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The importance of salience: public opinion and state policy action on climate change

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Abstract

How does the salience of environmental issues influence climate policy adoption in the American states? This article considers how two aspects of public salience, issue problem status and issue attention, work with environmental interest group membership to influence climate policy adoption in the American states. We contribute to the theoretical development of issue salience and offer alternative measures that capture differences in salience across subnational units. We find evidence that states where climate change is perceived to be a problem, and where attention to environmental issues is high, are more likely to adopt relevant policies. Furthermore, states with Republican majorities in either legislative chamber are less likely to adopt climate policies. Our findings have implications for the impact of salience on the policy process.

Democratic theory argues that when an issue is salient to the public, the government should take appropriate actions to be more responsive to its citizens (Dahl 1956; Page and Shapiro 1983). While scholars have demonstrated that the rise and fall of issue salience tend to correspond with changes in government policies at the national level (Wlezien 2005), whether such correspondence exists at the state level remains an open question. Though evidence suggests that increases in salience should produce a state policy response (e.g. Lax and Phillips 2012), this relationship is not a given. Even when salience is high, government elites that oppose policy action may utilise veto points in the policy process to prevent adoption. For instance, in the United States issues like gun control, climate change and immigration have frequently become salient with little to no governmental policy response.

This study examines an important policy issue facing the United States and other countries – climate change. We focus on climate policy adoption at the subnational level to further understand the dynamics between public issue salience and policy adoption. Building on work by Wlezien (2005), we argue that public

issue salience is comprised of two related, but theoretically distinct concepts: issue problem status and issue attention. We use unique measures to capture these components; the former is measured using public opinion data on the perceived seriousness of climate change, while issue attention is captured through Google Trends search data by state for environmental problems.

In addition to expanding the theoretical understanding and measurement of issue salience at the state level, we also provide a clear test of the relationship between issue salience and state climate change policy enactment. Importantly, we consider how salience interacts with environmental group membership while accounting for partisan control in state government. This research fills several gaps including the ability to assess variation in salience at the state level and understand how salience performs in a politically polarised environment. Current state-level research on issue salience does not account for variation in salience across states, which we believe to be highly relevant for public policy in those states. Though national salience is likely to have a broad impact on subnational policy processes (see Lax and Phillips 2012), the context of individual states would strongly suggest that salience is not uniform. Moreover, current ways of conceptualising public issue salience tend to lack nuance.

We find the influence of public issue salience – both issue problem status and issue attention – to be striking. States where salience and environmental group membership are high, and where Democrats maintain political power, are much more likely to adopt climate change policies. Despite the somewhat unique dynamics present in climate change politics in the United States, we believe that these findings are applicable to a broad set of policy areas and countries with similar institutional structures.

A focus on the United States

The United States is the second only to China in total greenhouse gas emissions (Boden et al. 2017). Despite this, the national government in the United States has remained reluctant to address climate change; President Trump has indicated that the United States will withdraw from the Paris Agreement, an international climate accord signed by nearly 200 countries (UNFCCC). In many ways, the United States stands alone in its inaction at the national and international levels, which necessitates further study to understand the policy process that is occurring there.

The United States is a federal system in which national efforts to address climate change have largely been blocked. As a result, state governments have stepped into the policy void, which provides a useful venue for study. Studying the American states allows us to exploit the rich variation in state political institutions and context that underlie our theoretical expectations. Moreover, studying the United States is ideal for ascertaining how changes in salience play out in a highly polarised context where political parties and voters are sharply divided. This intense polarisation may result in a lack of policy activity, even when salience is high, which presents a puzzle worth exploring.

Findings in the United States context can shed some light on what we may expect to see in other federal (or quasi-federal) systems on polarised policy issues. While some characteristics of this study are unique to the United States, the dynamics of issue salience are likely to be present in other countries. Issue salience varies over time within and across countries (Oehl et al. 2017). For example, when

considering the issue of climate change, extreme temperature and weather events are likely to raise the salience of this issue wherever they occur. We see evidence of this in literature examining the United Kingdom (Demski et al. 2017) and the United States (Konisky et al. 2016).

Public opinion and issue salience

Existing research indicates a relationship between public opinion about policies and adoption by elites, yet the magnitude and precise nature of the relationship are still under debate (see Page and Shapiro 1983; Erikson et al. 1993; Stimson et al. 1995; Monroe 1998; Lax and Phillips 2012). In a meta-analysis of articles gauging the impact of public opinion on policy responsiveness, Burstein (2003) finds that 75% of these studies indicate a link between opinion and policy suggesting that specific policy preferences are conditioned by issue salience.[1] Lax and Phillips (2009; 2012) conclude that policy congruence in the states is more likely as issue prominence grows, though the authors use a measure of national salience, which does not allow salience to vary by state.[2]

Current evidence indicates that legislators are incentivised to address highly salient issues in accordance with their constituency to pursue reelection goals, though this evidence is based on national level salience measures (Burstein 2003; Lax and Phillips 2009, 2012). We argue that issue salience plays an important and direct role in state policy adoption decisions and that the conceptualisation and measurement of issue salience in this arena deserve further attention.

Salience is generally defined in the political science literature as the level of importance placed on a given issue, particularly as it pertains to candidate evaluations and voting (Burden and Sanberg 2003). Wlezien (2005) has developed a more nuanced conception of salience that identifies two distinct characteristics: importance and problem status. Wlezien argues that policy issues can be generally important to individuals, even if they are not viewed as a current problem. For example, although individuals generally consider the economy to be important, they may not consider it to be a problem until unemployment rises. In addition, an individual may regard a policy issue as a problem, without believing the issue is currently important compared to other issues. For an issue to be seen as highly salient, it should be identified as both important and a problem.

The current ways of operationalising issue salience in the literature do not follow the nuance described by Wlezien (2005). Most aggregate research studying the connection between public opinion and public policy relies on the *New York Times* citation index as a measure of issue salience (Epstein and Segal 2000; Haider-Markel and Meier 2003; Lax and Phillips 2012). We argue that newspaper citations do a better job of reflecting salience among media and political elites

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[1]Burstein (2003) reviews the top three journals in political science and sociology and finds 30 studies that examine the relationship between opinion and policy published between 1990 and 2000. Of the 52 effects detailed in these studies, 35 presented statistically significant effects of opinion on policy. When salience is taken into account, Burstein finds that opinion always has an effect, thereby justifying theoretical consideration.

[2]The authors utilize the *New York Times* as a measure of salience, taking the log of the number of stories related to a range of gay rights policies. Using this measure, they find a strong conditional linkage between issue salience and gay rights policy adoption.

rather than problem status or attention from the public's perspective. The criteria that journalists and editors use to decide what stories are "newsworthy," such as novelty and conflict, have more to do with increasing sales than emphasising long-term problems or reflecting what the public at large believes is important (Bennett 2011).

Furthermore, the limitations of relying on a single national and elite news source like the *New York Times* are problematic for researchers interested in variation in public issue salience across the states. Issue importance and attention are likely to vary dramatically across the states because the political and economic contexts are so different. For the issue of climate change, publics in California and Kentucky differ dramatically in their estimation of whether reliance on fossil fuels is a problem. Without taking into account the variation across states, national measures of salience are limited in their ability to explain cross-state variation in policy adoption.

Some researchers also rely on responses to Gallup's most important problem (MIP) question (Smith 1985; Aldrich et al. 1989; Burden and Sanberg 2003). Because it is based on public opinion, the MIP avoids some of the elite-centric problems associated with the NYT index. Nevertheless, as Wlezien (2005) argues, the MIP measure does a better job reflecting problem status than issue importance. In addition, the focus of the MIP is squarely on the nation, not the individual, the state where they live or the world at large. For example, Yeager et al. (2011) find that the MIP question is limited in its ability to reflect the importance of global issues that may not be on the front burner of the nation's agenda. Their study shows that when respondents are asked more specifically about the most important problem facing the world in the future, global warming and the environment are identified most frequently.

We argue that public issue salience is best conceptualised as containing two components: issue problem status and issue attention. Issue problem status mirrors Wlezien's (2005) emphasis on problem status in that it reflects the degree to which voters or survey respondents view an issue as a problem. Issue attention is defined as an active form of information processing about a policy issue among the public; this implies the individual places some level of importance on the issue *and* is willing to invest a minimal amount of effort to investigate the issue.[3] This conception builds on Wlezien's discussion of importance, but adds an active component by the individual. While issue problem status and attention are related, we assume that because they can vary independently among different subpopulations within a state, the two can also shape policy adoption independently of the other. In other words, subpopulations are often far more interested in certain policy areas than the general population and are thus able to exert a disproportionate effect on policy, given their numbers (Bishin 2009). This interest can be seen as a difference in the recognition of problem status and in issue attention.

Attitudes – best understood as evaluations of an object of thought, typically conceptualised as an expression of favour or disfavour toward a person, place,

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[3]The term issue attention in relation to salience is also seen in work by Neundorf and Adams (2016). The authors discuss the reciprocal relationship between issue salience and political party behavior in Germany and Great Britain, finding that greater emphasis by constituents on certain issues leads political parties to focus on those issues. Furthermore, elite issue salience leads to a shift in the issues constituents deem salient as well.

thing or event – come in varying levels of strength and stability (Bohner and Dickel 2011). An individual may consider an issue to be a problem without placing a high degree of importance or active attention to that problem. Many people are vaguely concerned about public policy issues without taking the time or effort to learn much about them. Even politically apathetic people will tend to give some response of concern over problems if asked for their opinion (Zaller and Feldman 1992). These attitudes exist, but are often fragile and easily manipulated by the introduction of new considerations (Zaller 1992, Bizer et al. 2004). Issue attention is likewise possible without the clear belief that a policy issue is a problem. People can pay significant attention to topics and issues that are of interest and importance to them without being driven by worry. This type of issue interest can happen as a result of curiosity or a desire to be informed.

While believing a given policy issue presents a problem is critical to forming a policy attitude, it is not enough to form a strong or coherent attitude that is likely to shape behavioural intentions for most people. Actively considering a policy problem increases the likelihood that an attitude will crystalise over time (Abelson 1988).[4] Policy attitudes that are personally important to people are more likely to motivate political behaviour (Boninger et al. 1995), which, in turn, is more likely to influence the policy process (Abramowitz 1995; Arceneaux 2002; Burstein 2003).

While issue problem status and attention are both important aspects of salience in their own right, understanding how they jointly influence policy adoption is critical. We expect that when issue problem status and issue attention are both present within the public, an attitude will be translated into active political behaviour (Abelson 1988). Individuals who believe an issue is a serious problem and are highly attentive to that problem are more likely to join interest groups to help influence policy (Boninger et al. 1995). As such, increased issue salience can lead people to change how they evaluate government and motivate them to support or work through interest groups directly. While each component of issue salience may have similar directional effects (e.g. increased likelihood of policy adoption), they can occur together in complex ways based on who perceives an issue as a problem and who is attentive.

Different measures of problem status and attention are crucial for a clear understanding of the effects of issue salience.[5] By operationalising salience as a single measure, researchers implicitly assume paying attention to an issue and viewing it as a problem are either part of a single construct or make no difference in policy adoption, which we argue is simply not the case. Moreover, the typical ways in which issue salience is operationalised do not adequately capture the concept because they conflate issue problem status with attention or assume that elite concern and attention work well as a proxy for all people. The measures currently in use to capture salience are more likely to capture elite and national salience, where we believe our approach better captures public salience and salience across states.

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[4]Abelson refers to this phenomenon as ego preoccupation.

[5]In a multivariate multilevel model, they are statistically significantly related to one another, but only have weak substantive relationships. This relationship only holds when controlling for state internet access as the google trends measure suffers from selection bias by itself. See Table G in the Online Appendix for details.

Public opinion and climate change policy adoption

Prior research on public opinion toward climate change suggests that attitudes are shaped by exposure to extreme weather events, which adjust the level of importance (and thus the salience level) that individuals place on global warming (Owen et al. 2012; Konisky et al. 2016; Demski et al. 2017). Demski et al. (2017) use flooding in the United Kingdom as a natural experiment in their study of how extreme weather events influence support for climate mitigation policies. The authors argue that direct exposure to floods will increase the salience of climate change and increase risk perceptions associated with it. The authors' findings bear this argument out; individuals exposed to flooding conditions are more likely to support action to mitigate climate change and have higher climate risk perceptions.

These findings are particularly suggestive of the ways in which high issue salience should translate into environmental policy support and, consequently, policy adoption. Furthermore, work on environmental policy more broadly suggests that environmental attitudes have an influence on policy adoption (Brace et al. 2002; Johnson et al. 2005). While this research tests the relationship between public opinion and environmental policy adoption, there are no direct measures of salience in this work. As such, the relationship between those attitudes and the adoption of climate change policy is left nearly untouched by the literature on state policy adoption.

Work on the determinants of state climate policy adoption in the United States has become plentiful in recent years, incorporating both internal determinants and diffusion to explain such adoptions (Lyon and Yin 2010; Carley and Miller 2012; Matisoff and Edwards 2014; Bromley-Trujillo et al. 2016). Some scholars have utilised state policy liberalism as an indicator of public preferences. Findings indicate that states with a more liberal citizenry are more likely to adopt climate change policy (Huang et al. 2007; Matisoff 2008; Chandler 2009; Lyon and Yin 2010). This provides some evidence that policy makers are responsive to the public for this environmental issue. Despite the boom in climate change research, the relationship between issue salience and climate policy adoption has yet to be explored.

There are a number of powerful disincentives to adopt climate change policy at the state level. States may free ride on the actions of others, as is traditional for collective action problems (Ostrom 2010). In addition, climate change is an abstract issue given direct causality between climate change and consequences to the individual is difficult to demonstrate (Leiserowitz 2006). A high level of issue salience on climate change is likely to be a necessary condition for policy adoption and we expect higher levels of salience to increase the likelihood of adoption.

Causal story and expectations

As illustrated in Figure 1, we argue that issue salience – both issue problem status and issue attention – have a direct impact on policy adoption while also having an indirect effect via environmental interest group membership. Moreover, legislative control and the party of the governor are important to this story.

We argue that interest groups are able to take advantage of a context in which issue salience is high through a variety of theoretical mechanisms. Greater salience is likely to produce larger environmental interest group memberships as individuals become more motivated to address pressing policy problems. As a result,
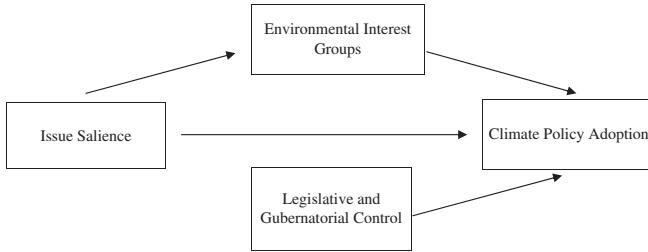
Figure 1. Diagram of theoretical causal mechanisms.

greater resources (financial and otherwise) are available to interest groups, which can be used to lobby government. In addition, higher issue salience should allow interest groups to make a stronger case for policy action by the state legislature, given the heightened attention by constituents and the reelection goals of state legislators (Lax and Phillips 2012). As such, interest groups are better able to place their policy concerns at the top of legislative agendas.

Our theoretical story also argues that partisan leadership within the states is particularly important. Climate change is a highly politicised and partisan issue within the United States, resulting in significant divides between Republicans and Democrats (and conservatives and liberals) (Dunlap et al. 2001). As such, we anticipate that unified Democratic leadership in state governments should produce more climate change policy, while Republican leadership within legislative chambers and the governorship may serve to block any policy attempts. As Republicans control a significant number of chambers in state government during this time period, this could have a significant dampening effect on climate change policy, even when issue salience is high.

While we are proposing a causal story, our model is correlational and thus cannot identify causality. Instead, our arguments stem from theoretical expectations from literature in political science, psychology and sociology. While we cannot prove that the political mechanisms work in the way that we describe, we offer evidence through our analysis that is based on strong theoretical arguments.

Based on our theory of public issue salience, we propose a set of hypotheses regarding the relative influence of salience on the adoption of climate policies. These hypotheses pertain to each type of issue salience: first, regarding the impact of whether climate change is perceived as a problem (as measured by public opinion data) and then considering the relationship between issue attention (measured by Google Trends search data) and adoption.

Hypothesis 1: As issue problem status of climate change increases, so does the likelihood of policy adoption.

Hypothesis 2: As issue attention over environmental issues increases, so does the likelihood of policy adoption.

We then offer a set of additional hypotheses based on the possibility of interactive relationships between our salience measures and between salience and environmental interest group membership.

Hypothesis 3:   As issue concern and issue attention over climate change increase together, so does the likelihood of climate change policy adoption.

Hypothesis 4a: As both issue attention and Sierra Club membership increase, so does the likelihood of climate change policy adoption.

Hypothesis 4b: As both issue concern and Sierra Club membership increase, so does the likelihood of climate change policy adoption.

Finally, we offer a hypothesis related to partisan leadership in state government.

Hypothesis 5:   Democratic unified control of the state legislature and governorship increases the likelihood of climate change adoption.

Data

This study examines the state adoption of climate change policy from 2004 to 2010 using original data. These data consist of policy adoptions among a set of nine policies associated with climate change, which are described fully in Online Appendix, Table A.[6] These policies were selected in order to cover the range of policy choices available to the states to mitigate and adapt to climate change. While the specific policy strategies vary, the overarching goals aim to mitigate and adapt to climate change.[7]

When considering issue salience, we argue that it is important to include a broad group of climate policies. States engaging in this policy area have many choices and selecting one policy option does not speak to a broader commitment to climate policy by a state. Furthermore, selecting one or few prominent climate policies would likely bias the results as states vary tremendously in the package of policies they choose to enact. This argument aligns with previous work on general environmental policy commitment (Hays et al. 1996). Previous work has considered a wide variety of energy and climate change policies and finds fairly consistent results for the direction of impact (Matisoff and Edwards 2014; Bromley-Trujillo et al. 2016). Bromley-Trujillo et al. (2016) specifically test the poolability of a large number of climate and energy policies – of which our policies are a subset – and show that while the magnitude of effects varies somewhat, the direction is consistent.

A number of the policies we include deal specifically with the energy sector. While some states enact energy programs for purposes completely separate from climate change, the energy sector is an important toolbox for climate policy solutions. As indicated by other scholars, renewable portfolio standards and other energy programs are ways in which states pursue climate change mitigation

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[6]These data were collected through the Center for Climate and Energy Sources. The center provides information on state climate policy adoptions that includes text describing the history or date of adoption (*U.S. Climate Policy Maps*). Dates were obtained from this text and supplemented through examination of state regulatory listings. We obtained early adoptions of climate action plans from work by Wheeler (2008).

[7]The policies vary in terms of scope and stringency; however, as clear criteria for weights in this case are not present, we anticipate that any weighting choices are likely to produce bias as is argued in other environmental policy studies (Daley and Garand 2005). While these policies take different approaches, directional hypotheses concerning our independent variables would be the same across these programs individually. In addition, a Chronbach's α of 0.83 demonstrates reliability of the scale.
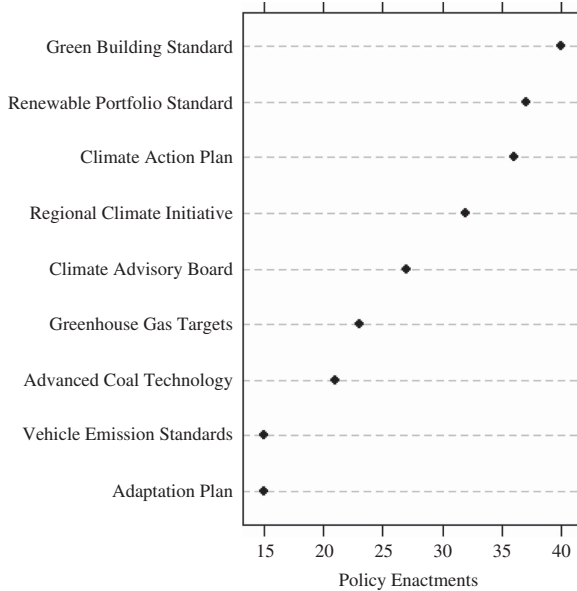
Figure 2. Total number of enactments by policy as of 2010.

(Carley 2011; Matisoff and Edwards 2014). In fact, every state climate action plan includes energy programs among the recommended policy strategies (Wheeler 2008). As such, leaving out these policies would cause greater bias than keeping them in the analysis. These policies are also ideal for our study because enactments have occurred primarily during the timeframe of our analysis.[8] We focus on the 2004–2010 time-period for several reasons: First, while American states began enacting policies pertaining to climate change in the 1990s, this activity accelerated during the time frame we consider, given the failures at the federal level to achieve policy action (Rabe 2010).[9] In addition, this time period allows us to utilise Google Trends data, which begin in 2004. These data provide a novel way of comparing issue attention across states. Figures 2 and 3 demonstrate the policy variation, both in frequency of adoption and differences across states.

Variables and analysis

In order to test our theory of issue salience, we examine state climate change policy enactments. Our dependent variable is a count of the number of policies a state enacts in a given year, from the set of nine climate change policies listed in Online

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[8]Some states enacted policies in our dataset prior to the time period we are examining. An alternative specification of the model included dummy variables for states that previously enacted a policy. These dummies produced no substantive changes and, as such, we leave them out of the final specification.

[9]Our analysis timeframe ends in 2010 because the state climate policy adoption space changes in important ways after this year. Very few adoptions of these policies take place after 2010, indicating that they have largely diffused. Also, some states began to reverse their actions in response to the recession after 2010. For example, several states withdrew from regional climate agreements. These actions are worthy of study in future work.
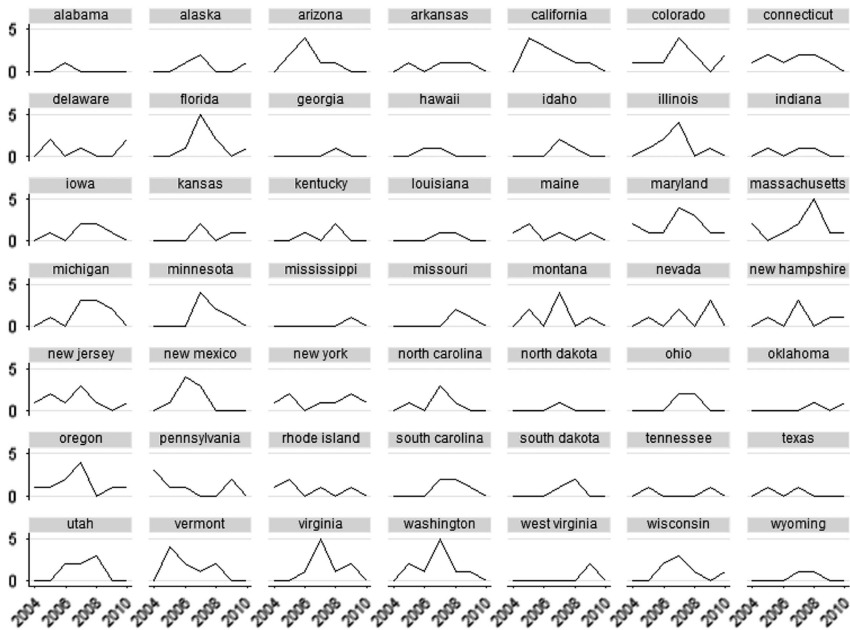
Figure 3. Policy enactments by state and year.

Appendix Table A. As we have no policy reversals within our sample, the data are count distributed; thus, we employ a generalised negative binomial regression as the primary statistical model.[10] Given our approach is to study state policy enactment over time, we use clustered standard errors to account for the repeated measurements of states.[11] We include two measures to capture the influence of issue salience: (1) state-level estimates of public belief in the seriousness of climate change, as a measure of issue problem status and (2) an index of issue attention to environmental problems, built from Google Trends search results by state.

We use national-level public opinion surveys and multilevel regression with poststratification (MRP) to generate a state-level measure of issue problem status for climate change. We began with a set of public opinion polls with nearly identical questions about the threat of climate change: *In your view, is global warming/climate change a very serious problem, somewhat serious, not too serious, or not a problem?*[12] The responses are grouped into two categories where a zero is classified as a respondent not believing global warming/climate change is a problem and one is coded so that a respondent does believe it constitutes a problem

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[10]The new policy enactment variable is treated as count distributed because of its low yearly average (0.53) and the fact that our sample contains no policy reversals. The observed maximum number of policies enacted in any given year for a given state is five and the minimum of observed new enactments is zero. Note that the actual distribution is well behaved in the sense that it is not zero inflated, over-distributed or multimodal. Alternative link choices – Poisson, zero inflated negative binomial – were tested and shown to work less well than the negative binomial.

[11]Alternate estimators were used for robustness tests and are reported in Online Appendix Table B.

[12]See Table E in the Online Appendix for detailed information about the sources of our survey data.

(see Lax and Phillips 2009, 2009b, 2012).[13] Multilevel regression and post-stratification were then used to predict the percentage of respondents in each state in a given year that believes climate change is a problem.[14] In years when no survey was available (i.e. 2005) linear interpolation was used to predict missing values.[15]

In order to capture public attention to environmental issues, we use a novel measure derived from Google Trends data for four search terms associated with the environment and build an index for comparative search frequency of those terms. We compare the frequency of searches for *global warming*, *climate change*, *acid rain* and *pollution* across states and by year and gave each state-year a score.[16] These terms were chosen because of their connection with environmental issues and their relative lack of missing data.[17] While acid rain and climate change are entirely different environmental problems, laypeople often do not differentiate between them. This is not surprising given the complexity of these scientific issues and the limited understanding the public has about climate change. For example, studies indicate that survey respondents fail to fully differentiate between ozone depletion, acid rain and climate change (Bostrom et al. 1994; Reynolds et al. 2010). Furthermore, political elites are likely to respond to constituent concerns about the environment more broadly when deciding on legislative priorities that would include climate change. As such, we include related search terms to adequately capture attention to environmental issues through Google searches.

Google Trends provides a rank ordering of states by year based on each search term so that the state with the highest percentage of searches for environmental issues receives a 100 for that term. States at the bottom of the list, or without enough searches to register, receive a zero. Each state's score is made up of the averages of their scores for each search term, scaled to 100. We use data from the Current Population Survey to control for states' level of internet access over time. While Google search data are fairly new, researchers have demonstrated its validity for state politics research (Reilly et al. 2012) and as a measure of salience (Oehl et al. 2017).

Google Trends provides a valuable source of information for studying issue attention because it gives researchers a more direct measure of what regular internet users are interested in. Survey instruments – while useful – can bias respondents by prompting them to think about climate change or otherwise tend to have too few respondents to make good inferences about the larger population. Research conducted by Oehl et al. (2017) provides further validity of Google Trends as an indicator of salience. The authors compare national Google Trends search data on climate change to Gallup's MIP and a published media indicator,

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[13]The use of dichotomous responses to produce MRP estimates is currently the standard practice in state politics as the goal of MRP is to produce state-level percentages. Additional details on our use of MRP can be found in the Online Appendix.

[14]Grouping the response categories in different ways also created alternative operationalisations of issue problem status. We viewed the best operationalisation as largely an empirical question and thus reported the strongest result in our main findings. Additional details can be found in Online Appendix Table F.

[15]Multiple imputation was also used as a robustness check for the linear interpolation. This resulted in almost no change in the final models or marginal effects predictions, so the simpler method was reported.

[16]The score is an additive index of each of four search terms that is rescaled to a maximum of 100 so that coefficients are comparable to the other independent variables. Cronbach's α is 0.70. Approximately 70% of the variation in this measure is across states.

[17]See Table D in the Online Appendix for a more detailed explanation of the composition of our index.

finding strong correlations between these measures. Google search data also indicate a willingness to think about and learn about these issues on one's own. Looking at the relative search frequencies of terms across states provides a way to gauge this willingness.

While useful as a measure of issue attention across states, it is important to understand that Google Trends does have a certain amount of sampling bias. While we control for state internet usage, Google Trends measures are likely to overrepresent wealthier and more highly educated people as they are more likely to use the Internet. As these individuals are also more likely to be involved in politics, we do not find this particularly problematic for our study, but research concerning other issues should proceed with Google Trends data carefully.[18] Given this sampling bias, it is difficult to study the relationship between Google Trends and other variables in isolation – some instrument like Internet access is necessary. It is also difficult to gauge the attitudes of searchers based on their search terms. Our measure would register climate change-related searches even if the searcher was a climate change *denier*. To this end, it is necessary to include some measure related to policy concern when using Google Trends, as we have done with public opinion estimates of the seriousness of climate change.

There are also some concerns regarding the potential that news coverage of state legislative activity actually influences online searches and not the other way around. While we believe that this is a possibility on some issues at the national level, we find the argument less compelling at the state level, given the relative lack of attention individuals pay to state politics and the fairly low level of media coverage surrounding state legislative activity. Individuals tend to have fairly limited interest and knowledge about state politics. A small percentage of voters can name their state representatives (see Carpini et al. 1994) and knowledge of specific state legislative action is likely to be even lower with potential exceptions for particularly controversial issues. In addition, survey research indicates that very few American voters tend to follow state political news coverage (Maibach et al. 2009; Rogers 2015).

Furthermore, media coverage of state legislative activity is relatively scant. The number of reporters that cover state politics is comparatively much lower than national political coverage and full-time reporters for both TV and print news has declined since the late 1990s from an already low number relative to other coverage (Dorroh 2009; Enda et al. 2014). Enda et al. (2014) find that more than 70% of newspapers do not have a full-time reporter that covers state politics. As such, we argue that it is unlikely for state legislative activity to prompt individuals to conduct Google searches when state legislators consider or adopt policy, unless the policy is particularly controversial.[19]

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[18]It is also important to note that we cannot differentiate 50 searches by 50 people versus 50 searches by 1 person. Given we are looking at state-level comparisons, we assume that roughly the same distribution among searchers exists across states when controlling for Internet access and state income per capita. As such, we expect the ratio of searches to searchers to be similar across states even as the frequency of climate-related searches changes across states.

[19]We conduct an additional robustness check by obtaining the residuals of a model predicting Google Trends searches by legislative activity. We then use these residuals in the main model in place of Google Trends. Our results are highly consistent, resulting in the same interpretations of our hypotheses.
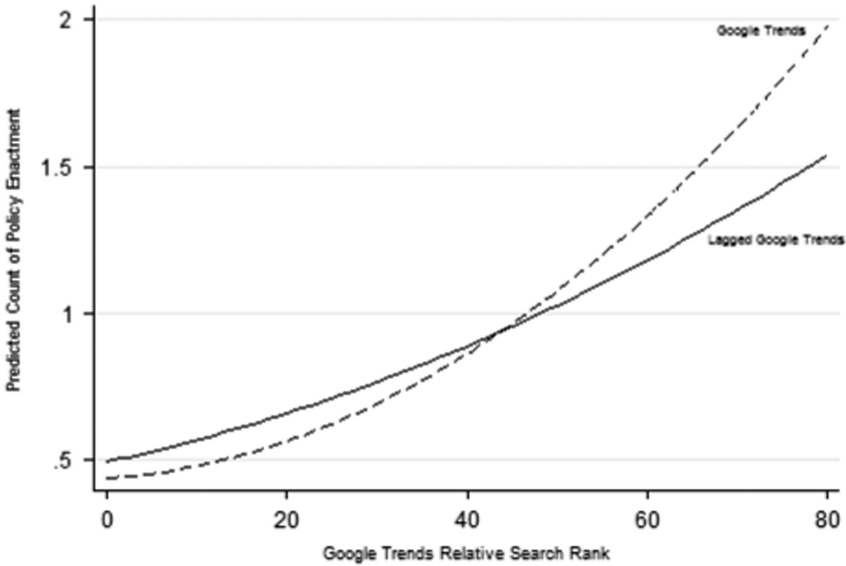
Figure 4. Google trends versus lagged google trends.

Despite these arguments, we offer a formal test of the possibility that state-legislative activity might trigger higher rates of online searches. By comparing the relationship between our Google Trends index and a 1-year lag of the index on the predicted enactment count, we demonstrate that issue attention leads legislative action. As indicated in Figure 4, the predicted effect from the lagged Google Trends measure is reduced to an additional 1 policy per state-year as opposed to the 1.5 that current Google searches predict.

The literature on state policy adoption indicates that a variety of factors beyond issue salience influence enactments. Given previous research, we expect state political characteristics to have an influence on climate change policy adoption. Several studies that consider climate change policy find liberal citizen ideology to increase the probability of adoption (Huang et al. 2007; Matisoff 2008; Chandler 2009; Lyon and Yin 2010). Citizen ideology is also a factor in other state policy adoption work including morality policy and taxes (Berry and Berry 1992; Mooney and Lee 1995). The relationship between government ideology and environmental policy adoption appears more limited, with very few scholars finding such a relationship (though, see Stoutenborough and Beverlin 2008). We incorporate measures developed by Berry and his colleagues including the revised citizen ideology series and the NOMINATE (Berry et al. 1998; Berry et al. 2010) measure of state government ideology.[20]

We also account for partisan control of state government, given Democratic state legislators are generally more likely to advocate for the adoption of climate

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[20]The citizen ideology measure is constructed using interest group scores for members of Congress, ideological estimates of electoral challengers and vote weights by district. The government ideology measure utilizes DW-Nominate scores. Both measures run from 0 to 100, conservative to liberal.

change policies than Republicans (Dunlap et al. 2001). Our measure of state legislative control compares Democratic control of both chambers and split control to a fully unified Republican legislature (Klarner 2003). We also include a measure of executive control that is coded as 1 for when the governor's party is also in control of the legislature and 0 otherwise (Klarner 2003). By including both gubernatorial control and legislative partisanship, we are able to capture the ability of Republicans to exercise veto points in the policy process.

We control for legislative professionalism using Squire's (2007) measure. As indicated in the literature on state policy adoption, professionalised legislatures have greater access to resources for policy innovation (e.g. Berry 1994). Thus, we would expect climate policy adoptions to increase as professionalism does. We also account for state environmental interest groups through annual membership in the Sierra Club, by state, per 1000 residents.[21] This measure is likely to be capturing broad environmental support within a state, however, it is possible that the measure is capturing environmental group efforts or influence. In either case, we would expect increases in membership to produce more climate policy adoptions. We also considered additional control variables to account for business interests in the state including manufacturing and mining as a proportion of GSP and total energy production by state. These variables are found to be insignificant and do not add to our results; as such, they are left out of the final model. These alternative specifications can be found in Online Appendix Table C.

State economic factors are also likely to play a role in climate policy adoption. Several environmental policy studies find that greater state wealth increases the probability of policy adoption (Ringquist and Garand 1999; Matisoff 2008; Chandler 2009). This finding is consistent with other state policy adoption literature, which finds that greater state wealth increases the probability of policy innovation (Walker 1969; Berry 1994). As such, we control for per capita income, obtained from the US Bureau of Economic Analysis.

Policy diffusion is also critical to understanding the adoption of a wide variety of policies in the states (see Karch 2007) and is also significant in studies of single climate change policies (Matisoff 2008; Chandler 2009). In order to account for horizontal policy diffusion, we include a lagged measure of neighbouring policy adoptions. We sum the number of policies adopted by neighbours in a given year and divide by the number of neighbouring states.

Finally, we control for a state's general propensity to adopt environmental policy by including the level of total policy enactments in the state in the previous year. By including the state policy level, we are controlling for different adoption rates due to a potential policy ceiling. This is important because—though no state adopts all nine policies during this timeframe—some policies may be easier to adopt than others. Including the lagged level of policy adoption helps to account for the fact that early adopters may be less likely to adopt new policies later in the period after having exhausted the relatively low hanging fruit.

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[21]Sierra Club membership data was obtained directly from the Sierra Club on 6 May 2014. While other environmental groups are relevant, the Sierra Club is the only such group that collects and is willing to share this data over time, by state. As the Sierra Club is a prominent environmental organisation with a large membership, we view it as an appropriate proxy.

Furthermore, unmeasured features of states (e.g. persistent drought conditions), could have an important influence on policy enactment over time. The number of relevant state-level features that could be estimated is extreme and would typically be solved by inclusion of state-fixed effects. However, negative binomial models have been shown to be inconsistent when used with fixed effects due to the incidental parameters problem (see Allison and Waterman 2002; Green 2004; Hilbe 2011).[22] In addition to the potential weakness of the fixed effect estimator, most of the variation in our sample is across rather than within states.[23] This means that fixed effects estimation would ignore most of the variation in policy enactment. By accounting for the level of policy enactment through the prior year we account for otherwise unmeasured state characteristics.

Findings

In column 1 of Table 1 we begin by estimating our basic model that includes internal determinants, diffusion from neighbouring states, the existing level of environmental policy in a given state, and our measures of issue salience. When looking at our primary measures in Column 1, it becomes clear that issue salience does indeed matter. Environmental issue attention (Google Trends) and issue problem status (public opinion surveys) for climate change are both positive and statistically significant, confirming our first two hypotheses. As these measures are on different scales it is difficult to compare their substantive impact from coefficients. Figure 5 displays the marginal effect of each measure of issue salience on the predicted policy enactments in state years.

The relative influence of our salience measures on predicted policy enactment becomes clearer with Figure 5 as each variable was rescaled to fit on a 0–100 axis so that their influence could be directly compared. This means that the scales from the figures and those from Table 1 are different, but the relative effects of a maximum to minimum shift are unchanged. Of the two salience measures, the effect of issue problem status seems to be less important. Without issue attention to activate the belief that climate change is a problem, it appears to have a somewhat smaller influence on the policy process. Issue problem status alone accounts for less than half of an additional expected policy enactment in a given state-year. The results indicate that issue attention accounts for a greater level of policy change. Attention, as captured by our Google Trends search index, represents an additional 1.5 policies enacted in a given state-year when going from the least (Delaware, in our data) to most-search prone state (New York).

The marginal effect of Sierra Club membership and its interaction with issue attention is shown in Figure 6. The influence of increasing Sierra Club membership going from its lowest levels of about 1 member for every 2,300 people in Mississippi to its highest levels of about 15 members for every 2,300 people in Oregon appears on par with issue attention captured by Google Trends. Almost two additional policy enactments are expected from the increase in Sierra Club

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[22]The incidental parameters problem occurs when including indicator variables in a nonlinear maximum likelihood model. It results in varying degrees of bias in coefficients, standard errors, or both, that is difficult to practically assess.

[23]62% of the variation is across states and not within states over time.

Table 1. Policy enactment 2004–2010

	Base model	Interactions across salience types		
State citizen ideology	0.021 (0.008)*	0.017 (0.007)*	0.020 (0.008)*	0.021 (0.008)*
State Government ideology	−0.015 (0.009)	−0.015 (0.009)	−0.014 (0.010)	−0.015 (0.010)
Legislative professionalism	0.799 (0.402)*	0.915 (0.491)	0.802 (0.384)*	0.814 (0.404)*
Per capita income	0.016 (0.019)	0.020 (0.017)	0.016 (0.019)	0.016 (0.019)
Unemployment (lagged)	−0.012 (0.074)	−0.015 (0.073)	−0.008 (0.074)	−0.016 (0.075)
Legislative control				
Democrat	0.476 (0.239)*	0.608 (0.224)*	0.478 (0.239)*	0.500 (0.246)*
Split control	−0.273 (0.213)	−0.252 (0.209)	−0.272 (0.208)	−0.234 (0.223)
Governor's party in legislative control	0.758 (0.303)*	0.764 (0.290)*	0.752 (0.303)*	0.768 (0.305)*
Neighbouring state adoption (lagged)	0.241 (0.126)	0.241 (0.121)*	0.224 (0.127)	0.239 (0.125)
Past policy adoption	−0.144 (0.038)*	−0.146 (0.037)*	−0.138 (0.037)*	−0.149 (0.039)*
Sierra club membership (per 1,000)	0.132 (0.061)*	0.144 (0.055)*	0.128 (0.061)*	1.090 (1.022)
Internet usage	0.031 (0.016)	0.031 (0.016)*	0.032 (0.016)	0.032 (0.016)*
Google trends index	0.013 (0.004)*	0.034 (0.008)*	−0.048 (0.047)	0.013 (0.004)*
% Who believe climate change is a problem	0.035 (0.014)*	0.043 (0.015)*	0.033 (0.014)*	0.062 (0.031)*
Sierra club/google trends interaction		−0.008 (0.002)*		
Google trends/public concern interaction			0.001 (0.001)	
Sierra club/public concern interaction				−0.010 (0.011)
Constant	−7.511 (1.771)*	−6.778 (1.764)*	−7.248 (1.767)*	−10.006 (3.128)*
AIC	790.13	785.94	791.34	791.44
BIC	851.53	851.18	856.58	856.69
Observations	343	343	343	343

All models use generalised negative binomial regressions with cluster robust standard errors at the state-level. Dependent variable is the count of policies for each state-year with an observed range of 0–5. Alternative model specifications using standard negative binomial approaches as well as multilevel approaches are included in Online Appendix Tables B and C.
BIC = Bayesian information criterion; AIC = Akaike information criterion.
*$p < 0.05$.

members. The final plot in Figure 6 shows that the combined relationship between interest group membership and issue attention is fairly strong. The magnitude of the interaction between Google Trends and Sierra Club membership is such that the predicted range from low to high is about two additional policies per state-year. Issue attention acts as a catalyst to transform the belief that an issue is a problem into political behaviour. People who are actively attentive to politics are more likely to exert political pressure through voting, protesting or joining an interest group. This means that states with higher levels of attention and greater membership in environmental interest groups are likely to have higher levels of political pressure on elected officials for policy solutions.

We find that states with Democratically controlled state legislatures and unified party control between the governor and legislature are more likely to adopt climate change policies. This is not surprising given the ability of Republican legislators and governors to act as veto players in the climate policy space. While increases in issue salience may persuade Republican leaders to act on climate change, the
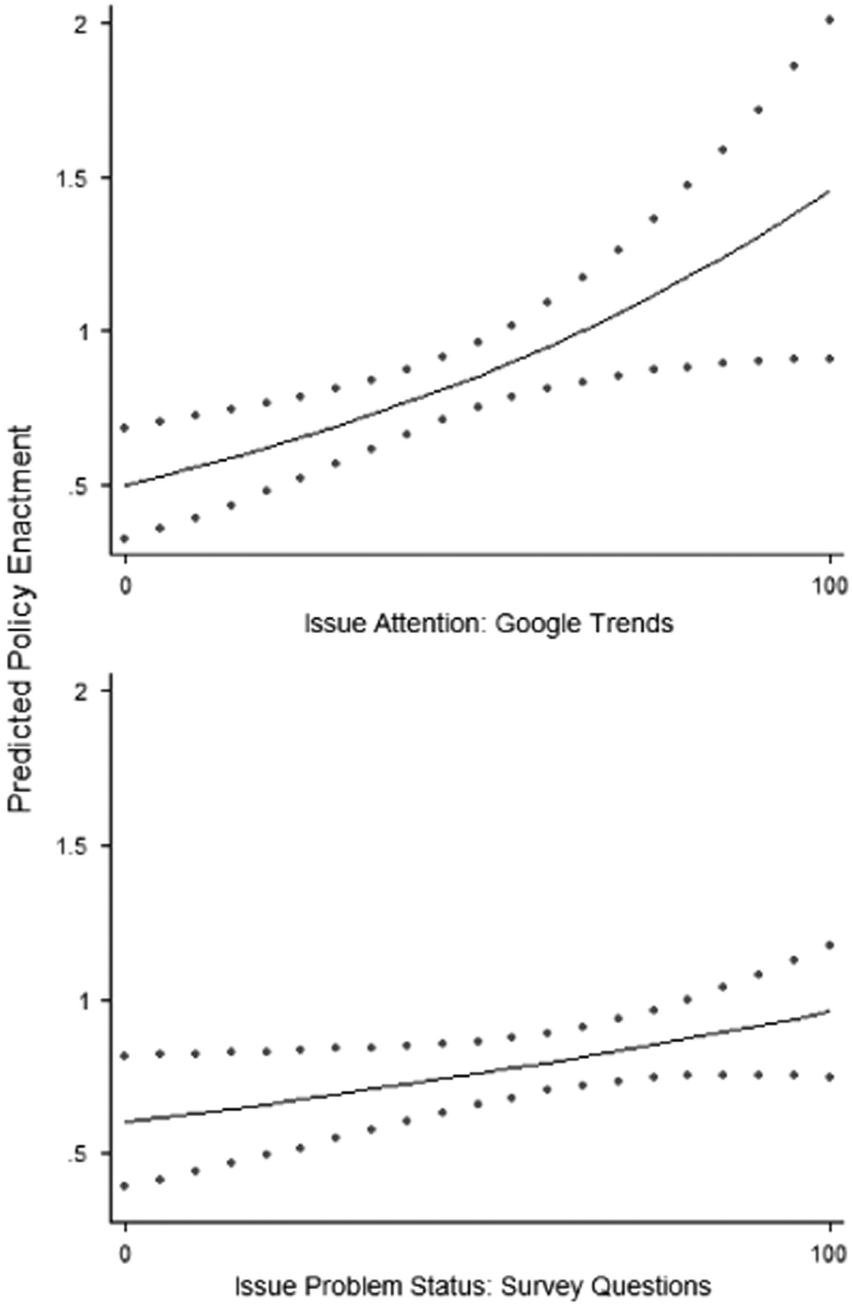
Figure 5. The marginal effects of issue salience on policy adoption.
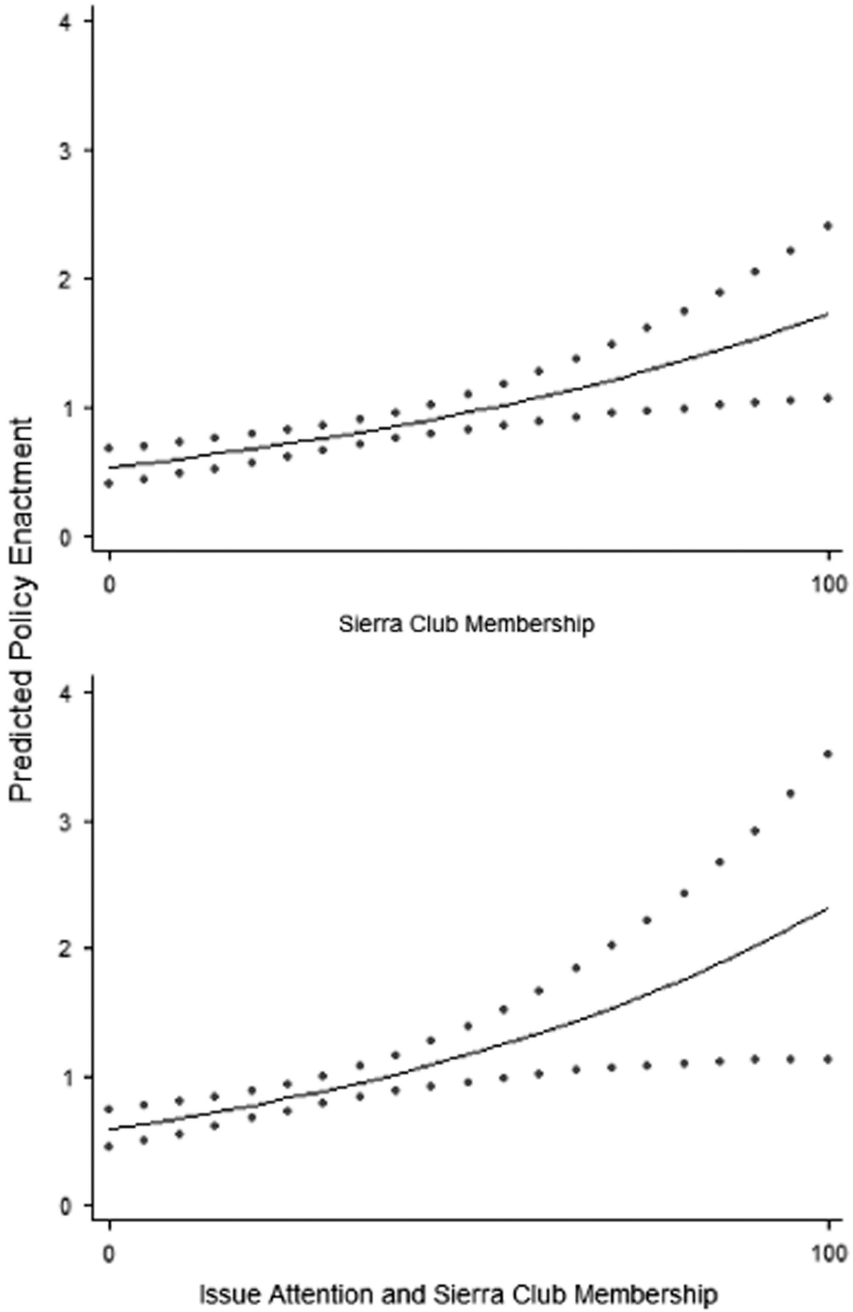*Note*: Bands represent 95% confidence intervals.

Figure 6. The marginal effects of Sierra Club Membership on policy adoption.
Note: Bands represent 95% confidence intervals.

partisan nature of this policy area plays out in state government in fairly predictable ways, with greater policy activity among Democrats.

Finally, states with more liberal electorates and more professional legislatures tend to enact a larger number of environmental policies in a given year. Our results indicate that economic factors like per capita income and unemployment matter less than expected with neither being statistically significant. Neighbouring state policy adoptions is statistically significant where a state's neighbours can have a large substantive impact on policy adoption with a large amount of variance.

Discussion and conclusion

This study conducts an important empirical test for a more nuanced conception of salience discussed by Wlezien (2005) and partially adapted here. Our study provides evidence that public issue salience plays a more nuanced role in influencing policymaking than has previously been discussed in the discipline. More specifically, we build on previous state politics scholarship that shows a positive relationship between national salience and state policy adoption (Lax and Phillips 2012). Here we provide evidence that variation in salience across states also has an important impact; as public issue salience increases in the form of problem status *and* issue attention, states are more likely to adopt climate change policies. State legislatures are responsive to public opinion when people believe a policy issue is a problem to which they are attentive and when individuals become advocates through environmental interest groups. Given the polarisation surrounding this issue, we also find that Republican controlled legislative chambers act as important veto points that prevent climate policy action.

Issue problem status – as measured by the percentage of a state that believes climate change is a problem – has a strong, independent impact on policy enactment. However, we find that problem status has a weaker influence on policy enactment than issue attention and Sierra Club membership. This largely fits with our theory as we have argued that policymakers are less likely to respond to public opinion when the public lacks strong feelings about an issue.

Our results for public issue attention through Google searches are intriguing. These Google searches for environmental problems signal a level of attentiveness by the public to environmental issues. Membership in the Sierra Club further amplifies the impact of issue attention. From a normative perspective, these findings are positive for those concerned with the influence of public will on policymaking. When individuals pay attention to an issue and mobilise to advocate for that issue, state policy-makers are more responsive.

These findings provide new insights for state politics generally, and state-level policymaking on climate issues more specifically. It is clear from our analysis that issue salience is one of the driving forces behind climate policy adoption and interacts with environmental interest group membership in important ways. Increasing public awareness and public attention to climate change seems to have a sizable influence on real policy outcomes within the states.

Consider California (mixed control), Vermont (Democratic) and Utah (Republican). What we see from Figure 7 is that more liberal states like Vermont, that were also controlled by Democrats, tended to be early adopters; however, without a high degree of salient climate conditions, their adoption rate drops off. California had a similar early adoption peak, despite their mixed-control. Their
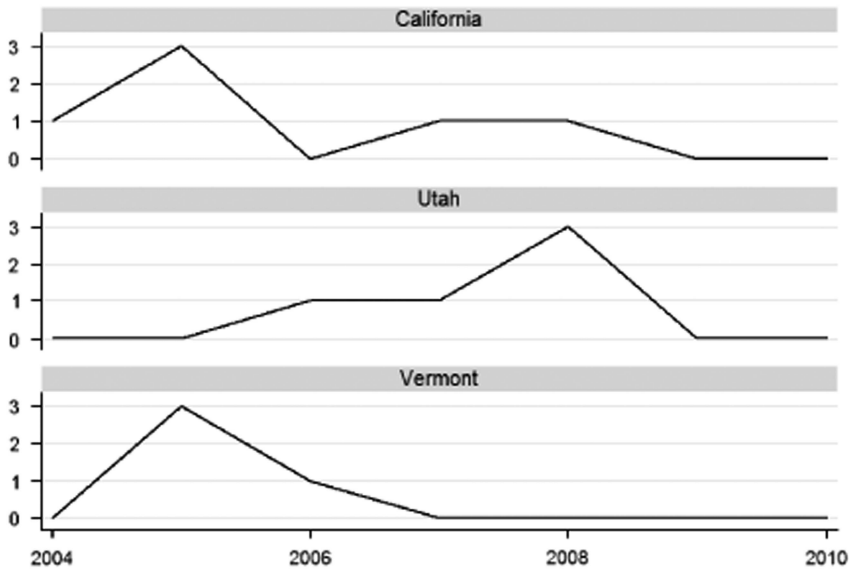
Figure 7. Policy enactments by state and year, California, Utah and Vermont.

subsequent adoption rate remains steady because climate issues are more salient and the political climate is favourable to adoption. During this time period, California has experienced natural disasters, including droughts and wildfires, often associated with climate change by both citizens and policy makers. These events have likely prompted problem status and attention from California citizens and policy makers (Owen et al. 2012).

Utah passed no climate policies in the early part of our time period; however, as the state began to experience more severe climate events, their rate of policy enactment increased. It is likely that these events increased the salience of climate change for residents of Utah. For example, the number of acres burned in Utah due to wildfires in 2004 was just over 76,000. In 2005 and 2006, it was just over 300,000 acres. In 2007, the number of acres burned was 629,000. During this time period, we see a similar spike in Google Trend search patterns in Utah as well. Salient events – like severe droughts and wildfires – motivate people to think about climate change and correspond to policy adoptions in the following year. These arguments fit well alongside previous literature showing a relationship between weather events and climate change attitudes (Konisky et al. 2016; Demski et al. 2017).

As suggested by our findings, the increase in salience results in state legislators being signalled by voters and interest groups to act. This translates to a temporary reordering of legislative priorities. For climate change, states have numerous policy options to consider. The data indicate that states select from these options in a fairly unsystematic – and probably localised – way, but adopt more policies at times when the issue is most salient.

We doubt that the relationship between state policy-making and issue salience is unique to climate change policy or to the context of the United States. When considering other policy issues, such as immigration, we expect issue salience to vary across states (and over time) and produce different policy decisions. For

example, we would expect that states closer to country borders and larger immigrant populations (or higher immigrant population growth rates) would have higher rates of issue problem status and attention regarding immigration.

We would also expect salience to vary across and within countries, allowing our theoretical expectations to readily apply in other federal or quasi-federal systems like the European Union. Public opinion on climate change in Europe has shifted over time, primarily in accordance with economic factors (Capstick et al. 2015) and in response to weather events (Kim and Wolinsky-Nahmias 2014; Demski et al. 2017). We would expect these changes to alter the salience level of climate change and consequently produce a government response at the supranational level in the EU and within European countries and subnational governments. The European Union and a number of member states (such as Germany) have presented themselves as leaders on climate change mitigation, in part because of strong public and elite concern over climate change and political support for action among key member states (Schreurs and Tiberghien 2007; Kelemen 2010). In contrast, the United States has largely been characterised by a lack of action at the national level resulting (in part) from low levels of concern and attention to climate change, particularly among Republicans, given intense polarisation on this issue.

Our findings also provide meaningful progress in the understanding of issue salience and public opinion. Existing measures of issue salience have significant problems when they do not account for issue problem status and issue attention. We have introduced a potential set of replacements with Google Trends, and public opinion data on whether an issue is perceived as a problem. We also find strong evidence that salience interacts with environmental interest group membership to produce policy action. We anticipate that other policy areas with heavy interest group involvement would show similar results. These findings suggest that environmental interest groups may be able to highlight particular aspects of policy issues to increase their salience and advocate for policy change. These results build on findings by Owen et al. (2012), who argue that focusing on what is salient to an individual when communicating about climate change is likely to be more effective in shifting attitudes.

We must be clear that the proper operationalisation of issue salience requires considerable thought based on the dynamics of the issue itself. For many policy issues, high-issue salience does not align with one set of policy preferences. For example, individuals that believe immigration is salient may differ substantially in their policy preferences; some would be supportive of strict controls on immigration while others may support a smoother path to citizenship. Similarly, an issue like same-sex marriage would produce multi-directional policy responses for individuals; believing that same-sex marriage is important would play out differently for proponents and opponents. In cases where public opinion cannot be treated as unidirectional, it is important to get measures of issue problem status and issue attention among people who hold differing policy preferences.

Climate change represents a rare policy area in that individuals who are concerned about and attentive to global warming typically support policies to reduce its effects (Zahran et al. 2006);[24] in other words, the relationship is largely

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[24]This relationship is further indicated in the Online Appendix Figure A using Pew Global Attitudes data. The level of support for climate change policies increases rapidly once an individual reports that climate change is a problem.

unidirectional. Those who oppose climate change policy typically frame their opposition by denying that there is a need for any policy because they either do not believe climate change exists or believe the process is natural (Dunlap et al. 2001; Leiserowitz 2006). This can be seen in the shift in conservative and Republican elite rhetoric on climate change in the United States over the past decade (see Greenblatt 2010; McCarthy 2014; Davenport and Lipton 2017 for journalistic accounts of the trend and Dunlap and McCright 2011 for an scholarly account of the mechanisms). While the vast majority of Americans view climate change as a real problem, it has become very common for Republican elites to claim that it is highly exaggerated or an outright hoax so as to justify their preferences against policy activity.

Our study should not be taken to indicate our variables are the only viable measures of salience. Any variable that can effectively tap into issue problem status and attention is worthwhile. While newspaper indices probably do not measure issue problem status within the broader public, they likely inspire it. Newspaper reporters inform the public about problems and tell people what to worry about. For that reason, measures based on newspaper coverage provide valuable proxies for issue problem status when public opinion data are unavailable. It is unlikely that traditional newspaper-based measures can capture issue attention. Indices based on the most emailed, posted or tweeted stories may provide a useful alternative to traditional citation measures. This work provides researchers with a more nuanced conceptualisation and measurement of issue salience that can be used and adapted to future studies.

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