Public Good Perceptions and Polarization: Evidence from Higher Education Appropriations

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Abstract

We conduct three field experiments to understand the causes and consequences of polarized demand for government expenditure, using US state spending on public higher education as a concrete example. The first two experiments study polarization in taxpayer demand. We provide different types of information to shape beliefs about the social return on investment. Our treatments decrease the political partisan gap in ideal policies by up to 32%, with differences in partisan reasoning from information as a key mediator. Information also affects how taxpayers communicate their ideal policies to elected officials, increasing their propensity to write a (positive) letter to an official of the other party—a reduction in affective polarization. In the third experiment, we send the taxpayers' letters to a randomized subset of elected officials to study how polarization affects the supply of policies. Officials who receive their constituents' demands engage more with higher education issues in our correspondences.

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1. Introduction

Taxpayers define and express their ideal level of public spending trading-off the value of these services and the cost to finance them. Across policy areas, political partisans often come to starkly different conclusions regarding this trade-off, leading to ideological polarization in ideal policies. On one hand, polarization could be the natural result of taxpayers with different preferences sorting into opposing parties. On the other hand, polarization might reflect cross-party differences in policy perceptions and reasoning. These perceptions, in addition to preferences and identity, may distort taxpayers' demand for public services as well as their opinions of the partisan elected officials who set policy, creating affective polarization—the dislike and distrust of those from the other party.

In this paper, we study the causes and consequences of polarized demand for public expenditure. We consider both the demand and supply of public investment in higher education, the third largest budget area of US state spending after Medicaid and K-12 education (Laderman and Heckert, 2021). To study demand, we first ask: do perceptions of state public higher education vary by political partisanship, and to what extent do those perceptions drive ideological and affective polarization? We focus on taxpayer perceptions of state productivity and the social return on investment. To study supply, we additionally ask: does constituent demand for higher education services affect the behavior of policymakers? If so, then polarized demand can undermine the provision of public services.

We conduct three field experiments to understand how perceptions of public higher education determine ideological and affective polarization, as well as policy. The first two framed field experiments focus on demand and the third considers the supply of higher education services. To study demand, we elicit taxpayers' perceptions of public higher education and provide randomized information about the public college graduation rate and appropriations per student in their own state and the rank relative to other states.[1] The experiments allow

[1]Since public colleges receive tax revenue from state governments to produce college graduates, state appropriations (tax revenue) per student and graduation rates are not only an important benchmark for accountability, but a measure productivity—more graduates or fewer dollars spent imply higher productivity.

us to document significant ideological and affective polarization by political partisanship and age and to estimate the causal effect of information on the demand for public expenditure and on political engagement. Given a price-theoretic motivation for the role of cross-party differences in reasoning (as in Stantcheva, 2021), we directly measure these differences in our second experiment. Finally, we conduct a natural field experiment with elected officials to measure how taxpayer demand affects the supply of higher education services.

We first document both ideological and affective polarization regarding the provision of public higher education services, absent any informational intervention. Based on their initial uncorrected perceptions, Republicans demand less spending and are less likely to donate to a public college than Democrats and Independents. Since Republicans are more likely to overestimate the amount their state already spends on public higher education, and therefore underestimate its productivity, this suggests polarization may be driven by perceptions that the return on investment is lower.[2] We also find evidence of affective polarization based on how partisan taxpayers communicate their ideal policies to elected officials. When given the opportunity to write a letter to elected officials in their state, partisan taxpayers—especially self-identified strong partisans—are more likely to communicate only with officials from their own party, and tend to express more positive sentiment when writing to own-party officials.

Although policy preferences are polarized at baseline, we find that receiving information about the graduation rate and its rank relative to other states decreases ideological polarization. In our first experiment, taxpayers that receive this information demand 5 percent higher spending levels on public higher education compared to those who receive no information. The effects are relatively large for Republicans, and information reduces the partisan gap in ideal spending by 32 percent. Republicans who learn that the graduation rate is higher than they initially perceived increase their demand by 28 percent, while those who learn the graduation rate is lower only minimally respond. Democrats and Independents

This also implies that. Moreover decreasing "dropout" (raising graduation rates) is important to taxpayers across the political spectrum (Doyle, 2007).

[2]We document similar gaps between the elderly and non-elderly.

also minimally respond to information.

We interpret our results through a price-theoretic model that motivates our second experiment on demand. In our model, taxpayers trade-off the perceived value of more public services—the marginal benefit of spending—with the perceived cost of financing them—the marginal cost. If information shapes taxpayers' perceptions by moving them along the marginal curves, then it will not affect their ideal policies. Information, in this case, affects their perceptions of what services are provided but not the point where marginal benefit equals marginal cost. Instead, if information shapes their perceptions by shifting the marginal curves, it will alter their demand for expenditure. The total effect of information on polarization results from differences in both initial perceptions and differences in how partisans reason about the information. To measure partisan reasoning about productivity, our second experiment elicits spending posteriors after taxpayers receive graduation information.

We find that rather than being driven by systematic differences in perceptions, the reduction in polarization from information happens because taxpayers from different parties reason differently about the same information. Republicans who learn that the graduation rate and/or rank in their state is higher do not update their beliefs about state spending. This implies that they now perceive that the state is relatively more productive, i.e., that the state produces more graduates per dollar of tax revenue spent– a shift of the marginal curves. However, Democrats and Independents with the same baseline perceptions tend to update that the graduation rate and rank were high because spending is (relatively) high; a movement along the marginal curves. Republicans, Democrats and Independents who learn that the graduation rate and/or rank is low update that spending must be lower as well. Since Republicans, and Democrats and Independents have similar graduation rate priors, these differences in partisan reasoning help explain why our treatments reduce polarization.

To further test the role of partisan reasoning, our second experiment provides some taxpayers with additional information about state spending per student. Providing spending information to Republicans who initially believe the graduation rate is low, in addition to

graduation information, stops them from overcorrecting about state productivity—they now believe the marginal curves shift by less. Since they no longer update as positively about productivity, they demand relatively less spending than when only their graduation beliefs are corrected. Moreover, demand remains constant for other taxpayers when given additional spending information. This is consistent with our interpretation that other participants treat graduation information as a movement along the marginal curves— the additional spending information provides no new signal of productivity in this case. The pattern of treatment effects from the second experiment on spending helps validate the finding that different types of taxpayers reason differently about higher education policy.

Perceptions are also important drivers of affective polarization. Our graduation information treatments lead partisan taxpayers to be 23 percent more likely to write any letter to an elected state official across party lines, and about 26 percent more likely to write one that is positive in sentiment. This corresponds to a decrease in affective polarization where partisans become more likely to interact and have more positive interactions with members of the other party. Consistent with our ideal spending results, our treatments have the largest effect on Republicans. The treatments also have relatively large effects on self-identified strong partisans. Information, therefore, reduces the negative effects of echo chambers as well (e.g. Levy and Razin, 2019). Additionally, taxpayers in our second experiment who learn that spending is lower than they initially perceived are more likely to have positive interactions with members of the other party. Overall, these results provide further evidence that perceptions and reasoning about tax and expenditure policy are key drivers of polarization, and provide evidence for a link between ideological and affective polarization (e.g. Rogowski and Sutherland, 2016; Webster and Abramowitz, 2017; Bougher, 2017; Lelkes, 2018).

To better understand the policy consequences of polarization, we conduct a natural field experiment with elected officials to test whether they respond to constituent demand for public investment in higher education. We randomize the timing of when each of the 238 governors and state legislators receive their constituent letters elicited in the first two exper-

iments. Elected officials who learn about constituent demand are more likely to click on a proposed resolution to maintain state funding for public colleges, our proxy for engagement on higher education issues, compared to elected officials who receive a similar email that does not contain information about constituent demand. Our emails with information about constituent demand also generate more email responses.

Our paper's main contribution is highlighting the causes of polarization—especially in the provision of public services. An established literature has examined the relationship between corrective information and support for public spending (see review in Haaland et al., 2023),[3] but newer work reflects an emerging recognition that ideological polarization arises from a combination of heterogeneous perceptions of economic facts, views of government, and social preferences (Alesina et al., 2020; Stantcheva, 2021). By providing information about both the provision of public goods (outputs) and state spending (inputs) our design allows us to document how perceptions of the return on investment shape polarization. Critically, while we find evidence of overall differences in partisan reasoning (as in Gaines et al., 2007; Nyhan and Reifler, 2010; Stantcheva, 2021; Alesina et al., 2021), in our setting, polarization comes from both partisan reasoning differences among taxpayers with the same prior perceptions of economic facts and within-party reasoning differences among taxpayers with different priors.[4] Moreover, although it has long been understood that aging populations may support public goods like education less because they benefit less from the services (Poterba, 1998; Alesina et al., 1999; Giaccobasso et al., 2022), our results show that their perceptions drive the intergenerational gap in support for higher education.

Second, we contribute a new revealed-preference measure of affective polarization that also allows researchers to consider its policy consequences. Researchers studying affective

[3]Many of these survey experiments study support for education spending in particular (Howell and West, 2009; Lergetporer et al., 2018, 2020; Lergetporer and Woessmann, 2021) as well as more general public spending (Cruces et al., 2013; Kuziemko et al., 2015; Peyton, 2020; Roth et al., 2021). Survey experiments have also been useful for understanding policy attitudes in general, like immigration (Alesina et al., 2023), affirmative action (Haaland and Roth, 2021), the gender pay gap (Settele, 2022), and racial gaps (Alesina et al., 2021), among others.

[4]This asymmetry highlights an interesting contrast with compelling evidence that individuals are motivated to reason in ways that reinforce their own incorrect priors (Thaler, 2023).

polarization have found that affective polarization has increased over time (Iyengar et al., 2012, 2019; Boxell et al., 2022), that it may be caused by greater ideological and cultural distance (Webster and Abramowitz, 2017; Desmet and Wacziarg, 2021; Bertrand and Kamenica, Bertrand and Kamenica, forthcoming), and that it increases political uncertainty (Baker et al., 2020)—generally measuring affect using self-reports[5] or nonpolitical actions.[6] We, instead, elicit open-ended responses from taxpayers about their first-order concerns (as in Ferrario and Stantcheva, 2022) and allow them to choose which elected officials receive the response. From this, we generate two measures of affective polarization based on political behavior: whether taxpayers choose to reach across the political aisle and the sentiment of the letters (treating the "text as data" Gentzkow et al., 2019). These measures allow us to understand how perceptions underlie affective polarization and, additionally, serve as key inputs to our experiment with elected officials to quantify how policymakers respond to (possibly polarized) constituent demand.[7]

Finally, we provide evidence that taxpayer support for public expenditures in higher education is sensitive to their perceptions of the return on investment. This higher-education context is particularly relevant given the trends of divestment in state appropriations to higher education (Laderman and Heckert, 2021) and growing polarization in higher education more broadly (Ehrenberg, 2008; Mettler, 2014; Taylor et al., 2020; Imlay, 2021). This erosion of political support for higher education has occurred despite economic research that quantifies large social returns on investment from higher education (Moretti, 2004a; Zimmerman, 2014; Deming and Walters, 2017; Hendren and Sprung-Keyser, 2020). Our finding that perceptions of these returns affect both support and polarization validate the conjecture that pessimism about return on investment may has contributed to state divestment in public higher education (Bound et al., 2019).[8]

[5]Like feelings thermometers or Likert scales of Like/Dislike.

[6]Like giving behavior in a dictator game (e.g. Iyengar and Westwood, 2015; Iyengar et al., 2019).

[7]Additionally, we build on similar experiments with elected officials and policymakers to study how they respond to information and evidence (e.g. Butler et al., 2011; Zelizer, 2018; Vivalt and Coville, 2023; Hjort et al., 2021; Kertzer and Renshon, 2022; Toma and Bell, 2023)

[8]Bound et al. (2019) suggest that decreases in the local return to spending (due to out-migration of

2. Perceptions, Preferences, and Polarization

This section presents a price-theoretic model describing taxpayers demand for public expenditure. In the model, taxpayers' ideal spending policies are shaped by perceptions (beliefs about their state's productivity) in addition to preferences (how much they value more public goods compared to lower taxes). Since information affects demand when it changes perceptions about the state's productivity, polarization can come from differences in baseline perceptions, in underlying preferences, or in partisan reasoning about information.

As we discuss polarization in the demand for public expenditure, we focus on state public investment in higher education. States collect tax revenue to produce college-educated human capital for the state. As of 2021, 46 states have codified explicit attainment goals to increase the number of workers with college credentials. For example, Florida's goal is to "increase the percentage of working-age Floridians with a high-value postsecondary certificate, degree, or training experience to 60% by 2030" (Lumina Foundation, 2021). States invest in higher education because it promotes growth, raises wages, and provides other social benefits (e.g. Moretti (2004a,c)); and because of inter-jurisdictional or "yardstick" competition (Agrawal et al., 2022).

To study the role of perceptions and information, we consider the relationship between the six-year graduation rate at public four-year colleges, or the "output," and tax expenditures, or the "input." We focus on this relationship for four main reasons. The first three are conceptual. First, the graduation rate reflects the level of provision, i.e., total number of graduates, in a way that is relatively straightforward for taxpayers to interpret. Second, state spending produces graduates by causally increasing enrollment and graduation rates (Bound et al., 2010; Deming and Walters, 2017). Third, for a given level of spending, the graduation rate reflects the average social return on investment: the number of graduates produced per dollar of tax revenue spent. A higher rate indicates that more graduates are produced from

graduates) may have decreased the political will to support higher education, and is consistent with the issues raised in the letters taxpayers write to their elected officials as part of our experiment.

a given level of spending and that the state is more productive and less wasteful.

Fourth, we focus on graduation rates because it is a first-order policy consideration for taxpayers. Taxpayers care about improving the graduation rate, and believe that state funding should be tied to it. Doyle (2007) reports that about 75 percent of people believe that it is "important but not essential" or "absolutely essential" to lower the number of college students dropping out or taking too long to finish—that is, those who do not graduate. This may be, in part, because the graduation rate is a key indicator for accountability. Nearly 90 percent of Republicans and Democrats believe that it is important for colleges make information on quality indicators, including graduation rates, publicly available and about 80 percent believe colleges should lose some taxpayer revenue if the graduation rate is low (Nguyen et al., 2023).

2.1 A Model of Perceptions, Preferences, and Demand for Public Expenditure

We consider how taxpayers form their demands for public expenditure. Taxpayers have a concave utility function, $u_i(c, G, R)$, over consumption, c, and a public good composed of the graduation rate in their state, G, and their state's (percentile) rank of $R = F(G)$, for a differentiable distribution function $F()$. Consumption c is related to graduation because increasing expenditures requires higher taxes. A shared price function, $p(G; \omega)$, reflects the tax liability needed to maintain graduation rate G, given the state's productivity, ω— in line with this argument, we use the graduation rate divided by spending per student as a heuristic for ω in our survey experiment.[9] Since more productive states produce more graduates per dollar of public investment, they require fewer taxes to achieve comparable graduation rates. Individuals have information set $\mathcal{I} = \{G, R, \omega, F()\}$.

Taxpayers value having high levels of public goods in their state, having more public goods than other states (yardstick competition, state pride, etc.), and dislike paying taxes that reduce consumption. As a result, they trade-off having better and more highly ranked

[9]Fixing $p()$ across individuals functions like a scale normalization, allowing us to make inferences about perceptions of ω.

services with the costs of higher taxes. Ideal bundles of public good provision and spending equalize the perceived marginal benefit of additional expenditure and the perceived marginal cost. Formally, an individual's stated preference, G^*, will satisfy the following first order condition with respect to G (given their information $\mathcal{I}$)

$$\underbrace{v_G(G^*|\mathcal{I}) + v_R(G^*|\mathcal{I})f(G^*|\mathcal{I})}_{\text{Perceived Marginal Benefit}} = \underbrace{v_c(G^*)p'(G^*;\omega|\mathcal{I})}_{\text{Perceived Marginal Cost}} \tag{1}$$

where $v(c(G), G, F(G))$ is the indirect utility, partial derivatives are denoted by subscripts, $f(G) = F'(G)$ is the perception of the probability density function of G, and $p'(G;\omega)$ is the perceived marginal price of increasing G.

The two terms on the left hand side of the first order equation capture the marginal benefit from additional graduates. $v_G(G)$ measures the marginal benefit of a higher graduation rate, and $v_R(F(G))f(G)$ measures the marginal benefit of a higher rank that comes from a higher graduation rate. The right-hand side of the first order equation is the marginal cost of producing graduates, or the marginal utility of consumption forgone to increase expenditure for a marginal increase in G. As such, individuals' marginal benefit and cost curves over G are determined both by both preferences ($v()$) and perceptions ($\mathcal{I}$).

We illustrate how heterogeneity in perceptions could generate polarization in Panel (a) of Figure 1. This figure presents the downward sloping marginal benefit and upward sloping marginal cost curves. Taxpayers' demand, or ideal bundles of services and expenditure, $G^*|\mathcal{I}$, are given by the point where the two curves intersect. If Democrats perceive that their state is more productive and ω is larger, then their perceived marginal cost curve will be flatter compared with Republicans, and they would demand higher graduation rates. We illustrate this in Panel (a) plotting a cost curve for Democrats in blue and for Republicans in red. The party differences in ideal policies reveal that even if both groups have the same underlying beliefs about the benefits, differences in perceptions of productivity can generate polarization. Analogous intuition applies suggesting that polarization may come from differ-

ences in perceived marginal benefits. For example, Doyle (2007) found that Democrats are more concerned about "dropout" than Republicans, suggesting that Democrats' perceived marginal benefit curves are higher than those of Republicans.

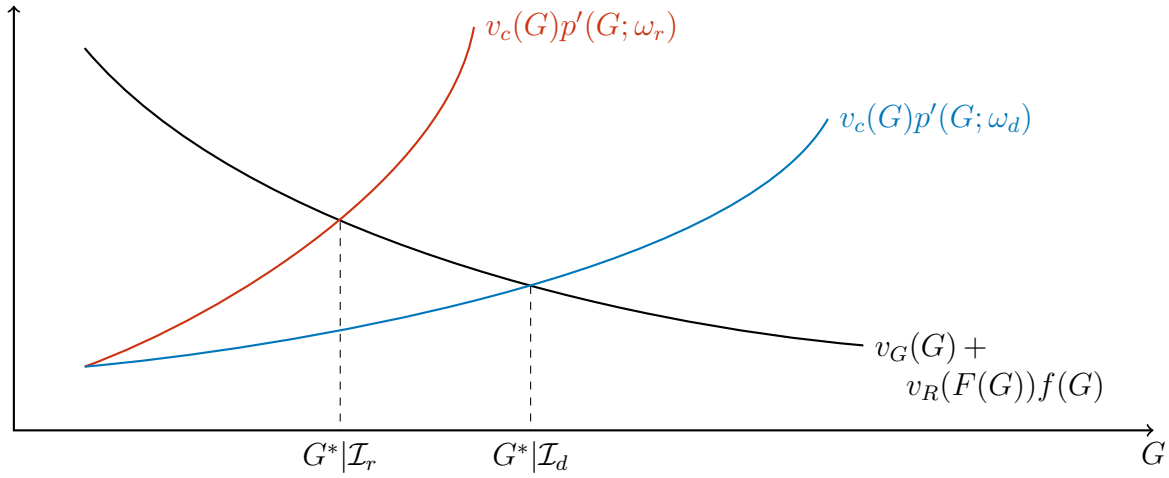
2.2 Information and Polarization

We now consider how information that shapes perceptions, $\mathcal{I}$, can affect the demand for public expenditure as in our experiments. We denote, prior and posterior perceptions of the public good process as $\tilde{\mathcal{I}} = \left\{\tilde{G}, \tilde{R}, \tilde{\omega}, \tilde{F}()\right\}$ and $\hat{\mathcal{I}} = \left\{\hat{G}, \hat{R}, \hat{\omega}, \hat{F}()\right\}$, noting that elements of either may be inaccurate. We first consider the effects of information that moves $\tilde{G}$ to the true $\hat{G} = G$. Throughout this discussion, we hold underlying preferences, or the utility function fixed, and focus on how an individual taxpayer would change her demand in response to new information that shapes perceptions.

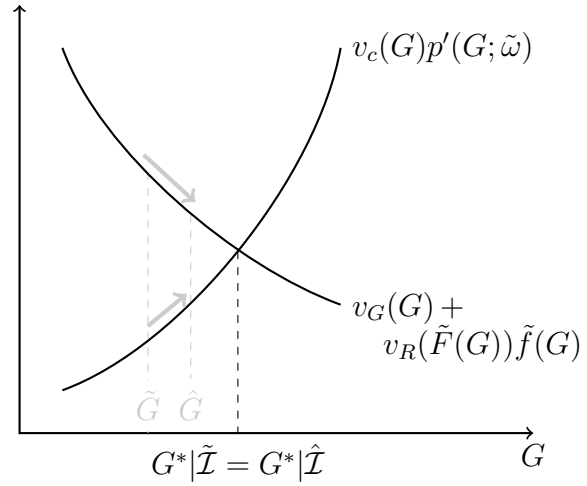
Consider an individual who learns that the true graduation rate is higher than initially perceived ($G > \tilde{G}$). This information by itself could lead her to update about her state's productivity in two ways. On the one hand, she may interpret this information as a *movement along* her perceived marginal cost and benefit curves, as shown in Panel (b) of Figure 1. In this case, she would conclude that the graduation rate is higher than her prior because the state is spending more than she initially believed (assuming $\tilde{\omega} = \hat{\omega}$). A movement along the cost curve like this implies that the price function does not change, and if the marginal curves do not change, neither does the point at which they intersect. In this case, the taxpayer's ideal policies remain the same even though she learned the graduation rate (and rank) are higher.

On the other hand, the taxpayer may interpret this information as an *outward shift* of her perceived marginal cost curve, as shown in Panel (c) of Figure 1. In this case, she would conclude that the graduation rate is higher than her prior because the state is more productive than she initially believed (assuming similar expenditure). A shift of the marginal cost curve like this implies that $\tilde{\omega} < \hat{\omega}$. As a result, the taxpayer now demands more public

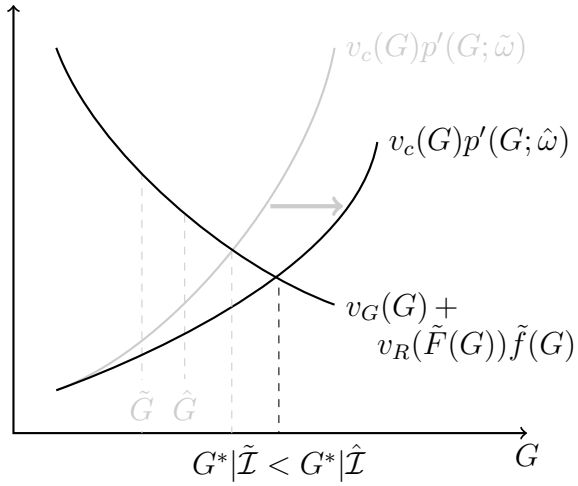
Figure 1: Perceptions, Preferences, and Ideal Policies



(a) Polarized Beliefs May Polarize Ideal Policies



(b) Info Moves Beliefs Along Marginal Curves



(c) Info Shifts Perceived Marginal Curves

Note: This figure shows how perceptions could affect polarization and the ideal public-good provision levels. Panel (a) focuses on polarization. It displays how differences in perceived productivity could generate ideological polarization even among individuals with identical preferences. Panels (b) and (c) demonstrate possible examples of reasoning through which information about public good provision may change taxpayers' ideal policies. Panel (b) shows the effect of a movement along the supply and demand curves. This type of reasoning may change taxpayers' perceptions about the current level of provision, but not their ideal policy. Panel (b) shows the effect of shifting the marginal cost curve resulting from changing perceptions of productivity. This type of reasoning will change the preferred policy.

services as the marginal cost curve shifts further to the right.[10]

Information about the graduation rate could also affect the marginal benefits curve if it leads the taxpayer to update about other states through $F()$. Similar to the discussion above, if the taxpayer concludes that R is higher because G is higher, and $F()$ is unchanged, the resulting *movement along* the marginal benefits curve will not affect her ideal policies. However, she may instead conclude that the distribution of $F()$ is higher (or more dispersed), generating a *shift of* the marginal benefits curve. For example, consider a taxpayer who interpret her own state's high graduation rate as a signal that the mean of F is higher than initially perceived, well. She will now derive a higher marginal utility from the same G under her posterior $F()$ because it is *relatively* worse than under the prior, shifting the marginal benefit curve up.[11] In this case, we would expect her to increase her demand for G from learning about F, all else equal.

The overall effects of information on polarization depend on the extent to which prior perceptions vary across groups and on differences in how members of these groups reason about information. Specifically, are Democrats or Republicans more likely to interpret information as a movement along or a shift of the marginal costs or benefits curves? Moreover, while our main focus in this paper is on political polarization, these gaps in demand for public expenditure due to differences in preferences and perceptions exist for other groups as well, most notably, between the elderly and the young (e.g. Poterba, 1998).

In our first two experiments, we provide information to shape perceptions and therefore allow us to better understand whether perceptions affect demand, for whom, and the underlying mechanisms. We then further consider the implications of (reducing) ideological polarization based on these changed perceptions. If ideological polarization propagates affective polarization and, consequently, reduces voters' inclination to interact with those that do not share their partisanship (Rogowski and Sutherland, 2016; Webster and Abramowitz, 2017; Bougher, 2017), then changes in ideological polarization from information can have

[10]Note that since the state is more productive, it is not guaranteed that she also demands more expenditure.
[11]Specifically, $\tilde{F}(G) > \hat{F}(G)$ for all G in this example.

broader effects. Decreased ideological polarization, therefore, might increase political engagement and increase voters' inclination to engage with elected officials who do not share their partisanship. We examine this possibility in the first two experiments, and its implications for policy in our third experiment.

3. Experimental Design and Data

3.1 Experiment 1: Information on Public Good Outputs

In this section, we outline the experimental design for our first experiment on information about absolute and relative public college graduation rates (outputs). The experiment and pre-analysis plan were registered with the AEA RCT registry (AEARCTR-0007619).

3.2 Sample

We initially recruited 3,715 participants through Qualtrics in May 2021. Specifically, we requested a sample pool that was broadly representative of the United States population in terms of political partisanship (a third of each Democrats, Republicans, and Independents), education level (41 percent high school equivalent or less, 29 percent some college or associate's degree, and 30 percent bachelor's degree or higher), and gender. We did not include participants from Washington, DC since it does not have a traditional public higher education system. However, since this sample was highly non-representative on age, we recruited an additional 1,004 participants in August 2021 using CloudResearch.[12]

3.3 Experiment 1 Procedure

After consenting to participate, participants answered demographic screening questions measuring political partisanship, gender, and state of residence.[13] Next, participants reported

[12]Overall, as we present in Section 5, the elderly are more responsive to information than the non-elderly, and so limiting our analysis to the original Qualtrics sample leads us to find larger effects.

[13]We elicit age, employment status, and connections to the public higher education system at the end of the survey. Connections included, whether or not the respondent has had (or does have) children attending a public college in their state, whether they believe their children will attend a public college in their state

their beliefs regarding the US average six-year public college graduation rate, the graduation rate in their state, and the rank of this graduation rate relative to the other 49 states. participants then reported their prior beliefs of the tax expenditure per student spent on public higher education in their home state and its rank.

Participants were then randomized to receive one of two information treatments or to receive no information (the Control group). The first treatment presented the actual six-year public college graduation rate in their state, based on data from the National Center for Education Statistics. The second treatment presented both the state's graduation rate and its rank. In both treatments, participants were also reminded of their prior beliefs and shown the difference between that prior and the truth. Figures B1 and B2 in the appendix show the information treatments. Appendix A shows that our treatments are balanced on both taxpayer characteristics and beliefs.

After exposure to the information treatment, participants answered a range of survey questions. First, they indicated their preferred level of annual tax revenue per student at public four-year colleges in their state.[14] This was our main measure of stated ideal policy.

After stating their ideal policy, participants were asked questions targeting potential mechanisms. We asked their beliefs regarding the impacts of marginal changes in public college financing, including how much graduation rate would change with an additional additional $100 spent per student and the benefit average resident in their state, themselves, as well as new graduates from public four-year colleges to from an additional $1 in tax revenue earmarked to higher education. Participants also answered five-point Likert questions gauging their general trust in the way public four-year colleges use tax revenue, the extent to which students should bear the cost of funding public higher education, and whether or not the federal government should provide financial support for public four-year colleges.

in the future, and whether they themselves have attended or are currently attending a public college in their state.

[14]We asked each participant two versions of this question one, "acknowledging the potential effects of the COVID-19" and the other "after the pandemic has passed." We prespecified the second question as a main outcome of interest to capture out preferences less affected by the unique context of the COVID pandemic, but responses to both questions were are highly correlated and treatment effects were similar.

Next, participants were given the opportunity to participate in two costly tasks designed to elicit revealed preferences.[15] First, we invite participants to share written opinions about their states' spending on public four-year colleges using an open-ended response format, which we offered to send to elected state officials of their choice.[16] A taxpayer's choice to spend time to send an optional letter without added incentives reflects a costly action since it lowers her effective hourly pay rate. She may choose to write a letter of support or opposition for public investment, in light of new information, to express her preferred policy. Critically, because sending the letter to more officials does not cost additional time, a taxpayer's decision of whether to address the letter to her own party or across the aisle provides a measure of affective polarization—as does the sentiment of the letter. This exercise builds on Ferrario and Stantcheva (2022) by allowing the researcher to observe participants' first-order concerns as expressed to policy makers while also studying selection into this political participation.[17] This outcome has policy significance when politicians update policy positions to reflect voters' preferences (Sevenans, 2021), and also serves as the key input into our third experiment with elected officials.

As a second costly task, participants were given the option to donate up to \$0.25 to a public college in their state, keeping any remaining funds as an additional payment. This amount is non-trivial. The median participant spent 6 minutes in total on the survey meaning this represents an additional hourly wage of \$2.50. Our two revealed preference measures are also similar to other recent experiments that have included charitable donations (Alesina et al., 2023; Akesson et al., 2022), and petition signatures or other government notifications (Grigorieff et al., 2018; Haaland and Roth, 2020; Holz et al., 2020).

[15]Relying solely on stated preferences to measure support will be misleading if participants suffer from "hypothetical bias" (List and Gallet, 2001; List, 2001).This bias may not be an issue because of main prespecified stated-preference measure of interest is ideal spending levels, which are strictly positive for the vast majority of the sample, and List et al. (2006) provides evidence that hypothetical and real responses on intensive margin decisions are very similar since respondents in both cases value the marginal attribute vector in the same way.

[16]They choose from one or more of the following officials: the Republican leaders in their state legislatures, the Democratic leaders in their state legislatures, and the governor.

[17]This exercise is also similar to Hager et al. (2023) in that they also provide political supporters with the opportunity to voice their opinions to elected officials.

Finally, at the end of the survey, we elicit the posterior beliefs of the participants in the CloudResearch sample who are randomized into the control or graduation rate only conditions. Participants in the graduation rate only condition are shown their treatment information page one more time and then asked for a posterior belief for the corresponding rank. Those in the control condition are shown the graduation rate treatment information and then also asked for their posterior belief for the rank. The posterior beliefs allow us to test for partisan differences in reasoning or learning from information.

3.4 Variable Definitions

Belief Errors: We calculate a continuous variable measuring the belief error as the participants' priors minus the truth for their state's graduation rate and corresponding percentile rank as well as spending levels and corresponding percentile rank.[18] A prior is too low if the bias is negative, that is, when a taxpayer underestimated the truth. We observed the state graduation rates and spending levels from Snyder et al. (2019) and Laderman and Heckert (2021), respectively.

Outcomes: The main survey outcomes are the taxpayer's preferred spending level (to address ideological polarization) and whether each taxpayer writes a letter to her elected officials (to measure affective polarization). For the writing an elected official task, we create three indicators for whether (1) participants wrote to any elected official(s); (2) they wrote to an official of their own party; and (3) they wrote to an elected official of the opposing party. We measure the sentiment of each letter using the Syuzhet dictionary. A letter is positive in tone if the Syuzhet score is greater than zero.

We additionally create a productivity index from our questions that elicit demand on the margin following Anderson (2008). These questions include whether a charitable donations was made to a public college, beliefs about the marginal impacts of additional spending on enrollment and graduation, and indicators for whether participants agree or strongly agree

[18]The treatments display the information as ranks out of 50, but we convert to percentile ranks for the analysis so that a larger number corresponds to both a higher rate and rank.

with Likert questions about the social benefits of spending, personal benefits from spending, and trust in the state to spend tax dollars well.

Demographics: Participants were coded as Republican if they indicated their partisanship as lean republican, not very strong Republican, or strongly Republican. Following our pre-analysis plan, we compare Republicans against Democrats and Independents in our analyses. We also create a family attachment indicator for whether the subject or her child has attended a public-four year college in their state. Finally, a subject is said to follow the state's public college sport teams if they watch at least 2 games per year. We define the elderly as participants 65 and older.

3.5 Experiment 2 Procedure on Public Good Outputs and Inputs

For the second experiment, we recruited 3,037 participants in May and June 2022 through CloudResearch. The experiment and pre-analysis plan were registered with the AEA RCT registry (AEARCTR-0009409).

The procedure for our second experiment mainly follows the first with a three exceptions. First, participants are randomized to receive one of three information treatments: (1) the graduation rate and rank information as in Experiment 1; (2) the amount of spending per student in dollars and this amount's rank relative to other states; or (3) the content from both treatments 1 and 2.

Second, we extend the way in which taxpayers can communicate with their elected officials. After having the option to write their own letter as in Experiment 1, they can choose from a set of pre-specified messages to send or add on to their own letter. Taxpayers first select a request for a desired level of spending (increase, decrease, or no change) along with as many reasons as they choose from a list. The reasons are intended to signal yardstick competition, the social returns on investment, and the private returns to students.

Finally, at the end of the survey we elicit posterior beliefs about the graduation and spending information. We show participants in treatment (1) the graduation rate and rank

information again and then elicit their spending level and rank posteriors. Similarly, we show participants in treatment (2) the spending information and elicit their graduation rate and rank posteriors.

4. Polarized Perceptions, and Polarized Support for Public Higher Education

In this section, we provide evidence of baseline ideological polarization, affective polarization, and polarized perceptions of public investment in higher education. This allows us to document the nature and extent of polarization—absent any intervention—before using our randomized treatments to measure the drivers of polarization in the following section.

4.1 Political Polarization in the Demand For Public Higher Education

We use the data from our first experiment to document polarization in the demand for public higher education expenditure. To measure whether there is systematic disagreement across groups in demand, we estimate the following Poisson regression:

$$\mathbb{E}(\text{Ideal Spending Level}_i) = \exp(\alpha_0 + X\alpha_1) \tag{2}$$

where X is a vector of taxpayer characteristics and α_1 captures the amount of ideological polarization by each characteristic. We limit the sample to the Control group in our first experiment to measure demand and polarization at baseline. The estimated coefficients are presented as blue diamonds in Panel (a) of Figure 2 and give the percent difference in ideal spending levels between two groups of taxpayers. Based on our interests in political polarization, we focus on the gaps by political partisanship, but also include demographics like age and gender, and measures of attachments to the public college system.

We find that demand for public higher education expenditure is highly polarized by political party. Republicans prefer 23 percent less public expenditure than Democrats and Independents. The only other group with differences is that the elderly prefer 12 percent

less than the non-elderly. These gaps by political partisanship and age are similar to results from two recent nationally representative PEW Research Center surveys on views of higher education (Parker, 2019) and support for free public college (Hartig, 2020).

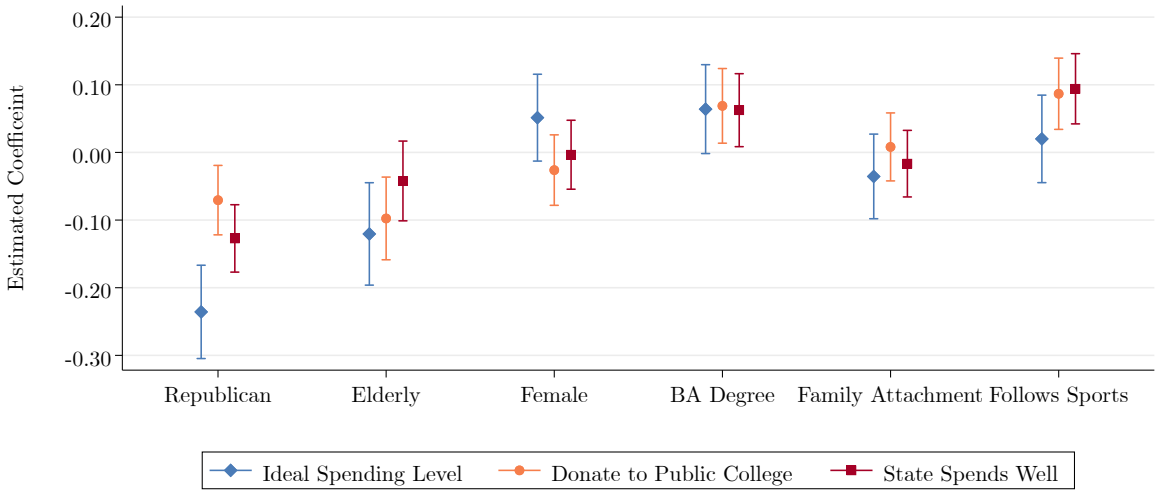
Since polarization in stated ideal spending captures differences across taxpayers in their optimal policies, we consider two complementary measures to understand demand for spending on the margin. First, taxpayers who believe that provision is below their ideal level may make a private donation to increase spending at the cost of their own personal consumption. We estimate the likelihood that an individual makes a donation to a public college and present the results as orange circles in Panel (a) and Figure 2. We again find evidence that Republicans and the elderly demand less expenditure since they are less willing to give up their own consumption to help finance the public services. Second, the difference between taxpayers' demanded policies may be related to whether they trust that the state uses taxpayer dollars well to fund public higher education. The red square estimates in Panel (a) and Figure 2 show that Republicans, although not the elderly, are less likely to agree or strongly agree that tax revenue is well spent. Those with college degrees and those who follow college sports also are more likely to donate and to trust the state to spend well, but the starkest differences are by political party and age.

4.2 Perceptions of State Productivity are also Polarized

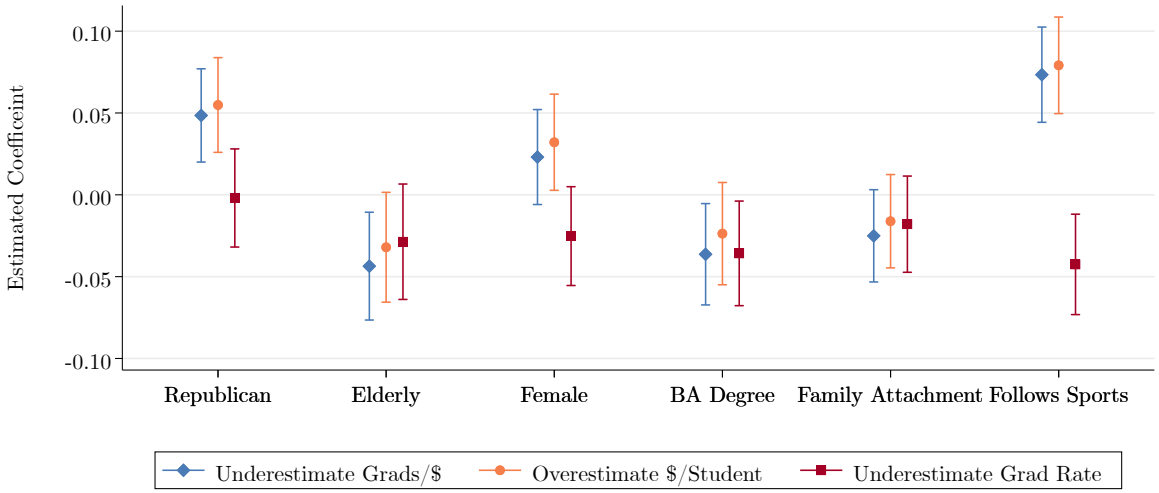
Our model suggests that polarization in perceptions of "reality" (Alesina et al., 2020) polarize demand. To explore this, we document differences across taxpayers in their perceptions of higher education productivity in their state—do Republicans and the elderly prefer less investment because they perceive the return on investment is lower, as modeled in Section 2? Following that discussion, we measure productivity as the number of graduates produced per dollar spent,[19] or the total public goods produced divided by the total cost. A higher number indicates that the state is more productive because that state produces more public

[19]Specifically, we observe perceptions of the graduation rate, or Graduates/Students, and Spending/Student. Taking the ratio gives Graduates per Dollar Spent.

Figure 2: Ideological Polarization and Perceptions of Public Higher Education



(a) Polarization in Ideal Public Higher Education Policy



(b) Polarization in Perceptions of Public Higher Education Productivity

Note: This figure shows the relationships between observable characteristics and individuals' ideal policies and perceptions. The three series in Panel (a) are measures of support for public higher education. The markers with blue diamonds are estimates from a Poisson regression of the ideal spending level, those with orange circles are estimates from a linear regression on an indicator that the taxpayer made a donation to a public college in their state, and those with red squares are estimates from a linear regression on an indicator that the taxpayer agrees or strongly agrees that they trust the state to spend tax revenue well on public higher education. Panel (a) uses only the control group who do not receive any information. The three series in Panel (b) are measures of perceived productivity. The markers with blue diamonds are estimates for indicator variables for whether taxpayers underestimate the graduation rate in their state, the markers with orange circles are estimates predictions of whether taxpayers overestimate the per-student spending on public higher education in their state, and the markers with red squares for whether taxpayers underestimate the number of graduates per $10,000 spent on public higher education in their state. Both panels reflect responses of taxpayers recruited from Qualtrics and CloudResearch for the first experiment.

goods for a given cost.[20] This measure is analogous to the one used by Conzelmann et al. (2022) who document the spatial distribution of the social return on investment for higher education across labor markets and states. We additionally consider perceptions of each component of the ratio, the graduation rate and spending per student.

We test for polarization in perceptions of productivity by estimating the association between taxpayer characteristics and whether they underestimate this measure of productivity in a linear probability model.[21] Since a taxpayer can underestimate the productivity by underestimating the graduation rate and/or overestimating expenditure, we then decompose the perceptions of productivity into those two channels. We plot the gaps for all three specifications in Panel (b) of Figure 2.

While most group characteristics are only slightly related with inaccurate perceptions of productivity, again the largest differences are by following sports and by political party. Republicans are about 5 percentage points more likely to underestimate the state's productivity based on this measure than Democrats and Independents. Interestingly, this gap is entirely driven by differences in perceptions of spending. Republicans perceive that they receive the same public goods based on the graduation rate, but that the state spends much more in tax revenue. Note that while gaps in demand by political partisanship and age are similar, the gaps in perceptions are reverse. We find that the elderly (slightly) overestimate their state's productivity—preferring low levels of expenditure in spite of the fact that they overestimate the state's productivity.

4.3 Letters to Elected Officials Reveal Affective Polarization

Having documented strong ideological polarization by party, we now document how taxpayers engage with elected officials along partisan lines. This allows us to measure affective polarization. With affective polarization, a taxpayer's dislike and distrust for members of

[20] Or the same number of public goods at a lower cost.

[21] Specifically, the dependent variable is 1 if a taxpayers perceived graduates per dollar spent is less than the true value.

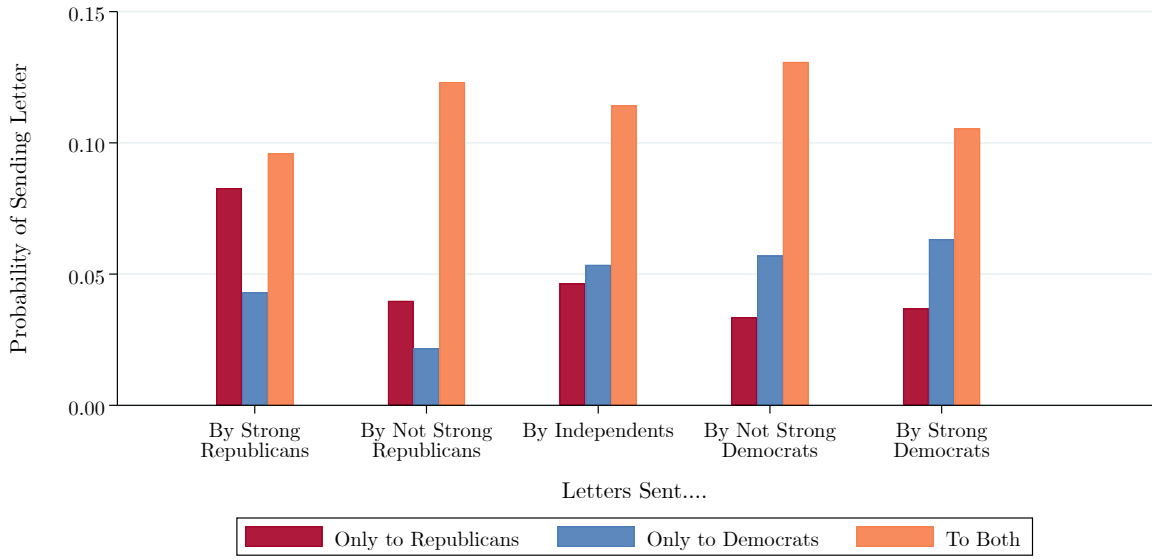
the opposing party will make it more costly to engage and therefore unlikely that she will write a letter for elected officials across the political aisle. In Panel (a) of Figure 3, we plot the likelihood that a taxpayer in our control group from Experiment 1, who does not receive information, sends a letter to an elected official as a function of both her and the official's political affiliation. The pattern provides evidence of affective polarization since taxpayers are more likely to interact with members of their own party. While all taxpayers are most likely to send their letter to officials of both parties, Republican taxpayers are more likely to only send a letter to Republican officials, and Democrats are more likely to only send a letter to Democrat officials. The difference in the likelihood of reaching across the aisle is largest for taxpayers who consider themselves "strong Republicans."

As a second measure of affective polarization, we examine the content of the letters. For each letter, we calculate the sentiment based on the Syuzhet Lexicon, and then plot the average sentiment of the letters for each combination of taxpayer and the elected official political identities. This is shown in Panel (b) of Figure 3. A value of 0 indicates neutral sentiment, while a positive number indicates positive sentiment. Our approach treats the text as data to capture revealed preferences, rather than relying on stated preferences of affective polarization.[22] In doing this, we build on Ferrario and Stantcheva (2022) by using the text from open-ended responses as a measure of both affective polarization and political engagement. Moreover, since the letters are sent to elected officials, this gives the experiment field context, as a framed field experiment.

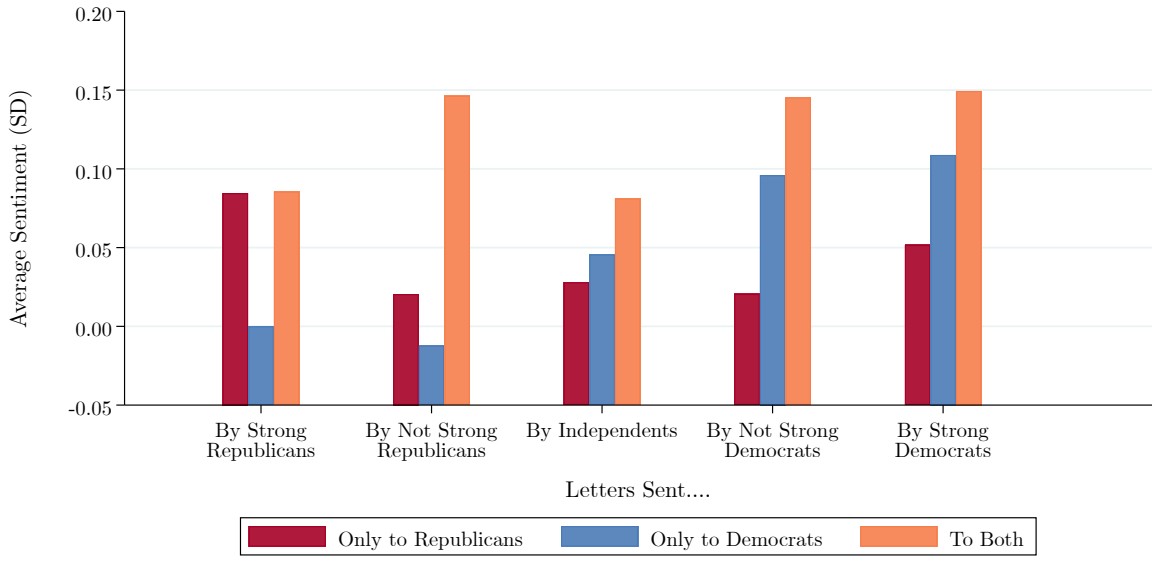
Letters from taxpayers who write members of their own party, or both parties, are more positive in sentiment than those who choose to reach across the aisle. This provides further evidence of affective polarization—when people choose to reach across the aisle, they are more negative, which indicates dislike or distrust. The difference in average sentiment between letters sent to members of their own party and those sent to the other party is also largest for self-described "strong Republicans." These differences are due to both the strength of

[22]Druckman and Levendusky (2019) provide an overview of measures of affective polarization.

Figure 3: Affective Polarization in Public Higher Education



(a) Extent of Political Engagement by Political Affiliation



(b) Affect of Political Engagement by Political Affiliation

Note: This figure shows two measures of affective polarization across party lines. In Panel (a) each bar plot presents the probability that an individual with a self-described political identity writes only republican elected officials, only democrat elected officials, or both. And Panel (b) reports the sentiment of letters sent by these groups to each type of elected official. Sentiment is measured as the average sentiment of words in the letters from the Syuzhet Lexicon, with no letter being zero, and are reported in standard deviation units (from the control group standard deviation). Both panels reflect responses of taxpayers recruited from Qualtrics and CloudResearch for the first experiment.

affective polarization across individuals, and selection into the types of individuals who choose to send a letter to only members of their own party instead of both parties.

5. Results

We now measure the effect of providing information about the public good outputs, or the graduation rate and its corresponding rank, affects demand for public higher education expenditure. Since the information treatments shape taxpayers' perceptions, changes in demand from information by different individuals inform the extent to which perceptions drive polarization.

5.1 Demand for Public Higher Education Expenditure

We first consider how information about the graduation rate and rank affect the demand for public expenditure in higher education. We estimate the average treatment effects of receiving information about the graduation rate only, D_1, and both rate and rank, D_2, on the taxpayer's ideal spending level from the following linear regression:

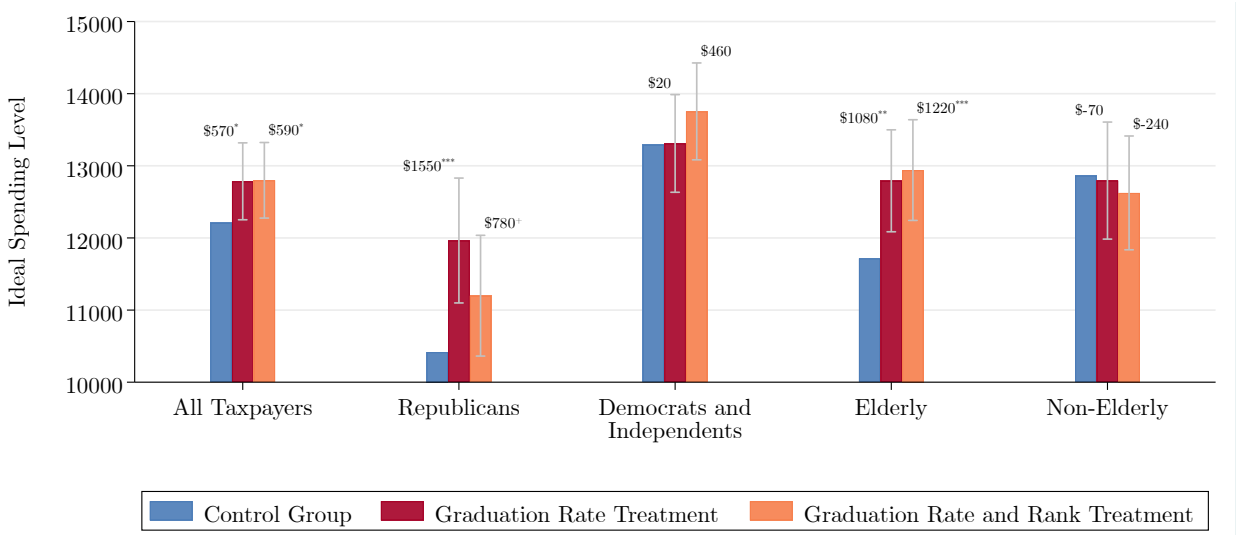
$$Y_i = \tau_0 + \tau_1 D_{1i} + \tau_2 D_{2i} + X\tau_3 + \varepsilon_i \tag{3}$$

where X is a vector of demographics plus an indicator that the participant was recruited from Qualtrics, as before.[23] Based on the discussion in Section 2 and the documented gaps by political affiliation and age. Based on the documented gaps in Section 4, we divide the sample by political affiliation and age and additionally estimate the treatment effects by subgroups. All participants appear in 3 specifications out of the 5 shown in the figure: (1) All Taxpayers; (2) either Republicans or Democrats and Independents; and (3) either Elderly or Non-Elderly. We present all five sets of results as well as the control means in Figure 4.

On average, information about the absolute and relative public good outputs in a tax-

[23]We estimate a linear regression since about 2 percent of the sample indicate 0 as their ideal spending level. Using a Poisson regression does not change the results.

Figure 4: Information Affects Taxpayers' Ideal Spending for Public Higher Education



Note: This figure presents taxpayer's stated ideal spending per student by treatment group and taxpayer characteristics along with 95% confidence intervals on the effects of the two treatments. The sample is the 4,679 taxpayers who completed surveys through Qualtrics and CloudResearch for the first experiment. *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$, $^{+}p < 0.1$

payer's state raises her ideal spending level by just under $600 per student per year, or about 5 percent. The effects are largest for and driven by Republicans and the elderly. Since these groups have lower baseline ideal spending levels, this information thus significantly reduces polarization. The political partisan gap in ideal spending falls by 32 percent, and the gap between the elderly and non-elderly is eliminated. Part, but not all, of the effect comes from the extensive margin— a 2.4 percentage point decrease for Republicans ($p = 0.016$) and a 1.2 percentage point decrease for the elderly ($p = 0.072$) in the likelihood they state an ideal spending level of $0 in public higher education expenditure. Information therefore especially helps reduce extreme polarization. Since we found no differences in average perceptions about graduation rate by political party or age (Figure 2), this suggests that there are differences in how these taxpayers reason about information. We provide support for this hypothesis in Section 5.2.

5.2 Partisan Reasoning from Information

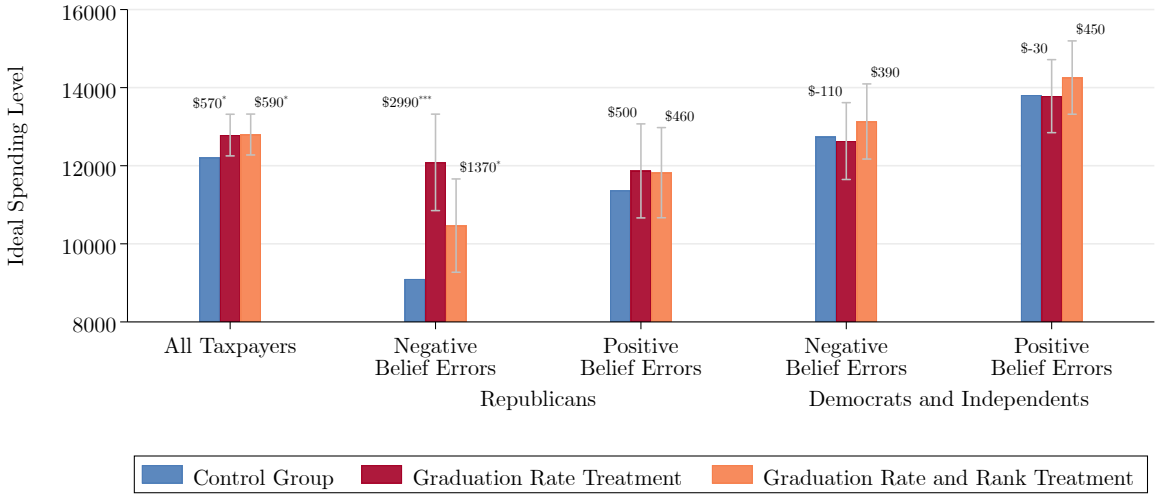
We now conduct two exercises to show that our results are driven by differences in partisan reasoning about information. First, we estimate ideal spending levels by taxpayers' initial perceptions, treatment assignment, and political affiliation. For example, do Republicans and Democrats respond similarly after learning that the graduation rate is higher than they initially perceived? More specifically, we separately estimate our treatment effects, as in Equation 3, but divide the sample into four bins: {Republican, Democrat and Independent} $\times$ {Negative Rate Belief Error, Positive Rate Belief Error }. Second, we plot taxpayers' posterior perceptions about spending after receiving information about the graduation rate from our second experiment. This exercise allows us to test whether Republicans update about their state's perceived productivity, ω, differently than Democrats and Independents.

While our previous results showed that Republicans on average respond to information by increasing their demand for public expenditure, Figure 5 shows that this response is driven by those who would otherwise underestimate the graduation rate in their state—those with a negative belief error. Among these Republicans, information that the graduation rate is higher increases their ideal spending levels by 28% ($p < 0.001$), and the graduation rate plus rank information increases this level by 14% ($p = 0.023$). When they learn the graduation rate is higher, they demand more expenditure. The difference between the graduation rate only and rank plus rank treatment may suggest that Republicans care about yardstick competition; learning the state is highly ranked decreases the competitive pressure to spend more.[24] We find no effect of information on Republican taxpayers who initially perceive that the graduation rate is high. Together, these asymmetric results imply that both perceptions and how taxpayers reason about information may matter for demand.

Independents and Democrats with both positive and negative belief errors respond mini-

[24]The effect could also be driven by the fact that some respondents who learn the rate is high also learn the rank is low and the mixed signals about productivity lead demand to respond by less than only learning the rate is high. However, more than 70% of respondents who in our second treatment who learn the graduate rate is high also learn the state is more highly ranked.

Figure 5: The Impact of Graduation Information by Partisanship and Perceptions



Note: This figure presents average treatment effects of information on ideal spending per student vary by partisanship and by prior perceptions of the state graduation rate. A negative belief error indicates that a treated taxpayer learns the graduation rate is higher, while a positive error indicates she learns the graduation rate is lower. The sample is taxpayers recruited from Qualtrics and CloudResearch for the first experiment.

mally if at all to information, as shown in Figure 5. In terms of our model in Section 2, these taxpayers seem to interpret the information as a movement along the marginal cost and benefit curves compared with Republicans. In the remainder of this subsection, we consider this more explicitly using taxpayers' spending posteriors after learning graduation rate and rank information.

One possible explanation for our result that information leads Republicans to demand more public expenditure, while having no effect on Democrats and Independents, is that these group reason differently about the graduation information. Republicans may interpret the information as an increase in state productivity, while Democrats and Independents interpret the information as a change in expenditure, or movement along the marginal cost and benefit curves. For taxpayers who receive both the graduation rate and rank information in the second experiment, we measure their change in perceptions about productivity by plotting the difference between their posterior and prior belief about spending as a function of their initial beliefs and the graduation information they receive.

To test for these differences in partisan reasoning, we estimate the following equation separately by political affiliation:

$$\hat{S}_i - \tilde{S}_i = \gamma_0 + \gamma_1(\tilde{G} - G)\mathbb{1}(\tilde{G} - G \leq 0) + \gamma_2(\tilde{G} - G)\mathbb{1}(\tilde{G} - G > 0) + X\gamma_3 + \varepsilon_i \qquad (4)$$

where S is taxpayer's belief about her state's spending percentile rank, and $\tilde{G} - G$ is her graduation rate or rank belief error, that is, her graduation rate or rank prior minus the truth. As before, we allow taxpayers who receive information that the graduation rate is higher to update differently, based on γ_1, than those who learn that it is lower (γ_2), based on our previous results.[25] Implicitly, Equation 4 is a first differences where the true graduation rate or rank, G, is treated as the taxpayer's posterior after receiving information.

Our goal from this exercise is to measure the extent that different taxpayers update about spending, and therefore productivity, after learning the true graduation rate and rank in their state. Based on our data, this exercise estimates γ from the non-random variation across taxpayers in their initial perceptions and therefore the size of the information shock they receive. γ therefore captures the extent that, for example, taxpayers who learn the graduation rate is 10 percentage points higher update more about spending than those who only learn it is 5 percentage points higher. However, in practice, we are interested in the relative differences between Republicans, and Democrats and Independents, or $\gamma_R - \gamma_D$, as in a difference-in-differences. Since priors are not exogenous, we interpret these estimates as descriptive and not causal. In Section 6, we discuss the results from the second experiment where we randomize information about both graduation and spending to additionally study these mechanisms.

We first consider how taxpayers reason about their state's spending relative to others, or its percentile rank, after learning its graduation rank. That is, we estimate Equation 4 where S is the spending percentile rank and G is the graduation percentile rank and graph

[25] This specification is a linear spline with a knot at $\tilde{G} - G = 0$, which imposes that the amount respondents update is a continuous function of belief errors. When we allow for separate intercepts, the results minimally change.

the implied estimates over a binscatter plot in Panel (a) of Figure 6. Democrats and Independents interpret the information that the graduation rate is relatively high compared to other states as evidence that their state spends more, indicated by the downward sloping lines. Republicans who learn that their state is less highly ranked, because they have positive belief errors, update in a nearly identical fashion. In terms of our model in Section 2 and consistent with the distribution of treatment effects by belief errors in Figure 5, these taxpayers do not change their ideal policies because they attribute the change to be a movement along the marginal curves.[26]

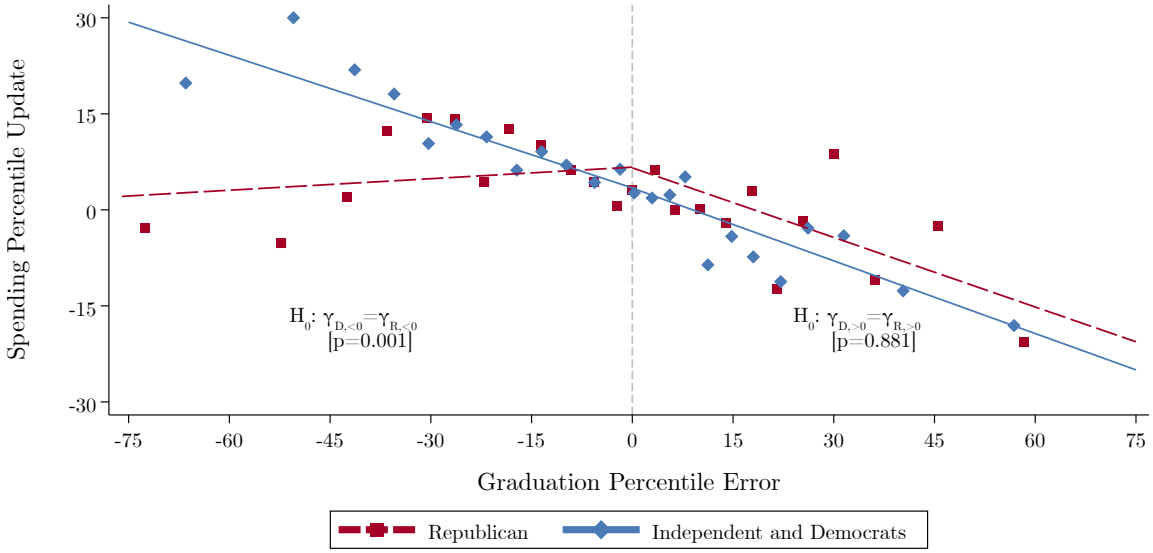
However, Republicans who learn the state is more highly ranked based on its graduation rate do not update about relative spending. The estimated slope is slightly positive, but not different from 0. With a higher graduation rank and no change in spending beliefs, these taxpayers may now perceive the state to be relatively more productive and therefore increase their demand for public expenditure, as we show in Figure 5.[27] These Republicans learn differently from Democrats and Independents with similar negative belief errors based on the estimates slopes ($p = 0.001$), which provides evidence of partisan reasoning driving our effects. Appendix B provides similar, but weaker evidence on how Republicans, compared with Democrats and Independents, update about the spending level after learning about the rank.

We find similar evidence of partisan reasoning when measuring how taxpayers respond to graduation rate information (Panel (b) of Figure 6). Republican taxpayers who learn that the graduation rate is high do not update about the spending rank. Democrats and Independents with similar priors interpret the higher rate as evidence that the state is spending relatively more. This provides further suggestive evidence that Republicans are more likely to interpret our information treatments as a shift of the marginal curves and therefore respond by demanding more spending, compared to Democrats and Independents. Overall,

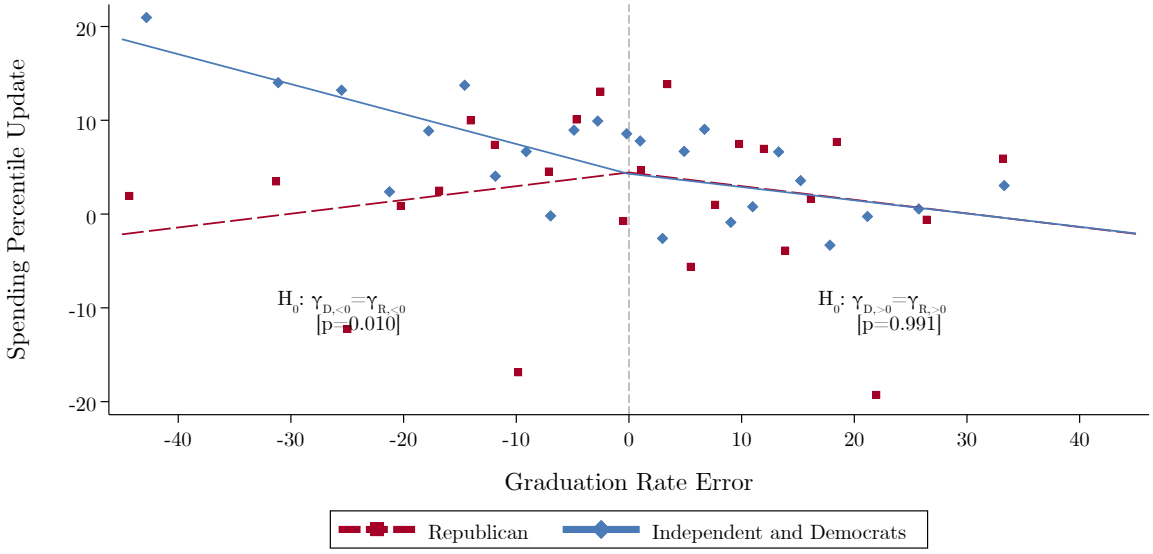
[26]Note that Figure 5 is from Experiment 1 and Figure 6 is from Experiment 2 and so these correspond to different samples.

[27]Similar to this implication, Doyle (2010) finds that conservative US senators are more likely to vote in favor of issues regarding the efficiency of colleges and universities.

Figure 6: Evidence of Partisan Reasoning about Productivity from Graduation Information



(a) Graduation Rank Information Changes



(b) Graduation Rate Information Changes

Note: This figure illustrates differences in updating by partisanship and by prior perceptions. Each panel presents the change in the perceived state spending percentile rank for individuals with different partisan identities over their belief errors, i.e., the prior perceptions minus the true rate. Panel (a) shows updating over the support of their belief error about the state graduation percentile rank and Panel (b) shows updating over the support of their belief error about the state graduation rates. In both graphs, markers represent averages of 12 quantiles above and below zero and lines represent regression lines with varying slopes for good and bad news, restricted to be continuous at zero. Points and lines are regression adjusted for the prespecified regression controls. Panels reflect responses of taxpayers recruited for our second experiment from CloudResearch.

our results suggest that perceptions importantly determine ideological polarization.

5.3 Demand for Public Higher Education Expenditure on the Margin

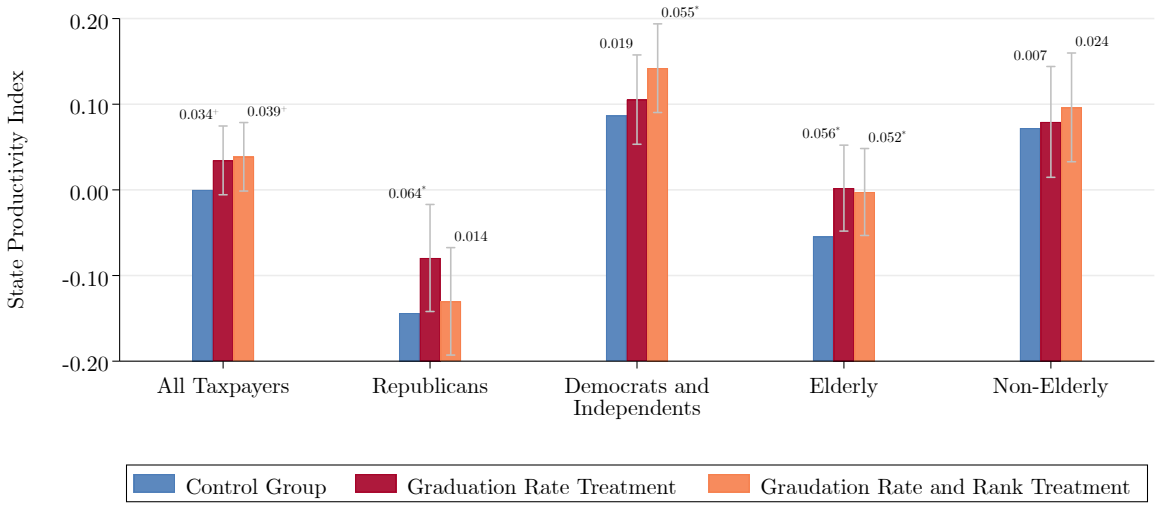
We now consider how perceptions and information affect taxpayers' demand for marginal changes in public expenditure. Information that shifts the marginal cost and benefit curves will affect both taxpayers' ideal policies and may also change the distance between their ideal and perceived policies, while information that leads to a movement along the curves will only affect the distance. Unlike our previous results on ideal spending levels, which will only change if there is a shift in perceived marginal cost or benefit, taxpayers may demand more spending above the current level after receiving information that moves them along the marginal cost and benefit curves. We combine all of our questions that elicit demand on the margin, including charitable donations to public colleges and beliefs about the value of additional spending for students and the state, into an index following Anderson (2008). We estimate the treatment effects on the index from Equation 3 and present the results in Panel (b) of Figure 7.

The index contains several types of question that elicit demand for expenditure on the margin. Each component is numbered in parentheses as follows. First, we ask participants to imagine that their state spent \$100 more per student and ask how this would affect (1) the number of students who enroll and (2) the graduation rate to capture how marginal changes in spending affect the amount of public goods produced. Next, we ask participants to imagine that the state collected an additional \$1 in tax revenue per person to spend on higher education, and ask how the added revenue would affect society using a 5 point Likert scale.[28] Specifically, we ask whether (3) the average person in the state benefits, (4) the participant personally benefits, and (5) new graduates have better careers.[29] These first two sets of questions explicitly ask about the effects of marginal changes in spending. Next, we

[28]Following our pre-analysis plan, we first convert the scale into an indicator that is 1 if the participant agrees or strongly agrees.

[29]If new graduates have better careers, they will contribute more to the tax base to add to social spending.

Figure 7: Demand for Public Higher Education Expenditure on the Margin



(a) Marginal Spending Increase Index

Note: This figure presents taxpayer's covariance-weighted index of survey outcomes stated in the text by treatment group and taxpayer characteristics along with 95% confidence intervals on the effects of the two treatments. The sample is the 4,679 taxpayers who completed surveys through Qualtrics and CloudResearch for the first experiment. *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$, $^{+}p < 0.1$

ask participants whether (6) they trust that the state uses taxpayer dollars well. Finally, we include (7) a indicator for whether the participant donated to a public college and (8) the donation amount. We combine these questions into an index following Anderson (2008) which allows us to consider only 1 outcome, while accounting for the correlation across questions to maximize the amount of information captured in the index.

We find that, overall, our treatments weakly increase demand for public expenditure on the margin. Republicans who receive graduation rate information demand more expenditure, but receiving rank information diminishes the effect. We also find that the elderly in both treatments increase their demand on the margin. This pattern of results is similar to our results on ideal spending levels. Based on some of the comments we received as part of the survey from participants, we believe some of the results are noisy because some participants misinterpreted marginal changes from questions (1) and (2) to be effectively no change.

Unlike our previous results on ideal spending levels, Democrats and Independents who receive graduation rank information demand more spending on the margin ($p = 0.038$).

This is additional suggestive evidence that participants interpret a change in the rank as a movement along the marginal cost and benefit curves, rather than shift in the curves.

5.4 Political Engagement and Affective Polarization

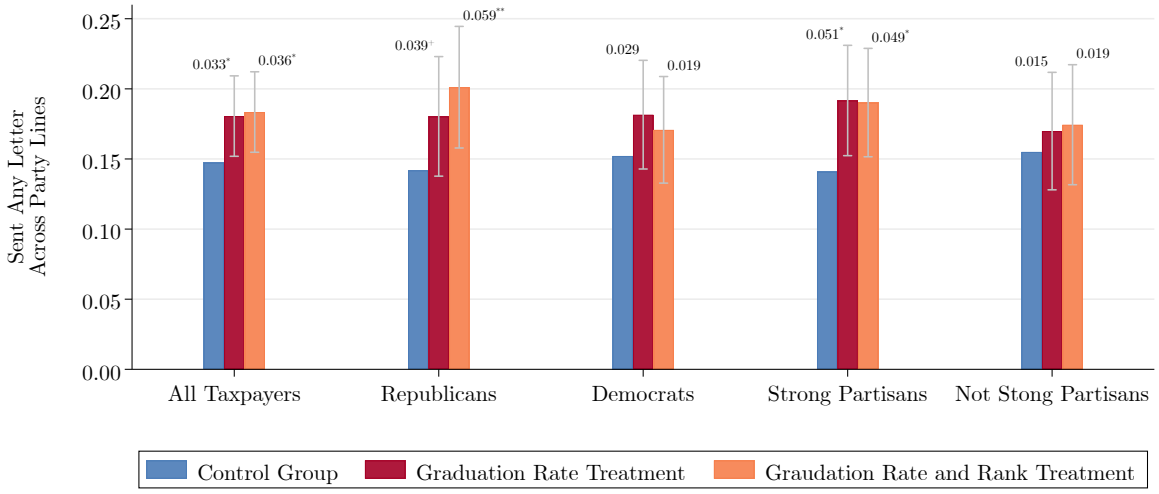
We now examine whether our information treatments increased political engagement. Prior work demonstrates that greater ideological polarization is associated with greater affective polarization, including aversion towards lawmakers from the opposing party Rogowski and Sutherland (2016); Webster and Abramowitz (2017), but the past evidence is mixed (e.g. Lelkes, 2018). Accordingly, partisans may be unwilling to interact with lawmakers of the opposing party when they perceive these officials to hold preferences that are far from their own. Given that our information treatments reduced ideological polarization by raising Republicans' preferred spending levels, they may have also increased Republicans' political engagement by making them more inclined to engage (positively) with Democratic lawmakers.

We first test the impact of information on affective polarization by estimating treatment effects on whether a partisan taxpayer sent a letter to an elected official across party lines. If information reduces affective polarization, then the personal cost of interacting with a member of the opposing party will be lower and taxpayers will be more willing to engage. We then use the text from the letter to capture the sentiment as a measure of whether the interaction is positive or negative. Our second test estimates the treatment effects on whether a taxpayer sent a strictly positive in sentiment letter to an elected official of the opposing party. If information only to induces more taxpayers to reach across the aisle to express their distaste or distrust, then affective polarization would have increased. The results are presented in Panels (a) and (b) of Figure 8 respectively.[30]

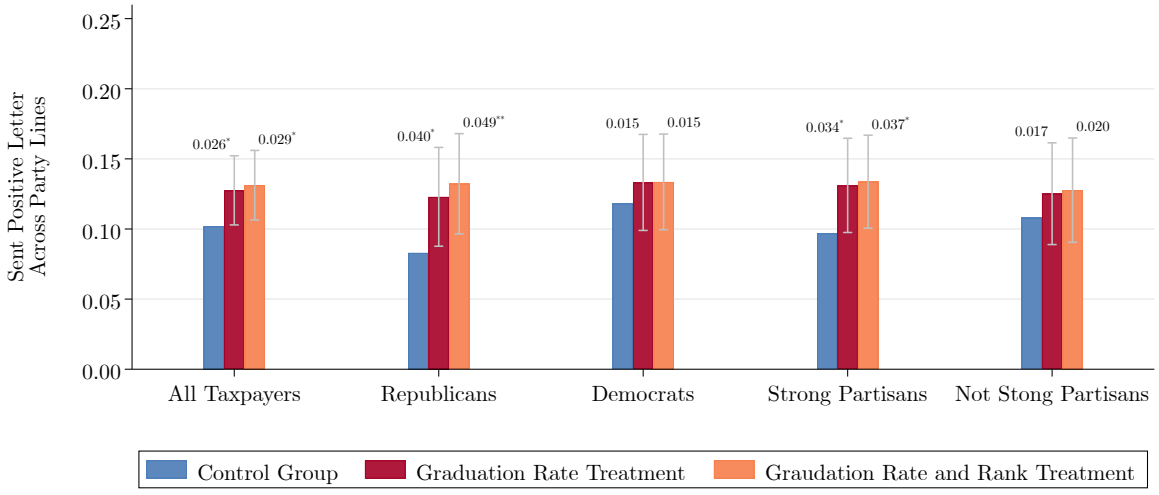
Across all partisan taxpayers, our information treatments increase the likelihood that they sent any letter to an elected official of the opposing party by about 3.5 percentage

[30]Since Independents do not have a party affiliation, they are excluded from this analysis.

Figure 8: Information Affects Taxpayers' Political Engagement



(a) Sent Any Letter Across the Aisle



(b) Sent A Positive Letter Across the Aisle

Note: Each figure presents an outcome of interest by treatment group and taxpayer characteristics along with 95% confidence intervals on the effects of the two treatments. Panel (a) reports the share of that taxpayers who wrote a letter to an elected official from the opposing party. Panel (b) reports the share of taxpayers who wrote a letter with positive Suyzhet sentiment score to to an elected official from the opposing party. Both panels reflect responses from 3,787 taxpayers who completed surveys through Qualtrics and CloudResearch for the first experiment and who at least lean towards a political affiliation.

points, or about 24%. This effect is largest and driven by Republicans, consistent with our results on ideological polarization, as well as for strong partisans.

The treatment effects on whether the taxpayer sent a positive letter directly mirror the effect on whether she sent any letter across the aisle. The effects in percentage points are slightly smaller in magnitude but similar or even larger as a percent of the control mean. Therefore, the Republican and strong partisan taxpayers who are induced to reach across the aisle after receiving information are having positive interactions on average with elected officials of the opposing party.

Overall, our results imply that information that decreases ideological polarization also reduces affective polarization. However, in our framework, we are unable to disentangle whether information directly affects the sentiment of the letters themselves, or whether it induces additional political participation among taxpayers with (latent) positive sentiment. In either case, information leads taxpayers to have more, and more positive interactions with elected officials. In our third experiment in Section 7, we consider the policy consequences of this change in a natural field experiment where we send these letters to elected officials.

6. Experiment 2: Additional Tests of Taxpayer Reasoning about the Return on Investment

Our previous results indicate that information about the public good outputs, or the graduation rate and rank, decrease ideological and affective polarization because Republicans update about their state's return on investment or productivity, perhaps too much. When Republicans who underestimate the graduation rate in their state learn the true level, they appear to treat this information as only a flattening of the marginal cost curve, and do not also update that the rate is higher because the state spends more.

In our second experiment, we study the joint role of perceptions of graduation and spending information, which together inform average productivity, on polarization. If, as we discuss earlier, information about the graduation rate decreases polarization because of partisan

reasoning, then providing spending information should (partially) undo the previous effects from providing graduation information. More specifically, Republicans who learned that the graduation rate is higher and therefore updated positively about state productivity, should update less positively (marginal cost curve shifts out by less). At the same time, other taxpayers should see minimal effects from this new spending information because the graduation information already lead them to update about spending.

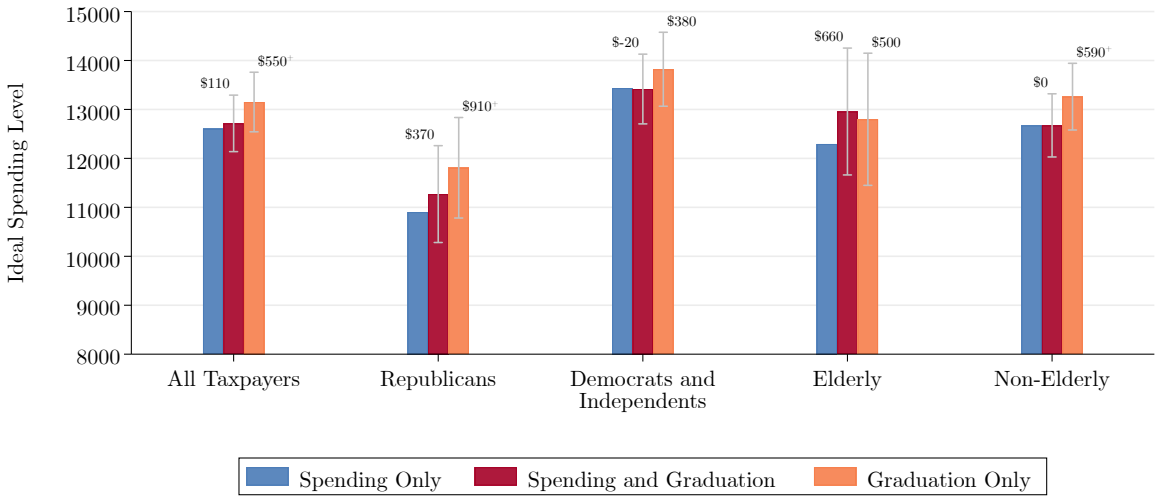
In this experiment, taxpayers are randomized to receive one of three information conditions: (1) graduation rate and rank information as in treatment 2 of experiment 1; (2) spending per student and its rank; or (3) both the information from (1) and (2). Since our main outcome on ideological polarization is a taxpayer's ideal spending level, we include treatment (2) to consider how spending information creates anchors ideal spending. The goal of treatment (3) is to shut down partisan reasoning about spending from graduation information to study its role for polarization. If Republicans' behavior is driven by updating too much about productivity because they do not appropriately update about spending, then those randomized into treatment (3) should demand less than those in (1). Additionally, if positive graduation information increases demand for expenditure because of its impact on perceived productivity, then those in (3) should demand more than those in (2). We present support for these partisan updating mechanisms in Figure 9 since spending information reduces demand compared to graduation information especially among Republicans.

To further estimate the joint role of graduation and spending perceptions on ideological polarization, we estimate how different types of taxpayers respond to different types of information from:

$$Y_i = \sum_t \left[\beta_{0,t} + \beta_{1,t}(\tilde{G} - G)\mathbb{1}(\tilde{G} - G \leq 0) + \beta_{2,t}(\tilde{G} - G)\mathbb{1}(\tilde{G} - G > 0) \right] + X\beta_3 + \varepsilon_i \quad (5)$$

where Y_i is a taxpayer's ideal spending per student, and $\tilde{G} - G$ is her graduation rate belief error, that is, her graduation rate prior minus the truth, and t is her randomized treatment

Figure 9: The Effect of Graduation and Spending Information on Demand



Note: The figure presents the average treatment effects and heterogeneity by political partisanship and age from our second experiment. We report the estimated treatment effects on taxpayer ideal spending per student from receiving information about the graduate rate and its rank relative to other states, as well as the effect of receiving both the graduation information and additionally information about level and rank of state appropriations (spending) per student, compared to only receiving spending information. *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$, $^{+}p < 0.1$

assignment. This specification is a linear spline with a knot at $\tilde{G} - G = 0$, which allow taxpayers' ideal spending to depend on both the magnitude of the belief error and its sign, in addition to their treatment.[31] We present the estimates in Figure 10 by partisanship and treatment. While this specification imposes linearity in the belief error by party and sign of the error, the results are similar when using a local polynomial.

Compared to Republicans in our graduation-only treatment who learn the graduation rate is high, those who are additionally provided spending information have ideal spending policies that are \$919 lower,[32] but the difference is not statistically significant (the right half of Panel (a)). This suggest that the spending information stops Republicans from overcorrecting about state productivity from graduation information and lowers demand, but not completely to the "no information" level. In contrast, again compared with the same

[31]It also imposes that demand is a continuous function of belief errors. When we allow for separate intercepts, the results minimally change.

[32]61 percent of these taxpayers have initial spending priors that are less than the true spending amount.

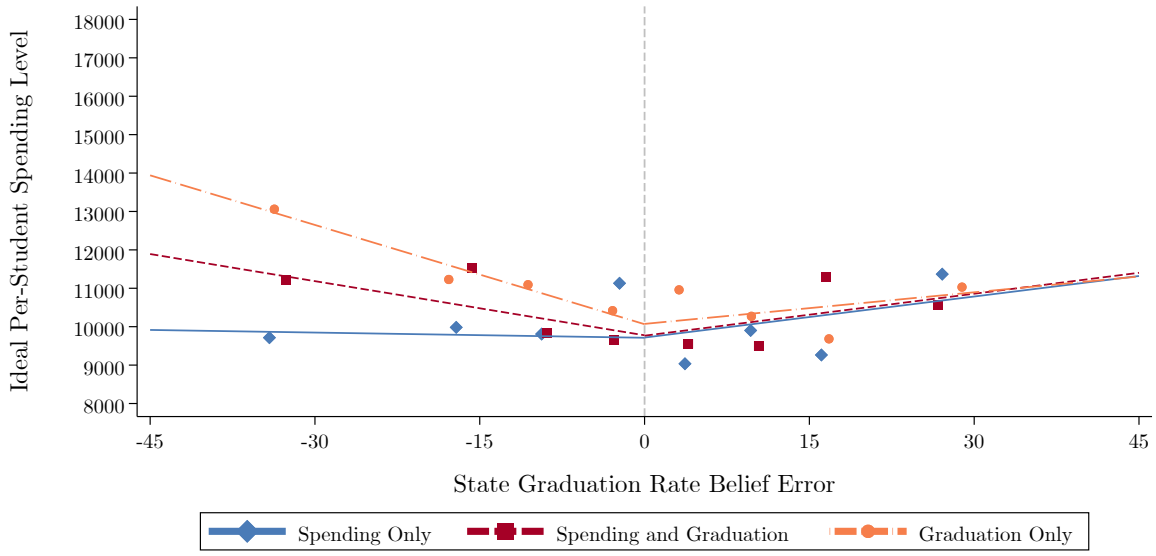
Republicans who only learn the graduation rate is high, those who only learn about spending in their state demand \$1327 less in ideal spending on average ($p = 0.099$). This pattern provides additional evidence that partisan reasoning helps explain our earlier findings, but the results are noisy.

Republicans who learn that the graduation rate is high as well as Democrats and Independents (Panel (b)) do not adjust their demand when they also learn spending information. Therefore, information about spending does not seems to interact with graduation information for these taxpayers, which provides suggestive evidence that they update about spending when they learn the graduation rate and/or rank; they appear more likely to interpret information as a movement along the marginal curves.

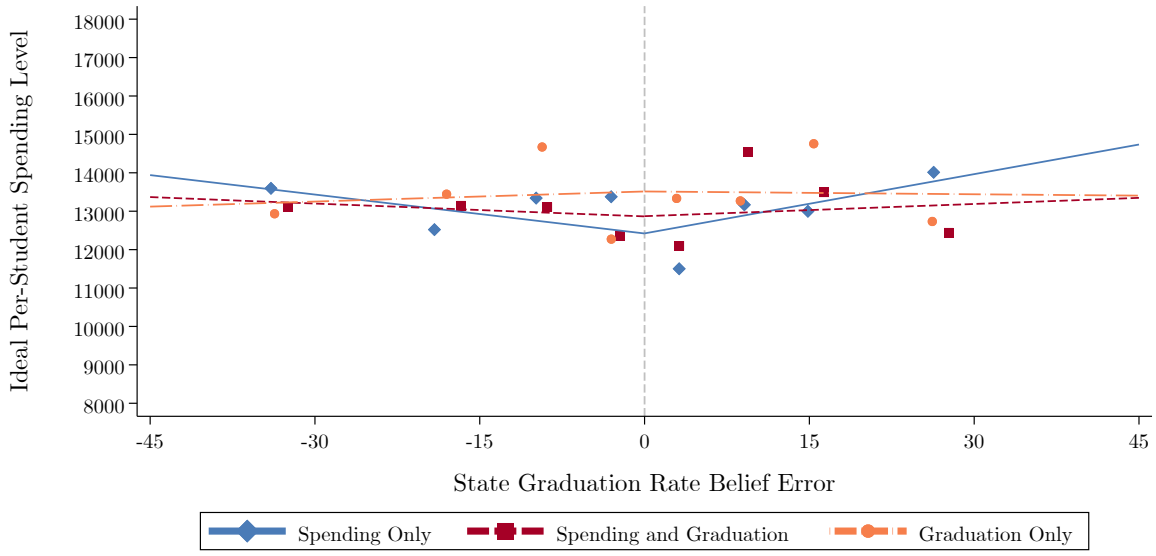
Finally, we consider the effect of spending information on affective polarization based on whether taxpayers interact with an elected official of the opposite party, and whether that interaction is positive. We present average treatment effects in Figure 11 for each measure of affective polarization by taxpayer political party and strength of partisanship. Our results suggest that spending information, compared to graduation information alone, may further reduces affective polarization even though we previously found that it increases ideological polarization, likely because of the different information content.

Consistent with our previous results, we find that effect of spending information on sending a (positive) letter across the aisle is largest for those who learn their state spends less and is therefore more productive. More specifically, Republicans who learn their state spends less are 10 percentage points more likely to send a positive letter across the aisle ($p = 0.004$) compared to Republicans in the graduation information treatment with similar priors, while we find no difference across our treatments for Republicans who initially perceive spending to be lower than the true level. Spending information may be more salient and easier to interpret for taxpayers.

Figure 10: The Effect of Graduation and Spending Information by Partisanship and Perceptions



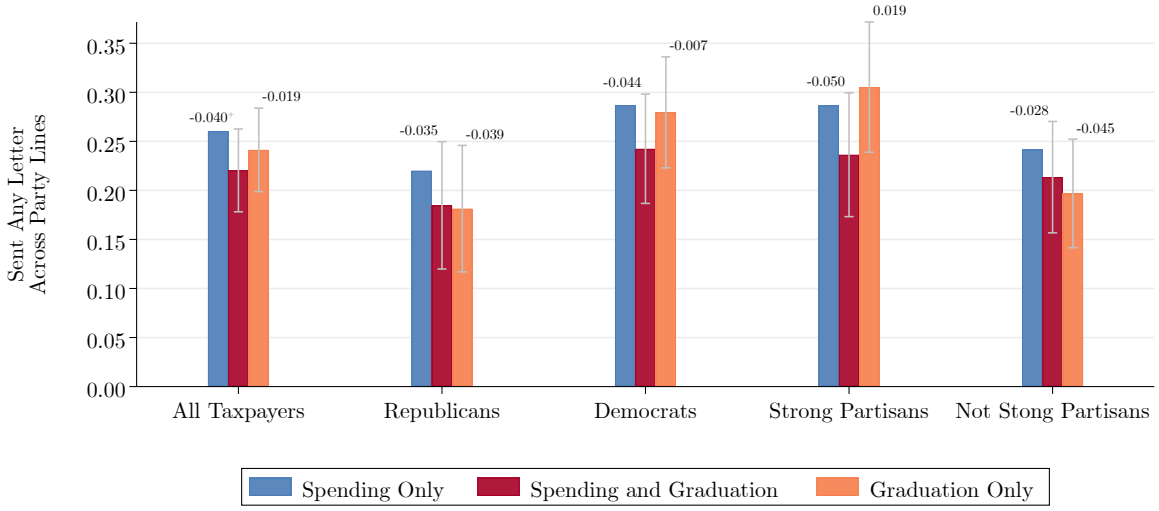
(a) Republicans



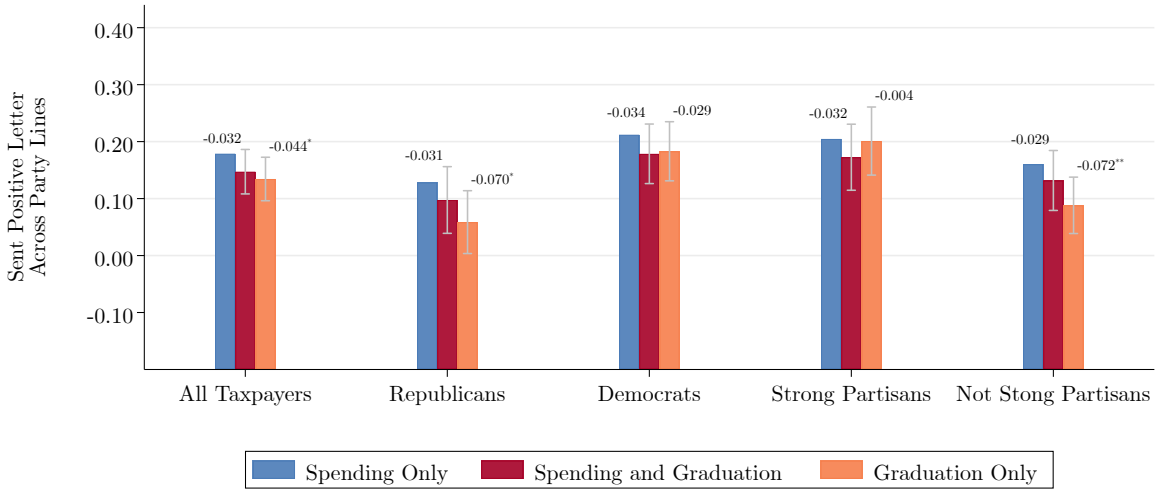
(b) Democrats and Independents

Note: This figure illustrates how the effects of information vary by partisanship and by prior perceptions of the state graduation rate. Each panel presents the ideal policies for individuals in different treatment groups over the support of their belief error about the state graduation rates, i.e., the prior perceptions minus the true rate. Panel (a) contains Republicans and Panel (b) Democrats and Independents. In both graphs, markers represent averages of four quantiles above and below zero and lines represent regression lines with varying slopes for good and bad news, restricted to be continuous at zero. Points and lines are regression adjusted for the pre-specified regression controls. Both panels reflect responses of taxpayers recruited for the second experiment.

Figure 11: Spending Information and Political Engagement



(a) Sent Any Letter Across the Aisle



(b) Sent A Positive Letter Across the Aisle

Note: Each figure presents an outcome of interest by treatment group and taxpayer characteristics along with 95% confidence intervals on the effects of the two treatments. Panel (a) reports the share of that taxpayers who wrote a letter to an elected official from the opposing party. Panel (b) reports the share of taxpayers who wrote a letter with positive Suyzhet sentiment score to to an elected official from the opposing party. Both panels reflect responses from 2,464 taxpayers who completed surveys for the second experiment and who at least lean towards a political affiliation.

7. Experiment 3: Policymaker Responses to Constituent Demand

In the first two experiments, we measure demand for public investment in higher education, in part, by collecting letters from the constituents of 48 governors, and 192 state legislators.[33] We conduct a third experiment to understand the supply-side of higher education policy and test whether (polarized) taxpayer demand affects the behavior of state policymakers. If taxpayer demand does, in fact, affect the way policymakers engage with higher education issues, then polarization in stated ideal policies will polarize actual policies. In that case, which taxpayers express their opinions on state spending and how they choose to express them have important consequences for the quality of services provided, in addition to the other negative effects of living in a polarized society.

We randomize whether elected officials receive the letters from their constituents and information about demand in April 2023 or early 2024. We then estimate the causal effect of receiving information about constituent demand on elected official behavior by comparing the 2023 behavior of officials who receive the information earlier to those who will receive it later. The experiment and pre-analysis plan were registered with the AEA RCT registry (AEARCTR-0011306).

We randomize each state-party (e.g. Michigan-Republicans) into one of three conditions. Half of the state-parties were randomized into our main treatment, *Constituent Demand*, and receive an email from the authors about constituent demand.[34] Each email contains: (1) summary statistics from the demand experiments that highlight how stated ideal spending is higher than actual national spending in the US, on average and by political partisanship and age; (2) up to three highlighted positive letters about the need for more public investment in higher education in their state; (3) a link to a document with the full set of letters; (4) a second link to a state-specific resolution for maintaining the level of higher education

[33]Individuals in each state could send a letter to up to five elected officials, except Nebraska because it has a unicameral legislature. While our sample includes individuals from all states, we did not have enough letters from North Dakota and South Dakota and so excluded those states from our randomization.

[34]For elected officials where an email was not publicly available, we use their online contact form.

appropriations per student for them to to consider and propose; and (5) an offer to meet with the authors and discuss the survey findings further. The other half of the state-parties are equally divided into a pure *Control* group, who are not contacted until 2024, and a *Contact Only* control group, who receive an initial email from us in 2023 that does not contain any specific information about demand from their constituents or nationally but contains the resolution and an offer to discuss more. Each state has one state-party in *Constituent Demand* and one in either of the two control groups.

For each contacted elected official, we measure their engagement with higher education policy by whether they view the attached resolution, whether they reply to the email, and whether they meet with us to discuss further.[35] For each of our higher education engagement outcomes of interest, H_l, for legislator l, we estimate our treatment effects from the following linear regression, and present the results in Figure 12:

$$H_l = \phi_0 + \phi_1 \text{Constituent Demand}_l + \phi_2 \text{Contact Only}_l + X\psi + \varepsilon_l \tag{6}$$

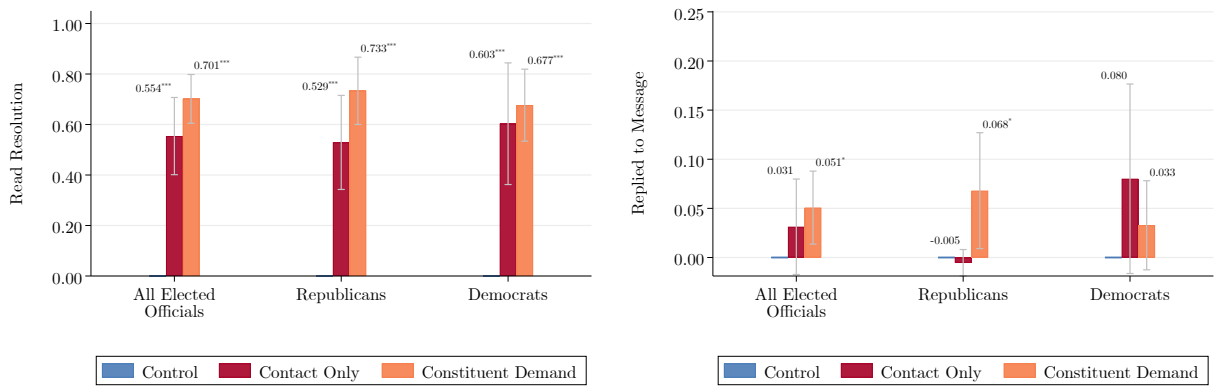
where ϕ_1 and ϕ_2 give the causal effect of receiving information about constituent demand on elected official engagement on higher education issues. In our specifications, we additionally control for the elected official's party, and her chamber. Following the discussion in de Chaisemartin and Ramirez-Cuellar (2020), since we conduct a clustered paired experiment, we cluster our standard errors by state and do not include state fixed effects.[36]

We find that providing information about constituent demand increases engagement from elected officials. Elected officials in the *Constituent Demand* treatment are 15 percentage points more likely to open our resolution to maintain higher education funding, than those who only receive a generic email from the researchers ($p = 0.034$). This is largely driven by Republican officials ($p = 0.079$), with small different from 0 effect for Democrats that are

[35] We additionally observe whether each official in the *Constituent Demand* and *Contact Only* groups opens the email, and whether those in the *Constituent Demand* treatment view the full list of letters.

[36] Including state fixed effects has minimal effect on our main estimates for all legislatures. We cannot include state fixed effects when limiting our analysis to Republicans or Democrats.

Figure 12: Elected Official Engagement on Higher Education Issues from Constituent Demand



(a) Open Resolution to Maintain Spending

(b) Send an Email Reply

Note: Each figure presents an outcome of interest by treatment and elected official characteristics along with 95% confidence intervals on the effects of the two treatments. Panel (a) reports the share of that elected official who open our resolution to maintain higher education funding. Panel (b) reports the share of elected officials who reply to our email. Both panels reflect responses from the 238 elected officials in our sample. Standard errors are clustered by state. *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$, $^{+}p < 0.1$

not statistically significant. Similarly, the *Constituent Demand* treatment also leads elected officials, especially Republicans, to engage more on higher education issues by responding to our emails, while our *Contact Only* treatment did not lead officials to engage in this way.[37]

The results from our three experiments together suggest that elected officials are setting higher education policy in response to distorted taxpayers' demands arising from incorrect perceptions. This plausibly heightens polarization in terms of the public discussions around higher education policy, and, ultimately, which policies are implemented.

8. Conclusion

Although public investment in higher education improves student outcomes like graduation rates (Bound and Turner, 2007; Bound et al., 2010; Deming and Walters, 2017) and higher education provides a broad public good (Moretti, 2004b), states have not prioritized its

[37]For Republican elected officials, the difference in the likelihood they respond to our *Constituent Demand* email, compared to the generic *Contact Only* email, is statistically different from 0 ($p = 0.024$).

funding. Our results indicate that taxpayers' beliefs about the return on investment for their state are an important driver of this decline as well as polarization in higher education services across states. When taxpayers, especially Republicans, believe that the their state spends a lot to support public higher education, without producing a sufficient number of graduates, they do not want to continue supporting the system with their tax dollars. We provide formal evidence that this channel helps explains low support, and likely contributes to state divestment.

In light of these considerations, state policymakers who are cognizant and responsive to their constituents' needs as we find in our final experiment, may want to tie public investment in higher education to local accountability measures. As highlighted in the letters to elected officials collected in our experiment, taxpayers are more sympathetic to funding students in certain fields who will both graduate and remain in state—which increases the perceived or actual return on investment.[38] New York has already implemented such a policy, the "Excelsior Scholarship." While these policies may have more political tractability by tying the benefits of producing a college-educated workforce to the taxpayers who fund the services, they may be unrealistic or have negative unintended consequences since highly educated workers are also mobile. Tying support to the location of graduates also likely has implications for how colleges use high out-of-state and international student tuition to subsidize in-state students (e.g. Bound et al., 2020). The federal government, in this case, may be better suited to ensure support for colleges. However, since our results suggest taxpayers care about the state's position relative to other states (their rank), there may be some advantages to allowing for state competition as well.

Which policies are implemented not only affects provision but the way partisans view each other, and therefore social cohesion as well. Our results suggest that low spending levels that lead to underfunded and low quality services can exacerbate affective polarization. Our work

[38]For example, "If we give more money toward students should be requirement [sic] they reside in Wisconsin for period of time or are required to reimburse rather than taxpayer funding education for them to get money and then move elsewhere. Possibly State tax credit after than graduate as long ad [sic] paying Wisc taxes."

contributes to a somewhat divided literature,(e.g. Lelkes, 2018), on the connection between ideological and affective polarization. We provide evidence that they do in fact appear to reinforce one another. Therefore, state divestment in public higher education may not only negatively affect colleges and students, but may have broader implications for societal interactions.

Overall, our results highlight the role of perceptions and the value of information about public higher education and state productivity for providing public goods. Information, in our setting, decreases ideological and affective polarization because Republicans initially believe that their states are less productive, but are more likely to interpret information that the graduation rate is high as a signal that their state is productive compared to Democrats and Independents. Altering perceptions for other public goods and services may not have the same benefits for reducing either ideological or affective polarization based on how different types of people reason about tax and expenditure policy. Nonetheless, our results help us understand the extent to which partisan reasoning matters and our work provides a framework for assessing its role in other settings.

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Online Appendix

A Balance **53**

B Other Evidence of Partisan Reasoning **55**

C Survey Questions and Treatments for Experiments 1 and 2 **56**
C.1 Demographic Questions 56
C.2 Measuring Priors 57
C.3 Information Treatments 58
C.4 Survey Outcomes 59
C.5 Behavioral Outcomes 60
C.6 Additional Questions 61
C.7 *Updating Questions 61

D Treaments for Experiment 3 **63**
D.1 Control 63
D.2 Treatment 63

A. Balance

Table A1: Balance Table for Experiment 1

Panel A: Belief Errors	Mean	Control	Rate	Rate and Rank	Control - Rate	Control - Both
US graduation rate	1.283	1.078	2.052	0.704	-0.974	0.375
	(17.5)				[p=0.114]	[p=0.556]
State Graduation Rate	0.591	0.246	1.195	0.316	-0.950	-0.070
	(19.1)				[p=0.166]	[p=0.918]
State Graduation Rank	6.799	6.619	6.756	7.021	-0.138	-0.402
	(16.0)				[p=0.809]	[p=0.485]
State Per-Student Spending	2894	2786	2873	3023	-87	-238
	(7019)				[p=0.730]	[p=0.346]
State Spending Rank	3.359	2.848	3.309	3.913	-0.461	-1.065
	(18.2)				[p=0.474]	[p=0.105]
Panel B: Respondent Characteristics	Mean	Control	Rate	Rate and Rank	Control - Rate	Control - Both
Female	0.500	0.494	0.494	0.512	0.000	-0.018
	(0.500)				[p=0.991]	[p=0.315]
Republican	0.368	0.377	0.362	0.367	0.015	0.010
	(0.482)				[p=0.385]	[p=0.579]
No College	0.348	0.345	0.349	0.349	-0.004	-0.004
	(0.476)				[p=0.802]	[p=0.801]
BA Degree	0.364	0.364	0.361	0.367	0.003	-0.003
	(0.481)				[p=0.878]	[p=0.845]
Age	61.98	61.11	60.93	60.89	0.18	0.23
	(16.2)				[p=0.755]	[p=0.699]
Attend Public	0.314	0.313	0.319	0.310	-0.007	0.002
	(0.464)				[p=0.695]	[p=0.893]
Child Attended	0.239	0.238	0.244	0.233	-0.006	0.005
	(0.426)				[p=0.709]	[p=0.746]
Child May Attend	0.722	0.708	0.734	0.724	-0.026	-0.016
	(0.448)				[p=0.111]	[p=0.323]
Follows College Sports	0.363	0.366	0.374	0.350	-0.007	0.016
	(0.481)				[p=0.670]	[p=0.357]
Observations	4,679	1,535	1,585	1,559	3,120	3,094

Note: Each row presents the overall sample mean, mean by treatment group, and the difference between the two treatments and control. The standard deviations are also listed in parentheses in the overall mean column.

Table A2: Balance Table for Experiment 2

Panel A: Belief Errors	Mean	Rate Only	Spending Only	Spending and Graduation	Spending - Both	Spending - Graduation
US graduation rate	0.662	0.269	1.219	0.498	-0.951	-0.229
	(16.25)				[p=0.184]	[p=0.753]
State Graduation Rate	-0.068	-0.861	0.788	-0.126	-1.649	-0.735
	(18.44)				[p=0.042]	[p=0.374]
State Graduation Rank	3.405	3.703	2.988	3.524	0.715	0.179
	(14.97)				[p=0.287]	[p=0.786]
State Per-Student Spending	1775	1590	2073	1660	-483	-70
	(6643)				[p=0.101]	[p=0.815]
Sate Spending Rank	2.210	3.052	1.720	1.844	1.332	1.207
	(17.26)				[p=0.081]	[p=0.119]
Panel B: Respondent Characteristics	Mean	Rate Only	Spending Only	Spending and Graduation	Spending - Both	Spending - Graduation
Female	0.555	0.548	0.558	0.560	-0.010	-0.012
	(0.497)				[p=0.661]	[p=0.576]
Republican	0.326	0.329	0.322	0.328	0.008	0.001
	(0.469)				[p=0.715]	[p=0.970]
No College	0.226	0.215	0.231	0.232	-0.016	-0.017
	(0.418)				[p=0.379]	[p=0.357]
BA Degree	0.429	0.423	0.429	0.436	-0.006	-0.013
	(0.495)				[p=0.789]	[p=0.559]
Age	45.2	45.3	45.0	45.3	0.3	0.0
	(16.0)				[p=0.671]	[p=0.955]
Attend Public	0.453	0.468	0.436	0.456	0.032	0.012
	(0.498)				[p=0.144]	[p=0.590]
Child Attended	0.165	0.166	0.154	0.174	0.012	-0.008
	(0.371)				[p=0.474]	[p=0.646]
Child May Attend	0.778	0.779	0.777	0.778	0.003	0.001
	(0.416)				[p=0.892]	[p=0.949]
Follows College Sports	0.397	0.418	0.382	0.393	0.036	0.025
	(0.489)				[p=0.093]	[p=0.245]
Observations	3,037	1,024	1,017	996	2,041	2,020

Note: Each row presents the overall sample mean, mean by treatment group, and the difference between the two treatments and control. The standard deviations are also listed in parentheses in the overall mean column.

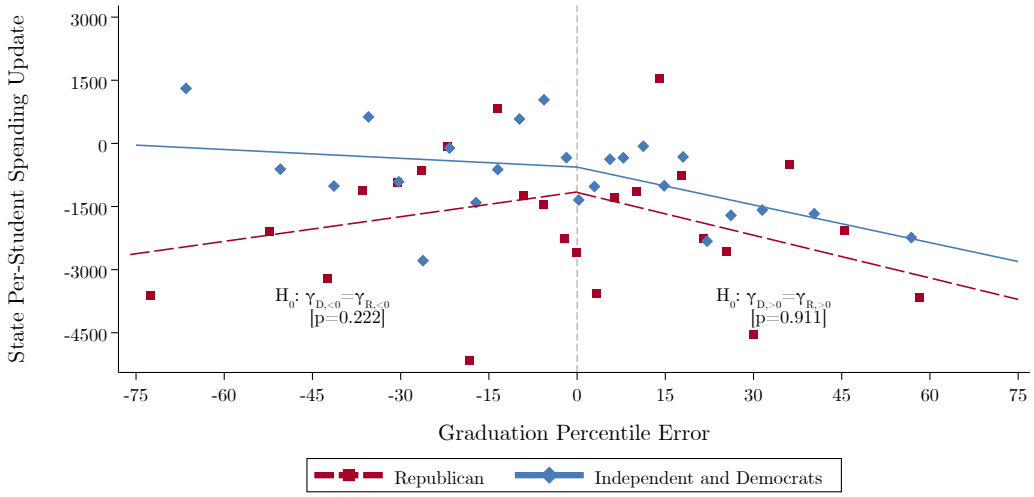
Table A3: Balance Table for Experiment 3

	Mean	Pure Control	Contact Control	Constituent Demand	Constituent - Either Control	Constituent - Contact
Republican Governor	0.202	0.190	0.226	0.195	-0.013	-0.031
	(0.402)				[p= 0.777]	[p= 0.541]
Republican House	0.395	0.397	0.387	0.398	0.007	0.011
	(0.490)				[p= 0.777]	[p= 0.659]
Republican Sentate	0.403	0.414	0.387	0.407	0.007	0.020
	(0.492)				[p= 0.777]	[p= 0.448]
Per student spending in respondent's state	8058	7883	7898	8227	337	330
	(3969)				[p= 0.148]	[p= 0.502]
Spending Rank (/50)	25.4	25.9	26.2	24.8	-1.2	-1.4
	(14.7)				[p= 0.156]	[p= 0.539]
State Rate (%)	59.0	59.1	59.8	58.5	-1.0	-1.3
	(8.7)				[p= 0.053]	[p= 0.360]
State Rank (/50)	25.0	25.0	23.4	25.8	1.6	2.3
	(14.6)				[p= 0.062]	[p= 0.342]

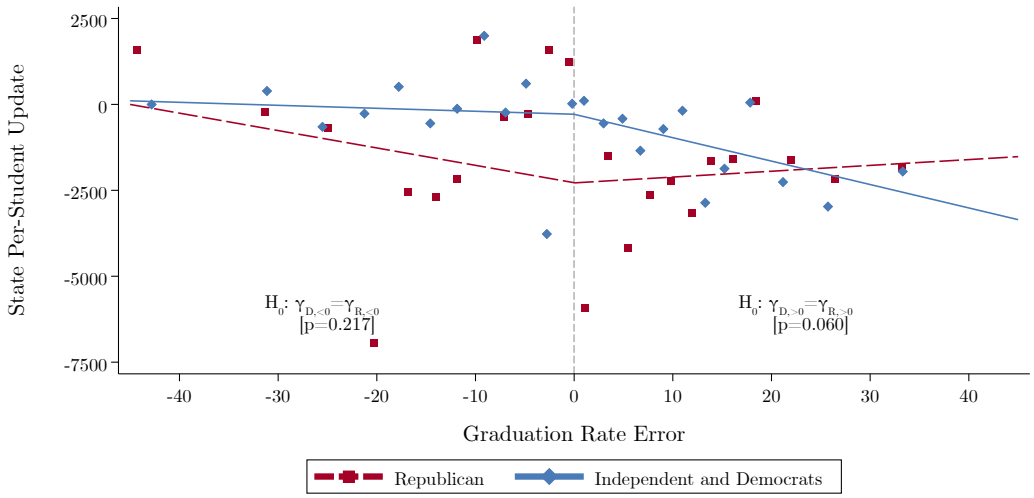
Note: Each row presents the overall sample mean, mean by treatment group, and the differences between the two controls and constituent demand and between the contact control and constituent demand. The standard deviations are also listed in parentheses in the overall mean column.

B. Other Evidence of Partisan Reasoning

Figure B1: Additional Evidence of Partisan Reasoning from Graduation Information



(a) Graduation Rank Information Changes



(b) Graduation Rate Information Changes

Note: This figure illustrates differences in updating by partisanship and priors. Each panel presents the change in the perceived state per-student spending for individuals with different partisan identity over their belief errors, i.e., the prior perceptions minus the true value. Panel (a) shows updating about the state graduation percentile rank and Panel (b) shows updating about the state graduation rates. In both graphs, markers represent averages of 12 quantiles above and below zero and lines represent regression lines with varying slopes for good and bad news, restricted to be continuous at zero. Points and lines are regression adjusted for the prespecified regression controls. Panels reflect responses of taxpayers recruited for our second experiment from CloudResearch.

C. Survey Questions and Treatments for Experiments 1 and 2

*Only included in Experiment 2

C.1 Demographic Questions

- To start, select the state where you live:
  Subject chooses state from dropdown list.
- What is your gender?
  Male; Female; Non-binary/third gender; Prefer not to say
- What is the highest level of education you have completed
  Less than a high school degree; High school degree or equivalent; Some college but no degree; Associate degree; Bachelor's degree; Graduate degree (e.g., Master's, JD, MD, PhD)
- Generally speaking, do you consider yourself to be a:
  Strong Republican, Not very strong Republican, Independent leaning Republican, Independent, Independent leaning Democrat, Not very strong Democrat, Democrat
- How old are you?
  Subject enters answer in a text box
- Which of the following best describes your current employment situation?
  Employed, working 40 or more hours per week; Employed, working 1-39 hours per week; Not employed, looking for work; Retired; Disabled, not able to work
- What is your residential zip code?
  Subject enters answer in a text box
- Choose one or more races you consider yourself to be.
  White; Asian; Black of African American; Native Hawaiian or Pacific Islander; American Indian or Alaska Native; Other (with text box in which to specify)
- Are you Spanish, Hispanic, Latino, or none of these?
  Yes; None of these
- How frequently do you watch [Subject's State]'s public colleges' sports teams compete? This can includes both in-person and remote (radio, television)
  Never; Once a year; 2-5 times a year; 6-15 times a year; 16+ times a year
- Do you have any children who have attended (or are currently attending) a public college in [Subject's State]?
  Yes; No
- How likely is it that one of your children will someday attend a public college in [Subject's State]?
  Very Unlikely; Unlikely; Likely; Very Likely; NA

- Previously, you indicated that you have attended at least some college. Have you attended or are you currently attending a public college in [Subject's State]?
  Yes, I am currently attending a public college in [Subject's State], Yes, I have attended a public college in [Subject's State]; No. I have attended public college, but not in [Subject's State]; No, I have never attended a public college.

C.2 Measuring Priors

- What percent of students who enroll in public four-year colleges in the United States graduate within six years of enrollment? Use the slider below to indicate your guess.
  Participants indicate answer using a sliding bar on a scale between 0 and 100 on increments of 1.

- What percent of students who enroll in public four-year colleges in [Subject's State] graduate within six years of enrollment? Use the slider below to indicate your guess.
  Participants indicate answer using a sliding bar on a scale between 0 and 100 on increments of 1.

- Where does [Subject State's] graduation rate rank relative to other states? Use the slider below to indicate your guess.

  NOTE: A rank of 1 means you believe [Subject's State] has the country's lowest graduation rate.
  Participants indicate answer using a sliding bar on a scale between 1 and 50 on increments of 1.

- In 2019, how many tax dollars did [Subject's State] spend per student at public four-year colleges? Use the slider below to indicate your guess in $1000s.
  Participants indicate answer using a sliding bar on a scale between 0 and 25 on increments of 0.10.

- How does [Subject's State]'s spending per student rank relative to other states? Use the slider below to indicate your guess.

  NOTE: A rank of 1 means you believe [Subject's State] spends more tax dollars per student than any other state; a rank of 50 means you believe [Subject's State] spends fewer tax dollars per student than any other state.
  Participants indicate answer using a sliding bar on a scale between 1 and 50 on increments of 1.

C.3 Information Treatments

- Please take a moment to review these tables and see how close your guesses were to the true values.

Participants in the first experiment are randomized to see either Figure B1 or Figure B2, or to not see this screen at all. Participants in the second experiment are randomized to see only Figure B2, Figure B2 and Figure B3, or to not see this screen at all.

Figure B1: Graduation Rate

Graduation Rates for Public Four-Year Colleges in Alabama

	Your Guess	**True Value**	**Difference**
Graduation Rate	30%	**57%**	**27%**

Figure B2: Graduation Rate and Rank

Graduation Rates for Public Four-Year Colleges in Alabama

	Your Guess	**True Value**	**Difference**
Graduation Rate	30%	**57%**	**27%**
Rank Among US States	15 / 50	**27 / 50**	**12**

Figure B3: Spending Level and Rank

Spending on Public Four-Year Colleges in Alabama

	Your Guess	**True Value**	**Difference**
Spending Level	$5000	**$5667**	**$667**
Rank Among US States	15 / 50	**34 / 50**	**19**

C.4 Survey Outcomes

- How much do you think [Subject's State] should spend per student each year at public four-year colleges (in $1000s)?

  Participants indicate answer using a sliding bar on a scale between 0 and 30 on increments of 0.10.

- Imagine [Subject's State] spends an additional $100 per student on public four-year colleges next year. As a result of this additional spending...

  ...how much would you expect enrollment at public four-year colleges to increase (in percent)? A negative number indicates fewer students would enroll.
  Participants indicate answer using a sliding bar on a scale between -5 and 5 on increments of 0.10.

  ...how much would you expect the graduation rate for four-year colleges to increase (in percent)? A negative number indicates a lower proportion of students would graduate.
  Participants indicate answer using a sliding bar on a scale between -5 and 5 on increments of 0.10.

- Now imagine [Subject's State] collects an additional $1 in tax revenue each year from every resident in the state to spend on public four-year colleges in [Subject's State]. To what extent do you agree with the following statements regarding this change?

  (1) The average person in [Subject's State] would be better off.
  Strongly disagree, Somewhat disagree, Neither agree or disagree, Somewhat agree, Strongly agree
  (2) I personally would be better off.
  Strongly disagree, Somewhat disagree, Neither agree or disagree, Somewhat agree, Strongly agree
  (3) New graduates from public four-year colleges would have better careers.
  Strongly disagree, Somewhat disagree, Neither agree or disagree, Somewhat agree, Strongly agree

- To what extent do you agree with the following statements?

  (1) I trust that public four-year colleges in [Subject's State] use taxpayer dollars well.
  Strongly disagree, Somewhat disagree, Neither agree or disagree, Somewhat agree, Strongly agree
  (2) I personally would be better off.
  Strongly disagree, Somewhat disagree, Neither agree or disagree, Somewhat agree, Strongly agree

(3) [Subject's State] should shift the cost of public higher education from taxpayers to students by charging higher tuition.
(4) The federal government should increase financial support for public four-year colleges.
Strongly disagree, Somewhat disagree, Neither agree or disagree, Somewhat agree, Strongly agree

C.5 Behavioral Outcomes

- Thank you for sharing your opinions regarding state spending on public four-year colleges in [Subject's State].

  We'd now like to give you a chance to share your thoughts about public higher education with your elected officials.

  We will compile any comments you make in a report for [Subject's State] state officials.

  If you wish to make any comments, please provide them here:
  Participants are provided an essay text box in which to make their comments.

  Who would you like us to send these preferences to? Please select at least one.
  The Governor of [Subject's State]; The Republican leader in the [Subject's State] House of Representatives; The Democrat leader in the [Subject's State] House of Representatives; The Republican Leader in the [Subject's State] Senate; The Democratic Leader in the [Subject's State] Senate; I do not wish to make any comments

- *Thank you for sharing. In addition to what you just wrote, would you like to add one of the below statements to your message to your representative?
  I believe [Subject's State] should (select one)...
  increase its spending on public higher education; decrease its spending on public higher education; not change its spending on public higher education; I do not want to add any of these additional statements

- *because...
  it's important for [Subject's State] to be a leader on public higher education, it's not important for xx to be a leader on public higher education, [Subject's State]'s spending on higher education generally strengthens the economy, [Subject's State]'s spending on higher education generally goes to waste, [Subject's State] is responsible for providing college education for students, [Subject's State] is not responsible for providing college education to students, I do not want to add any of these additional statements

- We'd also like to give you a chance to directly support public higher education in [Subject's State] .

  As part of this survey you can donate up to $0.25 to higher education in [Subject's State] , keeping any money you do not donate as a bonus payment (for example, you could choose to donate $0.10 and keep $0.15).

In the first box below, please type the name of the public university in [Subject's State].

Please use the slider to choose the amount you wish to donate.

COLLEGE NAME:
Subject enters university name in a text box; Subject indicates donation amount using a sliding bar on a scale between 0 and 0.25 on intervals of 0.01.

C.6 Additional Questions

- Before we finish, we're interested in how you think about state spending on higher education. When you said that [Subject's State] should spend [Subject's answer from previous question] per student annually on public higher education, what were the main considerations that came to your mind?
  Participants are provided an essay text box in which to make their comments.

- What do you think the graduation rate and its rank relative to other states says about public higher education in [Subject's State]?
  Participants are provided an essay text box in which to make their comments.

C.7 *Updating Questions

- As a final exercise, please take a moment to review this table and see how close your guess regarding graduation rates in [Subject's State] was to the true value. Please also review your previous guess regarding how this rate ranks relative to other US states.

- Considering the information above, please again provide an estimate as to how much you believe [Subject's State] spent in tax dollars per student at public four-year colleges in 2019. As before, Use the slider below to indicate your guess in $1000s. *Participants indicate answer using a sliding bar on a scale between 0 and 25 on increments of 0.10.*

- Considering the information above, please again provide an estimate as to where you believe [Subject's State]'s spending on higher education ranks relative to other states. As before, please use the slider below to indicate your guess.

  NOTE: A rank of 1 means you believe [Subject's State] spends more per student on higher education than all other states; a rank of 50 means you believe [Subject's State] spends less per student on higher education than any other state.
  Participants indicate answer using a sliding bar on a scale between 1 and 50 on increments of 1.

- Considering the information above, please again provide an estimate as to what percent of students who enroll in public four-year colleges in [Subject's State] graduate within six years of enrollment. Use the slider below to indicate your guess.
  Participants indicate answer using a sliding bar on a scale between 0 and 100 on increments of 1.

- Considering the information above, please again provide an estimate as to where [Subject's State]'s graduation rate ranks relative to other states? Use the slider below to indicate your guess.

  NOTE: A rank of 1 means you believe [Subject's State] has the country's highest graduation rate; a rank of 50 means you believe [Subject's State] has the country's lowest graduation rate.
  Participants indicate answer using a sliding bar on a scale between 1 and 50 on increments of 1.

D. Treaments for Experiment 3

In experiment 3, a set of state politicians, including governors as well as Democratic and Republican leaders of states' houses of representatives and senates, were randomized to receive emails. All of these emails included an invitation to review a draft resolution preventing further reductions in state higher education appropriations. The randomized difference was whether these messages included or did not include information about information regarding preferences for higher education spending gathered from our survey experiments. The emails were sent from one of the authors' official university account. For illustration, here are the control and treatment emails for politicians in Montana.

D.1 Control

Dear [Politician's name],

My name is [Researcher's name], and I am an economist at the [Researcher's university]. My collaborators and I study support for higher education at state colleges and universities.

Over the last few years many states have drastically cut spending on public higher education. In light of this and our survey results, we invite you to propose a resolution preventing further reductions of higher education appropriations in Montana. A draft resolution for Montana, including information on historical appropriations, can be found here: [Link to resolution]

Finally, we would appreciate the opportunity to talk more about higher education in Montana. If you would like to meet, please send us a few times when you are available. If you have any other questions, comments, or further considerations, we would also love to hear from you.

Sincerely,
[List of research team names and academic affiliations].

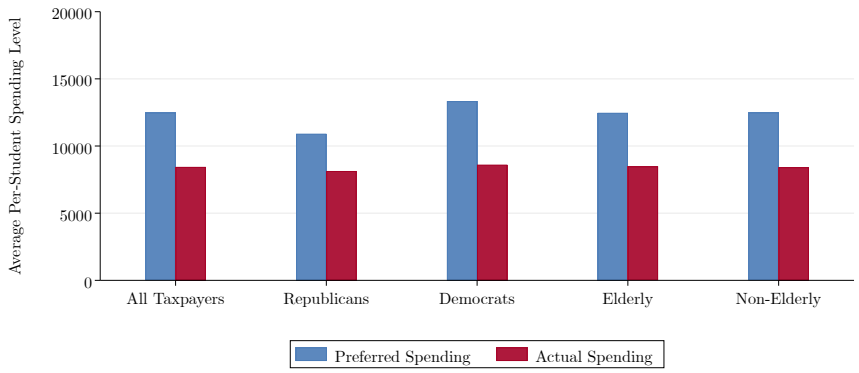
D.2 Treatment

Dear [Politician's name],

My name is [Researcher's name], and I am an economist at the [Researcher's university]. My collaborators and I study support for higher education at state colleges and universities.

We recently surveyed taxpayers in all fifty states and found that, on average, they would prefer their states to spend more per student on four-year colleges than they currently do. The figure below summarizes our findings, revealing that across partisan and generational lines, taxpayers would prefer 30-60% more spending on public higher education.

Figure B1: Graduation Rate



In addition to these findings from our nation-wide survey, a number of responding taxpayers in Montana specifically asked us to share their support for public higher education with you.

- *Public higher education in Montana is important and should be supported by Montana's government. By providing support to higher education, the state of Montana will grow as more people become college graduates. (Republican, Age 54)*

- *Investing in our young people will benefit the state more then not investing in them. (Democrat, Age 74)*

A full list of comments directed to you can be found here: [Link to comments]

Despite this taxpayer preference for higher spending, over the last few years many states have drastically cut spending on public higher education. In light of this and our survey results, we invite you to propose a resolution preventing further reductions of higher education appropriations in Montana. A draft resolution for Montana, including information on historical appropriations, can be found here: [Link to resolution]

Finally, we would appreciate the opportunity to talk more about higher education in Montana. If you would like to meet, please send us a few times when you are available. If you have any other questions, comments, or further considerations, we would also love to hear from you.

Sincerely,
[List of research team names and academic affiliations].