The distribution of city climate action: How civic capacity enables green building certifications in U.S. cities

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Christof Brandtner

Department of Sociology

Stanford University

Abstract. Whether and when cities proactively embrace solutions for problems such as climate change varies starkly by geography. Differences in *city climate action* are argued to be the result of persistent variation in a city's organizational makeup. *Civic capacity*—the presence of nonprofit organizations indicating the population's ability to recognize and solve social problems—in particular affects the timing and extent of municipal action. I argue that civic capacity affects the interplay between public and private initiatives in three stages: During the *initiation* of a novel practice, nonprofit and public organizations lead by example and adopt early. Governments in early-adopter cities are more prone to passing legislation *legitimating* the practice. Corporations *scale* the practice in accordance with local norms, which leads to the misconception that they drive the bulk of adoptions. Studying the geographic dispersion of green building certifications from 2000 to 2016, I find support that civic capacity explains the timing and extent of city climate action. This effect is greatest early on, which indicates that nonprofits act as community leaders within cities. Public policy, which has a positive effect as well, is endogenous to prior private certification rather than preceding it. I conclude with implications for the understanding of local policies in response to social problems, the role of civic capacity in activating local communities, and investments in social infrastructure for climate change mitigation.

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INTRODUCTION

Sociologists have recently begun examining the social dynamics of adaptation, mitigation, and resilience to climate change, highlighting political and institutional conditions of how states and individuals respond to a changing environment (Pellow and Nyseth Brehm 2013; Hironaka 2014; Jerolmack and Walker 2018). In the periphery of sociological attention, *cities* have also contributed to climate change mitigation in important ways, for instance by setting ambitious goals of carbon neutrality, launching resilience programs, and building green (Bulkeley 2013; Klinenberg 2016). In 2016, for instance, more than 600 cities voluntarily reported their carbon emissions to the Carbon Disclosure Project. Yet many cities do not embrace their environmental responsibility. Only about 1 in 4 U.S. cities, for instance, signed a pledge to reaffirm its commitment to the Paris Climate Accords after the federal government shunned the international agreement in 2015. The adoption and implementation of practices intended to address climate change locally is unequally distributed across the nation.

To explain this disparity, I investigate the burgeoning and heterogeneous diffusion of environmental guidelines for buildings in US cities, where regulating construction is one of the most effective strategies for reducing carbon emissions. Sociological theory has struggled to illuminate the divergent development of such environmental initiatives because cities cannot uniformly "adopt" a practice. The acting bodies of city, such as municipal governments, are limited in their autonomy to pass legislation and thus often described as "creatures of the state" (Peterson 1981; Frug and Barron 2013). Additionally, environmental considerations are at odds with now conventional understandings of how growth coalitions determine urban politics (Molotch 1976). This paper offers a structural argument to analyze cities' contributions to climate change mitigation as a result of a city's organizational makeup.

In particular, I complement conventional accounts of municipal politics and elite interests by examining the processes through which *civic capacity* contributes to climate change mitigation. Civic capacity is broadly understood as the ability of the population to recognize problems, organize solutions, and mobilize consensus around those solutions. Civic capacity is commonly approximated by the presence and density of nonprofit organizations, differences in which are "enduring, sizable, and extensive" among local communities (Clifford 2018: 1577). These organizations do not operate in isolation, and their effects can be direct as well as indirect (Levine 2016; Brandtner and Dunning 2019). Civic capacity has shown to affect regional disparities in such outcomes as public health, social cohesion, environmental resilience (Browning et al 2017, Klinenberg 2018) and the geographic dispersion of such social behaviors as real estate speculation and delinquency (Sharkey et al. 2017; Goldstein 2018).

Civic capacity can also determine how new practices and ideas, such as green construction, spread between and within cities. Social movement theories of diffusion emphasize that the presence of advocacy organizations can increase the susceptibility of a nation, state, or city to surrounding ideas and practices (Martin 2001; Vasi 2007; Sine and Lee 2009; Negro, Carroll, and Perretti 2013). Focusing on the diffusion among polities, these theories provide important insights about the timing and conditions of first adoption or a policy or practice, but rarely investigate success and failures of implementation in the post-policy period (Soule and King 2006). Institutional theories of organizational community investigate the institutionalization of practices and ideas within a community of organizations (Greve and Rao 2012; Marquis et al. 2013; Rao and Greve 2017). Focusing on the diffusion within polities, these theories suggest why there are persistent differences among places but neglect that when and how organizational ecosystems facilitate institutionalization can change over time.

Although both perspectives highlight the importance of local organizational ecosystems in opening the windows to fresh winds, neither offers a full picture of how individual organizational behaviors determine collective differences (Soule and Zylan 1997).

I join these arguments about heterogeneous diffusion and organizational communities to simultaneously consider the spread and institutionalization of a new practice (Colyvas and Jonsson 2011). Following the insight that organizational fields are nested (Schneiberg and Soule 2005), organizations in pursuit of collective goals are a persistent and consequential determinant of a city's aggregate performance. In this view, change is implemented neither by a unitary, central actor with binary outcomes, nor by a network of exclusively private organizations that operate in isolation. Rather, cities are understood as constituted by a network of public and private organizations (Laumann et al. 1978; Powell et al. 1996; Safford 2009). In the aggregate, the micro-behaviors of public and private organizations can amount to action on the macro-level of the city.

The case of *green construction* supports this argument. Cities' built environment matters a great deal for climate change mitigation. The U.S. Geological Survey (2000) estimates that buildings are responsible for some 40% of U.S. energy usage, which is why green construction constitutes the primary way in which city regions and their inhabitants have addressed their environmental footprint (Trisolini 2010). Green buildings illustrate that city climate action is not limited to the highest echelons of city hall and their legislative commitments. Green construction may also be enabled by the city's population, such as through energy-efficient construction by privately-owned organizations.

To explain the emergence and expansion of green construction among U.S. city regions, I combine building-level data on green building certifications aggregated to U.S. city regions between 2000 and 2016 with rich data on cities' organizational,

social, and political ecosystem. Civic capacity is shown to be linked to the practice of green construction in three stages: the initiation, legitimation, and scaling. This sequence highlights collaborative dynamics at the intersection of the public, nonprofit, and corporate sectors. I find that cities with greater civic capacity display climate action sooner than others; higher numbers of nonprofit organizations are associated with more green building certifications. Within cities, the locus of innovation shifts over time. Nonprofits play the most critical role in the initiation stage, and then recede in influence after public policy legitimates green construction. Even though corporations are responsible for the vast majority of total adoptions, most firms are followers, consistent with a line of research on the emergence of new industries (Lounsbury 2001; Bartley 2007; Sine and Lee 2009; McInerney 2014).

This paper contributes to three lines of sociological research. First, I show that diffusion *between* and diffusion *within* a polity interact, which contributes to a view of institutional change that sees internal and external sources of action as distinguishable but intertwined. Second, I suggest that the the timing and extent to which local communities take innovative action with regards to climate change is shaped by the intersection of public and private organizations. I also outline how future research could take this model of distributed action further in studying social innovation in cities and organizations more generally. Finally, I contribute a sociological view of city power in the age of anthropogenic climate change that takes seriously social infrastructure and soft law as sources of urban resilience.

GREEN CONSTRUCTION AS CITY CLIMATE ACTION

Green construction is a substantively important and theoretically apt case to study the conditions of social action among cities. The market volume of non-residential green construction, which aims to improve the energy efficiency of buildings, is valued at around $120 billion in the United States alone and has been growing rapidly at around 12% p.a.[1] Despite some regulatory floors imposed by states, building codes are almost exclusively in the domain of municipal governments and there is little legal preemption by states, which is common in the context of taxation or the regulation of emissions (Peterson 1981). Building codes are also relatively standardized and follow model codes such as those created by the International Code Council.

Environmental issues are addressed uniformly in building codes. "Where local governments have adopted green building programs," Trisolini (2010:703) states in an analysis of local climate change regulation, "the vast majority have employed the LEED program." Leadership in Energy and Environmental Design (LEED) is a leading certification for green buildings developed by a social movement organization, the U.S. Green Building Council. LEED has become a standard for new construction (and increasingly the operation and retrofitting of existing buildings) since the inception of the certification protocol at the turn of the century. Green buildings are a low-cost climate change mitigation strategy whose greatest challenge to implementation are weak incentives on part of potential

[1] I estimated a compound annual growth rate of 12% between 2010 and 2018 based on a conservative of a $120B market volume in 2018 (Dodge Data Analytics 2014:8). The non-residential market in particular allows insight into the progression of this growth. Between 2005 and 2008, this market grew from $3B to $25B dollars. While the overall non-residential construction market contracted from $212B to $154B from 2008 to 2010 as a result of the economic crisis, green construction continued to grow from $25B to $48B, increasing its market share from 12 to 31%. Projections estimate that at $119-134B, today's market share is roughly half the non-residential construction market, with continuing growth. The economic consequences of the U.S. green building market are also significant. Green building is estimated to create 1.1 million jobs in 2018, 386,000 of which are directly attributed to LEED (and some $26.2 billion in wages) (Booz Allen Hamilton 2015).

adopters (Pacala and Socolow 2004; Brown and Southworth 2008; CMI 2011). This raises the question of who adopts LEED, and when.

Figure 1 shows a steep increase over time in new registrations for the LEED certification process. The building-level data indicate three stages for the diffusion of green building certification in U.S. cities: *early adoption* with a total of 336 cities that saw at least one LEED-certified construction project (2002-2006), *rapid expansion* in which organizations in 351 additional cities registered in only three years (2007-2009), and *lagged adoption* in which another 110 cities saw their first LEED project (2010-2015). In 2015, only 5 cities experienced a first-time registration. The S-pattern of the diffusion between cities suggests that there will be very few city regions that take up LEED *de novo* going forward.

In the aggregate, figure 1 confirms the common conception that LEED certifications are driven to a large degree by businesses (York et al. 2018). Particularly in the later period—after 2006—corporations make up the lion's share of entities that register new construction projects with the U.S. Green Building Council. By 2006, LEED had become a legitimate way to build green and professionals (such as LEED Accredited Professionals) spread the practice (Jones et al. 2019). The rapid expansion of LEED certifications among corporations after 2008 may in part also be driven by reputation repair by banks and other organizations in the finance, insurance, and real estate industry. As one executive of the U.S. Green Building Council explained in an interview, the financial crisis provided "a boost" for the certification protocol because presumably corporations publicly advertised their pro-social orientation. In the third stage, financial districts have particularly high concentrations of green building certifications.

[figures 1 and 2]

Analyzing all stages of city climate action, rather than focusing on the aggregate

alone, reveals that different organizations coin different phases. In the first stage in particular, the share of nonprofit and public organizations adopting LEED exceeds that of corporate adoptions. This is a critical insight because the geographic diffusion patterns of buildings throughout the United States became locked in around 2006 and remained stable in the later stages, when the majority of corporate adoption occurs. Figure 2 illustrates this solidification. At this point, LEED is already widely disseminated and corporations may pursue green building certifications to boost their legitimacy (Meyer and Rowan 1977).

This concern is exacerbated by the fact that the causal benefit of whether the means of certification serve the ends of either climate change mitigation or cost efficiency is debated (Bromely and Powell 2012). Previous research has found inconclusive evidence for savings from energy efficiency in LEED certified buildings compared to such buildings that barely failed the certification process (Matisoff et al. 2014). Still, a survey of 1,026 construction professionals found that 76% of respondents viewed cost savings as the primary reason driving green building activity (Dodge Data Analytics 2016). For corporations, government agencies, and non-governmental organizations alike, green building certification is also a way to signal support for the natural environment, but this support may be largely symbolic—74% of respondents to the same survey indicated encouragement of sustainable business practices as a key motive. Whether certification is causally related to greater efficiency due to selection effects or not, LEED-certified buildings use a third less energy than non-certified buildings (Trisolini 2010:704).

Studying green construction over time improves on previous research investigating diffusion among cities in three ways. First, it allows analyzing the *locus* of action. Green building certifications are adopted by individual organizations, which allows insights into who drives adoption within a community rather than relying

on a unitary conception of the city as adopter. Identifying which organizations are responsible for different aspects of the uptake of green construction is a prerequisite for assessing city climate action as a distributed, collaborative process in the community. Second, given that LEED certifications pose real restrictions on construction projects, they are indicators of concrete actions rather than mere symbols, such as announcing a commitment to register greenhouse emissions or devising a climate action plan (Vasi 2007; Millard-Ball 2013). Despite the promise of savings through long-term energy efficiency, green construction and its certification incur immediate costs to adopters. Besides a certification fee, construction-related expenses "can increase a project's cost by about 10 to 30 percent" (Vamosi 2011). Third, research on the differential diffusion of novel practices typically focuses on a binary dependent variable (for instance the adoption of a reporting requirement such as CDC or a law such as the municipal bill of rights), which allows theorizing factors that determine the timing of adoption. In contrast, this study takes into consideration the extent of private action, in the both the pre- and post-policy stage (Schuhmaker 1975; Soule and King 2006). I analyze a voluntary certification scheme for green construction, LEED, to consider both the timing and the extent of city climate action.

THE DISTRIBUTION OF CITY ACTION

Administrative and distributed city action

The question of how and when cities are environmentally proactive nurtures thorny issues about what it means for a city to take social action. Portraying the city as a discrete actor raises the suspicion of an ecological fallacy. Despite having an elected government, cities are not a monolithic block with predefined decision-making processes across participants in governance (Schragger 2016; Levine 2016). Instead, local communities "can be seen as intricate, overlapping systems of inter-organizational relationships" (Safford 2009:5), This perspective

follows an organizational view of cities, which effectively holds that communities are networks of people and organizations (Park 1921; Laumann et al. 1978; Whittington et al. 2009; Marquis and Battilana 2009).

Thinking of the city as a network raises the question how a medley of interests and viewpoints translate into coordinated action, particularly as government power recedes in influence in urban governance (Bevir and Rhodes 2006; Marwell 2004, Brandtner et al. 2016). Such questions motivated some of the initial debates about coalition-building and community power in urban politics (Hunter 1953; Dahl 1961). Due to its dispersed nature, an urban agglomeration has no a priori actorhood the way we usually ascribe it to an individual or sometimes an organization. Instead, the perception of agency is culturally constituted by people's institutionalized beliefs, and these beliefs can have multiple cultural bases (Berger and Luckman 1966; Jepperson and Meyer 2000). It is therefore fruitful to distinguish between *administrative* and *distributed city action.*

Administrative city action is enacted by city governments and other organizations authorized to speak on behalf of the city, e.g. through elections or elite approval. This view is predominant in previous studies of the diffusion of policies among cities (Martin 2001; Vasi 2007; Strang and Vasi 2009). City power, according to Schragger (2016:1), comprises both the "formal authority to engage in particular activities" as well as "the city's actually capacity to govern—its ability through its policies to improve the material well-being of its citizens." Studies of administrative city action place the emphasis on formal acts such as signing an agreement or passing an ordinance. In many cases, however, it is not formally designated custodians that act on behalf of a locale, but action distributed across many individuals and organizations. This view complicates the idea of homogeneity across cities because not all individuals are bound by the same constraints and not all cities design the same constraints for their dwellers. To

overcome this problem, I expand the analytical toolkit to include what I call distributed city action.

Distributed city action is an aggregation of behaviors of the individuals and organizations that constitute the urban community. City action on the macro-level stems from the aggregation of micro-behaviors. When many individual actors share a consensus about the value of an action, their potentially uncoordinated activities can create the impression of coordination, regardless of the possibly heterogeneous motivations among adopters. One example of this kind of distributed action is the cultural-cognitive cohesion of beliefs about appropriate organizational conduct that arguably explains regional concentration in patterns of corporate social responsibility (Marquis et al. 2007; Marquis and Battilana 2009). Such synchrony may exist as a result of osmotic mobilization, without a coordination mechanism such as board interlocks (Mizruchi 1996; Fergusson, Dudley, and Soule 2016).

Distribution between and within polities

Theoretically, the distinction between administrative and distributed action is analogous to related research on inter-state diffusion and community organizations at the intersection of social movement research and organizational sociology (Davis et al. 2005, Schneiberg and Lounsbury 2017). Extant research emphasizes either *administrative action*—the distribution of a practice between city governments—*or* distributed action—the distribution of a practice among private actors within cities.

To investigate the former, diffusion studies have highlighted spatial patterns of diffusion and common institutional pressures that lead to homogeneity between polities (Tolbert and Zucker 1983). These studies focus on the initial adoption of a phenomenon and deemphasize both non-adoption and the extent of adoption

(Strang and Soule 1998). One challenge of such models is that adoption need not lead to implementation or institutionalization. Many policies, practices, and structures are adopted symbolically without changing everyday practices (Meyer and Rowan 1977). More importantly, when a polity adopts a new practice (or policy to require a practice), that practice (or the practices required by the policy) does not have to spread throughout the polity's population. For instance, a state may pass a new incentive but organizations in that state can refrain from taking it up.

Studies of community organizations provide the flipside of this argument. Organizational sociologists have emphasized the role of private organization for the institutionalization of practices in a community with regards to economic development and democratic governance. Galaskiewicz (1997) shows that there are lasting cultural norms about giving, which in the case of the Twin Cities shaped corporate philanthropy. As Safford (2009) finds, the network structure of a community can determine its ability to coordinate economic collaboration, which facilitated the renewal of some rust-belt cities such as Allentown, PA. Marquis (2003), similarly, finds that organizations within a community are imprinted through their community membership. Consequently, organizational behavior within regions tends to cohere strongly. For instance, metropolitan regions covary in their propensity for corporate social responsibility because of shared cultural pressures, which applies to all organizations in a community, not just businesses (Marquis, Glynn, and Davis 2007; Marquis and Battilana 2009; Longhofer et al. 2018). The primary outcome in these studies is the probability or extent of adoption rather than their timing. Estimating implementation independently of first adoption is a challenge in that common models of diffusion consider institutionalization as the second stage in a 2-step model. What is more, despite noted exceptions, most work on practice spill-overs within communities

selects on cases in which initially a practice is successfully adopted.

Congruently, diffusion and institutionalization within a community are both components of city action. Social movement scholars have indicated that between-polity considerations influence within-polity processes. McAdam (2009) acknowledges that international relations during the Cold War put pressures on the U.S. federal government to confront its treatment of black people, contributing to the political opportunity structure that made the Civil Rights Act possible. Soule and Zylan (1997) find that work requirements in Aid to Families with Dependent Children programs were adopted in response to intra-state pressures, but spread through institutional linkages between states. Soule and Zylan's (1997) insight that "the lack of discourse between the two schools [is] unnecessarily limiting and somewhat perplexing" remains true on a local level of analysis.

The separation of intra- and inter-polity perspectives limits the analytical strength of both. First, adoption and institutionalization can be mismatched. Figure 3 illustrates the extent to which a city "adopts" a practice as a function of adoption (early or late) and institutionalization (successful or failed). The figure highlights that late adopters can institutionalize a practice (panel 3) just as much as institutionalization can fail in places that adopt a practice early (panel 2). The two frameworks address one another's weaknesses. As argued above, diffusion studies regularly locate change in the offices of government agencies and legislators whereas studies of organizational communities highlight the initiative of private actors. Rather than focusing on either governments or private organizations, I locate distributed city action in the network of organizations that constitute the city. The interplay of private and public actions are hypothesized to condition both the inter-polity diffusion of novel practices and their intra-polity institutionalization.

[Figure 3]

CIVIC CAPACITY AND DISTRIBUTED CITY ACTION

I develop a sequential model for the distribution of city action between and within cities in three stages: the initiation, legitimation, and scaling of a new practice. My argument asserts that civic capacity increases the propensity of adoption and institutionalization of a new practice in an interplay between private and public actors. To test this claim, I offer hypotheses about the relationship between city action and early adoption as a result of civic capacity, legitimation through legislation, and corporate scaling.

Civic capacity. Extensive research on cities has documented the role of nonprofits both in fostering individual civic engagement and in mobilizing citizens for social change (Marwell 2004). Community organizations in particular have been found to bolster community resilience and provide resources for the creation of social capital (Small 2004; Klinenberg 2015). A longitudinal study of Chicago found that the number of nonprofits in a neighborhood had a significant, positive effect on "collective civic action" (Sampson, McAdam, McIndoe, and Elizondo 2005). These studies propose a series of direct mechanisms such as the creation of social capital, the dissemination of civic skill, or service provision (Sharkey et al. 2017).

Nonprofits also operate in part through indirect, diffuse effects. Scholars have previously highlighted the effect through which cultural beliefs and toolkits shape society. As organizational fields, cities are subject to shared, external cultural influences that shape their behavior (DiMaggio and Powell 1983; Marquis and Battilana 2009). Similar to U.S. states or nation states, cities choose their actions not in a social vacuum but in response to external institutional pressures (Soule and Zylan 1997). And similar to organizations, cities are embedded in a social, cultural, and economic environment that influences the form and content of their behavior (DiMaggio and Powell 1983). In the current writings on the effect of nonprofits on cities, these indirect institutional channels play second fiddle to

direct channels that can be modeled with greater methodological sophistication. Acknowledging both direct and indirect effects, I thus propose that civic capacity will have a positive effect on city action:

> *Hypothesis 1:* Civic capacity will increase the likelihood and extent of LEED registrations in a city.

Temporal dynamics of civic capacity. Under what conditions does civic capacity enable city action? I argue that civic capacity is particularly important in the initiation phase for two reasons. First, nonprofits introduce novel ideas to solve established social problems, such as environmental sustainability. The social movement literature has shown that local organizations increase the susceptibility of polities to social innovation (or challenging policy proposals) by pulling in ideas from the wider environment (Strang and Soule 1998; Briscoe 2015). Schneiberg and Soule (2005), for instance, claim that organizations can cause community action by introducing new ways of thinking, fueling contention, and provoking legitimacy crises. This effect is not particular to social movement organizations in a narrow sense. As Strang and Vasi (2009) find, a "miscible" ecology of different local organizations that advocate on behalf of a policy issue—such as ACLU offices and movement chapters—has an additive effect on the adoption of civil rights legislation. Commercial organizations, too, can contribute to the susceptibility of a local polity, as Negro, Carroll, and Perretti (2013) show in the context of LGTBQ rights ordinances in U.S. counties. Local organizations can serve as receptors to adopting certain practices.

Second, since organizations without a profit motive are motivated by value rationality rather than instrumental rationality, they are often early movers on costly, voluntary action. Nonprofit organizations and public agencies may therefore lead distributed city action through early adoption because they believe

in the value of an action regardless of its immediate pay-offs. Corporations and investors, on the other hand, may scale distributed city action once a scheme becomes institutionalized and rewards the adopter with legitimacy vis-à-vis its stakeholders. Compared to private industry, the nonprofit sector is relatively small (10% of employment and 9% of all wages; Bureau of Labor Statistics 2014). As soon as distributed city action develops a momentum, the marginal influence of early adopters will thus recede. This dynamic would be consistent with the diffusion patterns of civil service reform among U.S. cities in the early 20^{th} century (Knoke 1984). As Tolbert and Zucker (1983) find, initial adoption of the manager-council structure was determined by properties of the city. But once the system had become institutionalized by consultants and think tanks, characteristics that determined initial susceptibility to the innovative practice became less important.

> *Hypothesis 2:* Civic capacity will have a larger effect on LEED registrations during the initiation stage than in later stages of diffusion.

Legitimation and scaling through policy feedback. The third channel through which civic capacity is linked to distributed city action is through administrative action. Even though individual organizations may be encouraged by civic leadership, they do not make decisions about construction protocols in isolation from the local regulatory environment. In fact, it is reasonable to assume that the only rationale for adoption among corporations is that they are incentivized or required to build in accordance with a green building code, regardless of how enthusiastically they ultimately embrace said requirement (Dobbin 2009). As Sine and Lee find in their analysis of the emerging wind energy sector (2009), social resources provided by social movements such as the Sierra Club can have direct and, through legislation, indirect effects on entrepreneurial activity.

The interaction of distributed and administrative city action may in fact explain cascade effects after the period of early adoption. Rather than thinking about policy as an alternative cause of private behaviors, I conceptualize it as a channel through which institutional differences between cities lead to divergent outcomes in city action. Institutional pressures lead governments to design policies that then constrain individual actors as coercive isomorphism. In the LEED case, a plethora of tax incentives and other government policies explain scaling effects among corporations in particular. Such policies offer a "mode of reproduction" that affords the institutionalization and scaling of certifications (Colyvas and Jonsson 2011:43).

This means that policy both follows and predates private action. Diffusion research often assumes that policy adoption is determined externally and antecedent to individual uptake of the practices required by it (Strang and Meyer 1993). Strang (1991), for instance found that the transition of colonial dependency to sovereignty varied over time rather than with dependency age, which contradicts Marxist views of socioeconomic transformations specific to countries. In reality, however, private organizations often take the lead in adopting a new practice rather than waiting for coercion. There are multiple mechanisms for this. One is anticipatory obedience, i.e. when or regulatory threats cause firms to respond to the demand of a social movement before they are even targeted (McDonnell and King 2013). Here, I introduce another source: that individual organizations in fact establish a proof of concept that serves as a precondition for the passing of a policy. Municipal government can legitimate early adopters through legislation. Corporations play a critical role by scaling previously institutionalized practices, but civic influences recede as a practice enters the mainstream. Additionally, corporations that learn about a practice in a place with high civic capacity can transpose the practice to late adopting

locales, causing spill-overs to late adopters.

> *Hypothesis 3a:* Cities with higher civic capacity are more likely to adopt LEED policies encouraging individual organizations to register with LEED.
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> *Hypothesis 3b:* Cities that already have LEED buildings are more likely to adopt such LEED policies.
>
> *Hypothesis 3c:* LEED policies–both incentives and requirements–will increase LEED registrations in a later period.

DATA AND METHODS

Research design

The study examines city climate action in U.S. cities by tracing the timing and extent of registrations for LEED green building certifications over time. The dataset spans the years from the first year of a building registering for LEED in 2000 to 2015. These building-level data stem from the public LEED project directory.

The research design draws on two levels of analysis to consider both regional dynamics and properties of multiple governments within the metropolitan (or micropolitan) area. To model differences in civic capacity, I compiled a new dataset of U.S. cities from 2000 to 2015. The main indicators for the density and multiplicity of civil society and corporations stem from the *National Center for Charitable Statistics*, *COMPUSTAT*, and *KLD*. Robustness checks available upon request included additional measures of the organizational ecosystem for higher education (*IPEDS*), social movements (*Dynamics of Collective Action*), and community-oriented businesses (*NRDRC*). All variables are aggregated from the Census place or county-level to the level of core-based statistical areas,

which comprise 381 metropolitan and 536 micropolitan areas defined by the U.S. Census Bureau. Places were weighed by population.

Data and measures

LEED certifications. The dependent variable is the timing and extent of individual organizations' green building certifications in US cities. From registration with the US Green Building Council to the time of certification an average of 700 days pass. Because the outcome of interested is best reflected in the intention of applying, and to account for varying lags between registration and certification, I focus on the number of registrations in a given city per year. Each building is attributed to a sector based on a USGBC classification: Governmental (municipal and other), non-governmental nonprofit, corporate, educational, and homes. Because sector affiliations are self-reported I reassessed them by hand. I then aggregated the micro-data to the city level. I performed secondary analyses including the duration of the certification process, the level of accreditation, the average achieved score, and the percentage of successful certifications by applicants in a given city.

Civic capacity. Civic capacity is measured as the presence of local 501(c)(3) organizations.[2] I used data from the National Center on Charitable Statistics (NCCS), aggregated from IRS 990 tax forms. There is no obvious way to identify the geographic reach of a public charity based on its IRS filings, but in-depth research of metropolitan nonprofit sectors has shown that about 3 in 4 nonprofits focus on issues or provide services in city or county in which they are located (Hwang and Powell 2009, Barman and MacIndoe 2013). Simple count data weighs smaller organizations the same as very large ones, which

[2]The number of nonprofit organizations in an urban area is correlated with population numbers. I therefore tested various versions of this variable: density (organization count per capita) without population control, density with population control, and standardized counts with size controls. In the present models, I used standardized, logged counts to account for the skewed distribution and facilitate interpretation of the coefficients. Substantively, the results are robust to these model choices.

is why I included the organizations' average annual budget as a control in secondary analyses. Although my argument emphasizes nonprofits as a proxy of civic capacity irrespective of the policy area, I also took into consideration the presence of environmental nonprofits according to the NTEE classification scheme. Because of the high correlation between nonprofit density in general and environmental nonprofit density in particular, I also relied on a measure of the share of environmental nonprofits in the total population.

LEED policies. I base estimations of the effect of public policies on distributed city action on the presence of a green building policies in a given municipality. In contradistinction to previous work evaluating policy impact on buildings, I perform these analyses on the city level rather than aggregating the policies of multiple governments to the CBSA level (York et al. 2016). Data come from the LEED public policies database provided by the U.S. Green Building Council. I distinguish between coercive and encouraging policies (requirements and incentives), as well as the year in which such a law or ordinance was passed:

> *Requirement.* "The City Council of Austin passed a resolution in June **2000** requiring that all future building projects be built in accordance with the standard of [LEED] Silver."
>
> *Incentive.* In Chicago, since **2011**, "projects striving for higher levels of LEED certification [than Silver] will receive their permits within 30 days and are eligible to receive a partial permit waiver up to $25,000."

City controls. A battery of controls on the city-level account for political and economic explanations for place-based disparities in green building certification. First, I used the average vote share for the democratic candidate in four presidential elections from 1996 to 2012 from the Atlas of Presidential Elections to proxy for the political leanings of the local population. First, I used the individual unit files from the Census of Government 2012-2015 to control for city and county budgets within the CBSA. In cross-sectional models, I used the full 2012 Census

of Government budget data. I also included traditional measures of social capital based on the work of Putnam (2000). These measures are not available on a yearly basis and have the limitation that they include the unweighted number of nonprofits as a component. I therefore used average voter share as a covariate in all models (Rupashingha and Freshwater 2006). All models are robust to the inclusion of the full social capital measure. I included demographic data from the American Community Survey (ACS) to account for qualitative differences in cities' population including median income, percent black, percent college graduates, and the employment rate.

To control for cultural pro-social norms, I followed Marquis et al.'s (2007) proposition to devise a measure of average regional CSR using the KLD database of corporate social responsibility. KLD evaluates a number of publicly listed firms in terms of their positive and negative social and environmental performance. I also controlled for the number of large corporations because that enlarges the risk set of organizations that can register a LEED building. For the same reason, I control for the number of housing units authorized by building permits according to the Census Permits Survey.

State and region covariates. Models control for region as defined by the International City and County Management Association (ICMA). I included covariates from the Correlates of State Policy Project to account for the ideological disposition of states and state governments (Jordan and Grossmann 2017) as well as state policy innovativeness (Boehmke and Skinner 2012). I also draw on the Dynamics of Collective Action database to test the robustness of my results to the presence of environmental protests in a given year and state (Earl et al. 2004, Muñoz, Olzak, and Soule 2018). State-level robustness checks are available upon request.

Methods

Timing of first registrations and policies Because panel models analyze within-unit change, cities without any LEED certifications are dropped from the analysis. I thus include a cross-sectional logistic regression predicting which cities do not see any LEED registrations. (4) I also conducted an event history analysis of the first year of adoption of a LEED certification or public policy for the entire risk set from 1999 to 2015. Because some city regions experienced early certifications before 2002, I linearly imputed independent variables to avoid left-censoring.

Number of registrations Poisson models for panel data including city-level fixed effects allow assessing the extent of adoption. Fixed-effects models have the benefit of being able to control for time-invariant unobservable factors such as regional culture and history. To investigate the impact of LEED policies on the subsequent number of LEED registrations I employ interrupted time-series analysis to analyze difference in differences between adopters and non-adopters (Bernal et al. 2017).[3]

To control for time trends, I included a continuous time variable and year fixed effects where feasible. All coefficients other than for dummy variables are standardized with a mean of 0 and a standard deviation of 1 for ease of comparison.

[3] A Vuong test indicated that a zero-inflated negative binomial model provides the best fit for a count data due to the presence of structural zeros ($p < .001$). The assumption of a zero-inflated negative binomial model, compared to Poisson model, is that different processes generate zero and count values in the dependent variable. ZINB models thus remedy two problems that Poisson models for panel data could not address: over-dispersion and zero-inflation due to structural non-adoption. The models allow to explicitly test model robustness to stable factors such as such as location and wealth. Standard errors are clustered at the city level.

RESULTS

Civic capacity

Presence. How does the presence of green building certifications differ between and within U.S. cities? Table 1 reports descriptive statistics of the population of places in the study. I begin by showing a simple model suggestive of the importance of civic capacity for green construction in 2015. Table 2 shows that there is a very strong relationship between civic capacity and a city's official action to encourage or require green construction. The effect is highly significant controlling for the city's size, liberalism, political participation, municipal budget, construction activity, companies, and region ($\beta = .92 p < .001$). By 2015, cities with higher civic capacity were also three times as likely to have at least one LEED certified building, also taking into account the presence of a city's official LEED policy ($\beta = 1.15 p < .001$). On average, the number of nonprofits in cities with at least one LEED building is an order of magnitude higher than in those that do not have any such building (3.6 to 58.4).

Timing. The event history analysis reported in model 3.1 shows that individual organizations in cities with more civic capacity also adopt LEED certifications sooner regardless of politics and size ($\beta = .76, p < .001$). The average year of first adoption for cities in the highest quintile of civic capacity was 2005; those in the two lowest quintiles averaged 2009, well past the initiation phase.[4]

[tables 1, 2]

Extent. Table 4 shows fixed-effects models of the number of registrations for green building certification in every given year. Including fixed effects to control for time-invariant city characteristics, I confirm that civic capacity is positively

[4]The event history analysis shows that some cities are at very low risk of experiencing any certification, often because they are too small. Cities that had not added any LEED buildings by 2015 are excluded from the count models presented in tables 4–6, resulting in a sample of 3,819 whose building numbers varied over time.

associated with the number of registrations. Model 4.1 provides strong support for hypothesis 1 ($\beta = .78, p < .001$). A full standard deviation increase in civic capacity is associated with twice the number of LEED registrations in the subsequent year. Furthermore, controlling for a city's size and political leanings, an increase in 3 organizations from one year to another will increase the likelihood of at least one registration in a given year by a factor of 7 ($\beta = 6.5, S.D. = 249$).

[table 3]

Initiation

Early adopters. Who contributed to the emergence of green construction in US cities? A first, descriptive question is who was responsible for early adoption. The leftmost window of figure 1 gives some insight. Both nonprofits and municipal governments played an active role in legitimating the LEED scheme. The majority of certifications in the early period was by nonprofit and governmental entities. Environmental leaders such as the California Academy of Sciences were among the first adopters in the San Francisco Bay Area. Governments are themselves among the initial adopters of LEED certifications. The Hewlett Foundation, for instance, spearheaded LEED in the foundation world to be "consistent with the environmental grant portfolio at the time," as a former board member remembers. As one LEED executive said in an interview, government and nonprofit entities were among the early adopters because green buildings reflected their pro-social missions. In the San Francisco Bay Area, for instance, the City of San Francisco has taken an early leadership role. A comparison of the predictors of LEED registrations by sector in table 5 shows that nonprofit organizations were the only project owners whose number of registrations declined over time; the majority of growth over time is due to homes and corporations, as figure 1 had suggested.

[tables 4 and 5]

Initiation through civic capacity. Hypothesis 2 suggested that the effect of civic capacity may be stronger at the onset, when the certification scheme is less institutionalized. As reported in model 4.1, controlling for the total time trend, cities had a lower probability of adopting LEED and did so at a lower number in the period of early adoption. Model 2 shows that the marginal effect of civic capacity at different points in time. In total, the number of predicted LEED buildings before 2006 is dramatically lower than after 2006. But civic capacity matters relatively more for early adoption than for late adoption. These results are not sensitive to the cut-off; in fact, there is a continuous interaction between time and civic capacity. Although this is consistent with earlier work on two-stage diffusion (Tolbert and Zucker 1983), I do find that place-based characteristics such as size, political attitudes, and civic capacity matter for continued adoption *even* when the idea of green building certification has become institutionalized.

Initiation through environmental advocacy. Could these effects be due to the direct activities of environmental advocacy organizations rather than civc capacity more broadly conceived (Sine and Lee 2009)? Model 4.3 shows that LEED registrations are also associated with environmental nonprofits only, but at a decreased rate and only in the initial period ($\beta_{combined} = .05, p < .001$). The share of environmental nonprofits in the local nonprofit sector, too, adds to the association of nonprofits in the initiation stage ($\beta = .38, p < .001$). As model 4.4 shows, the effect of general civic capacity is virtually undiminished upon inclusion of the share of the environmental nonprofit sector of the total nonprofit sector. This suggests that the indirect effects of nonprofit organizations complement the direct influence of environmental advocacy organizations in important ways. Such indirect effects reflect such properties of the population as collective efficacy, social cohesion, and the ability to recognize and solve problems.

Public policy

Policy effect. How did public policy factor into the legitimation of green construction? I analyze municipal policies encouraging or requiring green building certifications in U.S. cities affects private certification behavior. Table 6 presents results for an interrupted time-series regression (Bernal et al. 2017). According to model 6.1, the adoption of a policy leads to a level change, which suggests an immediate effect of policy on certification activity in the following year ($\beta = .40, p < .001$). Even though the level change increases the overall number of certifications, the time trend is slightly diminished after a policy has been issued as indicated by a slightly negative slope change ($\beta_{before} = .10, \beta_{after} = .07, p < .001$). The findings are similar for coercive and incentivizing policies, which implies that the legitimation of the certification scheme itself may be responsible for the level change. In one notable difference, incentives accelerate subsequent adoption (model 6.2), whereas requirements slow it down (models 6.3). The effect of civic capacity is not diminished upon inclusion of the policy effects. As model 3.2 showed, cities with higher civic capacity, all else equal, adopt public LEED policies significantly sooner ($\beta = 1.29, p < .001$). This supports hypothesis 3b.

[table 6, figure 4]

Policy follows private initiative. Figure 4 further illustrates the difference in differences of registrations between cities with and without a policy. The vertical red line indicates the time of the first policy incentivizing or requiring LEED for new construction.[5] However, the figure also suggests that the adoption of green building certifications is not exogenous. As the event history analysis in model 3.2 further showed, cities whose governments eventually issue a policy to ensure high environmental standards in construction were among those with

[5] For non-adopters, the cut-off year is 2007, the average of years in which policies were adopted.

early adopting organizations ($\beta = .47, p < .001$). Overall, private certification activity precedes a public decree by an average of 2 years: a Wald test shows that the average first year of a LEED building ($\mu = 2005$) is significantly lower than the first year of a LEED policy ($\mu = 2007; p < .001$). This policy-loop is another important indication of the collaborative dynamics of distributed city action.

Matching. To account for the structural differences in size, political orientation, civic capacity, and region between cities that eventually adopt a policy and those that do not, I also employ propensity score matching. The average treatment effect of adopting a policy of around 18 buildings per year in the unmatched sample decreases to some 10 buildings per year in the matched sample ($p < .001$). Even after matching, there is a significant difference in adoptions of LEED certified buildings in the year prior to a policy between cities with a policy (7 buildings) and cities without one (3 buildings). The estimated treatment effect among the untreated—cities with a low propensity of adopting a policy in the first place—is insignificant. While public policy has an immediate effect on subsequent adoption, cities without prior private adoption see few policies, and policies in cities without prior certification activity have a smaller effect.

Robustness

Structural non-adopters. Panel data allows controlling for unobservable time-invariant characteristics of cities, such as local climate, customs, or resource endowments, through fixed effects. It is still possible that there are time-varying factors that confound the estimates. I therefore employ a series of secondary models to test alternative explanations for variation in green building certifications between U.S. city regions. Table 7 reports several of these robustness tests and finds results consistent with the longitudinal analyses.

Demographic factors. Cities with an expansive civic life could also more prosperous. I controlled for demographic community factors. For the 270 metropolitan regions where ACS data were readily available, median income partially did not alter the effect between civic capacity and certifications. Absence of the buildings is less likely in cities with higher median income (model 7.2). Race, average age, and education had no independent effect.

Construction activity. A related explanation for the findings is that cities with higher civic capacity also see more construction activity—due to wealth or other confounding factors—and therefore simply have a greater possibility of having certified construction projects. The number of building permits (both total and for very large buildings) did not alter the main effects (model 7.3).

Municipal state capacity. Another concern about private action for the social good is that it is in response to government failure. I therefore estimated whether urban regions whose local governments have lower budgets are associated with increased certification activity. This is not the case, as average municipal and county budgets are associated with a higher LEED count and not associated with the presence of LEED in general (model 7.4). I also tested whether the average number of municipal services reported in an ICMA survey on Alternative Service Delivery compromised the association between civic capacity and certifications, but there was no effect ($p > .05$).

Cultural context. One alternative explanation is that civic capacity reflects a favorable governance context, akin to a general political opportunity structure that encourages environmental action among individual actors (McAdam 2002). The effects could be driven by a general cultural propensity to live up to high organizational standards. I use the average rate of corporate social responsibility within a community as an indicator of such cultural norms (Marquis et al. 2007, Marquis and Battilana 2009). There is a small, negative association between

CSR and the presence of at least one LEED building in a city (model 7.5). City regions with greater average CSR scores also showed a marginally larger number of certifications ($\beta = .04, p < .001$) that offsets a negative effect of the number of large corporations in the city region.

Spatial dynamics. One of the drawbacks of using models with city fixed-effects is that they fully absorb spatial dynamics. Yet spatial differences are likely given the unequal distribution of environmental risk between cities, as well as potential changes in the urgency with which these risks have been perceived over time. Region dummies in the cross-sectional models reveal that cities on the West Coast of the United States tend to have the lowest probability of structural zeros (non-adoption), but that the average count does not systematically differ by region. Spatial autoregressive models for panel data (LeSage and Pace 2009) suggest that there are spatial spillovers between cities, so that cities in proximity of cities with many LEED certifications are themselves prone to adopting green building certifications. The direct effect of civic capacity is robust to both tests of spatial spillovers.

Autocorrelation. Because professional know-how and infrastructure for certification may accumulate within a community, certification counts in t_1 may be a direct consequence of adoption in t_0. A measure for lagged adoption (green building certifications in an earlier period) was statistically significant but did not change the results. AR(1) models for autocorrelation yield the same results.

DISCUSSION AND CONCLUSION

How does a city's organizational makeup facilitate the uptake of city climate action? This study provides evidence that the timing, presence, and extent of green building certifications in U.S. city regions is enabled by civic capacity—broadly defined as beliefs and social skills that facilitate the population's ability to organize and mobilize. Departing from a parsimonious conception of cities as unitary administrations with binary outcomes, I conceptualized city action as a distributed process in which the sum total of individual actions by members of a city region can evoke perceptions of "action" in the absence of a central command center. Such distribution requires the interaction of participants from multiple sectors—nonprofits that establish proofs of concept for a practice, governments that legitimate the practice, and corporations that, bound by legislation, scale the practice. The findings contribute to theories of policy diffusion, organizational communities, and a sociological conception of city power.

Contributions to theories of policy diffusion

First, this paper suggests that the distribution of city action is best described as a combination of diffusion and institutionalization rather than one or the other. Colyvas and Jonsson (2011:27) argue that the two processes through which practices either "flow or stick" are often confounded. In fact, between-polity diffusion and within-polity institutionalization are two distinguishable aspects of distribution. The two layers of adoption—administrative and distributed—are at clear display in cities. But such a dual structure is not unique to cities. The passing of state legislation, for instance, has been shown to respond to factors both within and between states (Soule and Zylan 1997; Schneiberg and Soule 2005). Organizations, too, have been characterized as "discrete actors" although they are classically thought of as sites of collective action (King, Felin, and Whetten 2010; Bromley and Sharkey 2017).

The finding that the two stages of diffusion are intertwined is in contradistinction to Tolbert and Zucker's (1983) and Strang and Meyer's (1993) models of the institutional conditions of diffusion. Indeed, there are powerful external drivers to diffusion that accelerate spillovers between places. The earliest adopters of green building certifications did so in correspondence with a national social movement organization. The USGBC continued to provide technical assistance to local governments out of the capital for the entire period of the study. But municipal susceptibility to such assistance was contingent on internal properties including the existence of champions and internal spill-overs to other private organizations. Late adopters that show many adoptions offer special insight into the ways in which the institutionalization of a practice in one place determines diffusion to another. Consequently, external drivers need not be opposed to internal drivers, as suggested by the institutionalist account. Exogenous and endogenous factors of organizational change interact.

Second, this research also offers a more complete picture of the policy process than that provided by scholarship studying responsiveness to political mobilization, or policy analysts studying the impact of a policy (Schumaker 1975; Amenta et al. 2010). As Soule and King (2006) note, social movement scholars have as of yet paid scant attention to the stages following the adoption of a policy. The rare inclusion of negative cases, i.e. cities in which no policy is adopted, allows extending these insights into the post-policy stage. Much administrative city action such as treaties of formal resolutions appear symbolic—motivated by reputational concerns of competing city governments and mimicking the behavior of others. City administrators justify these ordinances with the awareness and behavioral changes they may create on part of individual citizens and organizations in the community. For instance, the municipal bill of rights is a case of an administrative initiative that is developed in concert with local civil

society (Vasi and Strang 2009). The spill-over effects of administrative behavior on private actors and the degree to which administrative action is endogenous to pre-existing beliefs and behaviors in the population are underexplored. In green construction, behavioral implications are limited in the absence of a municipal policy, even though individual private adoptions occur.

My findings also shed light on the intertwined nature of civic capacity as precursors of public policy and administrative practice. Previous work has shown that the influence of social movements is stronger in the earliest stages of the policy formulation process, because the resources needed for garnering the support of a single legislator who sponsors a bill are smaller than those needed for generating consensus for this bill (King et al. 2005). Tracing the number of green buildings before and after a municipal policy, my theory underscores that civic capacity is particularly important before a policy becomes adopted. This primacy effect, however, is due to the establishment of clear proofs of concept by experimenters rather than anticipatory obedience or declining efficacy over time.

Contributions to theories of organizational communities

The observation of civic leadership also has implications for research on organizational communities. The robust relationship between civic capacity and city action adds to cumulating evidence of the fact that shared, geographically rooted institutional legacies in organizational communities explain some organizational behavior (Marquis and Battilana 2009; Greve and Rao 2012). Previous work has highlighted the influence of organizations through creation of social capital (Putnam 2000; Klinenberg 2018), civic skills (Verba, Schlozman, and Brady 1995), and social norms of philanthropic action (Galaskiewicz 1997). Entangling the mechanisms of the base effect of civic capacity is beyond the scope of this paper. My work, however, adds experimentation as an additional channel that explains the time-varying effect of civic capacity. Nonprofit organizations are

among the early adopters of innovative practices rather than following trends in the for-profit sector (Schneiberg and Soule 2005; Hwang and Powell 2009). Municipal governments, too, can lead by example when their ability to prescribe innovation is bound (Frug and Barron 2013). To be sure, public policies to incentivize or require green building certifications, for instance, accelerate green construction. But these policies are endogenous to voluntary, private actions prior to adoption.

Second, this paper differs from previous conceptions of organizational communities by highlighting the interplay between sectors and the shifting locus of innovation. Organizational scholars often see corporations as the leaders of social innovation (Marquis, Glynn, and Davis 2007; Kwon, Heflin, and Ruef 2013). These nascent entrepreneurial activities are sometimes spurred on by social movements (Sine and Lee 2009; Greve and Rao 2012). In the case of green buildings, corporations are indeed critical in scaling innovation late in the game. At the same time, pro-social organizations play a pivotal role throughout. But they often do so in conjuncture with local governments, who legitimate a practice and lead by example as well. In contrast, most extant work on organizational communities ignores or downplays the role of public sector, in part because it is conducted in contexts with private primacy (e.g., Greve and Rao 2012, Powell et al. 1996). Instead of just focusing on the isomorphic pressures that urban communities exert on organizations, organizational sociologists should understand cities as intertwined collectives of different types of organizations, and cities' proactive behaviors as an outcome of regional organizational processes (Powell et al. 2012; Storper et al. 2015).

Towards a sociology of city action

Finally, this paper contributes to an organizational view of cities that is "missing" in urban sociology (McQuarrie and Marwell 2009). Challenging the portrayal of

cities as monolithic actors, this paper conceptualized city action as a distributed process that evolves with administrative organizational behavior. My view differs from a legal-political understanding of city action in two important ways. First, in contrast to accounts of city power as a function of the legal and political environment of cities, I highlight the critical role of soft law in shaping expressions of sovereignty (Schragger 2016; Frug and Barron 2013; Peterson 1981). The fact that the effect of incentives and requirements on subsequent adoption is statistically indistinguishable suggests that the primary mechanism may be that policy legitimates action rather than just forcing the hand. Sociological research has shown the pervasive power of soft law such as ratings, rankings, and awards in a wide variety of contexts such as university administration (Espeland and Sauder 2016) and corporate environmental conduct (Sharkey and Bromley 2013). Similar to other forms of external appraisal, certifications in many cases do not exert direct, coercive control over a private actor the way a law does. But organizations still change their behaviors in the face of certifications because they engage in status competition, demonstrate clear membership in a category, and recalibrate their cognitive maps (Podolny 2001; Brandtner 2017). The 'rule of non-law' may not cause widespread enrollment the way that a city ordinance or state law do. But it may encourage enthusiasts to establish proofs of concept and garner support among the entities that can subsequently establish binding rules.

The 'distributed' view of city action holds larger implications for how to understand social innovation in local communities in general. The civic capacity argument is not dependent on the specific political context of innovative social action but generalizes to all sorts of city action. First, this claim of generalizability demands clarity about the scope conditions of the argument. The present explanatory model only applies to behaviors where both private and public

actors have leeway to set relevant actions. Some examples include efforts to increase workplace diversity, maintain worker rights, and improve openness and transparency. These behaviors should have global legitimacy in the wider social context of individual organizations—if private actors face other environments with diverging goals, they may be discouraged from doing what is locally legitimate. Likewise, if there is dissent within civic infrastructures due to goal conflicts and divergent interests or because multiple solutions are available for one and the same problem, the same collaborative dynamic may not unfold. These conditions are testable.

Second, to show that these conditions of city action are not idiosyncratic to climate action, researchers should collaboratively collect observations of city action across a wide variety of social, political, and economic areas. This quest invites the development of a general, longitudinal index of administrative and distributed city action. Such a composite index could follow state innovativeness scores (Walker 1969; Boehmke and Skinner 2012). Similarly, one might devise a list of potentially innovative policies and evaluate their adoption by city. Some challenges are that small cities are likely underrepresented in many data sources, that often there is no information on the date of adoption, and that the list of policies is at risk of being arbitrary. Adoption information from advocacy organizations, for instance, is the basis of insightful studies by both Martin (2001) and Vasi and Strang (2009). Less politically contentious issues than living wage and human rights may not have the same data available. What is more, welfare and civil liberties are polarizing political issues where the capacity to act (latent) and action (observable) can be divergent due to a lack of political will.

Finally, this study is among the first to provide contemporary, comparative, and national evidence for the social dynamics of resilience and climate change mitigation in cities (Klinenberg 2016; Dutta 2017; Rao and Greve 2017). Most

saliently, I find that the degree to which cities live up to their promise ranges widely. I thus support the view that, rather than investing in expensive physical infrastructure, environmental policy makers should take seriously the option of investing in social infrastructure in cities that are starved for civic capacity. Besides improving the resilience of communities on the ground, community organizations bring ideas to the table, point out serious grievances in the city, and can help implementing timely solutions. The general association between civic capacity and city climate action suggests that the benefits of civic infrastructure spill over into other policy areas. For instance, educational and arts organizations can indirectly increase the population's capacity to problematize, organize and advocate for resilience in many domains. Investigating when and how civic infrastructures produce civic capacity—and disentangling these indirect sources of action from direct, causal impacts of nonprofits—is an important challenge for future research.

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FIGURES

Figure 1. Accumulative LEED registrations by year and sector, 2000–15

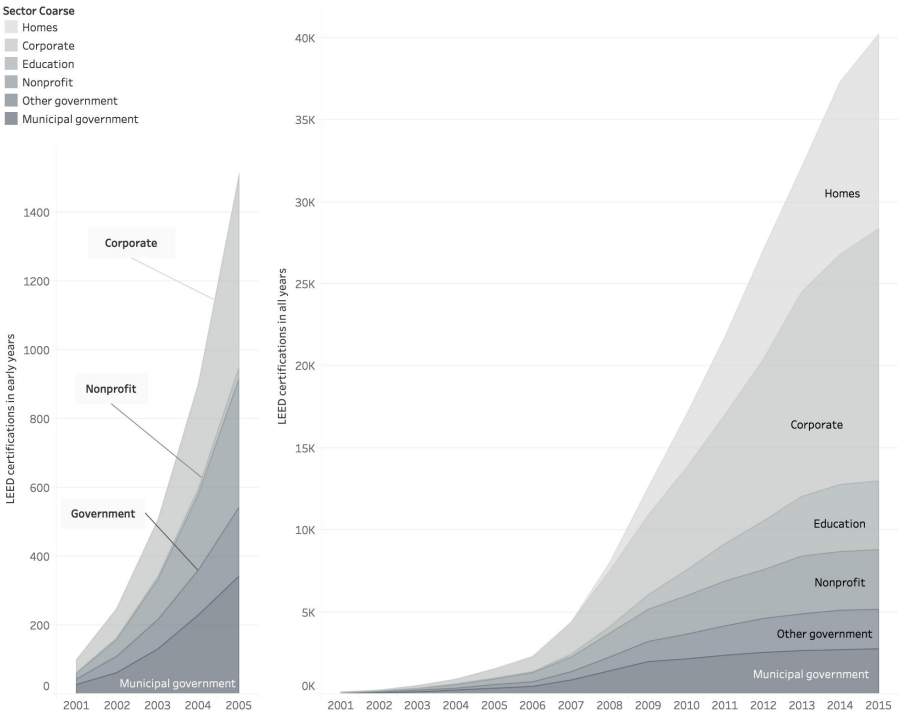
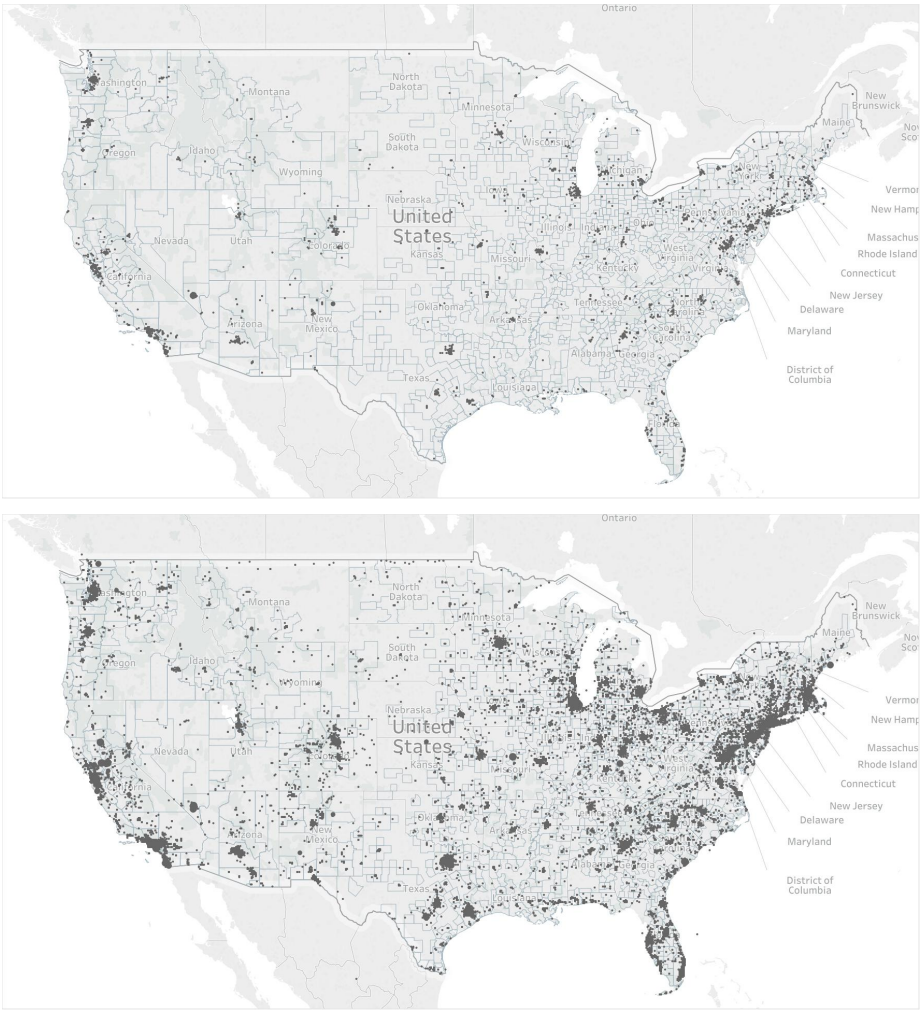


Figure 2. Map of accumulative LEED registrations in contiguous United States, 2006 and 2015



Note: Each dot represents one building registered for evaluation for LEED certification. The map shows registrations in all previous years.

Figure 3. Conceptual framework of distribution of action within polities as a function of diffusion between polities

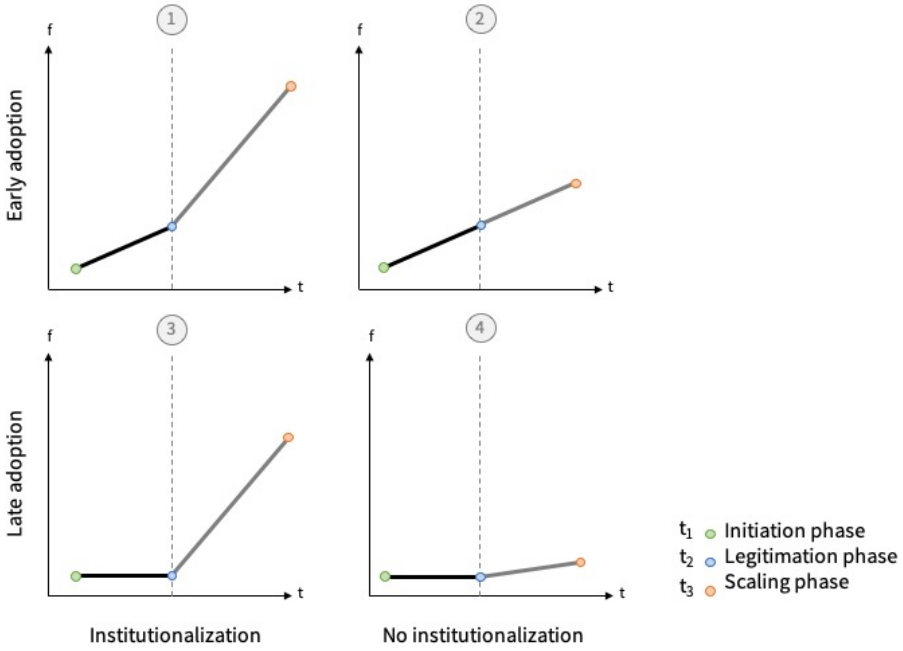
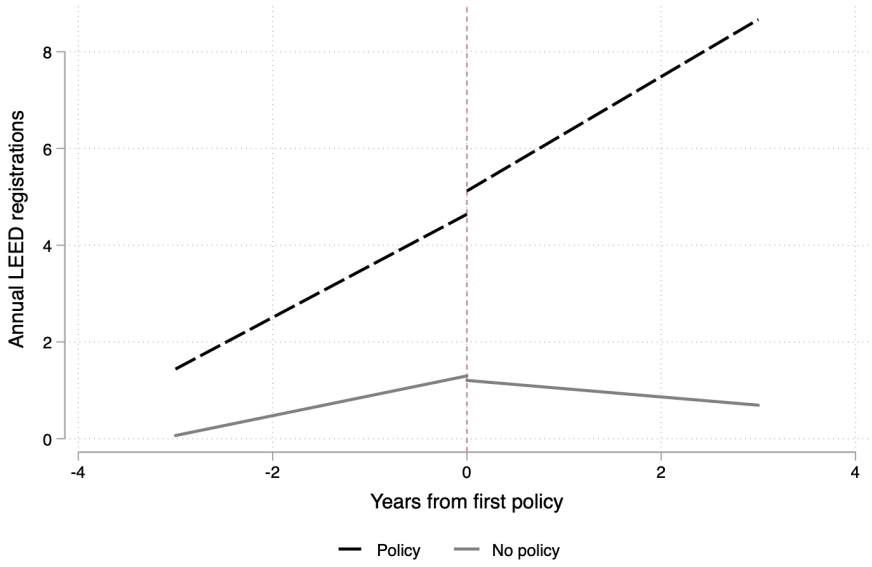


Figure 4. Interrupted time series with linear fit of new LEED certification count per year before and after time of policy adoption



TABLES

Table 1. Summary statistics

	Source	N	Mean	S.D.	Min	Max
Any LEED building	US Green Building Council Project Directory	163,207	0.31	0.46	0	1
LEED buildings		163,207	0.38	5.23	0	649
LEED buildings (government)		163,207	0.04	0.45	0	48
LEED buildings (corporations)		163,207	0.13	1.88	0	206
LEED buildings (nonprofits)		163,207	0.03	0.41	0	53
LEED buildings (homes)		163,207	0.12	3.50	0	481
First LEED building		50,638	2007.51	3.30	1999	2015
Any LEED policy	US Green Building Council Policy Library	163,207	0.02	0.15	0	1
LEED policy		163,207	0.01	0.12	0	1
LEED requirement		163,207	0.01	0.09	0	1
LEED incentive		163,207	0.01	0.07	0	1
First LEED policy		5,695	2007.83	2.26	2000	2014
Nonprofits (total)	National Center for Charitable Statistics	163,207	20.62	141.32	0	13630
Nonprofits (environmental)		163,207	0.156	0.475	0	5.78
Nonprofits (% env.)		123,047	0.049	0.127	0	1
Population	Census Bureau	163,207	15,082	103,109	4	8,582,459
Building permits		99,211	7.89	1.66	1.79	11.37
Percent white	American Community Survey	68,816	76.52	10.88	31	95.1
Median income		68,816	405,805	1,019,563	7,391	6,839,116
Vote share Democrats	David Leip's Atlas of Presidential Elections	163,207	0.46	0.12	0.08	0.86
Voter turnout		163,207	0.59	0.09	0.25	1.12
Companies	COMPUSTAT	163,207	31.79	86.93	0	527
Companies: CSR		80,802	-0.37	1.40	-7	12
Budget: municipal (log)	Census of Governments	163,207	16.37	2.01	0	21.44
Budget: county (log)		163,207	19.31	2.33	0	23.82

Table 2. Logistic regression of whether there is a LEED policy and at least one LEED building in a city in 2015

	(Model 2.1) *Presence of LEED policy*	(Model 2.2) *Presence of LEED building*
Nonprofits	.916***	1.145***
	(.158)	(.069)
LEED policy		2.105***
		(.490)
Population	.691**	.823***
	(.217)	(.090)
Voter share Democrats	.835***	.181**
	(.129)	(.066)
Voter turnout	.023	.048
	(.138)	(.069)
Building permits	.263	.073
	(.167)	(.072)
Budget: county	.090	.136**
	(.096)	(.051)
Budget: municipality	-.103+	.031
	(.054)	(.038)
Companies: count	-.115	-.086+
	(.093)	(.044)
Companies: CSR	-.242	-.055
	(.170)	(.064)
Region dummies	Yes	Yes
Constant	-7.261***	-2.280***
	(.372)	(.129)
N	4,954	4,954
pseudo R^2	.36	.40
AIC	1264.68	4141.47
DF	13	14

Note: Standard errors in parentheses; + p<.1, * p<.05, ** p<.01, *** p<.001

Table 3. Event history model predicting a city's hazard of adopting a LEED policy or a LEED building, 2000–2015

	(Model 3.1) Hazard of building	(Model 3.2) Hazard of policy
Nonprofits	.759***	.686***
	(.038)	(.128)
LEED policy	.436**	
	(.152)	
Early LEED adoption		.470**
		(.165)
Population	.582***	.645***
	(.051)	(.178)
Voter share Democrats	.127***	.612***
	(.023)	(.079)
Voter turnout	.097***	.033
	(.025)	(.079)
Region dummies	Yes	Yes
N	90,266	128,068
pseudo R^2	.08	.19
AIC	38017.56	4099.84
DF	9	9

Note: Standard errors in parentheses; + p<.1, * p<.05, ** p<.01, *** p<.001

Table 4. Poisson model predicting number of new LEED registrations including city fixed effects, 2002–15

	(Model 4.1)	(Model 4.2)	(Model 4.3)	(Model 4.4)
Nonprofits	.778***	.520***		.504***
	(.046)	(.049)		(.049)
Adoption stage		-1.720***	-1.470***	-1.696***
		(.043)	(.030)	(.043)
Adoption x Nonprofits		.086***		.093***
		(.010)		(.010)
Nonprofits (environmental)			-.006	
			(.013)	
Adoption x Nonprofits (env.)			.053***	
			(.007)	
Nonprofits (% env.)				.027
				(.034)
Adoption x Nonprofits (% env.)				.353***
				(.048)
LEED policy	.409***	.224***	.228***	.226***
	(.024)	(.026)	(.026)	(.026)
Population	1.376***	2.579***	2.534***	2.661***
	(.133)	(.149)	(.164)	(.150)
Voter share Democrats	.868***	.141***	.128***	.142***
	(.022)	(.023)	(.025)	(.023)
Voter turnout	-.164***	-.195***	-.204***	-.197***
	(.005)	(.005)	(.005)	(.005)
Year	.098***	.034***	.048***	.034***
	(.002)	(.002)	(.002)	(.002)
City FE	Yes	Yes	Yes	Yes
N	50,486	50,486	27,707	49,119
AIC	1.1e+05	1.0e+05	74874.49	1.0e+05
DF	6	8	8	10

Note: Standard errors in parentheses; + p<.1, * p<.05, ** p<.01, *** p<.001

Table 5. Poisson model predicting number of new LEED registrations by sector, 2002–15

	(Model 5.1)	(Model 5.2)	(Model 5.3)	(Model 5.4)	(Model 5.5)
	All	*Nonprofit*	*Corporate*	*Government*	*Homes*
Nonprofits	.762***	.959***	.575***	.543***	1.280***
	(.047)	(.182)	(.083)	(.126)	(.091)
LEED policy	.412***	.385***	.439***	.434***	1.753***
	(.024)	(.069)	(.036)	(.062)	(.120)
Nonprofits (% env.)	.105**	.109	.182**	-.028	-.153*
	(.032)	(.121)	(.056)	(.087)	(.069)
Population	1.435***	-2.543***	.699**	-2.063***	.509*
	(.134)	(.528)	(.257)	(.473)	(.222)
Voter share Democrats	.867***	.998***	.549***	.819***	1.577***
	(.022)	(.072)	(.037)	(.059)	(.051)
Voter turnout	-.165***	-.047*	-.091***	-.169***	-.222***
	(.005)	(.023)	(.008)	(.017)	(.008)
Year	.098***	-.040***	.096***	.016**	.216***
	(.002)	(.007)	(.003)	(.005)	(.004)
City FE	Yes	Yes	Yes	Yes	Yes
N	49,119	14,995	32,978	21,910	9,356
AIC	1.1e+05	13123.95	39705.34	19182.20	49883.90
DF	7	7	7	7	7

Note: Standard errors in parentheses; + p<.1, * p<.05, ** p<.01, *** p<.001. Sample size differs due to limitation to cities with at least one building in the relevant sector.

Table 6. Poisson models of interrupted time series of LEED building count with LEED policy as treatment

	(Model 6.1) Any policy	(Model 6.2) Incentive	(Model 6.3) Requirement
Number of buildings			
Nonprofits	.623***	.633***	.616***
	(.048)	(.047)	(.048)
LEED policy	.399***		
	(.025)		
Time from policy	.100***		
	(.002)		
LEED policy x time from policy	-.033***		
	(.003)		
LEED inventive		.101**	
		(.032)	
Time from incentive policy		.092***	
		(.002)	
LEED incentive x time		.014**	
		(.005)	
LEED requirement			.411***
			(.026)
Time from requirement			.103***
			(.002)
LEED requirement x time			-.043***
			(.003)
Population	1.849***	1.876***	1.825***
	(.140)	(.141)	(.141)
Nonprofits (% env.)	.097**	.095**	.091**
	(.033)	(.033)	(.033)
Voter share Democrats	.834***	.867***	.825***
	(.022)	(.022)	(.022)
Voter turnout	-.172***	-.171***	-.171***
	(.005)	(.005)	(.005)
City FE	Yes	Yes	Yes
N	45,595	45,595	45,595
AIC	1.0e+05	1.0e+05	1.0e+05
DF	8	8	8

Note: Standard errors in parentheses; + p<.1, * p<.05, ** p<.01, *** p<.001

Table 7. Zero-inflated negative binomial models of number and absence of buildings with controls, 2002–15

	(Model 7.1)	(Model 7.2)	(Model 7.3)	(Model 7.4)	(Model 7.5)
Number of buildings					
Nonprofits	.696***	.716***	.748***	.704***	.803***
	(.101)	(.109)	(.109)	(.100)	(.114)
LEED policy	.499***	.498***	.454***	.497***	.427***
	(.124)	(.134)	(.128)	(.123)	(.124)
Population: Median income		-.133**			
		(.043)			
Population: Share white		-.006			
		(.072)			
Building permits			.041		
			(.057)		
Budget: county				.003	
				(.042)	
Budget: municipal				-.021	
				(.023)	
Companies: count					-.163***
					(.046)
Companies: CSR					.129+
					(.077)
Constant	-3.338***	-2.835***	-3.446***	-3.347***	-3.762***
	(.261)	(.260)	(.300)	(.260)	(.301)
Structural absence of buildings					
Nonprofits	-.706***	-.830***	-.777***	-.702***	-.691***
	(.096)	(.105)	(.105)	(.096)	(.124)
LEED policy	-.604*	-.501	-.606*	-.591*	-.611+
	(.263)	(.306)	(.292)	(.254)	(.333)
Population: Median income		-.200**			
		(.063)			
Population: Share white		-.137			
		(.088)			
Building permits			-.099		
			(.068)		
Budget: county				-.182***	
				(.042)	
Budget: municipal				-.055	
				(.042)	
Companies: count					-.161+
					(.083)
CSR					.156*
					(.077)
Standard controls	Yes	Yes	Yes	Yes	Yes
Year & region dummies	Yes	Yes	Yes	Yes	Yes
Constant	3.791***	2.979***	3.580***	3.833***	3.134***
	(.345)	(.363)	(.454)	(.340)	(.499)
N	114,887	58,059	80,966	114,887	61,944
AIC	93734.50	69194.58	81649.10	93651.58	63528.32
DF	21	21	22	23	22

Note: S.E. clustered at the city level; + p<.1, * p<.05, ** p<.01, *** p<.001.