Title

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Abstract: Little quantitative research has been devoted to voluntary climate actions at the local level in comparison to those at federal and state levels. It is unclear why some cities act as leaders in the fight against climate change, some act as followers, while others remain laggards. This study empirically tests some hypotheses about local political will to mitigate climate change. Applying a survival analysis to California cities' adoption of the U.S. Conference of Mayors Climate Protection Agreement, this study examines the association between cities' adoption of the Mayors Agreement and a broad range of characteristics, such as: local demographics, jurisdiction size, government structure, political preference and environmentalism, local air quality and congestion level, and behavior of neighboring jurisdictions. Results support the importance of income level, political preference and environmentalism of the local communities, as well as a city's administrative capacity and autonomy. Congestion relief seems to be an important co-benefit motivating cities to reduce greenhouse gas emissions.

Keywords: local climate action; political will; U.S. Conference of Mayors Climate Protection Agreement; California

The role of local government in greenhouse gas (GHG) emissions reduction has drawn an increased amount of attention for several reasons. First, the projected failure to achieve the Kyoto Protocol targets by the major industrialized nations participating in the treaty signals that focusing on national and industrial policies, e.g., carbon credit trading, may be insufficient to meet our goals in a timely fashion. Second, the potential for carbon reduction and ancillary benefits of local climate actions have been recognized by more researchers and policy makers (Lindseth, 2004; Climate Action Team, 2006; Schreurs, 2008; Gore and Robinson, 2009). Local governments' own distinctive policies, such as zoning, building codes and municipal services, have significant effects on carbon intensities of major GHG-emitting sectors such as transportation, energy, water and solid waste, often argued as independent from state policies (Selin and Vandeveer, 2007). The proven effectiveness of state and local voluntary measures strongly argues for the position of these actions as an integrated part of, rather than being substituted by, the emerging federal climate policies under President Obama's administration (Lutsey and Sperling, 2008). In addition, local governments' willingness to cooperate with their neighbors is crucial to the success of regional policy measures, an emerging climate policy area pioneered by the state of California, through its Senate Bill 375, to link regional development patterns with GHG emissions. Finally, compared to top-down policies and programs, localized measures can be designed to match unique local circumstances and be implemented with fewer bureaucratic impediments. They can also be monitored more directly and adjusted more quickly.

There is, unfortunately, a gap in academic literature on voluntary climate actions at the local government level. Although a large literature exists on voluntary actions taken by industries (Dietz and Stern, 2002; OECD, 1999, 2003) and households (Rege and Telle 2004; Kahn, 2007; Kotchen and Moore, 2007, 2008), their findings may not apply to cities, where voluntary carbon reduction has different aims and is implemented in a much broader social context. Among the handful of studies on local climate actions, almost all are case analyses that provide detailed information on the processes of local climate actions (Betsill, 2001; Lindseth, 2004; Betsill and Bulkeley, 2006; Selin and Vandeveer, 2007; Engel and Orbach, 2008; Schreurs, 2008; Gore and Robinson, 2009). They generally rely on qualitative case analysis about motivations and mechanisms instead of robust hypothesis testing. For example, Betsill (2001) looks at the ICLEI-CCP experience and concludes that localizing the global climate issue is key to political support. Through interviewing local officials, Kousky and Schneider (2003) highlight the perceived importance of local co-benefits of controlling GHG emissions. Very few published studies quantify the relationship between city characteristics and carbon reduction commitment. Zahran et al. (2009) analyze the correlates of climate action commitment by U.S. metropolitan statistical areas (MSAs) by examining some aggregate measures of local climate change risks, emission intensities and local socio-demographic characteristics. However, their analysis may only help explain the differences between two groups of MSAs depending on whether they have committed to a climate action program at a single point in time. Such treatment loses important information carried by the diffusion of local policy innovations, given that the number of cities taking climate actions has been continuously growing in recent years. Overall, there has been little quantitative analysis on the relationship between local climate actions and local characteristics such as co-benefits, capacity, and governance structure.

On February 16, 2005, when the Kyoto Protocol became legally binding for the countries that had ratified it, Seattle Mayor Greg Nickels launched an initiative to advance the goals of the Kyoto Protocol through leadership and action by American cities willing to participate. By June 2005, 141 mayors had signed the U.S. Conference of Mayors Climate Protection Agreement (MCPA), vowing to reduce carbon emissions in their cities below 1990 levels, in line with the Kyoto Protocol. The number of signees quickly rose to 967 as of August 21, 2009. [1]

The climate action commitments of these cities raise two questions. What determines a city's participation in the MCPA? Why did cities act differently – some as leaders, some as followers, while some as laggards? Using the time sequence of cities' participation in the MCPA, this study addresses the gap left by previous studies on local climate actions. The remainder of this paper presents major hypotheses explaining local voluntary climate actions, followed by descriptions of data and methodology. After presenting the results, the paper concludes with policy implications, limitations, and future research possibilities.

Hypotheses about Local Voluntary Climate Actions

As a standard example of free riding, voluntary GHG emissions mitigation at the local level seems difficult to be interpreted as a rational choice. In reality, however, the driving forces of local political will to take climate actions can come from a mixture of local collective or individual self-interests, behavioral biases and true environmental altruism, as postulated by Engel and Orbach (2008). This paper specifically addresses the range of theories and/or hypotheses potentially applicable to local voluntary climate actions described below.

Income effect is also known as the *environmental Kuznets curve* (e.g., Kahn, 2006). Indicated by Kahn's comparison between smart growth cities and "brown" cities, people with higher income levels tend to care more about quality of life issues, and wealthier communities with more resources and expertise are more capable of creating strategies and implementing them. Whether the environmental Kuznets curve extends to the realm of climate change remains a question. The hypothesis that wealthier communities are more concerned with climate change and willing to act faster may prove true, given that as local communities aim to lessen their environmental impact, but continue wanting the same goods, wealthier communities can afford to substitute environmentally harmful industries and behaviors with those less so. Meanwhile, poorer communities are often constrained by their budgets, and have fewer choices (Betsill, 2001).

Administrative capacity refers to a city's ability to motivate and coordinate its resources, particularly the necessary human skills to address the complex issue of local GHG emissions. All else being equal, a more resourceful city government is certainly more capable of addressing this issue. For example, a richer local government has more funds available to enhance their technical capacity by consulting outside organizations. However, given the same level of per capita government expenditure, a city with more resources allocated toward planning or sustainability-related staff is likely to have higher administrative capacity to design and implement climate policies. Finally, as economies of scale may exist in the administrative capacity cities rely on to address specialized issues such as climate change, a larger city may have dedicated personnel for climate and sustainability issues, while a smaller but wealthier city may not.

Vulnerability perception stresses that people will react when they feel threatened. The local effects of climate change can sometimes be a part of daily life for a community, rather than being uncertain and intangible. Weather fluctuations, smoggy air, or wildfires can compromise local economies and force traditional forms of economic activity to adapt if the hazards are sufficiently severe and/or frequent. Subsequently, the affected communities are more motivated to mitigate future upheaval than those not directly affected by climate change. For example, one of the deciding factors that influenced the City of Durban, South Africa to pursue climate actions included "a series of extreme weather events" that threatened the city (Roberts, 2008). One way to test the vulnerability hypothesis might be examining the association between local climate actions and the extent to which the local economy may be affected by climate change, such as the portion of economic activities based on the weather and/or the ecosystem. However, due to the many unknowns in climate vulnerabilities of localities, what matters most is perhaps not the scientifically measured vulnerability of each community, but the *perceived* vulnerability. The education attainment of the citizens may play a role in this perception. To most local communities, anthropogenic climate change is an abstract theory not experienced in daily life. Education provides people with the ability to better understand complex issues such as the risks associated with global climate change (Kahn, 2006). Thus, cities populated by citizens with higher educational attainment are expected to be more responsive to climate change, as these individuals can more readily grasp the complexities of the issue.

Neighboring effect, also known as *peer influence*, hypothesizes the positive correlation between a city and its surrounding jurisdictions with respect to climate actions.

This is similar to the hypothesis that individuals are more likely to adopt a more environmentally friendly lifestyle if they observe their neighbors doing so. The underlying mechanism of neighboring effect, however, is unclear. It may come from a broad range of connections among peer jurisdictions including the simple transfer of climate change knowledge between local political elites, the diffusion of environmentalism among neighboring communities, the influence of regional top-down policies, and the economies of scale that occur when neighboring cities undertake joint efforts.

Local co-benefits exist mainly because GHGs are often emitted by activities that produce other non-market costs to the society. Even if climate policies cannot be implemented at a net savings or zero cost, they often generate local co-benefits that help localize climate issues, which may convince the public to support climate policies. For example, the sheer amount of vehicle-miles traveled in California produces not only GHGs, but also congestion and conventional air pollution. However, the significance of the effects of local co-benefits such as air quality improvement and congestion relief have to be carefully tested, as poor air quality and congestion may be results of higher concentrations of population, economic activity, and income level.

Local interest groups may also explain why cities act as leaders, followers, or laggards on climate actions. The net influence on local collective climate actions from local interest groups depends on the relative strength of support and opposition groups. Vocal individual environmentalists, organized local environmental groups, and those in green industries may act to increase the social awareness of climate change and influence political decisions. Conversely, local interest groups that view a certain climate policy as not being of interest to them may oppose the policy and even impede the overall idea of climate change mitigation.

Local governance structure is hypothesized to affect local willingness to act on climate change because structure is often considered to affect function. The structure of local government includes multiple aspects, such as (1) the extent to which an individual local political leader is allowed to influence public policy, and (2) a local jurisdiction's degree of autonomy with respect to upper-level governments. As some evidence suggests, "[L]ocal mitigation policy is predominantly a top-down decision based on what officials or staff members believe to be 'good business' or rational economic and political choices" (Kousky and Schneider, 2003, p.361). A stronger mayoral governance system can better enable a mayor to break the traditional bureaucratic structure of the city government so that climate policies can be coordinated across various government departments. However, even with strong local leadership, some administratively less autonomous cities are constrained by state governments when they attempt to further land use or economic development policies (Portney, 2003). In this case, cities with more administrative autonomy are more likely to lead policy innovations.

There are other explanations of local voluntary climate actions, such as (1) local elected or appointed officials' environmental preference and political entrepreneurship (Engel and Orbach, 2008) and (2) the local potential to save costs through "doing better by doing good", as suggested by the literature on the energy efficiency gap (e.g., Jeffe and Stavins, 1994; Levine et al., 1995). However, relevant data are very difficult to obtain. As will be shown in the data section, this study can only provide suggestive evidence by testing a small number of variables, such as local climate and governance structure, that may be correlated or interact with the above factors.

Data

California is famous for its leading position in fighting against climate change (Rabe, 2007). The state contains a wide range of local jurisdictions varying in their commitment to climate change mitigations, ranging from some of the early signatories of the MCPA, such as Berkeley, Palo Alto, San Francisco, Santa Monica, and West Hollywood to the long list of non-adopters. This study uses California cities' adoption of the MCPA by the end of 2008[2] as a proxy of local political will to take climate actions. Focusing on cities in a single state avoids potential effects of variations in state policies on local actions. A discussion on the limitation of the MCPA as a proxy is discussed in the conclusion.

The U.S. Conference of Mayors is a nonpartisan organization representing cities with populations of 30,000 or more. The MCPA has 969 members, the largest number of city members nationally in comparison to the other major voluntary climate programs involving local governments -- the International Council for Local Environmental Initiatives (ICLEI)' Cities for Climate Protection (CCP) and the California Climate Action Registry (CCAR). ICLEI boasts 545 members and CCAR 23, but both programs include significant numbers of other types of local governments, such as counties and utility districts. In addition, CCAR focuses specifically on GHG emissions inventory rather than a broader range of local climate actions promoted by the MCPA and the ICLEI-CCP. The ICLEI-CCP strategically targets specific cities and charges annual membership fees, while the MCPA is open to all city mayors willing to proclaim their climate policy position. Cities participating in the MCPA commit to taking three actions: (1) strive to meet or exceed the Kyoto Protocol targets (seven percent below 1990 GHG emission levels by 2012) in their own communities through various local policies, projects and campaigns; (2) urge their state governments and the federal government to enact policies and programs to meet or exceed the Kyoto Protocol targets; and (3) urge the U.S. Congress to pass comprehensive bipartisan GHG reduction legislation. Membership of the MCPA has grown steadily since its founding on February 16, 2005. By the end of 2008, 147 out of the 230 California cities with populations greater than 30,000, had not yet signed the MCPA (Population count based on 2005 Census estimates). Among the 83 signatories of the agreement, three are known to be among the nationally earliest adopters of the agreement, and 72 have made their signatory date available.

The data set used in this analysis was constructed from a set of characteristics that may be associated with a city's voluntary climate action, as described below. Population size indicates a city's overall administrative capacity, as it is highly correlated with total city government expenditure. Population size is expected to positively affect a city's likelihood of adopting the MCPA, although the effect of the overall administrative capacity on the likelihood of adopting the MCPA may not be linear. Two variables are used to measure a city government's capacity to implement climate actions in addition to population size. Per capita government expenditure represents the amount of resources a city government may spend at the per capita level. A city's number of planning professionals, who are often the key technical staff involved in land use, transportation, and environmental decisions, serves as a proxy of the level of technical capacity available to plan and implement climate policy and actions.

Average household annual income and percentage of population with bachelor degrees are obtained by matching the 2000 Census data at the place-level to cities. We also include population racial compositions as they often reflect the socio-economic status of a population, as well as potential cultural characteristics. We use percentage of registered Democratic voters to represent the general political preference of the local population, and use the percentage of registered Green Party voters as a partial proxy of the preference for environmental protection.

Three aspects measure the political and administrative structures of the local government. Local administrative autonomy is measured by a city's status as a charter city (i.e., a city governed by its own charter) or a city governed by the California general law. The establishment of a mayor-council or a council-manager leadership structure represents the strength of a mayor's ability to make decisions based on his/her personal political agenda. For example, a majority council vote may not be necessary to approve a policy decision if an influential mayor governs a city. We measure how closely a mayor's political decisions are aligned with the majority of voters by whether a city's mayor is elected through direct election or some other method.

We measure two social co-benefits of climate policies: local air quality and traffic congestion. We document whether a city is located within a nonattainment county/air basin, as designated by the U.S. EPA. The number of injuries in traffic collisions, standardized by population, is used as a proxy, due to the lack of more accurate indicators of traffic congestion. [3]

Local climate variables reflect multiple characteristics of a city. Climate directly affects the energy use pattern of a city, mainly through indoor climate control and water use. Local climate characteristics also reflect local vulnerabilities to climate change risks such as sea level rise and wildfires in California. The desirability to live in a specific climate can be correlated with population groups who differ in preference, as suggested by Glaeser and Kahn (2008).

Methodology

We use a survival model (also known as duration model) to analyze the sequence of adopting the MCPA by California cities. We estimate a hazard rate, *h*, which is the conditional probability that a city adopts the MCPA at time *t*, given that the city has not already joined, and given the characteristics of the city at time *t*. A survival analysis is appropriate for analyzing the effects of a city's characteristics on its participation in the MCPA because in addition to accounting for the differences between the adopters and the non-adopters, it also takes into account the sequence of adoption among cities. This is preferred to a simple cross-sectional choice model because cities not participating at the time when data were collected may have joined later. A survival model circumvents this problem by estimating the conditional probability of participation at each point in time when a new city (or new cities, if there is a tie) joined the MCPA.

There are two broad approaches to specifying survival models. The parametric models assume specific forms of time-dependence of the probability density function. Common assumptions include exponential, Weibull, and log-logistic distributions. However, parametric models are difficult to specify in this study for many reasons. For example, one may expect that the longer a city waits to sign the MCPA, the more likely it will sign in the future. This may be due to three reasons: (1) more knowledge of and information about climate change will have accumulated and become available; (2) the city will more likely become a target of national or international environmentalists; and (3) the city may feel peer pressure as more neighboring jurisdictions become signees. Conversely, one may also expect the reverse to happen because the longer a city has not signed the MCPA, the less likely local supporters may be passionate about climate change, as pointed out by Downs' (1972) "issue attention cycle", and the fewer pro-environment voters will remain in the community. Together these factors indicate that commitment dynamics are likely to produce non-monotonic hazards, while the exact trends are unclear.

The semi-parametric models do not require a parametric assumption about the density function. Instead, this method breaks the hazard rate down into two components: (1) a baseline hazard that is a function solely of time and is assumed to be constant across all cities, and (2) a component that is a function of the explanatory variables. We chose the most commonly used Cox (1975) proportional hazard model for this study. The Cox proportional hazard model further assumes that a city's hazard rate is proportional to the baseline hazard, and the ratio is represented as an exponential function of the explanatory variables that differentiate cities. The Cox proportional hazard model provides estimates of coefficients (frequently given directly in exponential form and referred to as "hazard ratios"), which show how each of the covariates may affect the hazard rate relative to a common baseline. The coefficients are estimated using maximum likelihood. Days serve as the temporal unit of analysis and the Breslow (1974) method is used to treat ties.

Results

Table 1 summarizes the maximum likelihood estimates from survival analyses in five alternative specifications. The estimated coefficients are hazard ratios, with a greater/smaller-than-one ratio representing an increase/decrease in likelihood to adopt the MCPA. Standard errors reported are adjusted to county-level clusters. Overall, results across the five alternative model specifications are quite consistent. We use results from Model 3 when estimating the impacts of variations in independent variables.

The probability of a city signing the MCPA increases as population increases (or as the size of the local government expenditure expands), although at a slowly decreasing pace, as can be seen from the coefficient of the secondary term. For cities with small to medium-sized populations (e.g., under half million), a 300,000 increase in population size roughly doubles the likelihood of signing the MCPA. Such positive effects diminish gradually until the city population reaches about 3 million. If per capita government resources do not positively correlate with the hazard (as suggested by the small and significant coefficient estimate of per capita government expenditure), this total size effect may indicate some kind of economies of scale in local climate policies for cities with fewer than three million residents.

As expected, average income and education levels are highly correlated, and our models show both coefficients have a positive correlation with cities' participation in the MCPA. However, the effect of the percentage of population with bachelor degrees becomes statistically insignificant once average household income is controlled for in the regression. A standard deviation (about $21,400 per annual household) higher in average household income reflects a 47% increase in the likelihood a city signs the MCPA.

Table 1: Hazard ratio coefficients from survival analyses [a]

Variables	Model 1	Model 2	Model 3	Model 4	Model 5
population	1.003261* (0.054)	1.003364** (0.041)	1.003203** (0.038)	1.003208** (0.032)	1.003699** (0.024)
$(\text{population})^2$	0.9999995* (0.08)	0.9999994** (0.047)	0.9999995** (0.039)	0.9999995** (0.039)	0.9999994** (0.02)
income			1.000022*** (0.002)	1.000026*** (0.001)	1.000019** (0.013)
pct. college grad	1.020159* (0.071)	1.030509** (0.012)	1.004568 (0.768)	0.9802583 (0.246)	1.006246 (0.688)
pct. Democrat		1.035775** (0.026)	1.038263** (0.019)	1.056953*** (0.006)	1.033086* (0.07)
pct. Green	1.953259** (0.042)	1.350509 (0.392)	1.91064* (0.073)	1.760096 (0.124)	1.560368 (0.173)
per cap gov't expenditure	1.000307 (0.172)	1.000193 (0.32)	1.000074 (0.707)	0.9999623 (0.853)	1.00008 (0.693)
per cap no. of planners	1.192522 (0.568)	1.298821 (0.322)	1.436643 (0.122)	1.697857* (0.062)	1.418389 (0.132)
charter city	2.083095*** (0.01)	2.212598*** (0.008)	2.378397*** (0.009)	2.497109** (0.011)	2.250066** (0.013)
strong mayor	0.1196552 (0.265)	0.1637117 (0.301)	0.230828 (0.39)	0.2790807 (0.437)	0.1975593 (0.362)
directly elected mayor	1.310246 (0.475)	1.392227 (0.391)	1.60546 (0.241)	1.646525 (0.198)	1.509553 (0.33)
air quality non-attainment	2.171009* (0.091)	2.002178* (0.096)	1.602376 (0.259)	1.456421 (0.36)	1.297692 (0.544)
per cap. no. of traffic injuries	1.080804** (0.014)	1.090894*** (0.006)	1.068132* (0.087)	1.064589* (0.079)	1.071409* (0.059)
pct. peer cities signed	0.9861128 (0.124)	0.9832421* (0.084)	0.9810453* (0.058)	0.9786026** (0.048)	0.9819463* (0.07)
pct. Hispanic				0.9777983 (0.107)	
pct. black				0.9810766 (0.292)	
pct. Asian				1.014922 (0.27)	
avg. precipitation					1.027977 (0.205)
avg. cooling degree days					0.9996685 (0.342)

*a. P>|z| in parentheses; ***, ** and * represent significance at levels of 1%, 5 % and 10%, respectively.*

Both percentages of registered Democrats and Green Party members are positively associated with cities' participation in the MCPA. A city with a share of Democratic voters that is one standard deviation (about 12%) higher is expected to reflect a 45% increase in the likelihood that the city signs the Agreement. One standard deviation (about 0.44%) increase in the share of Green Party voters in a city is associated with an 84% increase in the likelihood of signing. However, the magnitude and level of statistical significance varies across our models. When both percentages of Democratic and Green Party voters are included in the regression, the latter variable's influence becomes less stable and less statistically significant. Overall, the evidence still seems to support positive associations between local environmentalism and local voluntary climate actions. The coefficient estimates of Green Party voter share is less stable across models, indicating that this variable might be an imperfect measure of local environmentalism.

Although the total size of the local government matters, and is almost proportional to population size, two other measures of local government capacity do not strongly support the positive relationship between government capacity and voluntary climate actions. Both per capita governmental expenditure and per capita number of planners seem to be positively associated with cities' participation in the MCPA, but only the per capita number of planners shows some marginal statistical significance in our models.

Among all the measures of local government structure, the charter city dummy variable stands out as a powerful predictor of voluntary climate actions of the cities. Other things equal, charter cities are more than twice as likely to participate in the MCPA as general-law cities. This may indicate that administrative autonomy – the ability to create a city's "own rules" – may free the cities from governing in the conventional ways specified by general law at the state level, and allow them to adopt progressive policies. On the other hand, whether a strong mayoral government exists or whether the mayor is directly elected does not seem to make a difference (if not in the negative way). This poses a question on the important role of individual political leadership suggested by Kousky and Schneider's (2003) survey.

Estimated impacts of air quality and per capita traffic injuries partially support the co-benefits hypothesis. One standard deviation (about four cases per thousand people) in traffic injury per thousand people roughly increases the hazard by more than 26%. Cities within the nonattainment area seem to be more likely to participate in the MCPA, but this result lacks statistical significance. These results suggest that people may be more aware of or concerned with the interconnection between driving, congestion and climate change, but less aware of conventional air pollution.

Perhaps the biggest surprise of our analysis is the strong negative association between a city's likelihood to participate in the MCPA and the percentage of participation among its peer cities within the same county. All else equal, one mayor will be almost 50% less likely to sign the MCPA than the other mayor if her peer cities' participation rate is 25% higher. This seemingly erroneous effect is strong and consistent across our models. A possible explanation for this result is political opportunism of the mayors, which tends to happen when an official makes policy decisions based solely on whether the action will help advance his/her career. Namely, a mayor is more likely to make a political commitment when he/she finds that by making the commitment they will be a leader among peers instead of a follower, as long as such a commitment remains voluntary and no penalty will be applied to the laggards.

Models 4 and 5 test the effects of race and climate of local communities, respectively. As one would expect, after controlling for other variables, none of the race and climate variables show statistically significant impacts on local voluntary climate actions. In California, precipitation and temperature often reflect the potential vulnerability of a city to climate change hazards, such as sea level rise and wildfires. The insignificance of the two climate variables seems to indicate that such vulnerabilities were not well perceived, and/or perceived vulnerabilities did not translated into local willingness to mitigate GHG emissions.

Conclusion and Discussion

Understanding what truly drives the voluntary actions at the local level has the potential to help federal and state policy makers design policies that are more compatible with local incentives and more cost-effective to implement. Although both the independent and dependent variables in this analysis may be perceived as incomplete measurements of the hypothesized factors and the outcome, they provide an early set of quantitative evidence of voluntary local climate actions.

The overall capacity of a local jurisdiction, measured by population size (or total local government budget), affects the likelihood of joining the MCPA. Local communities with higher average household incomes are more likely to be early adopters. This seems supportive of the carbon emissions Kuznets curve and previous observations on local awareness of conventional environmental issues, such as those by Kahn (2006). Both general political preference and local environmentalism exhibit significant impacts on local willingness to take climate actions. Charter cities' significantly higher likelihood of joining the MCPA indicates that administrative autonomy or "home rule" probably matters. An increase in the per capita number of traffic injuries significantly improves the likelihood to act on climate change, showing that traffic congestion alleviation and/or safety improvements might be perceived as an important co-benefit of climate actions. This confirms that policy makers should link co-benefits when trying to build political will for voluntary climate actions.

Some hypotheses are not strongly supported by the results. Education level of the citizens may not be important if average household income is held constant. Capacity of a local government measured by per capita government expenditure and per capita number of planners do not seem to be crucial in forming the local political will on climate issues. The results also fail to support the importance of individual political leadership in climate policy because neither a strong mayoral government nor a directly elected mayor demonstrates significant impact. The insignificance of the climate variables may indicate that climate vulnerabilities are either not well perceived or considered to be less compelling. This is consistent with the findings of Zahran et al. (2009) regarding the effect of climate change risks on MSAs' climate commitments. Lastly, our result clearly rejects the hypothesis of positive peer influence among cities. In fact, they even indicate the existence of political opportunism. This may be a warning to those who are optimistic about the diffusion of voluntary climate actions across jurisdictions.

It is important to acknowledge that the validity of the results is constrained by what the data truly measure. Above all, one could argue that political commitments by the mayors sometimes do not translate into meaningful actions and may be largely irrelevant. Indeed, it would be ideal to analyze substantial climate actions instead of just political commitments if reliable data were available. However, political commitments by a mayor and his/her council are usually backed by a significant number of constituents. In addition, they are often important political strategies necessary to catalyze a series of local climate actions. The experience of cities' participation in the Mayors Climate Protection Agreement in California suggests that the leaders and the laggards do differ in multiple aspects, including the characteristics of local communities and how they are governed. Nonetheless, it is essential in further studies to analyze substantial climate actions taken by cities to see why some have been able to move beyond political rhetoric to substantial actions.

Notes

1. Data are from the U.S. Conference of Mayors Climate Protection Center (http://www.usmayors.org/climateprotection/revised/), retrieved on August 21, 2009.

2. We chose the "right censoring" date to avoid possible impacts on cities' primary motives given the change of national environmental politics following the 2008 presidential election.

3. The number of fatalities, perhaps surprisingly, is uncorrelated with the number of injuries. This may indicate that the number of injuries better reflects congestion levels. Traffic fatalities more strongly reflect high driving speeds, which are negatively correlated with congestion level.

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Table 1: Hazard ratio coefficients from survival analyses [a]

Variables	Model 1	Model 2	Model 3	Model 4	Model 5
population	1.003261* (0.054)	1.003364** (0.041)	1.003203** (0.038)	1.003208** (0.032)	1.003699** (0.024)
$(\text{population})^2$	0.9999995* (0.08)	0.9999994** (0.047)	0.9999995** (0.039)	0.9999995** (0.039)	0.9999994** (0.02)
income			1.000022*** (0.002)	1.000026*** (0.001)	1.000019** (0.013)
pct. college grad	1.020159* (0.071)	1.030509** (0.012)	1.004568 (0.768)	0.9802583 (0.246)	1.006246 (0.688)
pct. Democrat		1.035775** (0.026)	1.038263** (0.019)	1.056953*** (0.006)	1.033086* (0.07)
pct. Green	1.953259** (0.042)	1.350509 (0.392)	1.91064* (0.073)	1.760096 (0.124)	1.560368 (0.173)
per cap gov't expenditure	1.000307 (0.172)	1.000193 (0.32)	1.000074 (0.707)	0.9999623 (0.853)	1.00008 (0.693)
per cap no. of planners	1.192522 (0.568)	1.298821 (0.322)	1.436643 (0.122)	1.697857* (0.062)	1.418389 (0.132)
charter city	2.083095*** (0.01)	2.212598*** (0.008)	2.378397*** (0.009)	2.497109** (0.011)	2.250066** (0.013)
strong mayor	0.1196552 (0.265)	0.1637117 (0.301)	0.230828 (0.39)	0.2790807 (0.437)	0.1975593 (0.362)
directly elected mayor	1.310246 (0.475)	1.392227 (0.391)	1.60546 (0.241)	1.646525 (0.198)	1.509553 (0.33)
air quality non-attainment	2.171009* (0.091)	2.002178* (0.096)	1.602376 (0.259)	1.456421 (0.36)	1.297692 (0.544)
per cap. no. of traffic injuries	1.080804** (0.014)	1.090894*** (0.006)	1.068132* (0.087)	1.064589* (0.079)	1.071409* (0.059)
pct. peer cities signed	0.9861128 (0.124)	0.9832421* (0.084)	0.9810453* (0.058)	0.9786026** (0.048)	0.9819463* (0.07)
pct. Hispanic				0.9777983 (0.107)	
pct. black				0.9810766 (0.292)	
pct. Asian				1.014922 (0.27)	
avg. precipitation					1.027977 (0.205)
avg. cooling degree days					0.9996685 (0.342)

*a. P>|z| in parentheses; ***, ** and * represent significance at levels of 1%, 5 % and 10%, respectively.*