Understanding misrepresentation: How policymakers perceive signals from constituents on environmental policies

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Abstract

Several studies have identified a conservative ideological gap between public opinion and public policy in the United States. One proposed explanation for this gap is that policymakers underestimate how popular liberal policy proposals actually are, leading policymakers to misrepresent the public when they write and vote on policies. This explanation is evaluated in two survey experiments of local and state policymakers. In study 1, state policymakers were randomly assigned to either receive data on state-level opinions about support for the government limiting greenhouse gas (GHG) emissions or not. Those who received the data not only estimated that there was significantly greater state-wide support for limiting GHG emissions but also significantly greater district-wide legislative support for it. Furthermore, receiving the data significantly increased the percent of GHG emissions reductions that policymakers were willing to support as part of a hypothetical state climate change policy. Similar to study 1, local and state public officials in study 2 who were randomly assigned to receive hypothetical polling data about an electric vehicle (EV) policy also estimated significantly greater constituent support for the policy and were willing to require a greater percent of EV-ready parking spaces compared to a control condition, which just received information about the EV policy. Policymakers who were randomly assigned to receive information about letters from constituents groups in support of the EV policy did not perceive greater constituent support for the policy and were not in favor of a larger EV-ready parking space mandate than the control group. In both studies, however, policymakers expressed skepticism about the value of constituent signals in determining relevant public opinion. These studies suggest that under certain circumstances state and local policymakers are willing to update their beliefs about their constituents as well as their own policy preferences in accordance with signals from constituents.

1 Introduction

1.1 Background

In an effective representative democracy, democratically-elected policymakers have an incentive to respond to constituents' preferences. When constituents learn that their policymakers are not making decisions congruent with the majority of the constituents' preferences, then a majority of the constituents could vote the policymaker out of office (Mansbridge, 2003). Since public policy is largely a function of elected officials' decisions, public policy should theoretically reflect citizens' preferences. In practice in the United States, public policies at all levels of government often fail to reflect the will of those governments' constituents, creating a democratic deficit (Lax and Phillips, 2012; Gilens, 2012; Achen and Bartels, 2017).

There are numerous potential explanations as to why policymakers might break with con-

stituents' preferences. First, in addition to constituent preference, policymakers' decisions are guided by their own personal preferences, which might be constructed based on strongly held values (Miller and Stokes, 1963; Fiorina, 1974). Second, policymakers are accountable to and influenced by fellow policymakers and party-members, whose preferences might be at odds with those of constituents (Kingdon, 1989). Third, policymakers are disproportionately influenced by a sub-groups of constituents or interest groups that are attentive to specific policies. These groups could crowd out the interests of the majority (Fiorina, 1974; Gilens, 2012).

When making a policy decision, elected representatives must consider electoral consequences along with each of these other factors. Determining the potential electoral consequences of a specific policy decision, like a vote on a bill, requires knowledge of their constituents' opinions on the bill (Kingdon, 1989; Shapiro, 2011). One way policymakers could acquire that knowledge is through issue-specific public opinion polls of their constituents. Policymakers are, therefore, most likely to refer public opinion polls on issues that are more important and salient to a majority of their constituents, such that the electoral signal is strong relative to the other signals (Arnold, 1990; Burstein, 1998). Still, under those circumstances, policymakers might not have access to trustworthy, high quality public opinion polls of their specific constituency on a particular issue, which are relatively uncommon and resource-intensive to produce.

Thus, the democratic deficit could be a result of a relative lack of public pressure on policymakers compared to the other signals influencing policymakers, or it could be a result of a lack of information about constituent opinion. Prior research provides evidence supporting both explanations (Achen and Bartels, 2017; Broockman and Skovron, 2017; Hertel-Fernandez et al., 2019; Kalla and Porter, 2018; Kingdon, 1989; Shapiro, 2011). The experiments in this study focus on the second explanation. If lack of information about constituents explains misrepresentation, then provision of unambiguous public opinion data (e.g. a large majority supports a policy) is hypothesized to lead policymakers to revise their policy preferences towards that of their constituents. The present research tests that hypothesis.

2 How constituents influence public officials' votes

Fiorina (1974) explained that public officials' roll call votes will cater to the group or groups that they think are most influential in getting them reelected. Many members of Congress interviewed in Kingdon (1989) similarly described that regardless of their own or their colleagues' beliefs, many voted for some policies to avoid highly visible, active dissent by constituents or having to "explain" their vote to constituents. But after voting against their constituents' perceived preferences without retribution, representatives' fear of electoral retribution erodes over time. Instead, retribution

from business interests or fellow party leaders may become more salient (Kingdon, 1989; Hertel-Fernandez et al., 2019).

Recently, there have been several experiments focused on understanding the causal relationship between constituent opinion and representatives' roll call votes. Many of these studies have suggested that policymakers might not know their constituents' opinions, but when they become aware of those opinions, the policymakers make an effort to represent their constituents. Bergan (2009); Bergan and Cole (2015) found that even a small number of citizens' emails and phone calls advocating for a bill significantly increased legislators' votes on two non-partisan bills in the New Hampshire and Michigan state assemblies, respectively, after controlling for past voting behavior. A third experiment presented New Mexico state legislators with their district's public opinion on a relatively non-partisan bill and published the poll results in a local newspaper. Receiving information on their constituents' opinion significantly increased the likelihood that their votes aligned with their constituents' preferences (Butler and Nickerson, 2011). Cluverius (2017) used a survey experiment to determine that state legislators were more responsive to a small, critical mass of emails - between 6 and 60 emails - on an issue, which signalled meaningful interest in a topic without leading legislators to believe that they were mass, automatically generated emails. These studies along with findings at a federal level by Broockman and Skovron (2017); Hertel-Fernandez et al. (2019) suggest that the driver of misrepresentation is the lack of a clear signals from constituents about their policy preferences. And thus, once constituents' opinions are clearly communicated, legislators will better represent them.

However, while there is some evidence that clearer signals from constituents in the form of constituent contact or geographically relevant polling would increase representation, numerous studies have also indicated that policymakers are not very concerned with constituent opinion. Kalla and Porter (2018) found that the vast majority of state legislators did not try to access district-level polling information when it was available, and when they did access the polling information, they did not update their perceptions about their districts' opinions or their own policy preferences. It is noteworthy that the issues included in the survey by Kalla and Porter (2018) were all relatively partisan with respect to the political parties' official platforms. Just as policymakers were non-responsive to polling information, Butler et al. (2012) determined that both state legislators and members of Congress are less likely to expend resources writing a letter in response to policy requests from constituents compared to service requests, especially legislators that are in electorally noncompetitive districts. Local and state public officials have also been found to discount the policy opinions of constituents who disagree with their own opinion, rating those letters as less factual and those letter-writers as less competent. Furthermore, this disagreement discounting occurs regardless of how partisan the issue is (Butler and Dynes, 2016).

Hertel-Fernandez et al. (2019) provided one explanation for why legislators might be uninterested in constituents' opinions. The authors found that both greater contact with business groups and egocentric bias decreased Congressional staffers' accuracy in their perceptions of constituent opinion. In addition, exploratory interviews were conducted as part of the present study with current and former Congressional staff. The interview findings indicate that staffers are more likely to be influenced by direct constituent contact compared to district-level polling data. Interviewees explained that they perceived district-level polls they received on policy issues as biased or inaccurate.

3 Present study

Study 1 is a survey experiment, which tests the effect of receiving public opinion information on state policymakers' perceptions about constituents' attitudes and their own policy preferences. The study focuses on a policy aimed at limiting greenhouse gas emissions. Study 2 is a survey experiment about a hypothetical electric vehicle policy. The experiment tests the effect of a hypothetical public opinion poll, letters, or no information on local and state policymakers' perceptions about their constituents' attitudes and their own policy preferences. In study 2, policymakers are also asked to explain the factors that influenced their policy preference.

This research contributes to the literature, first, by evaluating the influence of receiving polling information on policymakers' perceptions of public opinion, with study 1 demonstrating that state-level data can influence district-level opinion. Second, this research demonstrates that receiving polling information can change policy preference on two policies - a relatively partisan state-level climate change policy and a relatively non-partisan local electric vehicle policy. Third, study 2 compares the influence of receiving polling data and letters on policymaker preference related. Finally, study 2 also evaluates the relative importance of constituent signals compared to other factors that policymakers say drive their decisions.

4 Methods study 1

4.1 Data

A 6-question experiment was included at the end of a larger, 10-minute survey of state policymakers at the National Conference of State Legislators (NCSL) in Nashville, Tennessee, USA in August 2019. A small number of (approximately 20) additional surveys were collected in the month following the event. A team of Stanford researchers reserved a booth in the NCSL exhibition hall under the title "Stanford Opportunity Zone Impact Initiative." The primary purpose of the

survey was to educate policymakers about a bipartisan national policy called Opportunity Zones and gather information about state policymakers' beliefs and attitudes about the policy.

Researchers primarily targeted individuals who were wearing badges indicating that they were state legislators or policy staff. Researchers stood at the booth and recruited survey participants using the following script: "Hi, we're Stanford University researchers trying to learn how best to communicate research to policymakers. Would you be able to spend 10 minutes on a survey for a Starbucks gift card?"

Of the 188 respondents in the sample, 100 of them are Democrats or Democratic-leaners, 22 of them are Independents, and 51 of them are Republicans or Republican-leaners. The sample includes 98 state legislators and 90 state legislative staffers. Respondents represent 42 states, the District of Columbia, Puerto Rico, U.S. Virgin Islands, and Guam (See Appendix A.1). In order to reduce the length of the survey and to ensure respondents were comfortable answering all of the questions in-person, demographic information was not collected at all.

4.2 Experimental design

All of the respondents first read a survey question about government limiting GHG emissions that was asked in a representative survey of US adults. Then, respondents in the control group were asked questions about their beliefs about their constituents' preferences and their own preferences related to government limiting GHG emissions. Respondents in the treatment group were first provided state-level public opinion data on government limiting GHG emissions for 50 states before being asked identical questions to the control group. After answering questions about their beliefs and preferences, the control group also received the state-level public opinion data. Lastly, both groups were asked questions about their perceived accuracy of the data and the usefulness of the data. The survey experiment is described in detail below:

Stimulus A - shown to all

Consider the following survey question that was asked in a survey of US adults:

As you may have heard, greenhouse gases are thought to cause global warming. In your opinion do you think the government should or should not limit the amount of greenhouse gases that U.S. businesses put out?

Option 1: Government should limit greenhouse gases

Option 2: Government should not limit greenhouse gases

Then, respondents were asked the following questions either before (control condition) or after (treatment condition) receiving state-level public opinion data about whether government should

limit greenhouse gas emissions:

Question 1-4

1. What percent of residents in the district that you represent do you think believe that the government should limit the amount of greenhouse gases that U.S. businesses put out? Please type a number 0-100.

2. What percent of residents in your state do you think believe that the government should limit the amount of greenhouse gases that U.S. businesses put out? Please type a number 0-100

3. Imagine if a bill were introduced in your state, which requires that economy-wide greenhouse gases are reduced by 100% by 2050, with a small portion of reductions provided by carbon offsets (e.g. reforestation). How likely would you be to vote for this bill? [Extremely likely, Very likely, Moderately likely, Slightly likely, Not likely at all]

   [If respondents do not answer "Extremely likely", they are shown Q4]

4. What percent of greenhouse gas reductions by 2050 would you vote to require in your state instead? Please type a number 0-100.

State-level public opinion information was communicated to the respondents as follows:

Stimulus B - shown before Q1-4 for treatment group

Researchers at a university conducted a series of national surveys on the American public's opinions about global warming. The survey used representative samples of US adults.

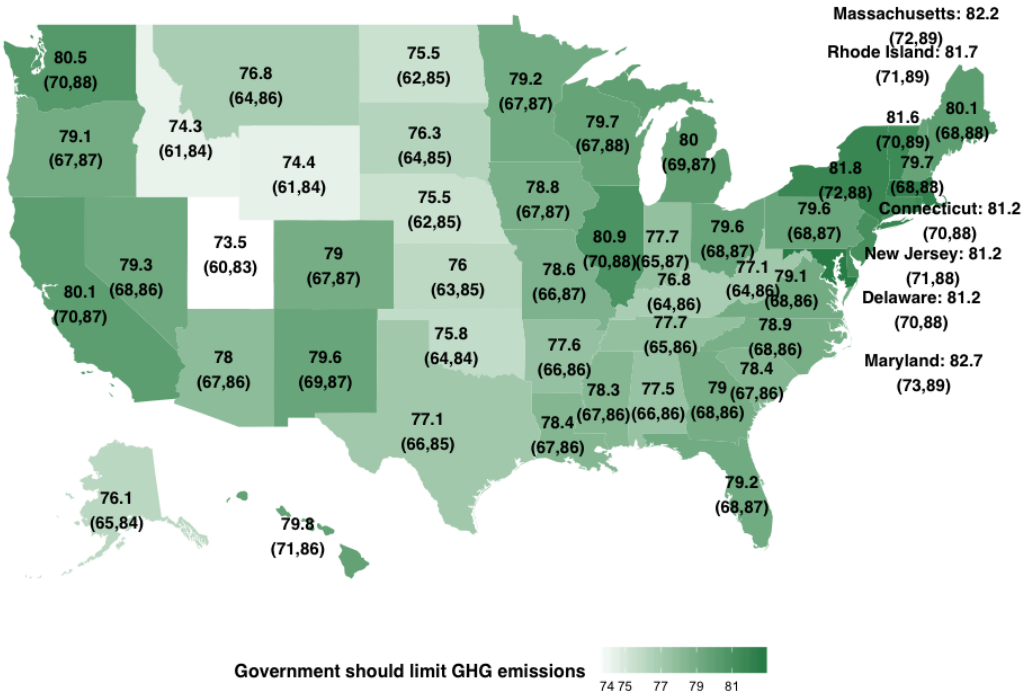
The research group then used a statistical technique to predict the percent of residents in each state who believe government should limit greenhouse gases from the the national survey data:

- Predictions are displayed in the map with confidence intervals, e. g. there is 95% certainty that the true state opinion on this issue in Iowa is between 67% and 87%

- Researchers validated the predictions by comparing them with state surveys

- All of the predictions were within 5 percentage points of the state survey results

The percent of residents in each state who believe government should limit greenhouse gases put out by U.S. businesses in 2018



Questions 5-6

5. How accurate do you think the prediction of your state is? [Extremely accurate, Very accurate, Moderately accurate, Slightly accurate, Not accurate at all]

6. What type of public opinion information would be useful for you when deciding how to vote on a bill aimed at reducing greenhouse gas emissions? [Open ended]

A climate change policy was chosen, because it was a relatively high salience issue with bipartisan public support (Howe et al., 2015). The policy described in this study is very similar to a law that passed in the state of New York in 2019 (Roberts, 2019).

4.3 Analysis

The analysis for this experiment was preregistered in OSF directly after data collection and prior to any data analysis. The responses to Q1 and Q2 were kept in numerical form. The responses to Q3 and Q4 were coded in two ways. First, likelihood of supporting the policy was coded numerically, such that 5 indicated "extremely likely" and 1 indicated "not likely at all." In addition, the two questions are combined to create a variable indicating preference for percent of GHG emissions reduced. This variable equals 100 if the respondent selected "Extremely likely" in Q3, and otherwise is equal to the response entered in Q4. The responses to Q5 were coded such that 5 indicated "Extremely accurate" and 1 indicated "Not accurate at all." See Appendix A.2 for a full description of the variables included in the analysis.

Simple t-tests and OLS regressions were used to analyze how the treatment affected responses to questions Q1-5. The OLS regressions adjusted for only party ID and perceived accuracy (Q5) of the opinion data. The regressions did not adjust for any demographic variables.

The Mediation package in R was used to assess the pathway through which the effect of seeing the public opinion data causes a change in policy preference.

5 Study 1 Results

5.1 The direct effect of constituent signals on policymaker preference

State policymakers who received data about state public opinion on limiting GHG emissions supported GHG emissions cuts that were 10% ($t(174) = 2.46$, $p<0.05$) larger than policymakers who did not receive the data until after reporting their policy preference (see Table 1, column 2). The effect of the treatment is only significant after controlling for policymaker party identification. State legislators and staffers respond similarly to the policy question and treatment (see Table 1, columns 3 and 4), so the sample will be combined from this point onward.

Public opinion data on climate change opinions influenced Republican and Independent policymakers' preferences more strongly than it influenced Democrats' preferences (Table 2). Democrats in the control group, on average, were in favor of an 81% GHG emissions reduction by 2050, where as Republicans in the control group were in favor of about a 17% emissions reduction by 2050. Those Republicans who received the public opinion data were in favor of a 43% emissions reduction. The treatment effect on policy preference for both Republicans alone and Republicans and Independents (shown in Table 2) is positive and significant ($t(69) = 2.19$, $p<0.05$). Democrats and Independents who received the public opinion data supported 85% and 52% GHG emissions reductions by 2050, respectively. The larger treatment effect among Republicans and Independents can likely be attributed to a ceiling effect among Democrats, who were already in favor of large emissions reductions in the control group.

Receiving public opinion data also increased the likelihood that policymakers would vote for a 100% emissions reduction bill (Table 3, column 1). On a scale from 1 (Not likely at all) to 5 (Extremely likely), receiving opinion data increased likelihood that Republicans and Independents would vote for the bill by 0.57 ($t(68) = 2.26$, $p<0.05$). Thus, Republicans and Independents in the treatment group reported being "slightly likely" to vote for the bill on average (Table 3, column 2). Democrats were no more likely to vote for the bill if they received the opinion data treatment (Table 3, column 3).

5.2 Perceived popularity of climate policies and policymaker preference

Nearly all of the people who were surveyed did not represent the state as whole but instead represented specific districts in each state. Thus, the public opinion information about their state provided in the treatment does not necessarily reflect their constituents' opinions. In order to ensure that policymakers distinguished between their constituents' opinions and their states' opinions in survey responses, policymakers were first asked about their perceived level support for limiting GHG emissions from U.S. businesses among the residents in their districts. On average, receiving the state-level public opinion information increased perceived district support for the policy by 11% (Table 4, column 1).

State policymakers were then asked what percent of their states they believed was in favor of the government limiting GHG emissions produced by U.S. businesses. Among those in the control group, Republicans underestimated support for limiting GHG emissions by 38% and Democrats underestimated support by 24%. In the treatment group, Republicans and Democrats perceived the policy to be about 13% more popular in their state, but their estimates were still, on average, 24% and 13% less than the map indicated, respectively (Table 4, column 2). The confidence intervals provided in the public opinion map as part of the treatment ranged from +/-7 percentage

Table 1: Receiving opinion data about their state increases the amount of GHG emissions reductions policymakers are willing to support after adjusting for policymaker party ID

	Preferred % emissions reduction			
	Full sample	Full sample	Elected officials	Policy staff
Received opinion data	8.496	10.545**	9.957*	8.654
	(5.428)	(4.286)	(5.349)	(6.965)
Republican		−51.437***	−58.914***	−40.458***
		(5.013)	(5.839)	(8.835)
Independent		−27.324***		−24.829***
		(6.736)		(8.666)
Constant	60.083***	76.320***	77.861***	74.943***
	(3.954)	(3.739)	(4.262)	(6.894)
Observations	179	179	92	87
R^2	0.014	0.405	0.562	0.241
Adjusted R^2	0.008	0.391	0.547	0.204
Residual Std. Error	36.240 (df = 177)	28.394 (df = 174)	25.564 (df = 88)	31.085 (df = 82)
F Statistic	2.450 (df = 1; 177)	29.583*** (df = 4; 174)	37.587*** (df = 3; 88)	6.515*** (df = 4; 82)
Note:				*p<0.1; **p<0.05; ***p<0.01

Table 2: Republicans and Independents support a greater percent of GHG emissions reduction if they receive state-level public opinion data

	Preferred % emissions reduction	
	Republicans and Independents	Democrats
Received opinion data	17.302**	7.420
	(7.914)	(5.344)
Constant	28.548***	78.000***
	(5.940)	(3.918)
Observations	71	93
R^2	0.065	0.021
Adjusted R^2	0.051	0.010
Residual Std. Error	33.071 (df = 69)	25.693 (df = 91)
F Statistic	4.780** (df = 1; 69)	1.928 (df = 1; 91)
Note:		*p<0.1; **p<0.05; ***p<0.01

Table 3: Republicans and Independents are marginally more likely to vote for 100% emissions reduction bill if they receive statel-level public opinion data

	Likelihood of voting for 100% emissions reduction		
	Full sample	Republicans and Independents	Democrats
Received opinion data	0.351**	0.567**	0.090
	(0.168)	(0.251)	(0.229)
Republican	−2.334***		
	(0.191)		
Independent	−1.888***		
	(0.260)		
Constant	3.956***	1.633***	4.098***
	(0.145)	(0.190)	(0.168)
Observations	166	70	89
R^2	0.516	0.070	0.002
Adjusted R^2	0.504	0.056	−0.010
Residual Std. Error	1.072 (df = 161)	1.039 (df = 68)	1.077 (df = 87)
F Statistic	42.944*** (df = 4; 161)	5.102** (df = 1; 68)	0.154 (df = 1; 87)
Note:			*p<0.1; **p<0.05; ***p<0.01

Table 4: Receiving state-level public opinion information increases perceived popularity of limiting greenhouse gas emissions from US businesses in both states and legislative districts

	Dependent variable:	
	Perceived district opinion	Perceived state opinion
Received opinion data	11.518***	13.484***
	(3.178)	(2.975)
Republican	−24.780***	−13.683***
	(3.588)	(3.386)
Independent	−2.516	4.285
	(5.081)	(4.724)
Constant	61.967***	52.665***
	(2.752)	(2.603)
Observations	156	159
R^2	0.291	0.197
Adjusted R^2	0.277	0.181
Residual Std. Error	20.049 (df = 152)	19.243 (df = 155)
F Statistic	20.751*** (df = 3; 152)	12.641*** (df = 3; 155)
Note:		*p<0.1; **p<0.05; ***p<0.01

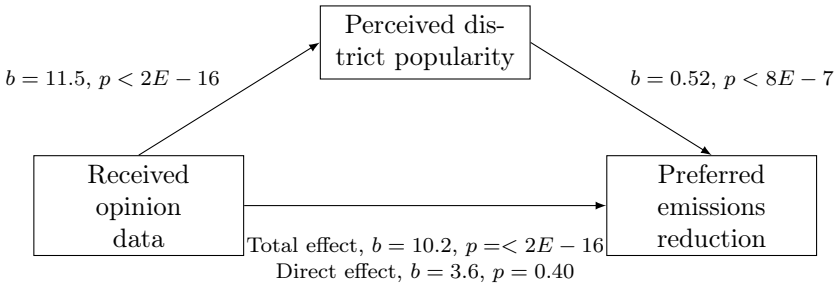


Figure 1: The effect of receiving public opinion information on preferred % of greenhouse gas emissions reductions is fully mediated by the change in perceived district popularity of a climate change policy after adjusting for political party ID.

points to +/-12 percentage points, so on average policymakers' opinions were not supported by the data.

The effect of receiving public opinion data on policymakers' preferred level of emissions reduction was fully mediated by the perceived popularity of climate change policy in their district after adjusting for political party ID (Figure 1). The total effect of receiving opinion data was approximately 10%, as indicated in the previous section. About half the treatment effect on preferred emissions reductions is mediated by a change in perceived popularity of climate change policy (6.6%). The direct treatment effect (4.2%) becomes non-significant with the inclusion of a mediator, perceived popularity of the policy.

The mediation by perceived district opinion of the treatment effect is somewhat sensitive to the correlation between the residuals of the mediator and the outcome variable (rho), however. The 95% confidence interval of the mediation effect becomes 0 when rho is equal to 0.4, indicating that even if the sequential ignorability assumption is violated, the effect might still be present (See Appendix A.5).[1]

5.3 Perceived accuracy of opinion data

Table 5: Among respondents in the treatment group, perceiving the public opinion data as more accurate did not change perceptions of state opinion on limiting greenhouse gas emissions or policy preference

	Dependent variable:	
	Abs(Perceived opinion-Opinion data)	Preferred percent of emissions reduction
Republican	8.050*	−42.080***
	(4.450)	(7.056)
Independent	−8.219	−33.337***
	(5.938)	(9.417)
Perceived accuracy	−2.362	0.737
	(2.063)	(3.271)
Constant	23.137***	83.061***
	(7.096)	(11.254)
Observations	90	90
R^2	0.089	0.324
Adjusted R^2	0.057	0.300
Residual Std. Error (df = 86)	18.629	29.335
F Statistic (df = 3; 86)	2.790**	13.731***
Note:		*p<0.1; **p<0.05; ***p<0.01

The public opinion data was shown to the control group after they were asked about their

[1] The medsens function in the mediation package in R was used to conduct a sensitivity analysis of the mediation.

perceptions of constituents' opinions and about their own policy preferences. Both the treatment and control groups were asked how accurate they thought the prediction of their state was in the opinion data provided. On average respondents thought the opinion data was "moderately accurate" (2.9 on a scale of 1 to 5), with Republicans reporting that the data was a little less accurate (2.6) than Democrats (3.1). In addition, there was no difference in perceived accuracy of the opinion data between the control and treatment groups ($t(157) = 1.23$, $p=0.22$).

The regression results in Table 5 show the relationship between perceived accuracy of the opinion data and the absolute difference between respondents' perceived state opinion and the state opinion data provided in the treatment (column 1). Column 2 shows the relationship between perceived accuracy of the opinion data and respondents' preferred percent of emissions reduction (column 2) among those in the treatment group. Only the treatment group is included, because only respondents in the treatment group could have been influenced by the opinion data when answering the questions about state opinion and their policy preferences. Even though those who rate the opinion data as more accurate would be expected to believe that state opinion on limiting GHG emissions is closer to the data provided, perceived accuracy of the data is not at all correlated with the absolute difference between perceived and provided state opinion. It is also not correlated with policy preference.

6 Methods Study 2

6.1 Data

A three-question experiment was embedded in a larger, 10-minute survey of state and local public officials by CivicPulse, a non-profit and non-partisan group, which collects data on and for local policymakers. The public officials were recruited via email and completed the survey in August and September 2018. Approximately 27,000 municipal, county, and state officials were invited to participate, and 820 completed the full survey. The order of each question block in the survey was randomized except for question blocks about their position in government and demographics, which were included at the beginning and end of the survey respectively.

Of the 820 public officials in the sample, 406 municipal officials, 173 county officials, 111 state legislators, and 130 staffers. Among the officials and legislators 690 were elected and 14 were hired or appointed. There were 372 self-identified Democrats or Democratic-leaners in the sample and 371 Republicans or Republican-leaners, in each case the latter was classified as either Democrat or Republican, respectively. There were 73 political independents in the sample.

To assess sample representativeness, information about the respondents' geographic units were compared with information about municipalities, counties, and states nationwide. Specifically,

Table 6: The CivicPulse sample of geographic units is slightly more urban and college-educated and substantially more populous than the average municipality, county, and state in the country

Municipal officials		
	CivicPulse Mean	Population Mean
% Urban	0.98	0.94
% College-educated	0.34	0.21
Population size	45,000	5,300
No.of Observations	587	19579
County officials		
	CivicPulse Mean	Population Mean
% Urban	0.53	0.43
% College-educated	0.24	0.20
Population size	87,000	66,000
No. of Observations	277	3,223
State legislators/staffers		
	CivicPulse Mean	Population Mean
% Urban	0.81	0.73
% College-educated	0.32	0.29
Population size	156,000	64,000
No. of Observations	414	801

CivicPulse collected data on the proportion of residents in each type of geographic unit nationwide who are at least 25 years of age and who have completed a 4-year or post-secondary degree from the 2015 American Community Survey; the proportion of residents in each geographic unit who reside in an urban area from the 2010 Census; and the total number of residents who live in each geographic unit from the 2015 American Community survey. Those population-level statistics were compared with the samples of each type of geographic unit represented in the survey. Table 6 describes the representativeness of the CivicPulse survey sample.

6.2 Experimental design

The survey experimental design included a passage in which the respondents were randomly assigned to either receive information about an EV parking space policy along with no additional information about their constituents (control condition); a public opinion poll showing 80% of their constituents supported the EV policy; or information about 8 letters from citizens' groups that supported the EV policy. The respondents then received three questions. First, an open-ended question asking about their perceived support for the EV policy among their constituents. Second, their preferred level of provision of EV parking spots. Third, an open-ended question about the factors they considered when deciding on which level of policy to support. Respondents were told that the proposed policy was being introduced to their "state", "county", or "local area" depending on the level of government in which they worked.

An EV policy was chosen, because it was a relatively low salience issue with bipartisan public

support (Union of Concerned Scientists). The policy described in this study is very similar to ones that passed in Atlanta, GA and other jurisdictions around the country (noa).

The stimulus and question wording was as follows:

Stimulus

Imagine a hypothetical scenario in which your [state/county/local area] is considering instituting an electric vehicle (EV) policy, which would mandate that 20% of the parking spaces in all new commercial and multi-family parking structures be EV-ready, such that there are charging stations for electric vehicles. **You receive a poll taken by researchers at Harvard University indicating that 80% of your constituents support the EV policy./You receive 8 letters from prominent local citizens' groups asking you to support the EV policy./[NONE]**

Questions

1. [Perceived popularity] In this scenario, what percent of your constituents would you think support the EV policy described above? [Text entry]

2. [Policy preference] Which of the following EV policies for all new commercial and multi-family parking structures would you support? 40%/30%/20%/10% of parking spots are required to be EV-ready/No parking spots are required to be EV-ready

3. [Decision-making process] Please explain what came to mind as you were thinking about which EV policy to support.

6.3 Analysis

The responses to question 1 were numeric values between 0 and 100. The responses to question 2 were coded as numeric values equivalent to the percent support indicated in the multiple choice question, e.g. "No parking spots are required to be EV-ready" was coded as 0 and 10% of parking spots are required to be EV-ready" was coded as 10, etc. The responses to question 3 were coded into 18 categories, with a single response possibly being coded into multiple categories. The categories were inductively generated after reading through the responses. See Appendix A.3 for a full description of the variables included in the analysis.

Two simple OLS regressions were used to assess whether the exposure to constituent polling information or information about letters from constituents affected the perceived popularity of the policy or policymakers' policy preference, and how those responses differed across respondents' position in government, party ID, and urbanicity of district. Responses to question 3 are analyzed descriptively.

The Mediation package in R was used to assess the pathway through which the effect of learning about the poll or about the letters caused a change in policy preference.

7 Study 2 Results

7.1 The direct effect of constituent signals on policymaker preference

The effects of the two forms of constituent signals, a poll and letters from constituents groups, on the percent of EV-ready parking spaces that policymakers prefer are shown in Table 7.

In the full sample and among elected officials, the poll increased the percent of EV-ready parking spaces that policymakers were willing to support by about 2-2.5% after adjusting for party ID and the urbanicity of the district that the policymaker represents, which would likely influence support for and practicality of installing EV-ready parking spaces, respectively. The poll had a slightly stronger effect ($t(597)=1.49$, $p=0.13$) on elected officials who were seeking reelection and had no effect on staffers. The letters from constituents groups did not have any influence on the percent of EV parking spaces that policymakers were willing to support in the full sample, among elected officials, or among staffers. However, both the poll and letters did increase the percent of policymakers who were willing to support some number of EV-ready parking spaces (i.e. did not answer "No parking spaces are required to be EV-ready") by 8% ($t(731)=2.06$, $p<0.05$) and 6.6% ($t(731)=1.71$,$p<0.1$), respectively.[2]

Although the EV-ready parking space policy was specifically chosen because of its bipartisan support, Table 7 clearly suggests that policymakers who identified as Democrats were more supportive of the EV policy than Republicans or unaffiliated policymakers. In addition, many policymakers represent rural areas in which EV cars and charging stations have had limited penetration, and as expected representatives of those areas are less supportive of the policy.

Even though the respondents were asked to consider a hypothetical situation, it is possible that policymakers for whom the poll result seemed more plausible were more likely to be responsive to the poll. Table 8 accounts for some of the differences in perceived poll plausibility at the state level. The poll plausibility indicator variable is equal to 1 if the difference between 80% (the number provided in the polling information treatment) and the percent of people in a given state that support a 20% renewable energy mandate in the state is less than or equal to the mean difference between 80% and the popularity of a renewable energy mandate across states, and 0 otherwise.[3] The indicator variable was constructed using the renewable energy mandate question, because it is the most similar conceptually to the EV-ready parking space mandate among the state level clean

[2] See Appendix A.4

[3] The data on renewable energy mandate support was collected from (Howe et al., 2015) at the following website: http://climatecommunication.yale.edu/visualizations-data/partisan-maps-2018/?est=supportRPSgroup=demtype=valuegeo=cd

Table 7: Receiving the hypothetical poll significantly increased the percent of EV parking spaces policymakers were willing to support. Receiving the hypothetical letters had no impact on EV parking space preference

	Dependent variable:			
	Preferred % of EV-ready parking spaces			
	Full sample	Elected officials	Elected officials	State staffers
Received poll	2.222***	2.634***	1.240	−0.238
	(0.841)	(0.909)	(1.284)	(2.223)
Received letters	0.072	−0.091	−0.172	0.051
	(0.850)	(0.914)	(0.916)	(2.399)
Republican or Other	−5.853***	−5.395***	−5.324***	−8.188***
	(0.554)	(0.594)	(0.596)	(1.733)
Urbancitiy	1.586***	1.427***	1.433***	2.001
	(0.393)	(0.409)	(0.410)	(1.396)
Seeking reelection			−0.541	
			(0.915)	
Received pollXSeeking reelection			2.360	
			(1.580)	
Constant	14.811***	14.319***	14.532***	17.784***
	(1.767)	(1.844)	(1.948)	(6.217)
Observations	736	605	604	120
R^2	0.185	0.171	0.174	0.226
Note:				*p<0.1; **p<0.05; ***p<0.01

technology policy questions for which state-level polling is available.

As expected, a positive attitude toward a clean technology mandate (poll plausibility = 1) is highly, positively correlated with greater preference for EV-ready parking spots. However, even after accounting for those differences in state attitude, the first model in Table 8 demonstrates that receiving the poll still increases policymakers' preferred percent of EV-ready parking spaces. There is also not an interaction effect between poll plausibility and receiving a poll, so the poll is no more effective (or only very slightly more effective, t(729)=1.43, p=0.16) at increasing EV-ready parking space preference when shown to public officials in states with a relatively positive attitude toward a clean technology mandate (Table 8, column 2). The third model in Table 8 tests whether the interaction is present among state-level officials, because the poll plausibility variable is most likely to be relevant at a state level. But the interaction effect is not present at the state level either.

Table 8: Even after adjusting for poll plausibility, receiving the hypothetical poll increased policymakers' preferred percent of EV parking spaces

	Dependent variable:		
	Preferred % of EV-ready parking spaces		
	Full sample	Full sample-moderation	State officials
Received poll	1.870**	0.812	−0.145
	(0.843)	(1.133)	(2.028)
Received letter	−0.019	−0.013	−0.994
	(0.853)	(0.852)	(1.629)
Poll plausibility	3.270***	2.587***	4.882***
	(0.727)	(0.875)	(1.692)
Republican or Other	−5.626***	−5.621***	−6.826***
	(0.569)	(0.569)	(1.286)
Urbanicity	1.145***	1.138***	2.191***
	(0.407)	(0.406)	(0.777)
Received poll:Poll plausibility		2.048	2.382
		(1.467)	(2.652)
Constant	14.418***	14.752***	12.179***
	(1.793)	(1.808)	(3.919)
Observations	699	699	195
R^2	0.212	0.214	0.384
Note:			*p<0.1; **p<0.05; ***p<0.01

7.2 Perceived popularity of EV policy and policymaker preference

In general, the intention of both forms of constituent signals studied here would be to influence a policymakers perceived popularity of a policy. In this study receiving a poll from Harvard University indicating that the EV policy is supported by 80% of constituents increases perceived popularity of the EV policy by 18.6% from an average (among Democrats) of 22.4%. The treatment effects were similar among elected officials and staffers, with staffers having a much higher baseline level of perceived policy popularity (39.5%). The letters, however, were not effective at changing policymakers' perceptions on constituent support for the EV policy. Non-democrats perceived support for the EV policy to be 8% lower than Democrats, on average. And representatives of more urban areas perceived policy support to be significantly higher than those from more rural areas (Table 9).

Table 9: Policymakers in the poll condition perceived a significantly greater level of support for an EV-ready parking spot mandate among their constituents

	Dependent variable:		
	Perceived popularity of EV policy		
	Full sample	Elected officials	State saffers
Received poll	18.568***	18.356***	20.681***
	(2.094)	(2.307)	(4.966)
Received letter	1.461	1.044	−0.193
	(2.118)	(2.324)	(5.423)
Republican or Other	−8.389***	−8.580***	−5.747
	(1.403)	(1.530)	(3.878)
Urbanicity	4.527***	5.115***	−1.080
	(0.982)	(1.042)	(3.123)
Constant	22.376***	20.503***	39.459***
	(4.444)	(4.721)	(13.894)
Observations	701	576	115
R^2	0.207	0.214	0.192
Note:			*p<0.1; **p<0.05; ***p<0.01

Specifically, receiving the poll caused policymakers to support the policy through its influence on the policymakers' perception of constituent support for the policy. This relationship is strong and significant, and the direct effect of receiving the poll on EV policy support disappears after accounting for the mediation (Figure 2). The mediation effect is somewhat sensitive to the correlation between the residuals of the mediator and the outcome variable (rho). The mediation effect becomes 0 when rho is equal to 0.4, indicating that even if the sequential ignorability assumption is violated, the effect might still be present (See Appendix A.5).

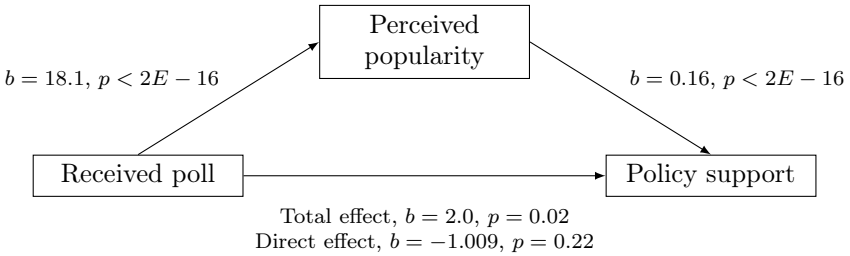


Figure 2: The effect of receiving the poll on preferred % of EV parking spaces is fully mediated by the change in perceived popularity of the policy

7.3 Other factors influencing policymaker preference

Table 10: Factors policymakers consider while making a decision about an EV policy

Code	Description	Count
PCVD_DEMAND_LOW	Perceived low current/future demand for EV	142
NO_REG_MKT	Do not believe in regulating market	130
MOREINFO	Want more information/data	99
SYS_COST	Cost burden of EV charging stations to business or government	81
PPL_PREF	Following constituents/consumers preferences	64
NOTSUITED	Not suitable for their area (e.g. mountainous)	66
PREP_FUTENV	Prepare for future and environment	57
CAR_PRICE	EV is too expensive for consumers	55
PARK_BURDEN	Limited parking space for non-EV	37
PCVD_DEMAND_HIGH	Perceived high current/future demand	35
TECH_ISSUES	Technical concerns with EV cars or policy	35
OTHER	Uncategorized responses	35
REF_POLL	Reference poll	32
GRADUAL	Gradual increase in requirement	32
PPL_PUSH	Trying to change constituent preference	31
PPL_NOTPREF	Explain deviation from/lack of trust in constituent preferences	28
EVPOL_OTHER	Would support/have other types of EV incentives	20
REF_LETTER	Reference letter	17
NOT_IMP	Not important/priority	14
CHARGE_SKEPTIC	Need for charging station skepticism	13
LIKE_EV	Like the idea of more EVs	11
NA	No substantial response	140

The policymakers' explanations for their policy decisions were more complex than the mediation analysis could capture, however. Responses to survey question 3 were inductively coded into 22 categories, which are described in Table 10. Six hundred and eighty of the respondents provided some substantive answer regarding the factors they considered while making a decision about the EV policy, and a single response could be coded into multiple categories.

The most common response was that the policymakers did not believe that there were enough EVs on the road to justify the construction of additional EV-ready parking spaces above and beyond the level they chose. Interestingly, the majority of these responses referred to the current level of EV demand, whereas the policy itself refers to future parking structures. Second most common,

was an expression of distaste for regulating the market. These respondents viewed characteristics of commercial vehicle structures as a choice to be made by those who own and operate the land, which should not be restricted by what many called an "unfunded mandate." A large number of respondents were concerned about the high costs of the mandate on businesses or the government. Similarly, 57 respondents described planning for the future or for environmental damage as a reason to support the policy. All of these perspectives, some of which might be both relevant and empirically provable, are nevertheless based on the policymakers' personal opinions.

Alternatively, only 64 policymakers indicated that they would refer to their constituents' preferences when deciding on the policy. In fact, several respondents explicitly described why they would deviate from their constituents' preference or urge them to change their preferences. Only 99 policymakers asked for more information about the details of the policy or about the expected future demand for EVs.

Overall, these results provide an explanation for the relatively small effect that the poll had and the null effect that the letters had on policy preference. To a great extent, these officials act as trustees even when they receive "clear" signals from constituents about their preferences. For instance, one respondent explains, "My answer above could be a higher readiness model IF I knew if the spots were restricted to EV use or open for others to park in if there was no demand. I don't believe that when you do a survey of what people support that they are truthful if the impact happens to them....so I just cut the support number in half. I don't love mandates." *(NO-REG-MKT, MORE-INFO, PPL-NOTPREF, REF-POLL, Policy preference = 10%)*. Similar to this respondent, many described a lack of certainty about how to interpret the seemingly clear constituent signals. Another explains, "I want to support the environment. I just would not make a decision based on eight letters. I would need more research into the needs of the community and prevalence of cars that would use the system." *(MORE-INFO, PREP_FUTENV, PPL_NOTPREF, REF_LETTER, Policy preference = No parking spaces)*.

In fact, these two respondents were actually in a very small minority of those in the treatment groups that even referred to the poll or letters when describing their policy choice. Only 9% of treatment groups respondents explicitly referred to constituents' preferences or signals in question 3, compared to 6.2% in the control group.

While Table 10 provides some insight into the respondents' decision-making process in aggregate, the individual responses are not highly reliable. Nisbett and Wilson (1977) found people are often unable to explain their opinions and decisions, because they are unaware of the relevant stimuli and the influence of stimuli on their decisions.

8 Discussion

Prior studies at the state and federal levels have drawn mixed conclusions about the influence of constituent signals on policymakers' policy preferences or votes. Similar to prior experiments, provision of constituent information does have an effect on legislator policy preference (Bergan, 2009; Bergan and Cole, 2015; Butler and Nickerson, 2011; Cluverius, 2017) and perceived constituent opinion. However, the interviews and small effect sizes, especially with respect to perceived public opinion, suggest a relative lack of trust in signals from constituents, such as polls and letters, which therefore leads to a lack of knowledge about constituents' preferences (Broockman and Skovron, 2017; Hertel-Fernandez et al., 2019; Skovron, 2018).

8.1 Policymakers' responsiveness to constituent signals

The main experimental results in this research seem to contradict the null findings by Kalla and Porter (2018), because seeing public opinion data consistently led to a change (in this case an increase) in policymakers' perceptions about their constituents' opinions in the direction of the public opinion data provided. Also, seeing public opinion data consistently changed (in this case increased) policymakers' own policy preference for GHG emissions reductions and EV parking spaces.

There are several potential explanations for the discrepancy between this finding and (Kalla and Porter, 2018). First, Kalla and Porter (2018) collected data on legislators' perceptions of constituent opinion and their own policy preferences two weeks after the last District Pulse email (containing public opinion data) was sent to them. Thus, Kalla and Porter (2018) was measuring both legislators' willingness to update their beliefs and attitudes as well as their ability to maintain the updated beliefs and attitudes for at least two weeks. This research only tests the former.

Second, the mode of survey administration in this study was meaningfully different than the study by Kalla and Porter (2018), which invited legislators to participate via email and phone calls. While soliciting additional survey responses from state legislators for the present research, many of the legislators explained that they receive numerous requests to participate in surveys and emails aimed at influencing their policy preferences. Therefore, legislators might be more skeptical and less responsive to public opinion information delivered by an unknown group via email. In study 1 participants were recruited in-person at the National Conference of State Legislators, and the participants took the survey in the researchers' presence. Study 2 surveyed local policymakers, who receive fewer survey requests and lobbying emails, and furthermore the majority of those policymakers had agreed to participate in an email panel.

A third explanation for the discrepancy between study 1 and the research by Kalla and Porter

(2018) is that study 1 only provided state-level opinion data to policymakers, whereas Kalla and Porter (2018) provided state legislative district-level data. Congressional staffers interviewed prior to this study explained that they are skeptical of polling data on their Congressional district, because they are aware of how resource intensive accurate polls are and would assume anyone who is willing to invest such a large amount of resources on their Congressional district has an agenda to influence the Member of Congress. Whereas provision of state-level data might not elicit the same level of skepticism, and as study 1 finds, state-level data can influence policymakers' perceptions of their own districts. Thus, one direction for future research would be to compare the influence of state-level and district-level data on policymakers' perceptions of their constituents and policy preferences.

Lastly, there were many differences between the way the public opinion data was displayed in study 1 and in Kalla and Porter (2018), which could have affected policymakers' level of belief in the data. In study 1, the public opinion information included: data on all 50 states; the exact survey question and answer wording; an explanation that state opinions were predicted using the national survey data and validated using state surveys; and confidence intervals associated with each state prediction. Kalla and Porter (2018) only explained that the district opinion was generated using the Cooperative Congressional Election Study, which they describe as a 65,000 person survey funded by the National Science Foundation. They also provided some information about the survey question but not the exact question and answer wording. Research suggests that expressing uncertainty about findings increase scientists' persuasiveness (Howe et al., 2019), suggesting that inclusion of confidence intervals could have made the data more convincing. Another direction for future research would be to compare the persuasiveness of survey results, especially to sophisticated survey consumers like policymakers, with and without details on question and answer wording and, in the case of MRP, statistical modeling.

The results from the present experiment are also different from those found by Butler and Nickerson (2011), in which they presented one New Mexico state legislator in each experimental matched pair with relevant district-level public opinion data during a special session of the state legislature. Each legislator was mailed a letter explaining that a large random sample of New Mexicans were polled about their opinions regarding a tax rebate and that the results were disaggregated to a district level. The legislators were informed that the polling results were reported in a popular state newspaper. The letter also provided the question wording for the questions and standard error for the results. Legislators who received the polling results were significantly more likely to vote against the tax rebate, because legislators' prior expectation was that the tax rebate would be popular. This result is unlike the present study, because receiving public opinion data in study 1 had a very small effect on legislators' stated likelihood of voting in favor of the

100% emissions reduction bill. Instead, the treatment led to a marginal change in the percent of emissions reductions legislators were willing to support. One explanation for this discrepancy could simply be the choice set that the legislators face - binary in the case of the field experiment compared to a larger, more incremental choice set in the present study. In addition, the study by Butler and Nickerson (2011) was unique, because the discrepancy between the legislators' votes and their constituents' opinions were made public, and therefore legislators could be punished for not representing their constituents.

One final explanation for the differences seen across research findings is the popularity of the policy itself. The policies presented in study 1 and study 2 both had more than 70% support. Similarly, Butler and Nickerson (2011) found that district public opinion data was most influential in the districts in which public opinion in favor of the tax rebate was the lowest. These two results suggest that if constituents send an unexpectedly strong signal, legislators are likely to be, at least somewhat, responsive. Kalla and Porter (2018) included three issues with strong signals as part of their treatment: background checks, abortion bans, and highway funding. If the treatment effects were evaluated by issue, perhaps these treatments would be found to be more influential. It may also be the case, however, that policymakers' beliefs and preferences about background checks and abortion bans, in particular, are so strong that they cannot even be influenced by a strong signal of popularity (or lack thereof).

In study 2, information about letters from constituents groups had no effect on policymakers' perceptions about their constituents' preferences or on their own preferences about an electric vehicle policy. This result is somewhat surprising, because prior field and experimental research has indicated that constituent contact can influence policymakers' policy preferences (Cluverius, 2017; Bergan, 2009; Bergan and Cole, 2015). Bergan (2009) found that legislators who received, on average 3, emails from constituents in support of an anti-smoking bill were more likely to vote for the bill. Bergan and Cole (2015) similarly found that receiving at least one phone call from constituents in favor of an anti-bullying bill were 11-12% more likely to support the bill. Cluverius (2017) found that state legislators were responsive to a low volume of letters on a low-salience issue, like an electric vehicle parking policy, in the context of a survey experiment as well. One significant difference between study 2 and the three experiments above is that the policymakers did not actually read the letters, they were only told the number of letters they received. Any emotional appeals or compelling anecdotes that might be communicated through direct contact are lost when the constituent signal is communicated as a number. In many legislative offices, constituent signals are communicated in terms of the number of contacts received. It should be noted, however, that descriptive letters are also not a panacea, because policymakers have been found to discount the opinions of constituents who disagree with their own point of view (Butler

and Dynes, 2016).

8.2 Misperceiving constituent opinion

While there are many differences between the present research and prior studies, the present research reaffirms the finding that policymakers have a conservative bias in assessing their constituents' attitudes (Broockman and Skovron, 2017; Hertel-Fernandez et al., 2019; Kalla and Porter, 2018). Policymakers in the control group on average underestimated support for limiting GHG emissions by 28.6%. Furthermore, policymakers in the treatment group on average underestimated support for limiting GHG emissions by 14.7%. Thus, even after seeing evidence, policymakers demonstrated a large bias in the conservative direction (in the context of US politics).

Hertel-Fernandez et al. (2019) found a similar conservative bias among Congressional legislative staffers, which they explained was driven partially by egocentric bias and contact with business-based interest groups. The open-ended responses in study 2 also suggest egocentric bias and concerns about burdensome regulation led to policymakers dismissing or, at least, devaluing constituent signals (Kuru et al., 2017). Many of the factors policymakers considered when making a decision about the EV policy could be categorized as their personal ideology, which is demonstrably shaped by business interests, such as a belief that all market regulation is bad or that an EV mandate would be too costly for businesses. Low perceived demand for EVs - the most common answer provided by policymakers - is also a personal belief, which shaped their policy preferences and trust in constituent signals. A comparatively fewer number of policymakers mentioned a scientific estimate of EV demand when making their decision. Thus, even if EV demand is meant to be a proxy for representing constituents' preferences, the majority of policymakers are not relying on a scientific estimate of EV demand but instead their own beliefs about whether their constituents would drive EVs.

The combined findings from study 1 and study 2 are largely in line with prior research, with respect to both identifying and explaining a conservative bias in policymakers' preferences. Although it was not explicitly tested in this research, study 2 suggests that a similar conservative gap that has been found at the federal and state level would also be found at the local level (Broockman and Skovron, 2017; Hertel-Fernandez et al., 2019; Kalla and Porter, 2018).

8.3 Limitations

There are several limitations of these studies, which rely on survey experiments focused on two similar issues. First, social desirability bias could be a concern. Policymakers might have been more responsive to public opinion data or to the letters than they would have been if faced with real signals from constituents. Second, the beliefs and preferences expressed by policymakers in the

survey are unaffected by the other political pressure that would be present when policymakers are taking a real vote. Third, the survey measures policymakers' beliefs and preferences directly after providing public opinion information. Realistically, policymakers might only vote on a measure in the following weeks or even months after receiving the public opinion information. Fourth, the respondents in both of these surveys agreed to participate and complete the survey, so this is not a representative sample of local or state policymakers. Fifth, the treatment effects seen in these experiments might be more relevant to environmental policies than other, less popular or bipartisan policies. All of these limitations suggest that this study provides an upper bound on the effect of constituent signals on policymakers' beliefs and attitudes.

8.4 Directions for future research

This research suggests that the democratic deficit is partially attributable to policymakers' systematic misperceptions of constituent preferences. Only one other experiment has aimed to correct that bias by providing public opinion data to policymakers (Kalla and Porter, 2018), and it identified a null effect on policymaker preferences. Investigating the disparate results found in these two papers will likely shed light on important aspects of the process of democratic representation at each level of government.

Specifically, public opinion data might be most influential 1) when policymakers face less pressure from their political parties or interest groups; 2) if they are provided by a trusted source; and 3) if they indicate that the policy under consideration is not only popular among their constituents but salient. It would be valuable to test these hypotheses in future research.

Field experimental tests of these hypotheses would evade some of the limitations of this study and that of (Kalla and Porter, 2018) by providing a more realistic understanding of the value of a poll. However, in a field experiment a single poll is unlikely to change a policymakers' minds on a politically salient (often polarized) topic. Instead, researchers might find the most meaningful effects by replicating a real-world constituent lobbying effort, which would likely combine the provision of polling data along with contact from constituents and other forms of democratic participation.

9 Conclusion

This research contributes to the small but growing number of experiments aimed at understanding how, if at all, policymakers are influenced by signals from their constituents. As has been identified in prior research, study 1 again establishes that policymakers vastly underestimate how liberal their constituents' views are, in this case with respect to a climate change policy. The present

research suggests that when presented with constituents' opinions in the form of a representative survey, policymakers are willing to update their perceptions of constituents to be closer to the levels indicated by the public opinion data. Furthermore, state legislators update their perceptions about their districts even if they are only provided public opinion data at a state level. Unlike public opinion polls, receiving information about letters from constituents groups do not change policymakers' perceptions of their constituents.

Once the signals change policymakers' perceptions about their constituents, policymakers are willing to update their own preferences a small, significant amount as well. In study 1 seeing public opinion data increased, particularly Republican and Independent, policymakers' preferred percent of GHG emissions reductions by 10%. In study 2 seeing public opinion information increased policymakers' preferred percent of EV-ready parking spots by 2%. However, when describing the factors that influenced their policy choices, policymakers largely refer to their own beliefs and ideology, not constituents' attitudes.

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Learn to Represent: Policymaker Responsiveness to Signals from Constituents on Environmental Policies

A Study 1: Geographic distribution of policymakers

State	Frequency
Alabama	4
Alaska	1
Arkansas	5
California	7
Colorado	9
Connecticut	2
District of Columbia	2
Florida	2
Georgia	7
Hawaii	6
Idaho	3
Illinois	1
Indiana	5
Iowa	3
Kansas	1
Kentucky	8
Maine	1
Maryland	2
Massachusetts	2
Michigan	3
Minnesota	2
Mississippi	2
Missouri	3
Montana	2
Nebraska	5
Nevada	4
New Hampshire	4
New Mexico	1

New York	0
North Carolina	0
North Dakota	1
Ohio	6
Oklahoma	5
Oregon	2
Pennsylvania	3
Puerto Rico	3
South Dakota	2
Tennessee	31
Texas	7
Utah	6
Vermont	1
Virginia	2
Washington	6
Wisconsin	10
Wyoming	2
Territories or District of Columbia	4

B Study 1: Summary of variables

Table 2: Summary of variables in study 1

Variable	No. of Observations	Mean	St. Dev	Min.	Max.
Treatment	179	0.531	0.500	0	1
Perceived state policy support	179	56.829	21.163	0	100
Actual state policy support	179	77.541	1.854	72.791	81.995
Perceived-Actual state policy support	179	−20.717	20.598	−76.974	24.709
Perceived district policy support	179	60.786	23.471	0	100
Likelihood of voting for bill	179	3.163	1.523	1	5
Perceived % of emissions reduction	179	64.592	36.388	0	100
Perceived accuracy of opinion data	179	2.867	1.045	1	5
Democrat	179	0.520	0.501	0	1
Republican	179	0.274	0.447	0	1
Independent	179	0.123	0.329	0	1
No Political ID	179	0.084	0.278	0	1

C Study 2: Summary of variables

Table 3: Summary of variables in study 2

Variable	No. of observations	Mean	St. Dev	Min	Max
Preferred % of EV parking spaces	699	11.260	10.260	0	40
Control condition	699	0.340	0.480	0	1
Letter condition	699	0.320	0.470	0	1
Poll condition	699	0.340	0.470	0	1
Political ID (Dem=1, Rep=2, Other=3)	699	1.620	0.630	1	3
Seeking reelection	699	0.550	0.500	0	1
Urbanicity of district	699	3.240	0.900	1	4
Perceived poll accuracy	699	0.500	0.500	0	1

D Study 2: Additional tables

Table 4: The poll and letters increase the percent of public officials willing to support an EV-ready parking space policy

	Dependent variable:
	Support for EV-ready parking spaces (binary)
Received poll	0.079^{**}
	(0.038)
Received letter	0.066^{*}
	(0.039)
Republican or Other	-0.207^{***}
	(0.025)
Urbanicity	0.085^{***}
	(0.018)
Constant	0.715^{***}
	(0.081)
Observations	736
R^2	0.140
Note:	*p<0.1; **p<0.05; ***p<0.01

E Mediation sensitivity analyses