institution (Eikenberry & Kluver, 2004). While the adversarial model captures a key function of the nonprofit sector, this model does not specifically predict the association between the size of government and nonprofit sectors (Young & Casey, 2017). Nonprofits can either advocate for more, less, or different governmental actions in a policy subsector. Because of the ambiguity and difficulty in deriving testable hypotheses from the adversarial model, there are few empirical studies quantitatively testing the adversarial model. The supplementary-complementary models of government-nonprofit relations thus remain the most tested framework based on Young's initial conceptualization, particularly in empirical studies using quantitative analysis.

While the supplementary model suggests a negative association between the size of the nonprofit sector and the breadth of government policy actions, the complementary model suggests a positive association. In their meta-analysis of 30 empirical studies examining the relationship between government size and nonprofit sector size, Lu and Xu (2018) found an overall positive yet generally weak association between government size and nonprofit sector size, offering overall limited support to the complementary model. Although Young (2000) recognized that these different modes of government-nonprofit relations may exist simultaneously in a policy subsector, we can conclude from this brief overview that empirical tests of his framework often frame them as competing models of how governments and nonprofits may interact with each other. The classic hypotheses corresponding to each model are as follows:

Classic supplementary hypothesis (H1a): there is a negative association between nonprofit sector size and the breadth of government policy actions.

Classic complementary hypothesis (H1b): there is a positive association between nonprofit sector size and the breadth of government policy actions.

Collaboration as a Moderator in the Relationship between Nonprofit Sector Size and the Breadth of Government Policy actions

As reviewed in the previous section, current research often assumes that one model of government-nonprofit relations dominates a policy subsector. Therefore, existing empirical

studies generally test these models in the aggregate to determine the dominant mode of government-nonprofit relations in a policy subsector via the association between nonprofit sector size and the breadth of governmental policy actions (Carroll & Calabrese, 2017; Cheng, 2019a; Grasse et al., 2021). These approaches, while efficient in establishing testable hypotheses (i.e., the classic supplementary and complementary hypotheses as we previously described), are inconsistent with Young's speculation in his original article. He states: "the three perspectives are by no means mutually exclusive. Nonprofits may simultaneously finance and deliver services where government does not, deliver services that are financed or otherwise assisted by government, advocate for changes in government policies and practices and be affected by governmental pressure and oversight" (Young 2000, p.151). However, the standard practice of examining the association between the size of the nonprofit sector and the breadth of governmental policy actions in a policy subsector is insufficient to incorporate this view.

Going back to the essence of the supplementary-complementary models of government-nonprofit relations, we suggest that existing studies overlook or assume away the nature of the relationship in their empirical analysis. The classic supplementary model is built on the assumption that nonprofit activities and governmental activities occur in different market niches, and they may compete with each other to fill in different niches (Cheng, 2019a; Smith & Grønbjerg, 2016). Therefore, the supplementary model rests on the premise that there is little collaboration between nonprofits and the government. The complementary model, on the contrary, emphasizes the prevalent collaborative and contractual relationship between the government and the nonprofit sector (Salamon, 1987; Salamon & Toepler, 2015). In other words, each model of government-nonprofit relations assumes a certain level of collaboration between the two sectors.

Based on this rationale, we propose that those classic hypotheses regarding the supplementary and complementary models of government-nonprofit relations are incomplete and do not offer a direct test of Young's framework. The relationship between nonprofit sector size and the breadth of governmental policy actions in a policy subsector depends on the level of collaboration between the two sectors. In particular, the classic supplementary hypothesis–which posits a negative association between nonprofit sector size and the breadth of governmental policy actions–will be supported when the level of collaboration between the two sectors is low. The classic complementary hypothesis, on the contrary, will be supported when the level of collaboration is high. Figure 1 presents a visual presentation of the moderating role of collaboration. We proposed the following modified hypotheses based on the supplementary and complementary models of government-nonprofit relations. What needs to be noted is that the following two hypotheses are on the flip side of each other. If one is true, the other is also true. Therefore, based on our conceptualization, when the level of collaboration between the government and nonprofit sectors is taken into consideration, the complementary and supplementary models of government-nonprofit relations become a unified framework.

[Figure 1 here]

Modified Supplementary Hypothesis (H2a): When the level of government-nonprofit collaboration is low, there is a negative association between the size of the nonprofit sector and the breadth of government policy actions.

Modified Complementary Hypothesis (H2b): When the level of government-nonprofit collaboration is high, there is a positive association between the size of the nonprofit sector and the breadth of government policy actions.

Research Context: Applying the Modified Model of Government-Nonprofit Relations to Urban Climate Governance

The field of urban climate governance offers a unique opportunity to test this modified model of government-nonprofit relations. Because of its complexity and the huge collective action problem involved in its mitigation and adaptations, many scholars and policymakers have advocated for a ground-up and multistakeholder approach to respond to this challenge (Cole, 2015; Ostrom, 2012; Dahe & Stocker, 2014). Environmental nonprofit organizations are considered important actors pushing forward the sustainability movement and climate initiatives among U.S. cities (Bies et al., 2013; Portney and Berry 2010; 2015). Although they share a general aim of improving environmental quality, local environmental nonprofits vary widely in their focus and approach. As a result, they are likely to develop a range of relationships with their local governments, reflecting various modes of government-nonprofit relations. For example, a segment of environmental nonprofits focuses largely on stewardship and have a relatively independent relationship with their local governments. Local Keep America Beautiful chapters or various "friends of the park" and water bodies groups often organize member events to pick up trash, plant trees, and offer public education programs to raise awareness of environmental issues in their communities (Cheng, 2019b; Gazley et al., 2018). As these organizations often organize their events on public lands, they need to work with local

governments and get their approval. However, the working relationship is more independent as these organizations make their own programming decisions and strategic priorities.

Other types of environmental nonprofits are likely to work more closely with local governments in the form of collaborative partnerships. These organizations may assist in policy development, implementation, and/or capacity building, enabling the government to take on a larger set of activities. One such example is the Clean Air Partnership (CAP), a registered public charity in Canada, which works in partnership with their local governments to reduce greenhouse gas emissions and improve air quality in their communities. In 2020, the CAP published a report to guide how local governments can work with local nonprofit organizations to advance their climate actions (Behan, 2021). The recent "30 by 30" conservation plan initiated by the Biden Administration also explicitly recognizes the importance of and encourages collaboration with local conservation groups and private landowners.

Given the varied and important roles that nonprofits play in the urban climate policy landscape and the leeway local governments have in their climate actions (Cheng et al., 2021), this policy area offers an ideal context to further refine and test the modified models of government-nonprofit relations we previously identified. In particular, according to the modified supplementary model of government-nonprofit relations, we expect that when the level of government-nonprofit collaboration in urban climate governance is low, there is a negative association between the size of the environmental nonprofit sector and the number of climate actions enacted by a city government. Based on the modified complementary model, we expect

that when the level of government-nonprofit collaboration in urban climate governance is high, there is a positive association between the size of the environmental nonprofit sector and the number of local climate actions. In the next section, we will discuss our data, measurements, and empirical strategy.

Data and Methodology

Data Source and Sample

Data for this analysis comes from two primary sources. First, the dependent variable and several of the independent variables were obtained from the 2015 Smart and Sustainable Cities Survey. Survey invitations were sent directly to the city government employee pre-identified as "most in charge of sustainability" in every US city with a population over 20,000 (n=1282). The identity of the survey recipient was obtained via systematic searches of city websites. Phone calls were made to city offices when either the appropriate person or their contact information was not able to be found online. The survey was administered online using Qualtrics survey software and was followed by two emailed reminders. Individuals who did not respond to the electronic invitations were mailed a paper copy of the survey. In total, 507 cities completed the survey yielding a response rate of 39.4%. Another 86 provided partial responses. Completed responses were received from cities in 48 states and Washington D.C. As shown in Table 1, the respondent cities are similar to non-respondents on basic demographic indicators and the number of environmental nonprofits in their residing counties. The one metric on which there is a statistically significant (α=0.05) difference is average educational attainment. However, the difference is modest with 2.5 percent more adults in the responding cities having attained a Bachelor's degree or higher.

[Table 1 Here]

The second main sources of data are the National Center for Charitable Statistics (NCCS) IRS Business Master Files (BMF), which contains the most comprehensive and timely information on active registered nonprofits in the U.S. (McKeever, 2018). We used the National Taxonomy of Exempt Entities (NTEE) Code C to identify and count the number of private nonprofit organizations with the primary purpose of protecting and conserving the environment in a locality. The 2015 American Community Survey (ACS) and the MIT Election Lab serve as sources for our control variables to account for city/county level socioeconomic and political characteristics.

Variables and Measurement

Our Dependent Variable is *local government climate actions*, an additive index of various initiatives and programs taken by municipalities to address climate issues and advance environmental sustainability. The Smart and Sustainable Cities survey asks a total of 17 questions about cities' climate-relevant actions, including around specific issues like water conservation, green space preservation, energy conservation, renewable energy generation, and waste reduction. Importantly, despite not being explicitly about climate, each of these actions has the potential to either directly or indirectly influence local greenhouse gas emissions. The dependent variable is essentially a count of how many of these actions cities have implemented. Each action is weighted equally, which places the focus on the number of distinct actions

undertaken or the breadth of local government climate actions, rather than on estimates of their difficulty or depth. Appendix 1 provides a full list of included actions.

As explained in the hypotheses section, our primary goal is to understand the nature of nonprofit-government relationships in urban climate governance. To that end, we employ key two independent variables in our study: *the number of environmental nonprofits* and *the extent of government-nonprofit collaboration*. Both variables are measured at the city level. Following Sharp (2011), we estimated the number of environmental nonprofits within each city by multiplying the total county-level number of environmental nonprofits by the proportion of the city's population to the overall county population. This approach is used over matching zip codes to cities because zip code boundaries do not always match city limits. The government-nonprofit collaboration variable is generated from the Smart and Sustainable Cities survey data and measures the extent to which a city government "works collaboratively on energy, sustainability, and climate issues" with nonprofit organizations. Respondents were presented with a five-scale response ranging from (1) "not at all" to (5) "very much", which we collapsed into three categories to make sure that there is a sufficient number of responses under each category. A total of 254 cities (50.3%) reported little to no collaboration while 116 cities (23%) indicated moderate collaboration. 135 cities (26.7%) reported they collaborate with nonprofits on climate issues to a significant degree.

The model also includes variables that extant research finds to be key predictors of local climate protection efforts. *Human capacity* and *financial capacity* are binary variables that respectively

indicate if each city has dedicated staffing and a dedicated line in the city budget for sustainability. *Climate Priority* captures the extent to which a city prioritizes climate change adaptation, ranging from 1(Not at all priority) to 5 (Very high priority). Given the significance of community influence on municipalities' political agenda, two additional variables are included that measure the level of support for the city's climate actions from key community stakeholder groups. The extent to which the general public and chamber of commerce and business associations support the city's climate action efforts were asked on a five-point Likert scale ranging from 1 (Strongly Opposed) to 5(Strongly Support). These factors have been documented as key factors in shaping U.S. cities' climate adaptation efforts (e.g., Shi, Chu, & Debats 2015)

We also control for several community characteristics that shape local climate actions in important ways, including the city's population size, median income, the proportion of the city's population that is non-Hispanic white[1], the percent of voters who voted for the Democratic presidential candidate, and whether a city is a member of the organization ICLEI-Cities for Sustainability. All of the information is available at the city level, except the Democratic voting data, which is at the county level. All continuous IVs are standardized to facilitate the comparison of coefficients. Table 2 offers the descriptive statistics of variables.

Because the number of environmental nonprofits varies considerably across cities, we have taken several measures to deal with the presence of outliers and its possible influence on our estimates. First, by visually inspecting a box plot, we removed 2 outliers from our analysis sample. We then followed up with an additional model that further excluded 63 observations identified as outliers by Interquartile Range (IQR) measure as a robustness check. Results of key variables

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consistently hold across models and significance slightly improves with the exclusion of outliers. This yields strong evidence for the reliability of our findings. In what follows, we present the estimates of our first model with the larger sample size and offer the results of the additional model in appendix 3. The frequency histograms of nonprofit counts for both samples are also provided in appendix 2.

[Table 2 Here]

Empirical Strategy

A fair amount of variation was observed in the range of actions respondent cities reported they were involved in. The additive index ranges from 0 to 16, indicating none of the respondent cities were undertaking all of the 17 actions asked in the survey. Because the dependent variable is a count of climate-relevant actions, we use a Poisson regression model, which allows a lower bound at 0 and accounts for the discrete nature of the outcome data. Poisson regression makes several key assumptions that must be met to validate its use. Specifically, the dependent variable should neither display excessive zeros nor be over-dispersed, meaning the variance of the distribution should not be greater than the conditional mean. Violating these assumptions necessitates alternative modeling techniques, including Negative Binomial regression that accounts for overdispersion in Poisson models. Excessive zeros are not a concern in our model, as less than 1% of our sample (4 cities) reported zero involvement in the identified climate-relevant actions. Half of our respondent cities reported at least 6 or more climate programs and activities while 25% of the sample indicates 10 or more programs and activities. Figure 2 plots

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the histogram of our outcome variable with the normal curve overlaid and shows no indication of overdispersion.

[Figure 2 Here]

The results of two goodness-of-fit tests and a likelihood ratio test further support the use of the Poisson regression. Deviance goodness-of-fit and Pearson-goodness-of-fit for both models are found to be highly insignificant, which indicates a good model fit. We estimate two models: one with main effects only and the other with interactive effects. The first model, which only tests the main effects of our key variables, shows that the current model fits the data well with a deviance of 405.818 on 409 degrees of freedom and a corresponding P-value of 0.535. Pearson goodness-of-fit for the same model is also highly insignificant with a P-value of 0.801. Our second model likewise proves to be well-fitting with a highly insignificant P-value at 0.617 (a deviance of 397.92 and 407 degrees of freedom) and Pearson goodness-of-fit at a P-value of 0.850. Lastly, a likelihood ratio test was conducted to compare with the Negative Binomial model and the Poisson model provided a significantly better fit, thereby further validating our model fit.

Empirical Findings and Results

We first run a model with main effects only to test the classic hypotheses developed from the supplementary and complementary models of government-nonprofit relations. We then proceed with a second model that includes an interaction term to test contingent relationships based on our refined hypotheses. Both models are estimated with state-fixed effects. Table 3 offers regression results for both models.

[Table 3 Here]

The main effects model shows some interesting dynamics shaping local climate protection efforts. First, the overall number of local environmental nonprofits is positively associated with an increased level of cities' climate efforts ($p < 0.1$), which provides modest support for the classic complementary hypothesis. As the number of environmental nonprofits increases by one standard deviation in a city, the log count of cities' climate programs increases by 0.059. This equates to roughly 1.146 of the 17 actions included in the index.

Second, the reported extent of collaboration between a local government and environment nonprofits is overall significantly associated with the number of climate-related actions a city has undertaken. The expected difference in log count between cities that moderately collaborate with environmental nonprofits on climate issues and cities that rarely collaborate is 0.132 (roughly 1.355 actions). When cities and nonprofits collaborate significantly on climate issues, the expected difference is even larger and increases by 0.178 (roughly 1.507 actions). Therefore, our results suggest that cities engaged in collaborative relationships with local environmental

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nonprofits are undertaking a larger number of climate-relevant actions. The positive effects of nonprofit-government collaboration, together with the number of environmental nonprofits in a city, further support the complementary relationships between local governments and environmental nonprofits in our sample cities.

Several other variables are also found to be statistically significant. As expected, cities that place a greater priority on climate mitigation are engaged in greater municipal climate efforts. The support from the business community shapes cities' climate protection efforts positively and quite significantly ($p<.000$), whereas the support from the public at large does not. Consistent with previous research showing that membership in ICLEI modestly increases cities' climate protection activities (Krause, 2012), our results also show that all else equal, ICLEI participants have a greater number of climate-relevant programs. ICLEI is itself an environmental nonprofit organization, and while a city's membership in it represents a type of collaboration with this sector, it is international in scope and not a part of any city's local nonprofit sector considered in the focal independent variable. Neither having a budget nor staff dedicated to sustainability appears to be a significant predictor of cities' climate actions. This may be a result of the binary nature of the variables, thus needing improvement in future research. No demographic variables are found to influence climate protection efforts.

The second model in Table 3 includes an interaction term to see whether the level of government-nonprofit collaboration moderates the relationship between the number of environmental nonprofits and the local governments' climate actions. As described in our

hypotheses, we are primarily interested in understanding how the impact of a larger local

nonprofit system is moderated by the overall nature of the relationship that a city government has

with the organizations that comprise it. Specifically, the modified supplementary hypothesis

suggests a negative association between the number of environmental nonprofits and local

governments' climate actions when the level of government-nonprofit collaboration is low, while

the modified complementary hypothesis suggests a positive association between the two when

the level of collaboration is high.

According to the results of Model 2 in Table 3, the positive impact on the number of climate-

relevant actions observed diminishes as the number of local nonprofits increases when there is

significant collaboration. The main effect of the number of environmental nonprofits without the

interaction term is 0.059 (Model 1). With the interaction, the total effect of the environmental

nonprofit sector size is 0.223 – 0.235 = -0.012. This shows that when the collaboration between

government and nonprofits is high, more environmental nonprofits actually have a negative

impact (the effect size is quite small though). Figure 3 shows the same story with a more

intuitive graphical presentation. For the blue and green lines (indicating the level of government-

nonprofit collaboration is little or moderate), we observe an upward-sloping curve for the

relationship between local governments' climate programs and the number of environmental

nonprofits. However, when the level of government-nonprofit collaboration is significant (the

red line), there is a slightly negative slope. In other words, when the level of government-

nonprofit collaboration is little to moderate, there is a positive association between

environmental nonprofit sector size and the breadth of local governments' climate programs.

When the level of collaboration is high or significant, there is a negative association. Neither the

modified supplementary hypothesis (H2a) nor the modified complementary hypothesis (H2b) are supported by the interaction model results.

[Figure 3 Here]

Moreover, Figure 3 shows the decreasing marginal effects of collaboration. Those three lines cross with one another, showing a cross-over interaction. The fewer environmental nonprofits cities have, significant collaboration is associated with a greater number of climate programs when compared with moderate collaboration. However, the red and green lines cross over and beyond that point, city governments that moderately collaborate with nonprofit partners start to surpass the cities that significantly collaborate with nonprofits in their number of climate programs. In other words, having a significant collaborative effort with a larger number of nonprofits does not necessarily benefit municipal climate efforts. This is further supported by looking at cities that rarely collaborate with nonprofits. The blue line also starts to surpass the other two lines and beyond the cross-over points, a blue line is always above the other two lines and draws a more rapidly increasing trend. Given that the majority of our sample cities have a moderate size of the nonprofit sector (below the crossover point), we can conclude that nonprofit-government collaboration generally brings a positive force to city climate efforts; that is, in most cases, cities that collaborate with nonprofits on their climate protection efforts do more than those who do not. Nonetheless, the effects of nonprofit size are not always linear and consistent across different levels of nonprofit-government collaboration while the positive effects of collaboration are also not uniform across different nonprofit sizes. Rather, once the number of

environmental nonprofits becomes large enough, cities with little collaboration tend to be engaged in more extensive climate action efforts. Government-nonprofit relations operate beyond a dichotomous and linear pattern - either positively or negatively associated.

Discussion

In this article, we propose a modification to the traditional complementary and supplementary models of government-nonprofit relations by incorporating the level of collaboration as a moderator of the relationship between nonprofit sector size and the breadth of government policy actions. While our findings support the moderating role of collaboration, they deviate from our initial hypotheses drawn from the modified complementary and supplementary models. We find that when there is little to moderate level of collaboration, the number of environmental nonprofits in a city is positively associated with the breadth of local government climate actions. However, when the level of collaboration is high, this positive association goes away. In this section, we provide additional interpretation and discussion about how our findings contribute to the existing literature around government-nonprofit relations and urban sustainability.

Consistent with recent research finding that service subsectors and the level of government funding (federal, state, or local) together determine whether public funding crowds out or increases private donations (Grasse et al., 2021), we find that underlying relationship parameters shape how governments and nonprofits interact with each other across different subsectors. In particular, the level of collaboration between those two sectors is a strong predictor of policy activity than the issue-based identity of the particular subsector or the size of the local nonprofit

sector itself. Moreover, our study speaks to the importance of further refining and modifying classic theories of government-nonprofit relations in the field by exploring possible moderating or mediating relationships (Cheng & Wu, 2021; Gazley & Guo, 2020; Paarlberg & Zuhlke, 2019).

Our findings also confirm some conclusions from the urban sustainability literature which suggests that the presence of a large environmental nonprofit sector is an important source of the local civic capacity necessary for carrying out climate actions (Brandtner, 2022; Brandtner & Suárez, 2021; Portney & Cutter, 2010). In terms of our findings of the strong positive correlation between government-nonprofit collaboration and city climate action, they are consistent with the existing literature's emphasis on finding collaborative solutions to address climate change (Cole, 2015; Park et al., 2021). Given the transboundary nature of climate issues, collaborative strategies are now widely recognized as a preferred, if not inevitable, approach to addressing them. Research well documents empirical evidence for inter-jurisdictional and -sectoral climate networks of various sizes and purposes (Lee & Dodge, 2019) while several studies find positive effects of such collaborative efforts on achieving greater climate and sustainability outputs and outcomes (Scott, 2015).

Our study departs from and contributes to the existing literature by incorporating the moderating role of collaboration. While our findings support the role of collaboration in moderating the relationship between environmental nonprofit sector size and governmental urban climate actions, they do not operate in the way we initially hypothesized based on the modified models

of government-nonprofit relations. We find that when the level of collaboration between

nonprofits and local governments is low, there is a stronger positive association between the

number of environmental nonprofits and governmental climate actions. When the level of

collaboration is high, as it is for the majority of our sample, governments in cities with a large

nonprofit sector take on fewer climate-relevant activities (see Figure 3).

Several dynamics may explain this finding; however, due to data limitations, we are only able to

capture the level of a collaborative relationship between nonprofits and local governments. When

the collaboration level is relatively low, one of two dynamics may be at play. First, it may mean

that environmental nonprofits are operating independently as supplement to government.

Alternatively, the low collaboration level may indicate that nonprofits and local governments are

involved in an adversarial relationship. In the current context, an adversarial relationship may be

characterized by nonprofits pushing local governments to undertake more, less, or different

climate actions. Given our data, we are unable to identify which dynamic is at play. However,

the observed direction of our results (i.e. when the environmental nonprofit sector is large and

collaboration is low, city governments are engaged in a larger number of climate actions)

suggests an adversarial dynamic where a robust environmental nonprofit sector is pushing the

government to do more.

Although somewhat speculative, this interpretation of results is consistent with other recent

studies that have discussed the diminishing marginal returns of collaboration around local

sustainability initiatives, given the various costs of forming and maintaining collaborative

partnerships. Specifically, when cities have higher capacity, they may have less need for

additional collaborative partners (Krause, Hawkins, &Park, 2021). Our results similarly suggest

that while working with nonprofits is conducive to municipal climate efforts, having more

nonprofit partners does not necessarily bring more benefits. The overall diminishing marginal

returns of government-nonprofit collaboration shown in figure 3 suggests that costs increase

along with the number of nonprofits. At some point, the costs of investment in collaboration start

to outweigh the benefits. These conclusions must be accompanied by a caveat, however, as the

number of observations in our sample with a "particularly large" nonprofit ecosystem is rather

small.

Conclusion

Climate change is one of the biggest collective action problems facing human society (Cole,

2015). There is an imperative to pay closer attention to how the nonprofit sector and the

government interact with each other to respond to this huge challenge, particularly because of the

polarized political environment which has stymied unified governmental action. Research has

recognized the increasingly important role nonprofits play in shaping climate governance

agendas (Bulkeley & Bestill, 2013; Gruby et al., 2021; Hughes, 2020). Studying government-

nonprofit relations in urban climate governance is not only of substantive significance but also

theoretical significance. As an emerging policy area where the government and nonprofits are

still negotiating and testing their proper roles in urban climate governance, it provides a unique

opportunity for us to test and refine our classic theories of government-nonprofit relations.

Focusing on the complementary and supplementary models of government-nonprofit relations, we contribute to the existing nonprofit literature by problematizing the existing empirical approach of associating certain policy subsectors with a particular model of government-nonprofit relations. By introducing the moderating role of collaboration, we show that multiple models of government-nonprofit relations can coexist in a policy subsector and the nature of the relationship seems to be key to understanding the dynamics of government-nonprofit interactions. Situated in the context of urban climate governance, we show that the relationship between nonprofit sector size and governmental climate actions depends on their level of collaboration. In particular, when collaboration between the two sectors is low, there is a stronger positive association between the number of environmental nonprofits and governmental climate actions. While this finding does not support either of our proposed modified hypotheses, it does reinforce the importance of taking the nature of cross-sectoral relationships seriously, both theoretically and empirically. The relationship between nonprofit sector size and the breadth of governmental policy actions appears more complex than stated. A highly collaborative relationship between the two sectors may sometimes be counterproductive in creating the desirable governmental efforts in responding to climate change. It is important to keep the adversarial and advocacy roles of environmental nonprofits in urban climate governance (Kagan & Dodge, 2022).

Our study has limitations and creates several promising avenues for future research. Although a comprehensive effort has been made to merge a unique national survey of U.S. local governments' climate actions and environmental nonprofits, our study only takes a snapshot of the complex relationship between the government and nonprofits in urban climate governance.

The dynamics of government-nonprofit interactions are likely to change over time as public opinions towards climate change evolve and as local governments further build or erode their administrative capacity in tackling climate change. Longitudinal data collection and study design are needed to better capture the temporal relationship between the government and nonprofits in urban climate governance.

Another limitation is that our study only focuses on one type of relationship between the two sectors – collaboration. As we have stated in the discussion section, the lack of collaboration does not always fall into the supplementary model. Future studies should develop a better measure to fully distinguish those three types of relationships between the government and nonprofits – collaboration, competition, and conflict (Ostrom et al., 1961), or complementary, supplementary, and adversarial (Young, 2000). Future research should also examine other policy subsectors to further test the modified complementary and supplementary models of government-nonprofit relations. We expect that the classic complementary and supplementary hypotheses would be supported in policy subsectors where there is one predominant form of government-nonprofit interactions. However, for policy subsectors where nonprofits interact with local governments in diverse ways (for example, urban climate governance in our research context), the modified model has a stronger explanatory power.

Finally, our study focuses on city-level government-nonprofit interactions in urban climate governance, therefore not being able to account for within-city variations in the size of individual nonprofits or collaboration heterogeneity (e.g., some nonprofits in a city may collaborate more

closely with the local government than other nonprofits). Future studies should zoom in on individual cities to fully capture these dynamics and understand how nonprofits use different strategies to exert influence on the local government decision-making process (Thompson, 2022).

In conclusion, our research points to the importance of reorienting our understanding of government-nonprofit relations based on the nature of the relationship, instead of solely focusing on the association between the size of the two sectors. We offer unique data and empirical approaches to test the supplementary-complementary models of government nonprofit relations. This widely used model of government nonprofit relations will be more theoretically and empirically sound if the size of the two sectors and the nature of the relationship can be simultaneously incorporated into model development and testing.

Notes:

1. Many recent studies suggest the linkage between whiteness and urban sustainability (e,g, Connolly & Anguelovski, 2021) and the lack of diversity in environmental organizations across governmental and nonprofit organizations (Taylor, 2014).

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Table 1. Comparison of Survey Respondents to Non-Respondents

	Respondents (n=507)	Non-respondents (n=775)	Significantly different (α=0.05)
Population (2010)	107,220	102,036	No
Median Household Income	54,661	55,046	No
Percent in Poverty	10.82	10.71	No
Education (Bachelors +)	31.71	29.21	Yes
Number of Environmental Nonprofits in their Residing County	38.77	52.48	No

Table 2. Descriptive Statistics of Variables

	N	Mean	Std Dev	Min	Max
Number of Local Government Climate Actions	507	6.765	2.994	1	16
Number of Local Environmental Nonprofits	593	9.429	21.919	0	355
Level of Nonprofit-Government Collaboration	505	1.764	.846	1	3
Climate Priority	586	2.699	1.127	1	5
Human Capacity	523	.514	.500	0	1
Financial Capacity	524	.225	.418	0	1
Public Support	492	3.496	.892	1	5
Business Community Support	490	3.227	.804	1	5
Population (log)	593	11.141	.820	9.885	15.177
Median Income (log)	593	10.875	.346	9.896	11.901
Demographics-White (%)	593	.712	.174	.127	.965
ICLEI Membership	593	.258	.438	0	1
Democrats (%)	593	53.645	14.300	5.77	90.948

Table 3. Poisson Regression Results for Main and Interaction Effects

	Models 1 (Main Effects Only)		Model 2 (Incl. Interactions)	
	Coefficients	*p-value*	*Coefficients*	*p-value*
Number of Local Environmental Nonprofits	.059* (.035)	.090	.223* (.118)	.058
Moderate Level of Government-Nonprofit Collaboration	.132*** (.049)	.008	.094 (.053)	.077
Significant Level of Government-Nonprofit Collaboration	.178*** (.056)	.001	.152*** (.058)	.009
Number of Local Environmental Nonprofits *Moderate Collaboration	-	-	-.123 (.118)	.296
Number of Local Environmental Nonprofits *Significant Collaboration	-	-	- .235** (.117)	.045
Climate Priority	.054** (.022)	.014	.055** (.022)	.011
Staff Capacity	.054 (.046)	.235	.048 (.046)	.299
Financial Capacity	.035 (.050)	.476	.047 (.050)	.344
Public Support	-.033 (.031)	.278	-.032 (.031)	.287
Business Community Support	.116*** (.028)	.000	.114*** (.028)	.000
Population	-.001 (.034)	.970	.018 (.036)	.609
Median Household Income	-.019 (.021)	.386	-.021 (.022)	.325
Demographics-White	.002 (.002)	.285	.002 (.002)	.266
ICLEI Membership	.106** (.047)	.024	.102** (.047)	.030
Democrats (%)	.002 (.002)	.355	-.001 (.002)	.465
State Fixed Effects	Yes	Yes	Yes	Yes
Constant	1.641*** (.269)	.000	1.669*** (.271)	.000
LR chi2	183.26 (59)		191.16 (61)	
Prob > chi2	.000		.000	
Pseudo R^2	.079		.083	
N	469		469	

Standard errors in parentheses. *** p<0.01 ** p<0.05, * p<0.1

Figure 1. Collaboration as a Moderator in the Relationship between Nonprofit Sector Size and the Breadth of Government Policy Actions
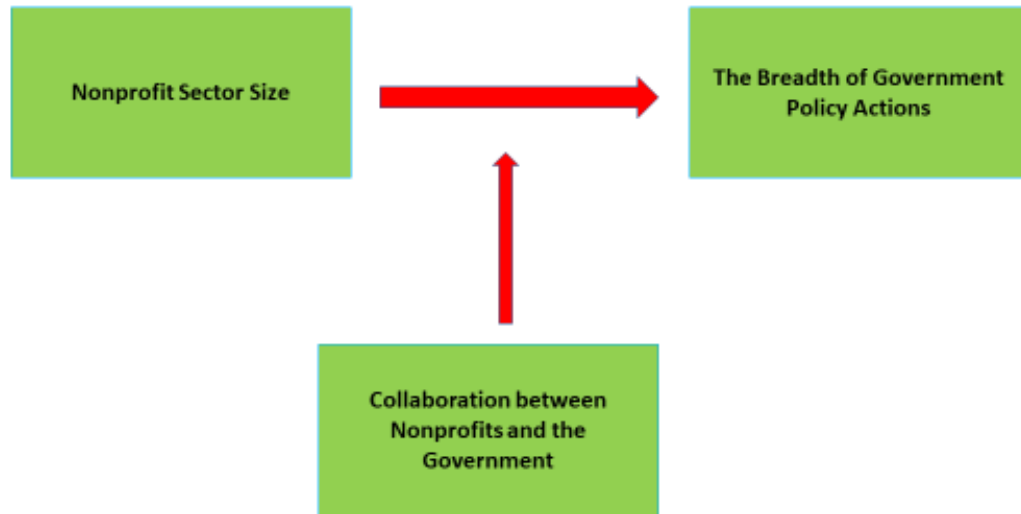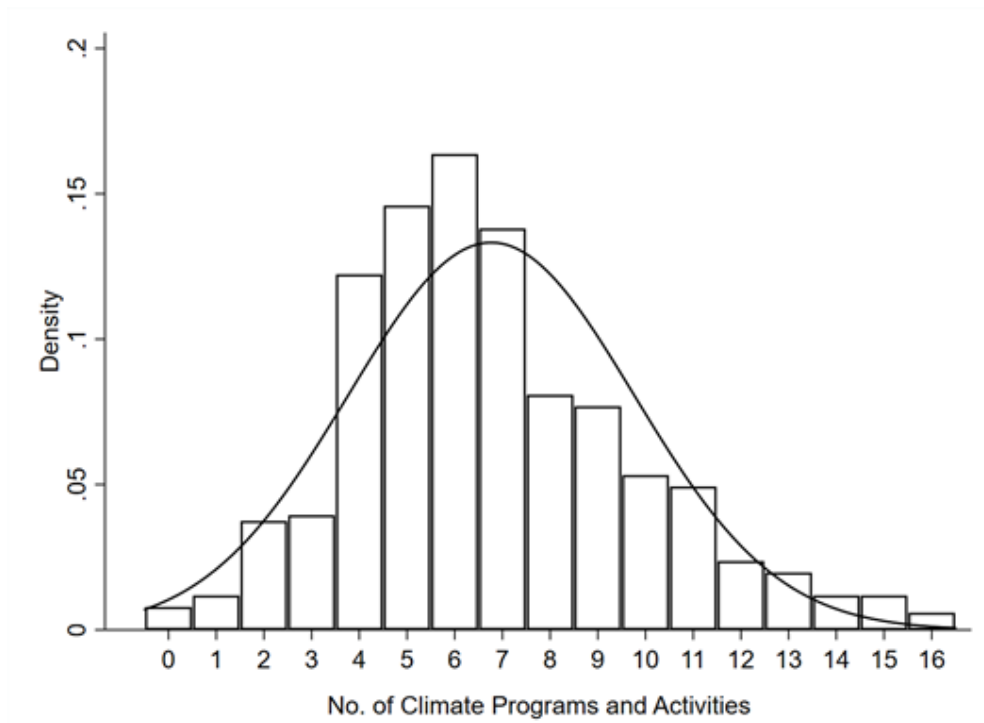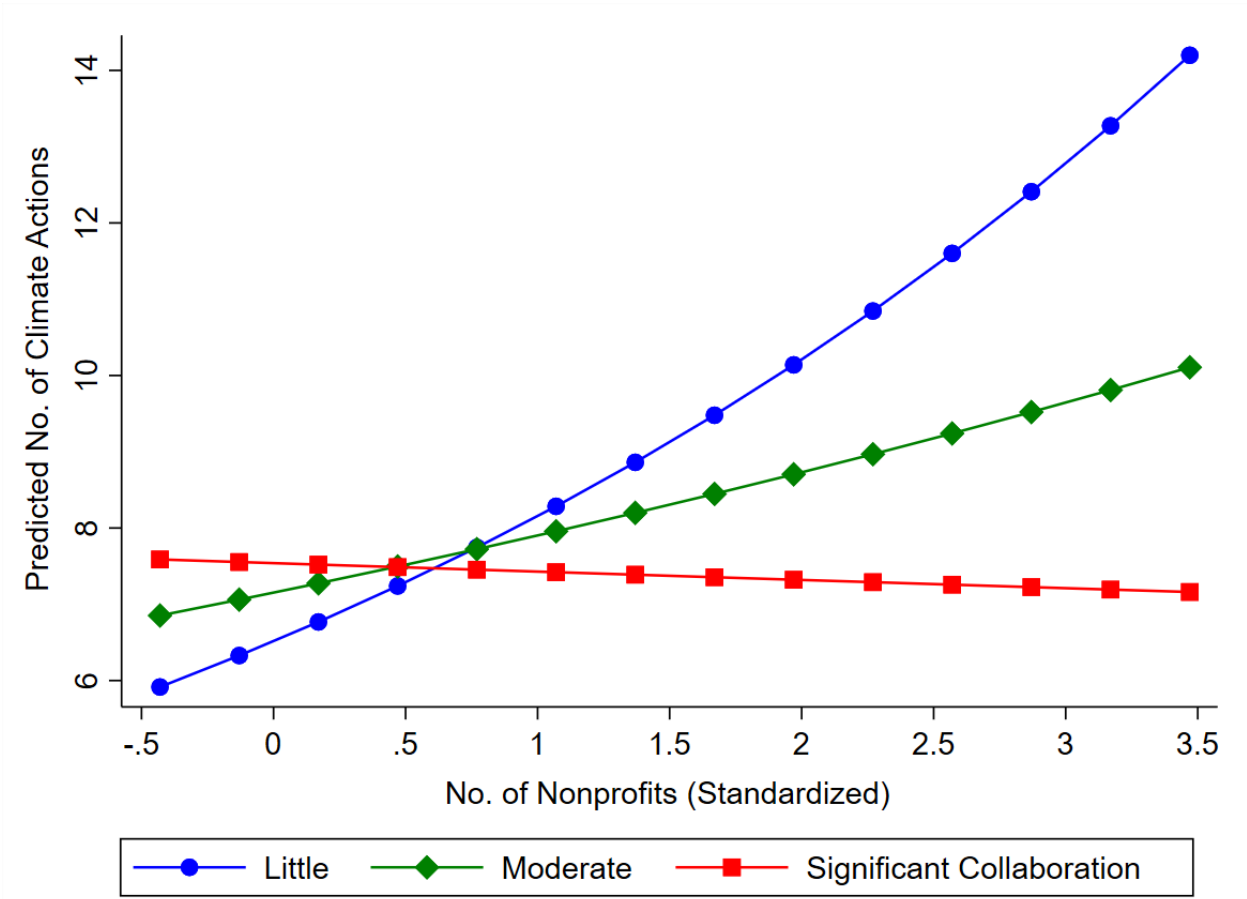
Figure 2. Histogram of Outcome Variable

Figure 3. Predicted Margins of the Number of Local Environmental Nonprofits

Appendix 1. List of Local Government Climate Actions

1) City/town works with existing businesses, employers, or business associations to identify opportunities to "green" operations or services

2) City/town provides financial incentives specifically targeted to support the renewable energy sector

3) City/town implemented "Buy Local" campaigns

4) City/town Provides property tax credits to any commercial building that achieved LEED certification

5) City/town created a demand for green products through public procurement policies

6) City/town Supports a local farmer's market

7) City/town requires sidewalks in new development

City/town unitizes regulations or financial incentives to encourage

8) Water conservation by city residents
9) Greenspace or open space preservation

10) Mixed-use development

11) Brownfield site repurposing

12) Reducing the use of plastic bags by grocery/retail stores

To reduce energy consumption, city/town offers residents or businesses financial incentives to take the following actions:

13) Retrofit existing buildings

14) Purchase energy-efficient appliances

15) Upgrade heating or air-conditioning systems

16) Install renewable energy infrastructure (e.g., solar panels)

17) Conduct energy audits

Appendix 2-1. Frequency Histogram of Cities by the Nonprofit Sector Size
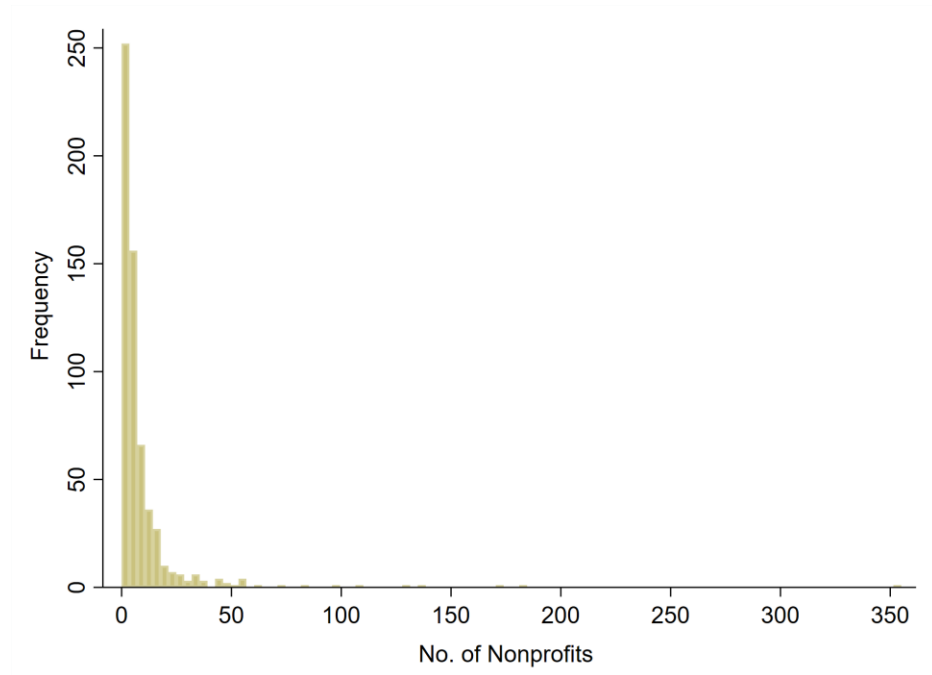
Appendix 2-2. Frequency Histogram of Cities by the Nonprofit Sector Size (Excluding outliers)
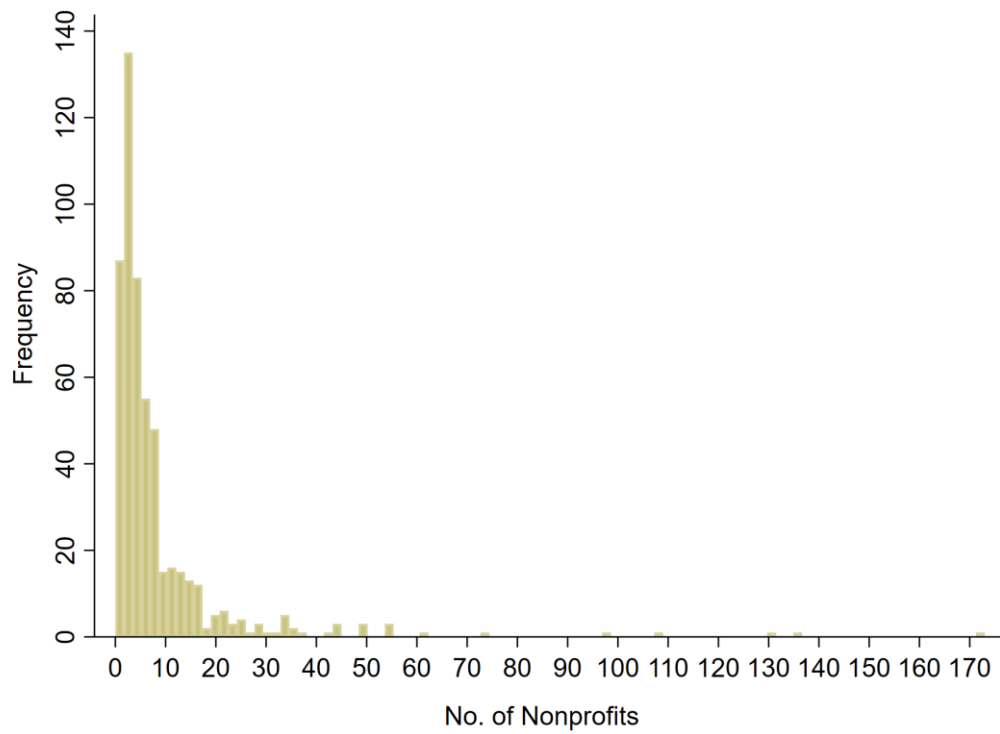
Appendix 3. Poisson Regression Results for Main and Interaction Effects (Excluding outliers)

	Models 1 (Main Effects Only)		Model 2 (Incl. Interactions)	
	Coefficients	*p-value*	*Coefficients*	*p-value*
Number of Local Environmental Nonprofits	.057 (.035)	.111	.233* (.121)	.053
Moderate Level of Government-Nonprofit Collaboration	.115** (.052)	.028	.074 (.056)	.187
Significant Level of Government-Nonprofit Collaboration	.172*** (.059)	.004	.144** (.061)	.018
Number of Local Environmental Nonprofits *Moderate Collaboration	-	-	-.135 (.120)	.263
Number of Local Environmental Nonprofits *Significant Collaboration	-	-	- .251** (.120)	.037
Climate Priority	.061* (.023)	.008	.062*** (.023)	.006
Staff Capacity	.053 (.049)	.282	.047 (.050)	.346
Financial Capacity	.034 (.053)	.524	.045 (.053)	.399
Public Support	-.021 (.032)	.514	-.020 (.032)	.533
Business Community Support	.094*** (.030)	.002	.092*** (.030)	.003
Population	.001 (.034)	.988	.021 (.036)	.560
Median Household Income	-.026 (.024)	.290	-.027 (.024)	.267
Demographics-White	.002 (.002)	.304	.002 (.002)	.279
ICLEI Membership	.074 (.051)	.146	.071 (.051)	.160
Democrats (%)	.002 (.002)	.391	-.001 (.002)	.471
Constant	1.689*** (.276)	.000	1.719*** (.278)	.000
LR chi2	152.61 (58)		160.88 (60)	
Prob > chi2	.000		.000	
Pseudo R^2	.074		.078	
N	418		418	

Standard errors in parentheses. *** p<0.01 ** p<0.05, * p<0.1

Appendix 4. Predicted Margins of the Number of Local Environmental Nonprofits with Confidence Intervals