# Partisan Reasoning and the Polarized Support for Higher Education

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**Abstract**

We conduct three theoretically-motivated experiments to study the polarized demand for public spending on higher education. Our first two experiments provide information treatments that differentially alter perceptions of public service provision based on how individuals reason about cost-effectiveness. The treatments changed ideal spending policies, generated engagement in a political letter-writing campaign, and reduced ideological and affective polarization. Consistent with the model, effects are driven by individuals whose reasoning reduced perceived under- or over-provision. Then in a field experiment with elected officials, we find that these changes in constituent behavior shape officials' engagement on higher education issues. Our findings highlight how differences in reasoning by partisanship and beliefs—not solely heterogeneous tastes—shape policy preferences and, as a consequence, both ideological and affective polarization.

**Keywords:** polarization, perceptions, field experiments, higher education finance
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## 1. Introduction

Across policy domains, determining how much to fund public services sparks significant controversy. While individual preferences and social views certainly inform these disagreements, perceptions about the cost-effectiveness of government spending are also predictive of support (Stantcheva, 2021). These perceptions are not exogenous but are actively formed through *reasoning* processes that reflect individuals' identities and priors (Alesina et al., 2020). Equilibrium policy therefore depends on which inferences individuals draw as they reason about service provision and how their policy views and behaviors respond. Using a model and three experiments, we study how people reason about public services, what mechanisms drive reasoning differences, and what this means for polarization and policy.

We propose a price-theoretic framework illustrating the implications of different ways of reasoning. In the model, individuals' policy views and political behavior are informed by preferences and by imperfect perceptions of two objects: the level of public-service spending and the cost-effectiveness of that spending. Because these objects jointly determine public-service outputs, new signals require *reasoning* to update about spending or cost-effectiveness (or both). Although other research often holds perceptions of cost-effectiveness fixed (typically to gain tractability in other dimensions, e.g., Lergetporer et al., 2018; Roth et al., 2021), reasoning about spending and reasoning about cost-effectiveness imply theoretically distinct effects on policy views and political behavior. The prevalence, distribution, and drivers of each type of reasoning are therefore first-order considerations for equilibrium policy and polarization.

We study reasoning in the context of US public higher education for three reasons. First, it is a large public service with a puzzling pattern of divestment. Despite its significant private and social returns (e.g., Chetty et al., 2020; Hendren and Sprung-Keyser, 2020), state support for higher-education spending has been falling over the last 30 years (Bound et al., 2019; Jones, 2024). Second, perceptions of cost-effectiveness are one of the three most common concerns with higher education (Jones, 2024)—along with social issues and private economic returns. Finally, there is growing political polarization surrounding higher education. For example, Democrats are twice as likely as Republicans to think that higher education has a positive effect "on the way things are going" in the United States (Parker, 2019). And these patterns may be affected by differences in reasoning.

We conduct three experiments to understand how reasoning about public service provision affects support for public higher education in the United States. In two survey experiments, we elicit individuals' perceptions of public higher education and then invite them to reason about public service provision by randomizing exposure to information on the graduation

rate at public colleges in their state (a signal of public service "outputs") and appropriations per student (spending "inputs"). Critically, the experiments allow individuals to attribute the signals between spending and cost-effectiveness.[1] Using individuals' stated policy views and behavior in an embedded letter-writing campaign with elected officials, we use the first experiment to test two model predictions about how differences in reasoning should affect policy views and political participation. The second experiment directly tests the mechanism of reasoning about cost-effectiveness and allows us to explore the cognitive processes related to differences in reasoning. Finally, in the third experiment, we randomize when elected officials receive the letters to measure how constituent demand affects policymaker behavior on the supply side of the policy market.

The first experiment reveals differences in reasoning that drive polarization in policy views and political participation. With regards to policy views, the model has a strong prediction that the graduation-rate signal will change individuals' ideal policies *if and only if* they reason about cost-effectiveness. As such, finding a reduced-form effect of the information treatment on ideal spending levels implies that this heretofore ignored reasoning channel meaningfully effects policy views. We find exactly this in the data. Reasoning about graduation information increases average ideal spending by 5% ($600 per student). Furthermore, because responses to information vary by party and prior, reasoning about graduation information closes 30% ($800) of the partisan gap in ideal spending policies—implying that differences in reasoning are a first-order driver of ideological polarization.

The results from the first experiment also confirm model predictions about differences in reasoning and political participation. In the model, political participation decisions are a function of the distance between individuals' ideal policies and their perceptions of status-quo policy. Neoclassical economic intuition suggests that increasing this perceived distance raises the expected marginal benefits of participation, but work in political science suggests it may also increase the "affective" costs of participation—particularly with out-partisan elected officials (e.g., Broockman and Ryan, 2016). Using the embedded letter-writing campaign, we find reasoning about graduation information increases letter-writing by 12%—an effect almost entirely driven by positive letters sent to out-partisan elected officials. Consistent with our theory, the only groups who write more letters are those that tend to reason that perceived distance is less severe than originally perceived. Together these results from the first experiment indicate that reduced ideological polarization ameliorates affective polarization and suggest that credibly changing partisan perceptions could soften contentious policy conversations around higher education or other policy issues.

[1] This innovation complements past approaches where researchers nudge participants to reason in specifics ways, e.g. Stantcheva (2021), allowing us to study how people endogenously reason from information.

The second experiment directly confirms that the differences in reasoning center around perceptions of cost-effectiveness in two ways. First, given the model-implied link between effect size and reasoning about cost-effectiveness, the second experiment elicits posterior perceptions after reasoning about graduation. We compare the reasoning of groups who experience larger and smaller treatment effects in Experiment 1. Conditional on prior, Republicans' ideal policies respond more to graduation information—and they reason more about cost-effectiveness. Similarly, and conditional on party, individuals who originally under-estimate graduation rates respond more to graduation information—and they also reason more about cost-effectiveness. Second, we jointly randomize spending and graduation information and find no effects for groups who tend to reason only about spending but suggestive evidence of effects for those who reason about cost effectiveness.

Understanding how reasoning difference could affect other policy contexts requires understanding the cognitive processes that drive them. The second experiment includes additional survey questions and open-ended responses that enable us to explore what drives the reasoning differences we document. Using the taxonomy of Benjamin (2019), we find little evidence of Bayesian updating or motivated reasoning based on priors. Instead, we find repeated evidence that reasoning differences are driven by preference-based reasoning, in which individuals update toward "better" states of the world. In particular, we find evidence that most groups reason in ways that reduce the perceived distance between their ideal policies and the status quo. This pattern is consistent with the treatment effects on policy views and political participation in Experiment 1, suggesting that affective and ideological polarization both grow out of asymmetrical reasoning about "better" states of the world.

Finally, we demonstrate how the effects of reasoning matter for policy in our third experiment. We examine policymakers' responses to constituent demand by randomizing when 238 governors and state legislators receive the letters elicited in the first two experiments. Elected officials, or their staff, who learn about constituent demand are more likely to click on a proposed resolution to maintain state funding for public colleges compared to those who receive a similar email without information about constituent demand. Emails including this information also generate more responses but we are not powered to detect effects on costlier actions. These results suggest that over-polarized political engagement, driven in part by misperceptions and preference-based reasoning, may have negative societal consequences because they bias policymaker perceptions and behavior.

We make several main contributions. First, we provide and empirically verify price-theoretic explanations for two puzzles in the information-provision literature: why information changes beliefs but not policy preferences, and why individuals—both across and within parties—reason differently from the same information. The key theoretical insight is that

whenever an economic outcome is co-determined by structural factors and policy responses (e.g., cost-effectiveness and spending level), new information requires reasoning about which changed. Although this endogenous reasoning channel is often ignored, we document its quantitative importance and demonstrate how it can arise out of preference-based reasoning (e.g., Benjamin, 2019; Möbius et al., 2022). We show that many individuals reason in ways that reduce the misalignment between their ideal policies and the status quo, rationalizing both the inter- and intra-party heterogeneity of our reduced-form effects, and complementing descriptive evidence on cross-party reasoning differences (as in Alesina et al. (2020) and Stantcheva (2021)) and psychologically-motivated reasoning differences among co-partisans (e.g., Chinoy et al. (2023)). This reasoning mechanism also gives a potential explanation for why information interventions so often change beliefs without affecting policy preferences (e.g., Kuziemko et al., 2015; Alesina et al., 2018, 2021; Roth et al., 2022). In our setting, we show that preference-based reasoning leads individuals to update in distinct ways, where only those who reason about cost-effectiveness change their ideal policies.

Second, we provide evidence that not only does reasoning about economic primitives generate both ideological and affective polarization, but that the two reinforce each other and further shape policymaker behavior. In particular, we find that individuals who reason in ways that reduce perceived over- or under-provision are more likely to engage politically with out-partisan officials, and to do so more constructively (based on letter content), indicating lessened affective polarization (e.g., Iyengar et al., 2019). This reasoning-based response contrasts with the view that deeply held partisan identities prevent individuals from updating beliefs and behaviors in response to information (Mason, 2018; Nyhan and Reifler, 2010). Instead, we find that reasoning from information can ameliorate the affective divisiveness generated by misperceptions (Acemoglu et al., 2024), with ideological and affective polarization reinforcing one another through the perceived distance between constituents' ideal policies and the status quo (Webster and Abramowitz, 2017; Desmet and Wacziarg, 2021; Bertrand and Kamenica, 2023). Because policymakers are responsive to learning constituent demand, as we find in a natural field experiment with elected officials, the reasoning-driven distortions in political communication we document have real consequences for policy.

To make these contributions, we provide methodological innovations based on a two-sided model of constituent communication where the letters generated by survey participants serve as the direct input into a natural field experiment with elected officials. On the demand side, we develop new revealed-preference measures of affective polarization based on a letter-writing campaign. Whether and to whom individuals write, along with the letters' content, provide measures of affect in a real world political context, whereas existing methods use self-reports or non-political behaviors (Iyengar et al., 2019). Our measure has the added

benefit of shedding light on the cognitive processes underpinning reasoning because the text captures individuals' first-order concerns (Ferrario and Stantcheva, 2022; Haaland et al., 2024). These behaviors have direct relevance for the supply side and policymaking since we find that receiving the letters leads elected officials to engage more with the policy issues. More broadly, this design provides a potentially useful template for future survey experiments (Haaland et al., 2023) illustrating how to connect revealed-preference survey measures of policy demand (e.g. petitions, donations, or social media re-posts) with the policymaking process to study the supply side of policy.

Finally, by providing causal evidence that reasoning about cost-effectiveness is a quantitatively important driver of both support for public higher education and ideological polarization surrounding it, our results inform the debate over the causes of state divestment. Because policy and media conversations about declining support for higher education often explore topics like ballooning student debt (e.g., Withnall, 2024), lackluster returns to some majors (e.g. Cooper, 2024), whether college education is a public or a private good (Quadlin and Powell, 2022), and ideological agenda-setting (e.g. Texas, 2023), divestment and polarization are often presented as the natural result of irreconcilable differences in tastes. Although beliefs about cost-effectiveness descriptively account for 20% of ideological polarization on tax issues (Stantcheva, 2021), existing research only conjectures about how such beliefs affect support for higher education (e.g., Bound et al., 2019) with no causal evidence to date. Contrasting with this narrative, we show that as much as a third of ideological polarization surrounding higher education is driven by (mis)perceptions of cost-effectiveness. Moreover, by designing our experiments to study both sides of the market, we trace a causal chain from these misperceptions to policy impact: information shifts policy views and political participation, and the resulting change in constituent communication increases policymaker engagement with proposals to maintain higher education appropriations.

## 2. Perceptions, Preferences, and Polarization

In this section, we present a price-theoretic model that describes the demand for public services. The model motivates our experiments by formalizing how perceptions and reasoning can affect demand and, in turn, polarization. In the model, individuals' ideal spending policies are shaped by their preferences (e.g., the value they place on public services relative to taxes) and perceptions of the processes that produce public services (e.g., beliefs about the cost-effectiveness of public investments). These perceptions also shape how individuals engage with elected officials on related issues. We show that while differing preferences can cause polarization, so too can differences in perceptions of or reasoning about provision.

### 2.1 Modeling of Support for Public Expenditure

Let $u_i(c_i, G)$ be individual $i$'s concave utility function over consumption, $c_i$, and a public service, $G$. Consumption $c_i$ is related to public good provision because increasing the level of provision requires higher expenditures and therefore higher taxes. Although individuals may experience different value (or harm) from the public services, we assume that residents of the same state share a the level of provision $G$ and costs based on a shared expenditure function, $S = p(G; \omega)$. This function reflects the tax cost of producing $G$ given the state's cost-effectiveness, $\omega$.[2] Individuals have perceptions of these two primitives $\mathcal{I} = \{G, \omega\}$ that may or may not be accurate. Appendix B considers extensions where there are multiple inputs (e.g., spending on public colleges and the preparedness of incoming students) and where the public good has multiple dimensions such as the state's rank relative to other states (e.g., yardstick competition).

To see how beliefs and preferences can create polarization, we first characterize how individuals evaluate possible allocations. Each allocation is characterized by a level of public services $G$, which (conditional on beliefs about $\omega$) determine spending and consumption. Individuals trade off the benefits of additional public services with the costs of higher taxes, which reduce their ability to consume. An individual's ideal policy, characterized by $G^*(\mathcal{I})$, trades off the perceived marginal benefit of additional expenditure with the perceived marginal cost and satisfies the following first-order condition with respect to $G$ (given $\mathcal{I}$) for interior solutions:

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

where $i$ subscripts are suppressed, $v(c(G), G)$ is the indirect utility, partial derivatives are denoted by subscripts, and $p'(G; \omega)$ is the perceived marginal price of increasing $G$.

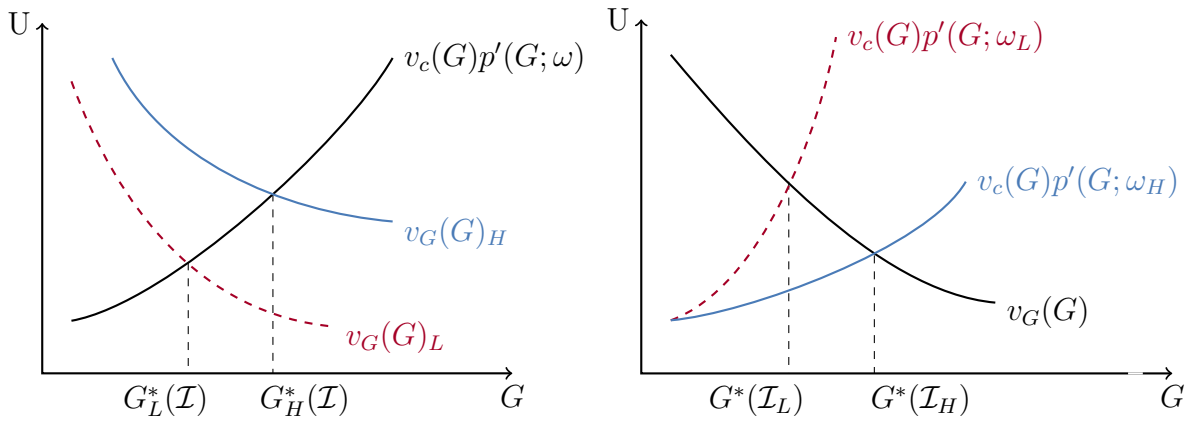
The left-hand side of Equation 1 captures the marginal benefit from additional public services, $v_G(G)$. The right-hand side captures the perceived marginal cost. This cost is the marginal utility of consumption forgone for a marginal increase in $G$ given $\omega$. As such the ideal policy is jointly determined by taste ($v()$) and perceptions ($\mathcal{I}$). Note that whenever $v_G(\cdot) \ll 0$, the individual perceives any amount of the service as a public "bad" the optimal level of provision is $G^* = 0$.

Figure 1 illustrates how polarization could arise from differences in tastes or perceptions.[3] Panel (a) illustrates how heterogeneity in taste can generate ideological polarization. It shows a shared, upward-sloping curve reflecting the perceived marginal costs of increasing public

[2] Fixing $p()$ within jurisdictions is a normalization allowing us to study perceptions of $\omega$.

[3] Polarization could also arise from differences in taste for consumption, not depicted.

Figure 1: Ideological Polarization Can Arise Through Tastes or Perceptions




(a) Different Tastes

(b) Different Perceptions

Note: Panel (a) displays how differences in preferences for public services could generate ideological polarization. Panel (b) displays how differences in perceived cost-effectiveness could generate ideological polarization even among individuals with identical preferences.

service provision. It also shows downward-sloping marginal benefits curves that vary by party. If Democrats value marginal increases in public services more, then their marginal benefit curve (solid blue) will be higher than Republicans' (dashed red). The intersection of the marginal benefit and cost curves at $G^*(\mathcal{I})$ determines each individual's ideal policy, with Democrats in this case demanding a higher level of provision.

While past work and policy discussions about polarization often focus on irreconcilable differences in tastes (marginal benefits) between political parties, our model also highlights the role of perceptions, especially about cost-effectiveness. Panel (b) illustrates how heterogeneity in perceptions can generate ideological polarization. It shows a shared downward-sloping marginal benefit curve alongside upward-sloping, partisan marginal cost curves. If Democrats perceive that their state is more cost-effective at producing the public service (larger $\omega$) then their perceived marginal cost curve (solid blue) will be flatter than Republicans' (dashed red). As a result, perceptions can also polarize $G^*$—even when both groups have the same underlying tastes for the public service. It is this mechanism that we test by providing information about spending and public services.

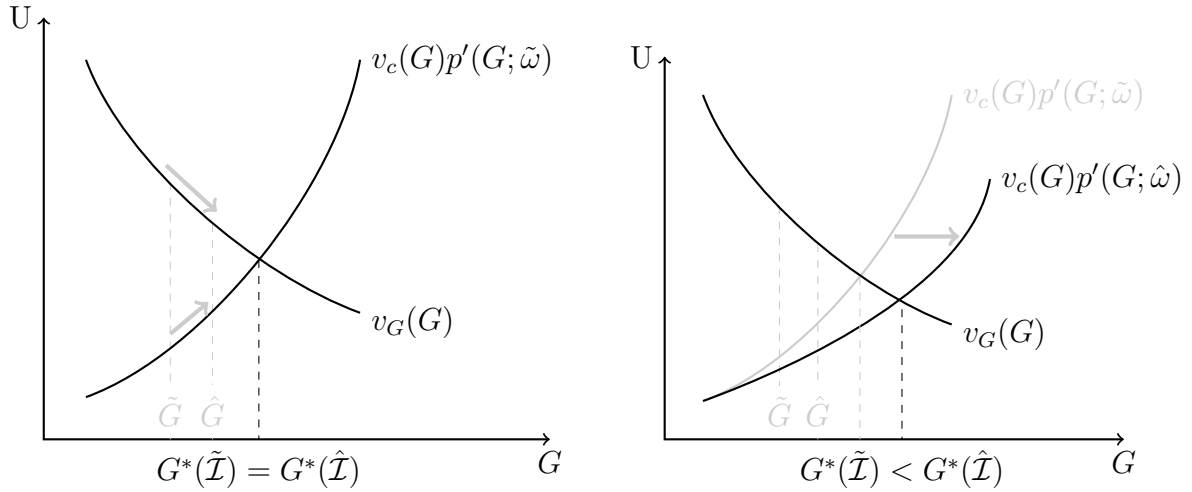
### 2.2 Information, Reasoning, and Polarization

Because perceptions affect demand, individuals' ideal policies will be shaped by how they interpret new information. We denote prior and posterior perceptions of public services with respect to some signal as $\tilde{\mathcal{I}} = \left\{\tilde{G}, \tilde{\omega}\right\}$ and $\hat{\mathcal{I}} = \left\{\hat{G}, \hat{\omega}\right\}$, where elements of either may be

inaccurate. We refer to the process of going from $\tilde{\mathcal{I}}$ to $\hat{\mathcal{I}}$ as "reasoning." Because spending, cost-effectiveness, and the level of provision are related, information about one can affect reasoning about the others. Consider three insights form the model.

First, individuals must endogenously reason to attribute new information across their priors. To see this, consider the effects of a signal about $G$ that moves $\tilde{G}$ to $\hat{G}$. We illustrate the effects of different types of reasoning on individuals who initially underestimate provision ($\tilde{G} < G$), but the converse argument is analogous. Figure 2 illustrates two ways individuals may reason from information about the level of provision: updating about spending or updating about cost-effectiveness. While individuals may update about both in practice, Figure 2 depicts the extreme cases of only reasoning about one or the other.

Figure 2: Whether Information Affects Ideal Policies Depends on Reasoning




(a) Movements Along Marginal Curves

(b) Shifting Perceived Marginal Curves

Note: This figure demonstrates how reasoning about public service provision may change ideal policies. Panel (a) shows the effect of a movement along the supply and demand curves. This type of reasoning changes perceptions spending and provision, but not ideal policies. Panel (b) shows the effect of shifting the marginal cost curve due to changing perceptions of cost-effectiveness. This type of reasoning will change the preferred policy.

On the one hand, learning the level of provision is higher than initially perceived could lead individuals to reason that spending is also higher than initially perceived. As shown in Panel (a) of Figure 2, reasoning about spending changes perceptions of the actual allocation, a movement along perceived marginal cost and benefit curves. Because these movements along the marginal curves do not change perceived prices ($\tilde{\omega} = \hat{\omega}$), reasoning about spending will not change individuals' ideal level of provision $G^*$. It will however change the perceived distance between the actual and ideal policies. This type of reasoning is required by papers that assume the prices are fixed (e.g., Lergetporer et al., 2018) and is implicit in survey

experiments that use perceived distance between the actual and ideal policies as the outcome of interest (e.g., Roth et al., 2021).

On the other hand, the same information could lead individuals to reason that the state converts spending into public services more cost-effectively than initially perceived. As shown in Panel (b) of Figure 2, reasoning about cost-effectiveness shifts the perceived marginal cost curve so that the same level of spending generates more public services (i.e., $\tilde{\omega} < \hat{\omega}$). By changing the perceived prices, reasoning in this way also changes the perceived distance between the actual and ideal policies, but this type of reasoning will affect individuals' ideal level of provision $G^*$.[4] Although reasoning about cost-effectiveness has starkly different predictions for policy, it has not been studied in previous work.

Second, differential reasoning may contribute to ideological polarization. Because individuals reason in ways that reflect their identities and priors (Alesina et al., 2020), the same signal may lead individuals to polarized conclusions. For example, even if Democrats and Republicans have similar priors, if one group is more likely reason about cost-effectiveness, the signal will still change the level of ideological polarization. This possibility is especially relevant given cross-sectional evidence that beliefs about cost-effectiveness account for over 20% of the partisan gap in policy views about taxes (Stantcheva, 2021).

Third, certain cognitive processes will lead individuals reason more about spending or cost-effectiveness. There are many processes that could apply. For example, individuals may update to inform beliefs about which they have less information (neoclassical reasoning), to confirm their priors (prior-based reasoning), or to believe in better states of the world (preference-based reasoning—see Benjamin (2019)). Our framework offers a natural conceptualization of "better" states of the world: allocations that reduce the difference between an individual's perceived level of provision and ideal level of provision $|G^*(\hat{\mathcal{I}}) - \hat{G}|$ are "better." We refer to this difference as perceived over- or under-provision.[5]

Based on the theoretical framework, incorporate three features into our survey experimental design that allow us to examine how differences in perceptions and reasoning affect demand for public services. First, by randomizing information provision, we can calculate the effect of information, by party and prior, on ideal policies. Second, in order to directly examine reasoning as a mechanism, we measure both priors and posteriors to assess whether individuals are updating about spending levels or cost-effectiveness. Finally, we use this framework to motivate additional measurements which provide suggestive evidence about the cognitive processes underlying why partisan reason differently and connecting that reasoning with over- and under-provision.

[4]It can be ambiguous whether this higher level provision requires more total expenditure.

[5]e.g., in Figure 2, reasoning about spending decreases perceived under-provision (Panel (a)).

### 2.3 Communicating with Officials and the Role of Affective Polarization

The policy implications of reasoning depend not only on individuals' ideal policies but how they communicate those preferences to elected officials. When reasoning shifts the nature and extent of communications policymakers receive, policymakers should revise their beliefs and change how they engage with the issues.

To conclude our theory, we propose a two-sided framework of political communication. On the demand side, individuals, $i$, can communicate their preferences to elected officials at some cost by writing a letter. On the supply side, Bayesian elected officials, $j$, form beliefs about constituent preferences from the communications they receive and decide whether to engage with policy issues based on those beliefs.

We first consider the constituent's problem. In Appendix B.3 we derive the following decision rule for communication:

$$\text{Letter}_{i,j} = \mathbb{1}\left[\nu_i\left(\kappa_{i,j}(G_i^* - \hat{G}_i)\right) - \alpha_{i,j}\right]$$

Here the expected benefit of writing a letter, $\nu_i(\cdot)$, is a function of perceived under- or over-provision, $(G_i^* - \hat{G}_i)$, and the perceived responsiveness of the elected official $\kappa_{i,j}$. The product of these two terms appears in the formula because they predict how much the letter will move the official's prior about constituent preferences. This result captures the intuition that individuals are more likely to advocate for policy reform when the distance to their ideal policy is greater and the idea that it is ineffective to communicate with unresponsive officials (e.g., those who have extremely strong priors about the right policy already). Individuals choose to communicate when the expected benefit, $\nu_i\left(\kappa_{i,j}(G_i^* - \hat{G}_i)\right)$, is greater than the cost of communicating, $\alpha_{i,j}$.

Crucially, this decision rule allows affective polarization (dislike and distrust of those affiliated with the opposing political party) to reduce communication. Although such responses would be absent in a purely neoclassical model of political economy, research in political science has shown that affective polarization does reduce cross-party communications (Broockman and Ryan, 2016) despite the fact that these policymakers are still responsive to communications from out-partisan constituents (Butler and Nickerson, 2011).[6] Experimental participants even accept financial penalties to avoid discussing policy with out-partisans (Carlson and Settle, 2022). Affective frictions like these would manifest in the model through increased costs of writing out-partisan officials ($\alpha_{i,j}$ above the effort cost of writing) or overly-pessimistic perceptions of their responsiveness ($\kappa_{i,j}$ below the truth).

[6] Although policymakers may be relatively more responsive to co-partisans than to out-partisans (Butler and Dynes, 2016; Pereira, 2022; Bolet and Campbell, 2024), they are still responsive to both on average.

Because affective polarization shapes political participation, understanding how reasoning affects policy requires understanding how it shapes affective polarization—especially, individuals' inclination to communicate with out-partisan officials. Different models of affective polarization, however, have different implications for the role of reasoning. On the one hand, if affective polarization is the result of strongly held (tribal) identities (Iyengar et al., 2012), then reasoning is unlikely to reduce polarization or promote political participation. On the other hand, there is mixed but growing evidence that ideological and affective polarization are intertwined so that increasing the perceived ideological distance augments stated affective polarization (Webster and Abramowitz, 2017; Desmet and Wacziarg, 2021; Bertrand and Kamenica, 2023). In this case, an individual who reasons that her ideal policy is closer (farther) to the policy implemented by an out-partisan policymaker may become less (even more) averse to communicating with that policymaker. Furthermore, reasoning that public service provision is in fact more cost-effective or that perceived over- or under-provision is less severe could increase individuals' inclination to communicate with out-partisan politicians by ameliorating affective frictions grounded in pessimistic beliefs about provision or waste.

Finally, we discuss the implications of constituent communication for policy. In Appendix B.4, we model officials whose prior beliefs about constituent preferences may be biased by selective communication—for example, because affective polarization causes officials to disproportionately hear from co-partisans—or because their constituents have inaccurate perceptions. When officials receive an informative signal about constituent demand, they update their beliefs and engage more on the policy issues when the perceived benefit of moving policy closer to constituent preferences exceeds the cost. The model highlights the importance of the two-sided structure: changes in individuals' ideal policies $G_i^*$ and in their willingness to communicate with out-partisan officials $\alpha_{i,j}$ jointly determine both the level and informativeness of the signal that officials receive. Therefore, changes in constituent behavior from reasoning shapes policy to the extent that it alters both ideological and affective polarization.

We now turn our attention to the experimental context and survey design that allow us to measure the effects of reasoning on policy preferences, ideological polarization, and political participation.

## 3. Design for Experiments on Support for Higher Education

In this section, we outline the samples and procedures for our first two experiments. The first experiment measures baseline demand and perceptions, and characterizes how these change

in response to information about public service provision. The second experiment measures how information about both provision and spending affects ideal policies. It also allows us to identify the partisan reasoning mechanism formalized in the preceding section.[7]

Our experimental context is public higher education, and we signal the level of public service provision using graduation rates. Specifically, we provide signals about public service provision using the six-year graduation rate at public four-year colleges in each state and signals about costs using the yearly per-student tax expenditures (both in levels and relative ranks). Graduation rates underlie most public motivations for investing in higher education such as promoting growth, raising wages, attracting migrants, increasing civic engagement, and promoting pro-social behavior (e.g., Moretti, 2004; Agrawal et al., 2022; Blesse et al., 2023). Furthermore, using graduation rates in the experiments has five conceptual and empirical advantages over using other metrics.

First, the graduation rate serves as a straightforward signal about the level of provision. This conceptual clarity is critical for designing a successful information intervention (Haaland et al., 2023), and the fact that graduation rates are bounded between 0 and 100 make belief elicitation more accurate (Stantcheva, 2023). Second, state spending produces graduates by causally increasing enrollment rates and graduation rates (Bound et al., 2010; Deming and Walters, 2017). This causal connection is required for interpreting effects through our conceptual framework. Third, graduation rates are more closely tied to the process of education than economic outcomes which is important because it allows for the negative valuations of higher educational outputs vocally expressed by some individuals. Fourth, for a given level of spending, the graduation rate contains information about the average social ROI (whatever the value placed on provision). In our setting the heuristic bound from Section 2.1 ($\frac{G}{S}$) is signaled by the graduation rate divided by spending per student—like metrics used in Conzelmann et al. (2023) and Hoxby (2018). As such, all else equal, a higher rate indicates that more graduates are produced from a given level of spending, the return on state investments is larger, and the state is less wasteful.[8]

Beyond these conceptual motivations, graduation rates are also a first-order concern for

[7]The experiments and preanalysis plans were registered with the AEA RCT registry (AEARCTR-0007619, AEARCTR-0009409).

[8]In Hoxby (2018), the value of higher education to society is the causal effect on outcomes divided by the social cost of educating students. This maps more neatly to our model extension which allows for an additional input into public services (i.e., the academic preparedness of incoming students) in which the adjustment maintains the informativeness of the signal conditional on beliefs about preparedness. Holding spending constant, individuals who learn the graduation rate is higher may reason that the causal effect of spending is higher. Alternatively, if they reason that student quality is higher, they may conclude that their tax dollar are less likely to be wasted to drop-out. Our goal is to measure how individuals reason about the overall benefits for the state verse the costs, but we do not aim to disentangle perceptions over particular components.

policymakers and taxpayers. As of 2021, policymakers in 46 states had codified goals for increasing their college-educated workforces. For example, Florida aims to "increase the percentage of working-age Floridians with a high-value post-secondary certificate, degree, or training experience to 60% by 2030" (Lumina Foundation, 2021). Taxpayers care about graduation rates too. Doyle (2007) reports that about 75% of Americans believe that lowering the number of college students who do not graduate is either "absolutely essential" or "important but not essential." Moreover, taxpayers emphasize graduation rates as a key accountability measure. Among both Republicans and Democrats about 80% believe that colleges should receive less tax revenue if graduation rates are low, and nearly 90% believe that publicizing indicators of college quality like graduation rates is important (Nguyen et al., 2023).[9] In this sense, our information experiments also allow us to discuss the causal effects of increased transparency on polarization.

Notwithstanding its theoretical and policy importance, prior research has never studied how taxpayers reason about the outputs of public services. A number of survey experiments have studied the effects of providing information about education spending (Lergetporer et al., 2018) and general spending (e.g., Peyton, 2020; Roth et al., 2021), often finding anchoring effects toward the true policy. Others provide information about the share of tax dollars spent on education (Giaccobasso et al., 2025), the private returns to public services (Lergetporer et al., 2021; Lergetporer and Woessmann, 2023), and inequities in access to these services (Lergetporer et al., 2020; Hermes et al., 2024), often finding muted effects on policy preferences. Because these results do not study the outputs of public services, they cannot speak to the core theoretical insight that individual perceptions about cost-effectiveness may be a first-order contributor to policy preferences and polarization. Because measuring cost-effectiveness requires a consideration of *both* costs and benefits even contemporary work like Blesse et al. (2023), which reveals the average outcomes of students in public schools to constituents and policymakers, misses the centrality of perceived cost-effectiveness.

### 3.1 Experiment 1: Information on Graduation

We initially recruited 3,715 participants through Qualtrics in May 2021. We requested a sample that represented the US population in terms of political partisanship, education level, and gender. However, since the sample we were provided with was non-representative on age, we recruited an additional 1,004 participants in August 2021 using CloudResearch.[10]

[9] Nguyen et al. (2023) also mention employment rates and earnings among graduates. While these statistics are also of interest, they miss the fact that nearly 40% of public college students do not graduate.

[10] Overall, elderly individuals are more responsive to information, so limiting our analysis to the original Qualtrics sample produces larger effects.

On average, participants finished the survey in about 6.3 minutes (with 90% taking between 3.3 and 15.2 minutes).

After consenting to participate, participants answered demographic screening questions measuring political partisanship, gender, and state of residence.[11] We targeted to have a third each of Republicans, Democrats and Independents to be nationally representative and to ensure we had sufficient sample of each group to study polarization. Next, participants reported their beliefs regarding the US average six-year public college graduation rate, the graduation rate in their state, and the rank of the graduation rate relative to the other 49 states. They also reported their beliefs of the tax expenditure per student spent on public higher education in their home state (in dollars) and the rank relative to levels of other states.

Participants were then randomized to receive one of two information treatments or to receive no information (the control group). The first treatment presented the 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.[12] Appendix Figures C1a and C1b show the information treatments, and Appendix Tables A1 and A2 show they are balanced on both demographics and beliefs.

Participants then reported their ideal level of state spending per student at public four-year colleges in their state.[13] Participants also answered questions capturing potential mechanisms. Specifically, we elicited policy beliefs about the impacts of marginal changes in public college financing including how much enrollment and graduation rates would change with an additional $100 spent per student and asked five-point Likert scale questions gauging their general trust in how 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.

Next, participants were given the opportunity to participate in two costly tasks designed

[11] We did not include participants from Washington, DC as it does not have a traditional public higher education system.

[12] Although we choose communicate objective measures of higher-education outputs to avoid experimenter demand effects, recent work indicates that demand effects tend to be minimal if they exist at all (e.g., de Quidt et al., 2018). In fact, Mummolo and Peterson (2019) find null demand effects even when respondents are financially incentivized to match researchers' stated objectives.

[13] 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 to capture preferences less affected by the unique context of the COVID pandemic. Responses to both questions were highly correlated, and treatment effects were similar.

to elicit revealed preferences.[14] Our first task expends the political letter-writing campaigns in other research (Grigorieff et al., 2018; Haaland and Roth, 2020; Holz et al., 2020; Hager et al., 2023). As in other studies we invited participants to share open-ended written opinions about their states' spending on public four-year colleges, but we uniquely and offered to send those letters to elected state officials of their choice.[15] Spending time writing an optional letter was costly because it lowered participants' effective wage. Critically, individuals send the same letter to all officials, so the marginal cost of sending letters to additional recipients is zero. As such, decisions about interacting with officials of the other party provide a measure of affective polarization, as do the letters' sentiments. In particular, we use a participant's decision to reach across the aisle to send a message negative in tone as a measure of affective polarization.[16] This exercise builds on Ferrario and Stantcheva (2022) by allowing researchers to observe participants' first-order concerns as expressed to policymakers while also studying selection into this political participation (as in Bursztyn et al., 2023). Political participation has policy significance when politicians update policy positions to reflect voters' preferences (Sevenans, 2021). The letters generated in this exercise are the key input into our third experiment with elected officials.[17]

We concluded the survey with questions about demographics[18] and (in the CloudResearch sample) posterior beliefs. Participants in the graduation-rate-only condition and the control group were shown graduation rate information and were then asked for a posterior belief for the rank. The posterior beliefs allow us to test for partisan differences in reasoning or learning from information.

### 3.2 Experiment 2: Information on Graduation and Spending

For the second experiment, we recruited 3,037 participants in May and June 2022 through CloudResearch.

[14]Relying on stated preferences will be misleading if participants suffer from "hypothetical bias." This bias may not present a significant issue as hypothetical and real responses to intensive margin decisions are similar (List et al., 2006), and our main stated-preference measure is ideal spending, which is strictly positive for most of the sample.

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

[16]Reaching across the aisle by itself, could reflect other priorities related to information sharing and political participation. However, if the message is negative in tone, it suggests dislike or distrust more explicitly. We additionally explore the content of the letters as further evidence on how individuals reason.

[17]As a second revealed-preference task, participants could donate some of their wages to a public college in their state similar to Alesina et al. (2023) and in Akesson et al. (2022). The median participant spent six minutes on the survey, so making a $0.25 donation implied a cost of $2.50 in median hourly wages.

[18]We elicit age; employment status; 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; whether they attended or currently attend a public college in their state; and how often they watch colleges from their state compete in sports.

The procedure for the experiment follows the first with three exceptions. First, participants were randomized to receive one of three information treatments: 1) the graduation rate and rank information (as in the first experiment), 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. The second difference was extending the ways individuals could communicate with their elected officials. After writing their own letter as in the first experiment, participants could choose from a set of prespecified messages to send or add to their own letter. These pre-written messages included a request for a desired level of spending (increase, decrease, or no change) along with reasons for this request that they could choose from the prespecified list. The reasons related to yardstick competition, the social returns on investment, and the private returns to students.

Finally, at the end of the survey, we elicited posterior beliefs about the graduation rate and spending information for individuals who had not received this information. After reminding participants in the graduation information treatment group (1) about the graduation information, we elicited spending posteriors. Similarly, after participants in the spending information treatment group (2) were reminded of the spending information, we elicited graduation posteriors.

### 3.3 Variable Definitions for Experiments 1 and 2

We define our key measures of perceptions, outcomes, characteristics following the pre-analysis plans (noting any changes).

**Belief Errors.** We calculate a continuous variable measuring the belief error as participants' priors minus the truth for their state's graduation rate and corresponding percentile rank, as well as spending levels and corresponding percentile rank.[19] An individual underestimates the truth when this difference is negative and overestimates when the difference is positive. We observe state graduation rates and spending levels from Snyder et al. (2019) and Laderman and Heckert (2021), respectively.

**Outcomes.** The main survey outcomes are the preferred spending level[20] (to measure policy views ideological polarization) and to whom individuals write letters (to measure political participation and affective polarization). As a supplemental outcome we also measure writing a letter with positive tone, where the tone as positive if the Syuzhet dictionary score is greater than 0.

**Demographics.** Participants were coded as Republican if they indicated their partisanship

[19]The treatments display ranks out of 50, but we use percentile ranks for the analysis.

[20]We originally prespecified log spending, but returned to levels when we found some individuals reporting a $0 ideal. Using a Poisson regression does not change any results.

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 controls for family attachment (whether the participants or their children has attended a public four-year college in their state), whether respondents follow the state's public college sport teams (if they watch at least two games per year) and elderly status (if they are 65 or older).

## 4. Reasoning, Policy Views, and Political Participation

In this section, we present the main results from Experiments 1 and 2. In these experiments, we first provide randomized individuals with information about graduation outputs and then allow them to endogenously reasons in different ways from the information. Our results use the behavioral responses from information to test model predictions about policy views, the cost-effectiveness mechanism, political participation, and polarization. We additionally present evidence from Experiment 2 that these patterns come from heterogeneous reasoning from information by measuring posterior beliefs from output information and the effects of spending information.

### 4.1 Reasoning about Graduation Changes Policy Views

We measure how ideal spending policies change as individuals reason about the outputs of higher education services. Following the pre-analysis plan, we estimate separate treatment effects on stated ideal spending for our two graduation signals: the graduation rate only, $D_1$, and both rate and rank, $D_2$. In the linear regression

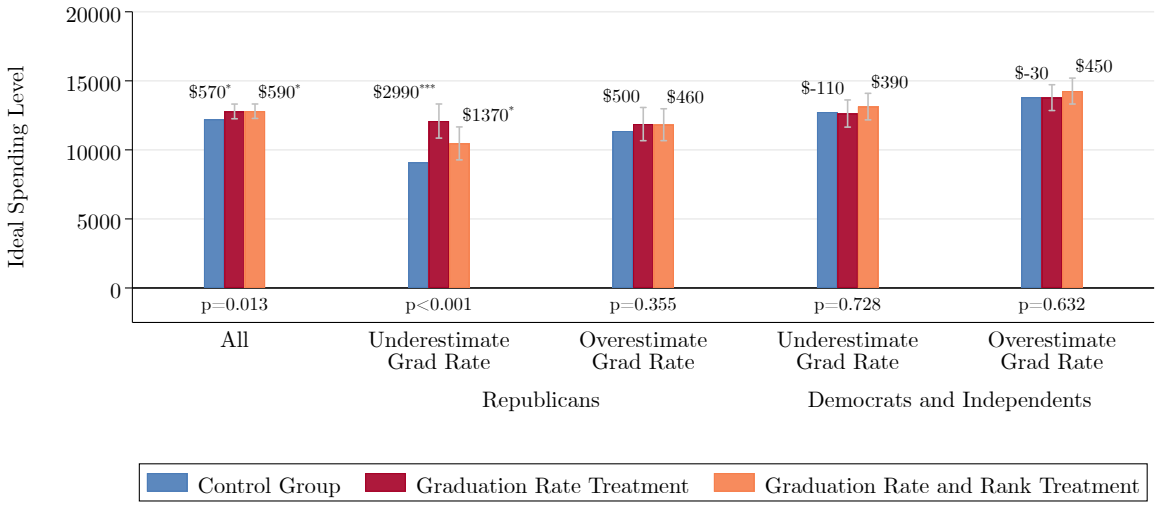
$$Y_i = \tau_1 D_{1i} + \tau_2 D_{2i} + \beta X_i + \varepsilon_i \tag{2}$$

$X_i$ is a vector of demographics plus an indicator that the participant was recruited from Qualtrics and a constant. Although, conceptually, reasoning about the graduation rate in addition to rank could lead to differences in reasoning, we find similar patterns in practice and so focus our discussion on the effects of graduation rate information.[21] As we discuss in Section 2, how individuals reason about this information may depend on their prior perceptions or on their (partisan) worldview. Given these model-based insights, and following the pre-analysis plan, we also divide the sample into four groups by political affiliation and graduation rate prior and estimate the treatment effects by subgroups.[22]

[21] We also report $p$-values for pooled tests of receiving any signal about $G$.

[22] The four subgroups are {Republican; Democrat and Independent} × {Underestimate graduation rate; Overestimate graduation rate}. Note that we also pre-specified family attachment to state universities and

Figure 3: Reasoning Shapes Ideal Higher-Education Spending Policies




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

Figure 3 presents ideal spending policy by treatment group for the full sample and for each party-by-prior subgroup.[23] We use these results to test three implications of the model: (1) linking baseline policy view (and polarization) to beliefs about cost-effectiveness, (2) identifying the presence of reasoning about cost-effectiveness vs reasoning about spending, and (3) assessing the implications of heterogeneous reasoning for polarization.

**Beliefs about Cost-Effectiveness are Linked to Policy Views.** First, using data on the control group, we measure high but polarized baseline demand for higher education spending. In our sample the average ideal level of state spending is $12,210 per student (which is higher than the actual $8,500). Both partisanship and beliefs are correlated with ideal spending: Republicans prefer 29% less (-$2800) spending than Democrats and Independents—21%after adjusting for other differences like age and education—and across both parties those who under-estimate graduation rates prefer about 10% less than those who over-estimate graduation rates. These large partisan gaps are similar to gaps in more qualitative questions about higher education from nationally-representative PEW Research

graduation rank priors as an additional dimensions for heterogeneity. After data collection, the sample contained insufficient respondents with no family attachment (fewer than 900). The results using rank priors look similar and are presented in Appendix Figure A3 to conserve space.

[23]Note that all respondents appear in two out of the five specifications shown in the Figure 3: (1) all individuals and (2) a relevant party-by-prior subgroup.

Center surveys (Parker, 2019; Hartig, 2020).

We also use the survey to test whether perceptions of cost effectiveness predict policy views. Appendix Figure A2 reveals that beliefs about the causal effects of spending are also equally strong predictors of policy views even conditional on party (and other demographics). For example, in the control group individuals with larger-than-average beliefs about the causal effect of a \$100 increase in per-student expenditure on enrollment and graduation demand 19% ($p < 0.001$) and 16% ($p < 0.001$) more spending than those with less-than average beliefs (Panel (a)). These relationships highlight a tight link between perceptions of policy impacts characterizing cost-effectiveness and individuals' ideal policies.

**Treatment Effects Imply Non-Trivial Reasoning about Cost-Effectiveness.** Recall the sharp prediction in Section 2 that if individuals reason only about spending, then reasoning about graduation will not change ideal policies. According to the model, identifying a meaningful average treatment effect on ideal spending would be a sufficient condition that cost-effectiveness is an economically important part of reasoning about public services. Figure 3 reveals that reasoning about the level of public service provision in an individual's state raises average ideal spending level by about \$600 per student per year, or 5%. Because priors of the graduation rate are unbiased on average, individuals in the sample are equally likely to have chances to update positively or negatively about the cost-effectiveness. The positive average effect suggests heterogeneity in reasoning about spending versus cost-effectiveness between individuals with different priors.

Descriptive evidence also supports the model-based interpretation of this result. In the control group, perceived cost-per-graduate ($\frac{S}{G}$), a heuristic for cost-effectiveness, is our strongest predictor of ideal spending levels.[24] Furthermore, partisan gaps in perceptions of cost-per-graduate are entirely driven by differences in perceptions of spending (Panel (b) of Appendix Figure A2), highlighting the importance of allowing individuals to reason jointly about public service inputs and outputs. While this evidence is consistent with reasoning about cost-effectiveness, in Section 4.2 we will use Experiment 2 to directly test reasoning about cost-effectiveness as the key mechanisms.

One concern with interpreting these average effects as evidence of reasoning about cost-effectiveness is the possibility that receiving any information about the public service lead to priming or experimenter demand effects. This seems unlikely for three reasons. First, by reporting their priors, individuals were all equally primed to think about education finance, and the effects of the randomized treatments are independent of this. Second, experimenter

[24] In the control group, the standardized regression coefficient for perceived graduates per dollar is quantitatively similar to that of political party with an even larger $t$-statistic.

demand effects should not affect real-stakes outcomes, but we find that treated individuals are 6% more likely to make a donation ($p = 0.060$) and send 12% more letters ($p = 0.069$). Finally, traditional experimenter demand effects should be constant across subgroups, but, as we discuss next, our treatment effects vary by both by party and prior.

**Heterogeneous Reasoning Contributes to Ideological Polarization.** Consistent with the model suggestion that identities and priors can shape reasoning responses, Figure 3 reveals that Republicans who underestimate graduation rates at baseline experience the largest increases in ideal spending. Among these Republicans, learning that the graduation rate is higher increases their ideal spending levels by 28% ($p < 0.001$).[25] This response almost completely drives the main effects. Indeed, we only find smaller, statistically insignificant effects on Republicans who overestimate graduation rates and on both groups of Independents and Democrats. Importantly for polarization, reasoning about the public service provision moderates the most extreme policy preferences; we estimate that 14% of the effect on Republicans who learn graduation rates are higher comes from a 3.7 percentage point (56%, $p = 0.035$) reduction in their likelihood of demanding \$0 in spending when treated.[26]

One implication of these results is that reasoning about cost-effectiveness accounts for roughly 30% of the partisan gap between Republicans and Democrats/Independents. At baseline, there is a \$2800 gap in ideal spending levels, but because effects are concentrated among Republicans,[27] this gap shrinks by over \$800 (30%) in the treated groups (\$1500 (53%) in the graduation rate treatment and \$300 (12%) in the rate and rank treatment). In the context of our model, our results imply that Republicans reasoning about cost effectiveness relatively more than Independents and Democrats, who update almost entirely about spending levels. The fact that reasoning about economic primitives reduces ideological polarization also contrasts sharply with popular conversations about polarized support for higher education. While the myriad other explanations for the polarization of higher education surely do matter, these explanations reflect differences in tastes for higher levels of provision. In contrast, we find that economic reasoning about could account for a full third of ideological polarization.

We also rule out two alternatives to our model-based interpretation of the results. First, because the magnitude of the treatment is a function of priors, heterogeneous effects could

[25]This is also the only group for whom there is an appreciable difference between the two treatments. In the model this would be because the rank information moderates updating about cost-effectiveness as individuals learn about the distribution of outputs (see Appendix B.1).

[26]For context, at baseline this group is almost three times more likely to demand \$0 in spending than the other groups (6.6% versus 2.3%).

[27]The average effect of reasoning is about \$1150 ($p = 0.002$) for Republicans compared to \$250 ($p = 0.427$) for Democrats and Independents.

reflect differences in information content by party or prior. In practice we find no differences in information content: the distribution of initial perceptions about graduation rates is very similar across parties (Appendix Figure A1). Furthermore, this mechanism cannot rationalize the within-party differences in reasoning or the heterogeneous responses to identical information along party lines. Second, because the signal communicated in each treatment varies by state, heterogeneous effects could reflect differences in information content by party or prior. But using only within-state variation from a version of from Equation 2 with state fixed effects, we find nearly identical results. Although our results are consistent with reasoning about cost-effectiveness being an important driver of support for public services, and although we rule out other plausible interpretations, Experiment 1 does not allow us to directly test the hypothesized reasoning mechanisms. For that we turn to Experiment 2.

### 4.2 Testing for Reasoning about Cost-Effectiveness

We design our second experiment to better isolate differences in reasoning as the core determinant of effect heterogeneity. By analyzing posterior beliefs about spending elicited after individuals receive graduation information, we directly test the model's implications for whether reasoning about cost-effectiveness drives the results from Experiment 1. We also consider ancillary evidence of reasoning about cost-effectiveness from the joint randomization of graduation and spending information and from posteriors about cost-per-student across treatment groups.

Based on the model in Section 2, spending posteriors from information about graduation provide a direct test of reasoning as a mechanism. Recall that individuals who reason that the level of provision, $G$, is different from their initial perception must either update about cost-effectiveness or the amount of spending, $S$. Because the model implies that individuals' ideal policies only change after reasoning about cost-effectiveness (and not solely about spending), the results in Experiment 1 can be driven by reasoning about cost-effectiveness if and only if Republicans who under-estimated graduation rates tend to update about cost-effectiveness and that all other groups tend to update about spending levels.

We test this hypothesis by measuring how graduation rate information shifts beliefs about spending. To begin, we plot the difference between participants' posterior and prior beliefs about spending ($\Delta S_i = \hat{S}_i - \tilde{S}_i$) as a function of their initial beliefs and the graduation information they receive:

$$\Delta S_i = \sum_p \gamma_p \Delta G_i \mathbb{1}[i \in p] + \gamma X_i + \varepsilon_i \tag{3}$$

where $\Delta G_i$ is operationalized with belief errors about graduation (truth minus prior percep-

tions) and reasoning is allowed to vary across the four party-by-prior groups, $p,$.[28]

Figure 4 reports the results as a set of binned scatterplots with the implied lines of best fit from the regression. Panel (a) presents estimates from Equation 3, where $S$ and $G$ are each percentile ranks and Panel (b) where $G$ is the numerical graduation rate. We focus on the rank-rank comparison because it required less numerical facility than spending levels, it seemed to be better understood by survey respondents, and was less affected by anchoring, but the analogous results are presented for levels in Appendix Figure A4. Interpreting these patterns through the model, updating only about spending would imply a positive $\gamma$, all else equal, and updating only about cost-effectiveness would imply $\gamma = 0$. However, because the $\gamma$s are identified by nonrandom variation in baseline perceptions, all else may not be equal. Instead, we focus on differences in updating by party and prior, as in a difference-in-differences. In this sense, a difference in relative slopes reflects differences in the relative prevalence of reasoning about cost effectiveness.

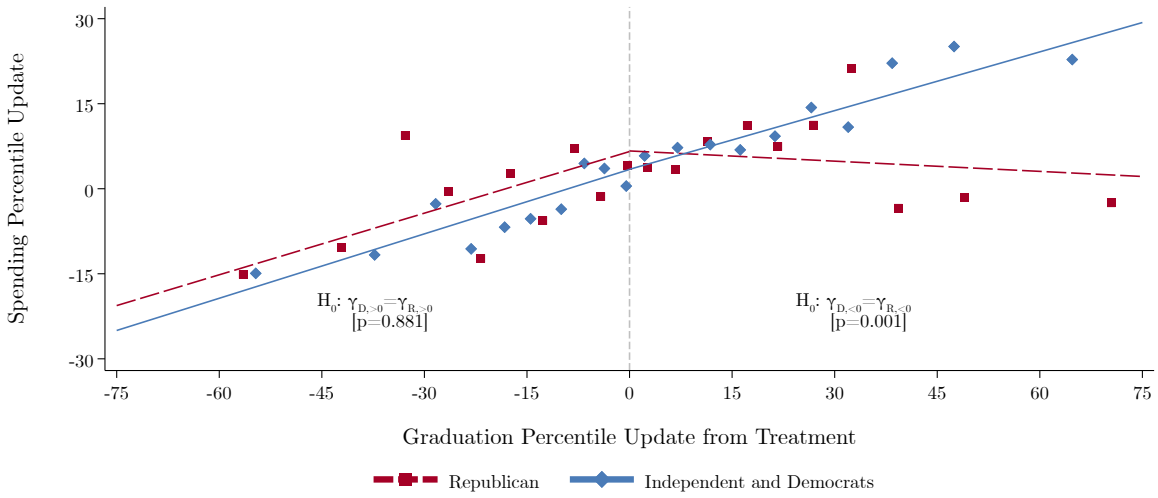
Consistent with Experiment 1, we find strong evidence that most individuals tend to reason about spending. Considering the left-hand side of Panel (a), we see that Republicans, Democrats, and Independents who learn that the graduation rate is relatively lower all tend to reason that their state spends relatively less, indicated by the upward -sloping lines. Looking to the right-hand side, Democrats and Independents who learn that their states' rank is higher tend to reason that it must be spending relatively more, also reflected in the upward-sloping line. Consistent with the Experiment 1 implication that these three groups update almost entirely about spending, there is no difference between the slopes of these lines ($p = 0.9$). Based on the results in Experiment 1 the model predicted that these individuals reasoned about spending—a movement along the marginal curves—and we see exactly that in Experiment 2. [29] We find similar updating about spending ranks in response response to graduation rate information (Panel (b)).

At the same time, we find sharp differences in reasoning that align exactly with the heterogeneous results of Experiment 1. To see this, consider the right-hand side of either Panel. In contrast to the other groups, Republicans who learn the state has a higher graduation rank do *not* update their beliefs about relative spending on average. The estimated slope $\gamma_{R,<0}$ are slightly positive but not distinguishable from 0. In the model, perceiving a higher graduation rank with no change in spending belief, implies a higher relative cost-effectiveness. As such, the model predicts they will increase their demand for public expenditure, which is what we

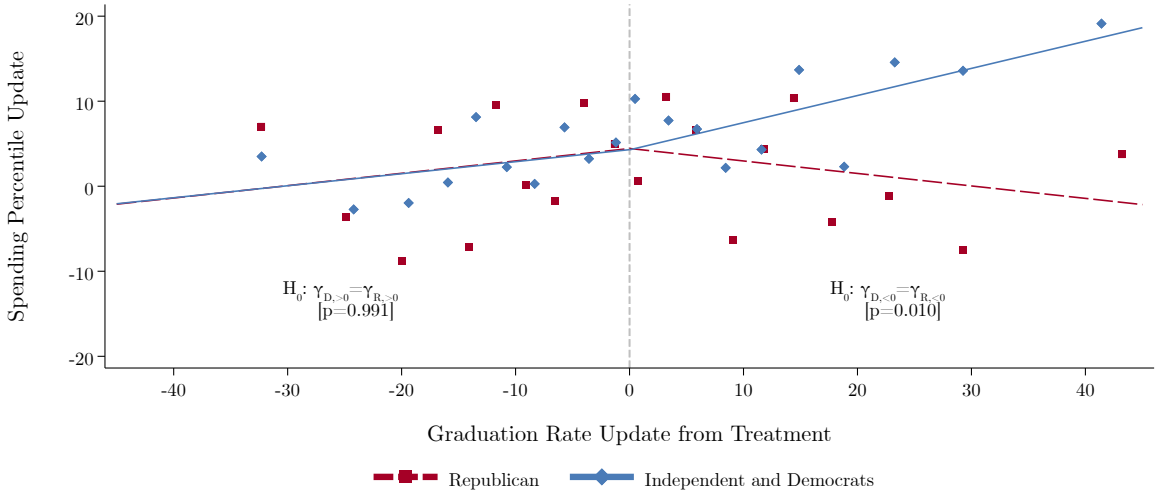
[28]This specification is a linear spline with a knot at $\tilde{G} - G = 0$ for each party, imposing that the amount respondents update is a continuous function of belief errors. When we allow for separate intercepts, the results don't change meaningfully.

[29]Note that Figures 3 and 4 are from different experiments and therefore use different samples, providing two pieces of independent evidence of this reasoning mechanism.

Figure 4: Posteriors Confirm Reasoning about Spending and Cost-Effectiveness




(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 participants recruited for our second experiment from CloudResearch.

found in Experiment 1 (see Figure 3). As indicated by the differing slopes, this reasoning process differs from that of Democrats and Independents who also underestimate graduation ($p = 0.001$) and from other Republicans ($p = 0.020$). In Panel (a), the differences in slope are partially driven by Republicans with significantly underestimated priors, suggesting that the magnitude of misperceptions is related to individuals' propensity to update about cost-effectiveness. In Panel (b), however, the asymmetric updating about cost-effectiveness holds across the distribution.

The differences in reasoning by party and prior enrich our understanding of "partisan reasoning" and related phenomena. The fact that Republicans and Democrats with the same priors reason differently is consistent with descriptive patterns in the tax reasoning literature (e.g., Stantcheva, 2021). By estimating causal effects, however, we show that the "polarization of reality" does not simply arise from selective information availability, but from heterogeneous responses to the same information. Furthermore, our results show that within-party reasoning differences by initial beliefs are equally important contributors to polarization. This insight complements contemporaneous work documenting psychological reasoning differences among co-partisans (like zero sum thinking Chinoy et al., 2023) with evidence about reasoning differences based on economic primitives.

**Ancillary Evidence of Reasoning about Cost-Effectiveness.** In addition to this direct test of the reasoning mechanisms, the Experiment 2 provides several additional pieces of evidence the help distinguish between potential mechanisms. First, the treatment effects from Experiment 2 provide another test of the cost-effectiveness mechanism. Having documented how individuals reason in response to graduation information in the first experiment, the Experiment 2 enables us to assess whether reasoning changes when uncertainty about spending levels is resolved. As such the main comparison of interest is between only learning about spending and learning about both spending and graduation (although we also include a graduation-only treatment for completeness). This comparison has the added advantage of partialing out anchoring effects from learning spending levels.[30]

When we conduct this test, we find that the groups who reason about spending respond in the same way same to learning about spending or graduation (or both). This response arises because for these groups learning about true graduation tends to leads them to also learn about true spending. Appendix Figure A5 depicts six treatment-by-party splines over graduation rate errors. For Independents and Democrats, there are no detectable differences

[30] Across both parties we find that learning spending shrinks ideal policies away from priors and toward the actual level in the state. This is consistent with results from other information experiments using spending levels (e.g., Lergetporer et al., 2018; Cattaneo et al., 2020), and would reflect learning about the average ROI in the state (as discussed in Appendix B.2.)

between learning about spending, learning about graduation, or learning about both. The same is true for Republicans who originally over-estimated graduation rates. Given the evidence in Figure 4 that learning about graduation led these groups to reason about spending, these patterns suggest that the spending information validates that reasoning, leading to no difference by treatment in ideal policies.

In contrast to the other groups, Republicans who underestimated graduation rates change their ideal spending after learning spending and graduation information. Appendix Figure A5 depicts a divergence in ideal policies across treatments for this group. Conditional on knowing the spending level, receiving a signal about the level of provision leads to higher ideal policies. Although the difference is not statistically significant on average, this divergence is concentrated among those who more significantly underestimated graduation rate—the same subgroup driving the reasoning about cost-effectiveness. Reasoning from graduation information reduces polarization, as seen visually in the closing gaps in Figure A5. This reduction in polarization induced by adding signals about graduation (rate and rank) to information about spending is 12%—nearly the same as the reduction in polarization by providing signals about graduation (rate and rank) in Experiment 1.

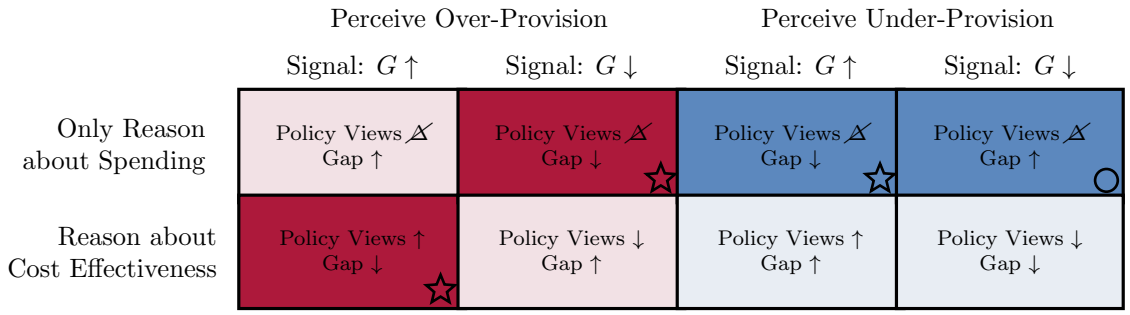
As an additional test we also examine beliefs about cost-per-student (which depends on both spending and cost-effectiveness) as a moderator of the effects of reasoning. If these beliefs are the key intermediate outcome drive our effects, controlling for them should push our effects to zero. We operationalize this insight by calculating posterior beliefs on graduates per dollar spent for all groups in Experiment 2. While not a structural parameter or sufficient statistic in a theoretical sense, these perceptions will reflect perceived cost-effectiveness. In Appendix Table A3, we shows that conditional on these posterior beliefs, all treatment groups have statistically indistinguishable ideal policies.[31] Furthermore, these results even hold when including the control group from Experiment 1 despite coming from different samples.

### 4.3 Reasoning Changes Nature and Extent of Political Participation

The broader economic and policy implications of support for higher-education spending (on the demand side) depend in part on how individuals express their preferences to policymakers (on the supply side). To the extent to which perceptions of public service provision affect political engagement, reasoning may change whether and how individuals communicate with elected officials and could either amplify or ameliorate affective polarization. Changing

[31] We regress ideal spending on grads per dollar, treatments, their interactions, and controls, clustering by state because after receiving information the posterior now varies at the state level. Because the key conditioning variable is a ratio, we Windsorize posterior perceptions at the 90th percentile.

Figure 5: Reasoning Reshapes Perceived Gaps Between Actual and Ideal Policies




Note: This Figure visualizes the implications of different reasoning responses (rows) for our four party-by-prior groups (columns). Each cell reports the model-predicted change in policy views and perceived gaps between actual and ideal policies. For each group, we highlight the dominant form of reasoning identified in Experiments 1 and 2. Based on the theory in Section 2, we also separate groups whose reasoning tends to reduce the distance between their perceived and ideal policies (star markers) and groups whose reasoning tends to expand increase this distance (circle marker). ∡ indicates no change.

constituent interactions with policymakers, at a minimum, should update policymakers' beliefs about constituent preferences and could shift equilibrium policy.

Our empirical approach assesses how differences in reasoning affect political participation. Recall two related model predictions: (1) the marginal benefits and affective costs of political participation are both shaped by perceived gaps between actual and ideal policies, and (2) for a given individual, the effects of reasoning about cost-effectiveness or spending have opposite-signed effects on this perceived gap (because reasoning about cost-effectiveness changes $G^*$ and reasoning about spending changes $\hat{G}$). Mapping the model into Experiment 1, we want compare the effects of reasoning based on whether it is likely to expand or reduce this gap. Because, individual-level reasoning is unobserved, we use the prior results from Experiments 1 and 2 to aggregate party-by-prior groups into those whose for whom reasoning is likely to reduce or exacerbate perceived under- or over-provision.

Figure 5 visualizes our approach for aggregating these groups. It reports the model-predicted effects of reasoning about cost-effectiveness or spending on the four groups—classified by initial perceptions of over- or under-provision and the sign of the graduation signal. We aggregate groups using this information in three steps. First, using survey descriptives we map these groups into the party-by-prior groups from the previous section placing Republicans—who tend to perceive over-provision on the left (in red)—and Democrats—who tend to perceive under-provision on the right (in blue).[32] Second, using the results from ran-

[32]Based on differences between ideal spending and their perceived spending in the Experiment 1 control group in, both Democrats who understate and overstate graduation rates tend to perceive under-provision (67% and 68%) as for Republicans with over-provision (62% and 55%).

domization, we identify the the dominant type of reasoning for each group and highlight it in each column: cost-effectiveness for Republicans who receive positive signals about $G$ and spending for the other three groups. Finally, we aggregate groups based on the model-based implications for perceived over- and under-provision. The model predicts reasoning will reduce the gap for all Republicans and for Democrats/Independents with positive signals about $G$ (star markers in Figure 5); reasoning will increase the gap for Democrats/Independents with negative signals about $G$ (circle marker).[33]

We estimate the effects of reasoning on political participation in Experiment 1 following Equation 2 in Section 4.1. The core difference is that rather than reporting heterogeneity by party and prior we report effects on the model-based groups depicted in Figure 5, but disaggregated results are presented in the Appendix. We discuss two sets of results. First, we examine letter-writing behavior and find that reasoning alters the nature and extent of affective polarization and is closely connected with ideological polarization. Second, we use the text from the letters to show that the direction of the change in the wedge is linked to how individuals reason, including about cost-effectiveness.

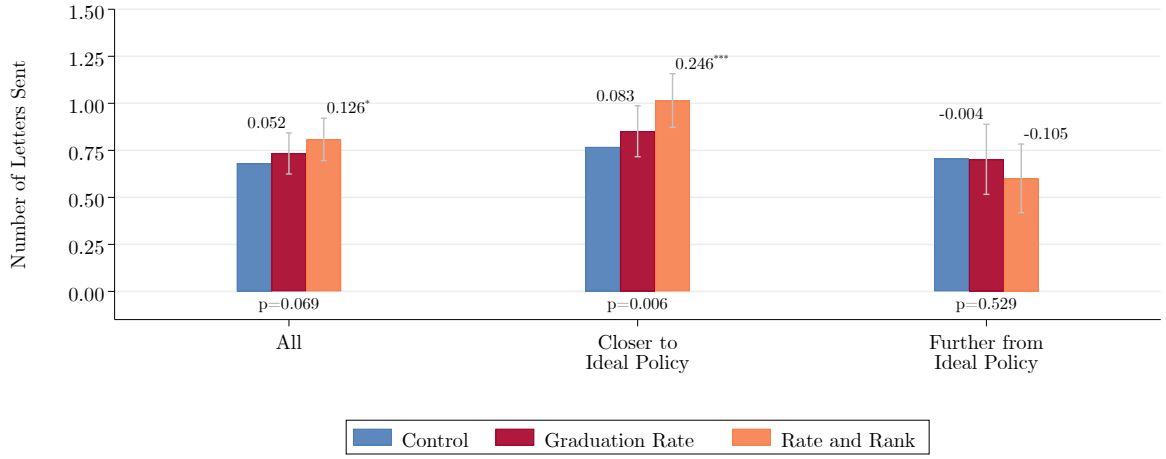
**Reasoning Connects Ideological and Affective Polarization.** We consider how political communication changes as individuals reason about the outputs of higher education services. As outlined in Section 2, reasoning may affect whether individuals communicate with elected officials, with whom they choose to communicate, and the content of those communications. Therefore, Figure 6 reports the results on total number of letters sent, letter recipients, and letter sentiment—again reporting effects of both treatments and joint tests of the pooled treatments versus control.

We consider four main results. First, we find that, on average, reasoning weakly increases communication with elected officials. Panel (a) of Figure 6 reports the results. In the control group the average individual sends 0.68 letters (out of a maximum of 5).[34] Reasoning increases letter writing by 0.05–0.12 letters (7–18%) in the full sample (p=0.069). Absent frictions from affective polarization, the theory in Section 2 implies that reasoning should only increase letter writing on the extensive margin (by changing the expected benefits of writing). In actuality, reasoning only induces a 2 percentage point increase in the share

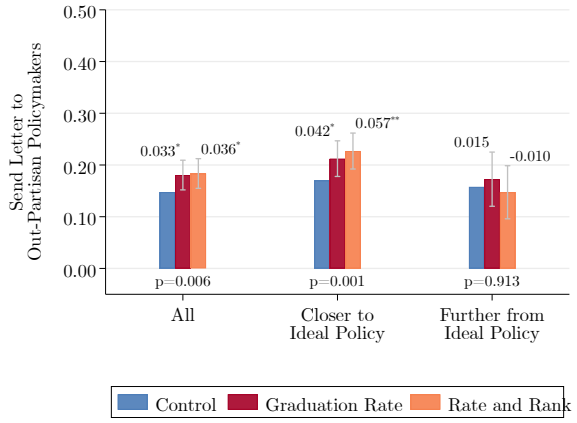
[33]To make this concrete, consider a Republican and a Democrat who both receive a positive signal about $G$. The Republican who learns graduation rates are higher reasons about cost-effectiveness, pushing ideal level of spending up toward their perceived level and reducing the perceived gap. The Democrat who learn the same information reasons about spending, pushing their perception of the status quo up toward their ideal level—also reducing the gap. For a Republican and a Democrat who receive negative signals about $G$, reasoning about spending will reduce both perceptions of the status quo, reducing the Republican's perceived gap (over-provision) but increasing it for the Democrat.

[34]Only 20% of individuals write letters. They send their letters to them to 3.2 elected officials on average.

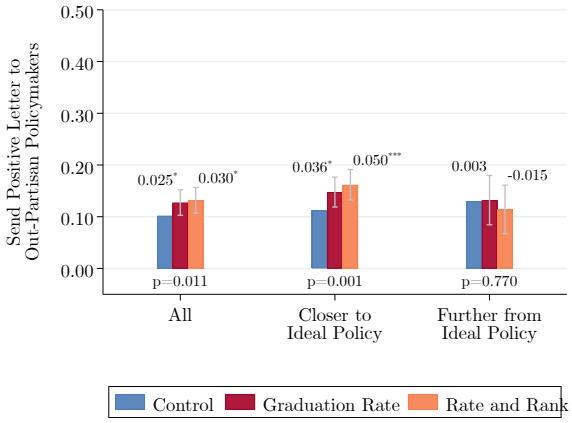
Figure 6: Reasoning Increases Communication—Especially with Out-Partisan Officials




(a) Number of Letters Sent




(b) Letter to Out-Partisan




(c) Positive Letter to Out-Partisan

Note: This figures depicts the treatment effects on political participation from our letter-writing campaign. Each panel presents an outcome of interest by treatment group and change in ideological distance along with 95% confidence intervals on the effects of the two treatments and joint tests of their effect relative to the control. Panel (a) reports the average number of letters written. Panel (b) reports the share who sent a letter to an out-partisan elected official. Panel (c) reports the share who wrote a letter with positive Syuzhet sentiment score to an an out-partisan elected official. Both panels reflect responses from 3,787 participants who completed surveys through Qualtrics and CloudResearch for the first experiment and who at least lean toward a political affiliation. We exclude Independents in Panels (b) and (c) because they do not belong to a party and so cannot reach out to out-partisans.

of respondents who write letters, indicating a substantial intensive-margin response and suggesting affective costs of interacting with out-partisan officials.

Second, the increase in communication is driven by groups who tend to reason that the over/under-provision gap ($|\hat{G} - G^*|$) decreases. In Section 2 identified an ambiguity in how this gap could affect participation. Reducing the gap will decrease participation when neo-classical benefits dominate, but will increase participation when affective frictions dominate. The second and third series in Panel (a) reveal that the entire increase in communication is driven by individuals from groups who reason that the gap is smaller (p=0.006). Point estimates even suggest that reasoning to increase the gap actually decreases letter writing. This negative relationship between the perceived gap and communication implies that the reduced benefits are more than offset by reductions in affective frictions. We parse these mechanisms directly by studying the recipients and contents of the letters.

Third, the increase in communication is entirely accounted for by letters sent to out-partisan elected officials, revealing reduced affective polarization. Panel (b) of Figure 6 reports how reasoning affects the probability that an individual sends a letter to an out-partisan official.[35] At baseline only about 15% of individuals (71% of letter writers) choose to include out-partisan elected officials as recipients of their letters. Reasoning about graduation information increases this by about 3 percentage points in the full sample and by 4–6 for groups whose reasoning reduces $|\hat{G} - G^*|$.[36] Because, we find no effect on sending letters to co-partisans, these results suggest that reductions in the perceived gaps reduce the affective costs of engaging with out-partisans. Consistent with this interpretation, the Appendix shows that the effects are 34% larger for individuals in states where out-partisan officials are in control of the state legislature.[37] To further reinforce this point, we also show that the gap in out-partisan engagement is most pronounced among self identified "strong" partisans (Appendix Figure A8) and that these same strong partisans experience the largest increases in cross-party communication (Appendix Table A9).

Finally, we find that the increase in cross-party communications is driven by positive, constructive interactions rather than negative, critical ones, sharpening the picture of reduced affective polarization. Panel (c) reports treatment effects on positive letters sent to out partisans (where "positive" sentiment is defined having a positive Syuzhet index). At baseline only 10% of individuals send positive letters to out-partisan elected officials (49% of

[35]Because independents do not technically have out-partisan elected officials, we omit them from Panel (b) and (c).

[36]This represents an 8% and a 14% increase in the probability that letter writers communicate across party lines.

[37]The reduction in political communication from individuals who reason that the gap is larger are also driven by individuals in these states (p=0.047).

letter writers). In practice this means that in addition to the 29% of letter writers who avoid cross-party communication, 31% of the individuals who do write out-partisans create negative interactions when they do. Reasoning about graduation information increases positive interactions by 2 percentage points (p=0.011), or from 49% to 54% of letter writers. Again this effect is concentrated among groups whose reasoning reduces $|\hat{G} - G^*|$ (4 percentage points or from 44% to 55% of letter writers, p=0.001). Our point estimates indicate that the share of positive letters decreases from 62% to 54% in the other group, although point estimates are not significant. Using the emergent coding described in the following subsection, we also find no increase in letters engaging in name calling, obscenities, or accusations of corruption, fraud, or nefarious intent.

Taken together these results provide new evidence that reasoning and political participation may perpetuate a cycle of mutually-reinforcing affective and ideological polarization. In the status quo most individuals perceive large gaps between their ideal and preferred policies, reflecting a pessimism about how well elected officials represent their interest. This pessimism about the policies that (out-partisan) elected officials enact could breed resentment (Iyengar et al., 2019) which is known to reduce cross-party communications (Carlson and Settle, 2022).[38] Because policymakers are not wholly unresponsive to the concerns of out-partisan constituents (as in Broockman and Ryan (2016) and confirmed in Section 6), this reduced cross-party communication can only exacerbate the distance between the policies preferred by individuals those pursued by out-partisan policymakers—which in turn may amplify affective polarization. Our results suggest that reasoning about core economic primitives reverses this self-reinforcing polarization by increasing political engagement across party lines.

**Letter Content Broadens Cross-Party Engagement.** In addition to documenting reductions in affective polarization consistent with our model of taxpayer reasoning, we also provide direct evidence of the key reasoning considerations using the letters' text. Following a process of emergent coding, we assigned each letter to one of six themes: (1) letters emphasizing the *public goods* nature of higher education, (2) letters emphasizing the *private goods* nature of higher education, (3) letters expressing concern for the *cost-effective spending* of state funds, (4) letters expressing concern about college access and *affordability*, (5) *ideological attacks*, and (6) other letters.We focus on the first four groups, which are the most common and which have direct analogues in the model. Letters emphasizing the public or private goods nature of higher education reflect taxpayers tastes for the output

[38]In the context of our theory, this relationship is why we model the affective cost of cross-party communication as a function of perceived ideological distance.

($v(G)$ or how much they believe society does or does not benefit from additional graduates). Letters about cost-effective spending reflect attention to the rate at which public funds are converted into the public good or the returns on state investments. Letters about access and affordability also focus on the connection between spending and graduation with the implicit assumption that there is a positive mechanical effect, which seems most related to reasoning about spending.

We find three main patterns from the letter content. First, letters from the control group discuss both the tastes for public education outputs or perceptions of the cost-effectiveness mechanisms, but partisans tend to raise different perspectives. In the control group 39% of the letters are about the value of public services (22% emphasizing public goods nature of higher education and 17% the private goods nature) and 42% are more related to reasoning (16% about cost-effective spending and 26% about affordability). The letters' central themes vary substantially along partisan lines. Republicans are more than three times as likely to bring up cost-effective spending (20% versus 6%) and twice as likely to discuss private goods (22% versus 10%). Democrats on the other hand, write much more about public goods (32% versus 10%) and and somewhat more about affordability (34% versus 20%). These differences characterize how Republicans and Democrats tend to think about public higher education differently both in terms of tastes for the outputs and in perceptions of the mechanism underlying the public goods production process.

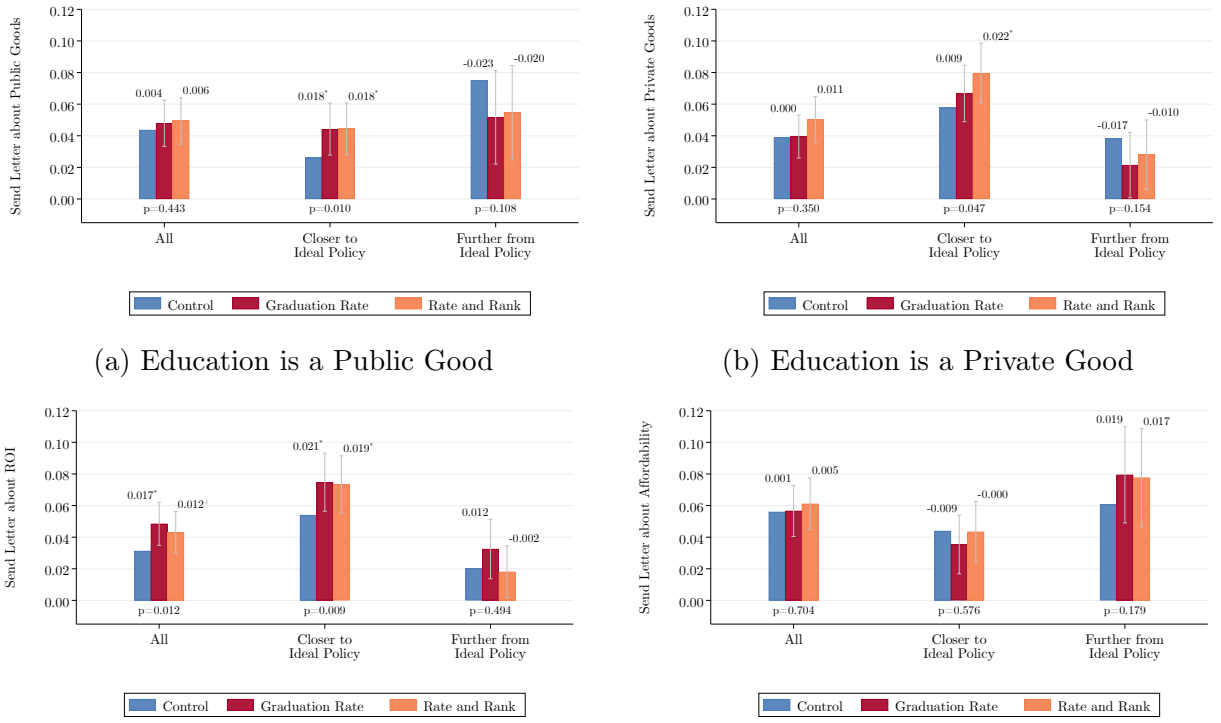
Second, estimating treatment effects on letter themes reaffirms the importance of reasoning about cost-effectiveness. In the full sample the only type of letter with a meaningful increase (1.4 percentage point, 45%) is about cost-effective spending.[39] Among groups who reason in ways that tend to reduce perceived over- or under-provision there is a roughly 2 percentage point increase in letters about cost-effectiveness and letters about the public good nature of higher education,[40] and there are slightly smaller increases in letters about education as a private good. These results indicate that the increase in political participation is coming from a broad support of individuals with different first order concerns about higher education, but that across the board, cost-effectiveness tends to be the concern with the largest marginal response from reasoning.

Finally, reasoning results in a significant increase in elected officials' exposure to out-partisan perspectives and concerns. In the full sample, there is a 3.3 percentage point (38%)

[39] As Republicans tend to be more attentive to cost effectiveness and cost-effective spending, this effect is primarily driven among them, with a 3 percentage point (71%) increase. But notwithstanding Democrats' lower baseline interest in cost-effective spending, they also see a marginally significant 1 percentage point (32%) increase.

[40] The decrease in letters noted in the previous section is almost completely driven my Democrats who no longer write about public goods after learning that graduation rates are lower ($p = 0.108$).

Figure 7: Reasoning Effects on Letter Content




(a) Education is a Public Good

(b) Education is a Private Good

(c) Cost-Effective Spending/ROI

(d) Access and Affordability

Note: This figures depicts the treatment effects on political participation from our letter-writing campaign. Each panel presents an outcome of interest by treatment group and change perceived over- or under-provision along with 95% confidence intervals on the effects of the two treatments and joint tests of their effect relative to the control. We report four results on letter content: writing a letter about (a) the public goods nature of higher education (b) the private goods nature (c) cost-effective spending and ROI, and (d) affordability. Both panels reflect responses from 4,679 participants who completed surveys through Qualtrics and CloudResearch for the first experiment.

increase of letters sent communicating traditionally partisan issues to out-partisan elected officials. To fix terms, this includes letters from Republicans to Democratic officials about cost-effective spending or the private goods nature of higher education as well as letters from Democrats to Republican officials about public goods or affordability. Among individuals who reason that ideological distance has decreased, the change is even more pronounced: 4.8 percentage points (65%). This increased communication means that as a result of taxpayer reasoning, elected officials now receive communications that reflect a more complete and nuanced set of constituent concerns. While reasoning does not completely override partisan's key concerns (Republicans are still expressing concern about cost-effectiveness for example), it does seem to embolden them to express those concerns to out-partisan elected officials who would rarely hear them otherwise.

## 5. Mechanisms Underlying Reasoning Differences

Documenting reasoning about cost-effectiveness clarifies the drivers of demand in the higher education context, but making predictions about other interventions or other policy contexts requires an understanding the cognitive processes underlying these results. We consider three broad classes of psychological mechanisms as defined in Benjamin (2019): (1) neoclassical reasoning, where individuals update using Bayes Rule; (2) prior-based reasoning where individuals update in ways to confirm their priors; and (3) preference-based reasoning, where individuals update in ways to interpret new information as "good news."[41] Neoclassical reasoning would lead individuals to update about spending versus cost-effectiveness based on the relative precision of their priors; prior-based reasoning would lead them to update in ways that confirm their perceptions about spending or cost-effectiveness; and preference-based reasoning would lead them to update toward better states of the world (such as reduced over- and under-provision, less waste, or more effective policies).

Overall, we find little evidence in favor of the first two, and more substantial evidence for preference-based reasoning as a key mechanism shaping how people interpret information. In the remainder of this section, we discuss several insights into preference-based reasoning based on the evidence in Figure 8, present evidence that other types of reasoning are unlikely to explain the pattern of results (see Figure A7), and extend our insight with two broader implications about taxpayer reasoning in general.

Following our discussions from Section 2 and our previous results, we first consider preference-based reasoning from misaligned ideal policies with state policies. The difference between ideal and perceived policies ($|G^* - \hat{G}|$) is a micro-founded measure of "good"

[41] Both prior based reasoning and preference based reasoning are sometimes referred to as "motivated reasoning" (see for example Thaler, Forthcoming).

or "bad" policy from an individual's point of view.[42] Under preference-based reasoning about the level of provision, individuals endogenous reason about spending or cost-effectiveness to reduce the gap, in line with depiction in Figure 5. For this kind of reasoning to drive divergent reasoning by party and prior, the model suggests that (1) there must be partisan differences (conditional on prior) in perceived over- and under-provision and (2) individuals must interpret the same information in different ways based on those perceptions.

Figure 8 illustrates stark evidence of these differences. For example, the first series in Panel (a) documents that Republicans who underestimate graduation rates are twice as likely to perceive over-provision as Democrats with similar priors.[43] Furthermore, Experiment 1 revealed that Republicans who learn graduation rates are higher update their ideal level of spending up toward their perceived level (reducing perceived over-provision) by reasoning about cost-effectiveness. At the same time, Democrats who learn the same information update their perceived level of spending up toward their ideal level (reducing perceived under-provision) by reasoning about spending. This model-based mechanism can also explain the reasoning differences between Republicans with different priors: Republicans who learn graduation rates are lower also tend to update their perceived level of spending down—toward their ideal level—by reasoning about spending.

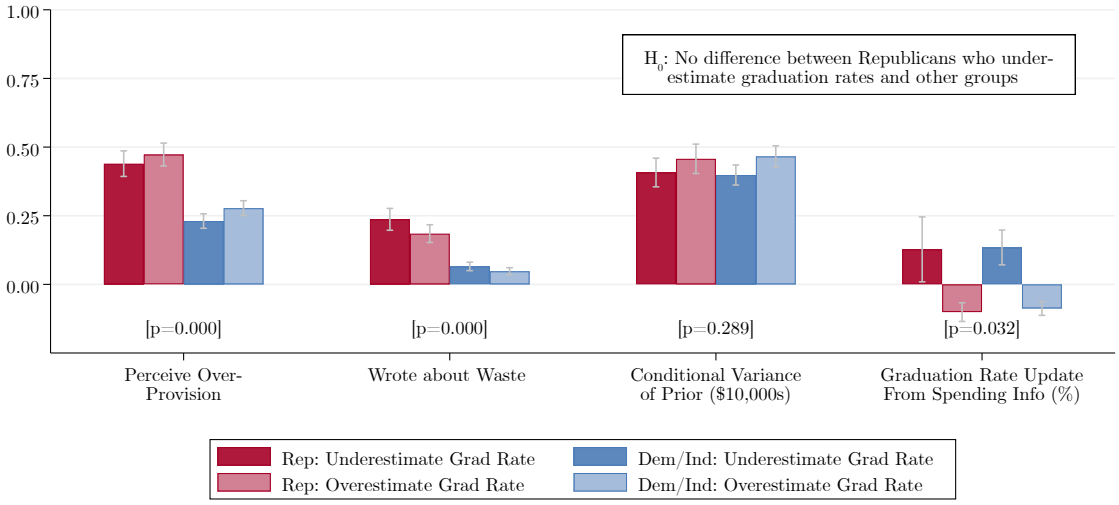
However, preference-based reasoning about over- and under-provision alone does not explain why Democrats and Independents who overestimate graduation rates reason that their states spend less (which exacerbates perceived under-provision). Given their priors on graduation rates and the information we provide, they could only reason that underprovision is smaller if they were to update that their state is less cost-effective. Lower cost-effectiveness would, in general, be a bad state of the world, especially for these individuals who believe the causal effects of spending is high (Figure A7). Appendix D also discusses this case in more detail. An alternative explanation is that these Democrats and Independents, instead, engage in neoclassical reasoning where they use their beliefs about the causal effects of spending to back out how actual spending must different when the learn graduation rates are lower.

We find additional confirmatory evidence of preference-based reasoning about cost-effectiveness in individuals' short letters to policymakers and first order-considerations about higher-education spending. We measure concerns about over-provision and cost-effectiveness based on their use of "waste" in these responses. The second series in Figure 8 shows that waste is

[42] Appendix D lays out this mechanism in greater detail and with some examples, and Appendix Figure A6 illustrates reasoning based on perceived over- or under-provision.

[43] We measure perceived over-provision as whether their perceived level of spending is higher than their ideal level of spending. These estimates use the whole sample, but we discuss above that we final a similar pattern with the control group

Figure 8: Cognitive Processes Suggest Preference-Based Reasoning




Note: This figure illustrates differences in individual characteristics, beliefs, or actions by partisanship and by prior perceptions. Bars for each group represent the share of individuals who perceive over-provision and who wrote letters about waste (measures of preference-based reasoning), the conditional variance of spending priors (neoclassical), and updating about graduation from spending information (prior-based). Hypothesis tests report the p-values for a binary regression of each outcome on an indicator for Republicans who underestimate graduation rates. The results reflect responses from all participants recruited for our second experiment from CloudResearch.

more likely to be a top-of-mind concern for Republicans as in Stantcheva (2021); however, we show that this is particularly true for Republicans who initially underestimate graduation rates. This concern suggests that part of what makes over-provision a bad state of the world for these Republicans is that their tax dollars are "wasted" when they are spent on students who do not graduate. After learning the graduation information, one respondent wrote "I was shocked that it was ranked number 2 but that makes me feel good about my tax dollars at work." Another wrote "colleges are doing a poor job if 1/3 drop out without a degree." In this sense, preference-based reasoning that reduces perceived over-provision leads Republicans to update in a way that implies less waste, attributing higher graduation rates to higher cost-effectiveness. Appendix Figure A7 explores the possibility of preference-based reasoning about student quality.[44] Although this is a first-order concern for about about 10% of individuals, we find no meaningful differences across groups marking it an unlikely driver of the reasoning documented above.

In addition to positive evidence about preference-based reasoning, we also find clear indications that neoclassical and prior-based reasoning cannot explain the patterns in the

[44]If individuals are also drawing inferences about input quality (see Appendix B), then learning that students are better prepared, more committed, or less revelrous may also be good news.

data. For example, differences due to neoclassical reasoning must reflect differences in the precision of priors and information content of the signal, but the third series shows that Republicans who underestimate graduation rates do not have less dispersed priors about spending.[45] Similarly, differences due to prior-based reasoning about spending would lead groups to confirm their own priors or give less attention to contrary information. The final series in Figure 8 shows that reasoning about spending leads individuals to more accurate posteriors about graduation rates—disconfirming their priors—the opposite of what prior-based reasoning would predict. Appendix Figure A7 also shows no differences in time spent engaging with the information and survey.[46]

Taken together these results about preference-based reasoning improve measurement and may shed some insights into the surprising inelasticity of policy preferences with respect to information. Our identifying perceptions of under- and over-provision as a theoretically-grounded metric in regard to which states of the world are "good" and "bad"—a complicated proposition in many empirical settings. In the conclusion we also highlight that providing information about equilibrium objects could lead to updating about either the effectiveness of current policy or the need for policy intervention and how this could rationalize many perplexing results from earlier information interventions.

## 6. Polarized Communication Distorts Policymaker Engagement on the Issues

How the reduced polarization and improved political participation translate to policy depends on the supply-side decisions of the elected officials who receive individuals' letters. When affective polarization reduces cross-party letter-writing and when constituents hold inaccurate perceptions of provision that affect the content of their communications, officials receive a biased signal about true constituent demand. Based on our two-sided model of political communication and policymaker engagement in Section B.4, our third experiment studies policymakers' responses to constituent demand. If constituent demand does in fact shape policymakers' engagement with higher education issues, increased cross-party dialogue could de-polarize actual policies that represent constituents better.

[45] Appendix Table A7 also shows that they are not much less likely to have a college degree—a proxy for exposure to information about provision. To the extent to which there are differences, they are driven by the high education rate of Democrats and Independents who over-estimate graduation rates, not cross-party differences given priors or within-party differences.

[46] Survey time is regression-adjusted for length of free response text as detailed in Appendix D.

### 6.1 Design for Experiment on Policymaker Engagement

In the first two experiments we collected letters from the constituents of 48 governors and 190 state legislators.[47] For our third experiment we randomize whether elected officials receive the constituent letters and information about demand in April 2023. 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.[48]

Within each state, parties (e.g., Michigan Republicans) are randomized into one of three conditions. In each state one party is randomized into our main treatment group, Constituent Demand. These parties receive an email containing the following:[49] (1) summary statistics from the demand experiments highlighting how stated ideal spending is higher than actual national spending in the US, on average, by political partisanship, and by 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 all collected letters; (4) a second link to a state-specific resolution for maintaining the level of higher education appropriations per student for them to consider and propose; and (5) an offer to discuss the survey findings with us.[50]

The remaining party in each state are then randomized equally into a pure control group, which have not been contacted, and a Contact Only control group, which receives an initial email from us in 2023 but without specific information about constituent preferences, containing only the resolution and an offer to discuss more. As a result, each state has one state party in the Constituent Demand treatment and one in either of the two control groups.

We note that the information sent to elected officials is, on average, a positive shock to perceived constituent demand for two reasons. First, as we document in Section 4, baseline ideal spending across partisan groups is higher than current state policy, signaling under-provision. Second, the information treatments in Experiments 1 and 2 uniformly increased stated ideal spending. We therefore discuss and interpret the results given that the information to policymakers should, if anything, nudge them to consider higher spending policies.

[47] Individuals could send a letter to up to five elected officials in their state (except in Nebraska, due to its unicameral legislature). We had few letters from North Dakota and South Dakota and therefore excluded them from the randomization.

[48] The experiment and pre-analysis plan were registered as AEARCTR-0011306.

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

[50] While our outcome measures are based on our interactions with the elected officials, Butler and Nickerson (2011) and Hager and Hilbig (2020) show that similar changes in exposure to constitution demand as we measure do impact the legislative behavior of elected officials.

### 6.2 Policymakers Respond to Constituent Demand

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 the resolution further.[51] For each of our higher education engagement outcomes, $H_j$, for legislator $j$, we estimate our treatment effects from the following linear regression:

$$H_j = \phi_0 + \phi_1 \text{Constituent Demand}_j + \phi_2 \text{Contact Only}_j + \psi X_j + \varepsilon_j \tag{4}$$

where $\phi_1$ and $\phi_2$ give the causal effect of receiving information about constituent demand on elected official engagement. In our specifications, we also control for the elected official's party and their chamber. Since we conduct a clustered paired experiment, we cluster our standard errors by state and do not include state fixed effects (following de Chaisemartin and Ramirez-Cuellar, 2020).[52]

Consistent with our model of policymaker engagement, we find that providing information about relatively high constituent demand increases engagement from elected officials (Figure 9). Elected officials in the Constituent Demand treatment are 15 percentage points more likely to open our resolution to maintain higher education funding compared to those who only receive a generic email ($p = 0.034$). This is largely driven by Republican officials ($p = 0.079$), with a much smaller effect for Democrats that is not statistically significant. Similarly, the Constituent Demand treatment leads elected officials, especially Republicans, to engage more on higher education issues by responding to our emails,[53] while our Contact Only treatment does not lead officials to engage in this way.[54]

Exploratory analyses suggest that party legislative control is an important moderator of these effects, as was the case with individuals' ideal spending and political participation. In the Contact Only treatment, members of congress are much less likely to engage if they are in the minority party of their chamber. Appendix Table A5 shows that for each 10 percentage point increase in the Republican share, Democrats are 10pp less likely (17%) to view the

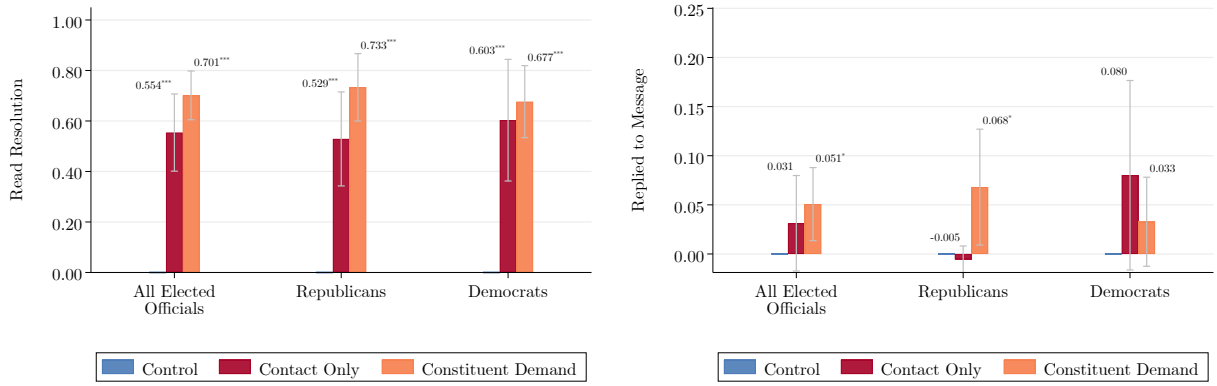
[51] We also observe whether each official in the Constituent Demand and Contact Only groups opens the email and whether those in the *Constituent Demand* treatment view the full list of letters.

[52] Including state fixed effects has a minimal effect on our main estimates for all legislatures. However, we cannot include them when limiting our analysis to Republicans or Democrats.

[53] The very small negative effect on "Contact Only" for Republicans is due to the fact that we include controls for chamber based on our randomization design. However, since Republican Governors are more likely to respond than members of the state House and state Senate, and Republican Governors are slightly overrepresented in "Contact Only," we would expect to have received a response from a Republican Governor in that treatment, but do not.

[54] 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 ($p = 0.024$).

Figure 9: Constituent Demand Boosts Engagement on Higher Education




(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. *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$, $^{+}p < 0.1$

resolution and 1pp (13%) less likely to respond to our email. A similar increase makes Republicans weakly more likely to engage. Receiving the Constituent Demand treatment completely erases this difference. In this treatment, both Democrats and Republicans have essentially flat gradients over majority for both outcomes. Conversations with legislators who met with us suggest disillusionment as a possible mechanism. Some Democrats expressed discouragement about higher education when in the minority party. Consistent with our model of policymaker engagement, minority officials face higher costs of engaging on issues where they have limited ability to move policy. The constituent demand treatment may level the gradient in engagement because the information reveals relatively broad support for higher education across constituents of both political parties.

The results from our three experiments suggest that elected officials may be shaping higher education policy in response to distorted perceptions of constituent preferences and in response to constituents' inaccurate perceptions of state higher education. This likely heightens polarization in public discussions around higher education policy, ultimately influencing which policies are implemented. While we find affective polarization is an important driver of distorted communication, our results that Republican constituents and elected officials respond the most to information indicate that within-party barriers likely also play an important role.

## 7. Conclusion

Despite its positive effects on student outcomes (Bound and Turner, 2007; Bound et al., 2010; Zimmerman, 2014; Deming and Walters, 2017) and society more broadly (Moretti, 2004), state investment in public higher education has been a low priority and marked by strong partisan disagreements. Our findings suggest that perceptions of the returns on investment are an important driver of both limited public support and polarized attitudes. When taxpayers, especially Republicans, believe their state spends a lot on public higher education without producing a sufficient number of graduates, they are less willing to support the system with their tax dollars. Correcting these perceptions reduces polarization, suggesting that not all ideological differences are irreconcilable. Moreover,these sentiments matter for policy, as they affect how constituents communicate with policymakers and in turn affect policymaker behavior.

Our findings indicate that state policymakers seeking to build support for higher education may benefit from tying public investment to cost-effectiveness measures and then communicating the associated returns to their constituents. Comments in the letters to elected officials collected in our experiments suggest that taxpayers may be more open to funding students who are likely to graduate and contribute to the economy, thereby increasing the returns.[55]

Our results about preference-based reasoning also have implications beyond higher education—especially with respect to the surprising inelasticity of policy preferences with respect to information. After reviewing many survey experiments, Haaland et al. (2023) notes the counter-intuitive pattern that even though information successfully changes beliefs, it often does not affect stated policy choices (for specific examples see Kuziemko et al. (2015), Alesina et al. (2018), Alesina et al. (2021), and Roth et al. (2022)). Our results suggest that one reason this might be the case is that these papers, like ours, all provide information about equilibrium objects. Whenever an economic object (whether a graduation rate, the extent of discrimination, or something else) is co-determined by both policy and exogenous factors, information about that object could lead to updating about either the effectiveness of current policy or the need for policy intervention. For example, in the context of Roth et al. (2022) on racial discrimination, individuals who under-estimated discrimination can choose whether to respond to information by concluding that the policies are less effective (which would affect support) or just more under-provided (which would not affect support). By

[55] As one respondent commented, "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."

identifying perceptions of under- and over-provision as a theoretically-grounded metrics that could drive preference-based reasoning, we document differences in how individuals choose to interpret equilibrium signals about education—differences that lead most groups to have highly inelastic policy preferences just as in earlier work.

Finally in the broader context of increasingly polarized political systems across the word, our results show how perceptions of the policy process also affects how partisans view each other. Our work provides evidence that ideological and affective polarization reinforce one another. Therefore, just as state divestment in public higher education may not only negatively affect colleges and students but also have broader implications for societal cohesion, other polarizing policies implemented by both political parties run the risk of further reinforcing the polarization that gave rise to them. Interestingly, we find that increasing transparency about service provision can lessen these negative social effects. While further research is needed to determine whether altering perceptions for other public services can yield similar reductions in polarization, 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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# A. Additional Tables and Figures

Table A1: Treatment Balance 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: Treatment Balance for Experiment 2

| **Panel A: Belief Errors** | Mean | Graduation | Spending | Spending & 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 A: Belief Errors** | Mean | Graduation | Spending | Spending & 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: Posterior Perceptions of Grads per Dollar Moderate Effects of Reasoning

| | Graduation Signal | Spending Signal | Both Signals |
|---|---|---|---|
| Treatment Effects Conditional on Grads per Dollar | 4 | -246 | -328 |
| | (455) | (525) | (399) |
| | t=0.01 | t=0.47 | t=0.82 |

Note: This table reports the treatment effects from a pooled regression of all individuals for whom we can estimate posterior perceptions of cost-per-graduate in Experiment 1 or Experiment 2. We regress ideal spending on treatment effects, quadratics of this posterior, their interactions, and baseline demographic controls. Because grads per dollar is a ratio, we Windsorize the right tail at the 90th percentile of all posteriors.

Table A4: Treatment Balance 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] |
| State's spending per student | $8,058 | $7,883 | $7,898 | $8,227 | $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.

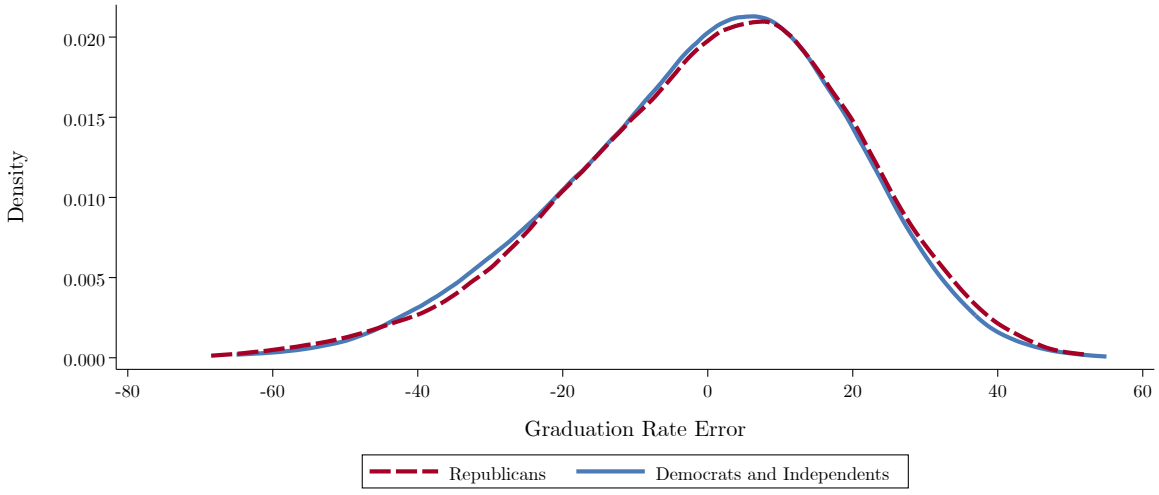
Table A5: Party Majority Moderates Baseline Policymaker Engagement

| **Panel A: Contact Only** | Democrats Click | Republicans Click | Democrats Reply | Republicans Reply |
|---|---|---|---|---|
| Share Republican (10pp) | -0.10 | 0.04 | -0.01 | 0.000 |
| | (0.05) | (0.05) | (0.03) | - |
| Mean at 50/50 | 0.62 | 0.52 | 0.11 | 0.000 |
| Test Equal Slopes | | $[p = 0.06]$ | | - |

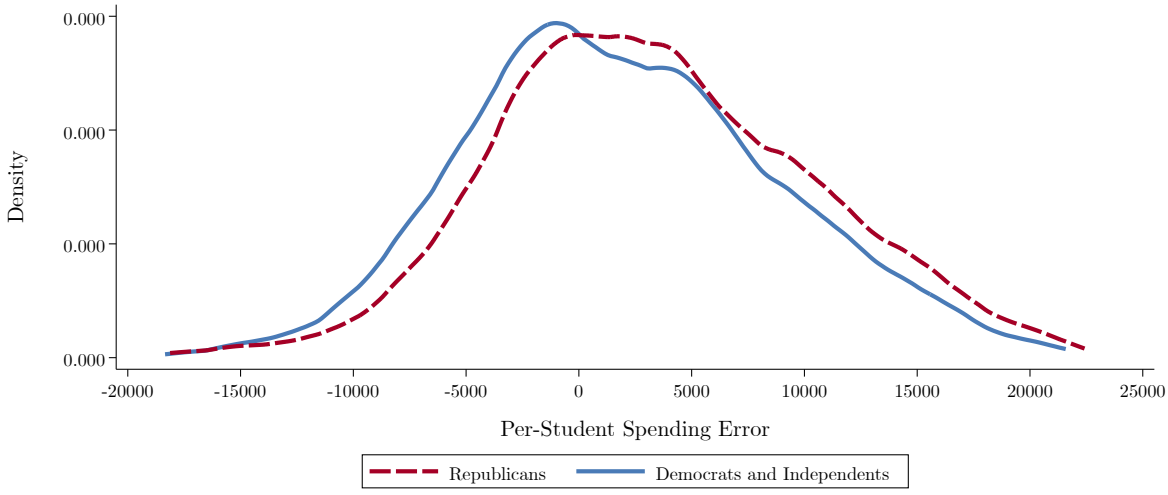
| **Panel B: Constituent Demand** | Democrats Click | Republicans Click | Democrats Reply | Republicans Reply |
|---|---|---|---|---|
| Share Republican (10pp) | 0.01 | 0.03 | 0.00 | 0.02 |
| | (0.04) | (0.04) | (0.00) | (0.02) |
| Mean at 50/50 | 0.60 | 0.66 | 0.02 | 0.04 |
| Test Equal Slopes | | $[p = 0.57]$ | | $[p = 0.88]$ |

Note: This table shows how responses vary by political partisanship and congressional vote share. The sample is limited to members of congress and results report bivariate regressions of outcomes on $s = \text{pct_rep} - 0.5$ for each subgroup. Hypothesis test come from models interacting republican share with party.

Figure A1: Perceptions of Higher Education by Party



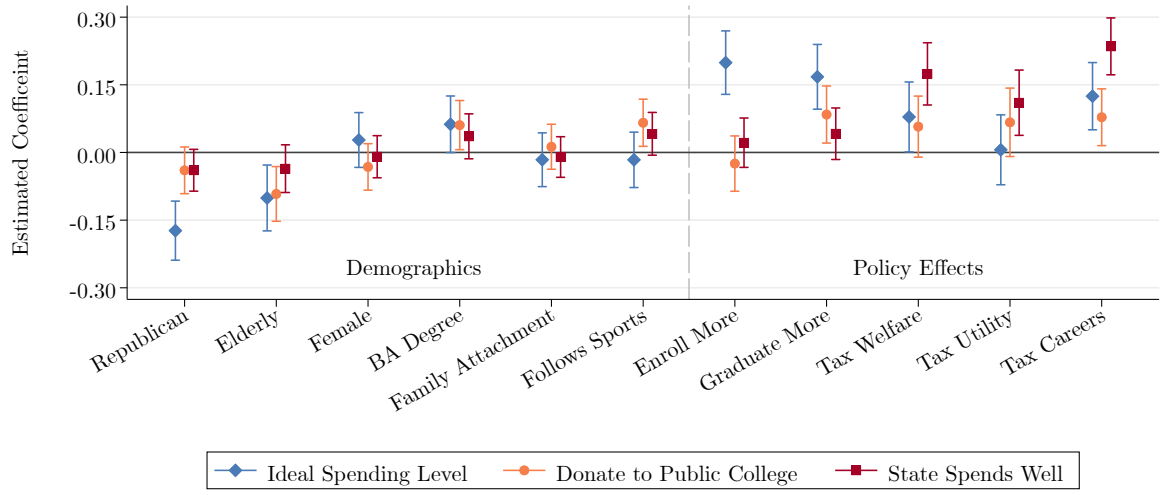

(a) Graduation Rate



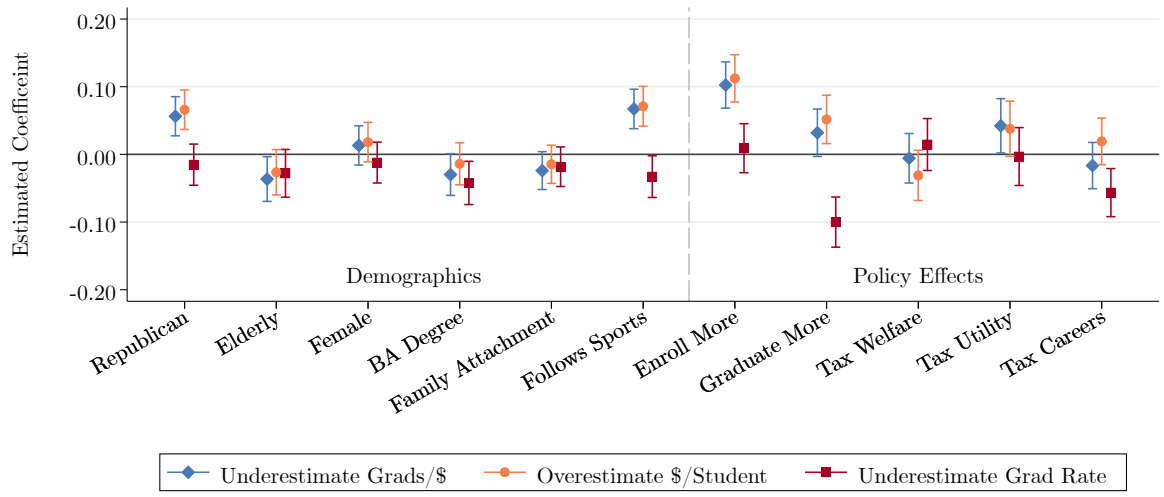

(b) Per-Student Spending

Note: Each figure presents the distribution of belief errors separately by party. Panel (a) reports the distributions of belief errors about the graduation rate in respondents' states and Panel (b) about the per-student spending. Both panels report pooled responses from the first and second survey.

Figure A2: Policy Beliefs Predict of Perceptions and Policy Views



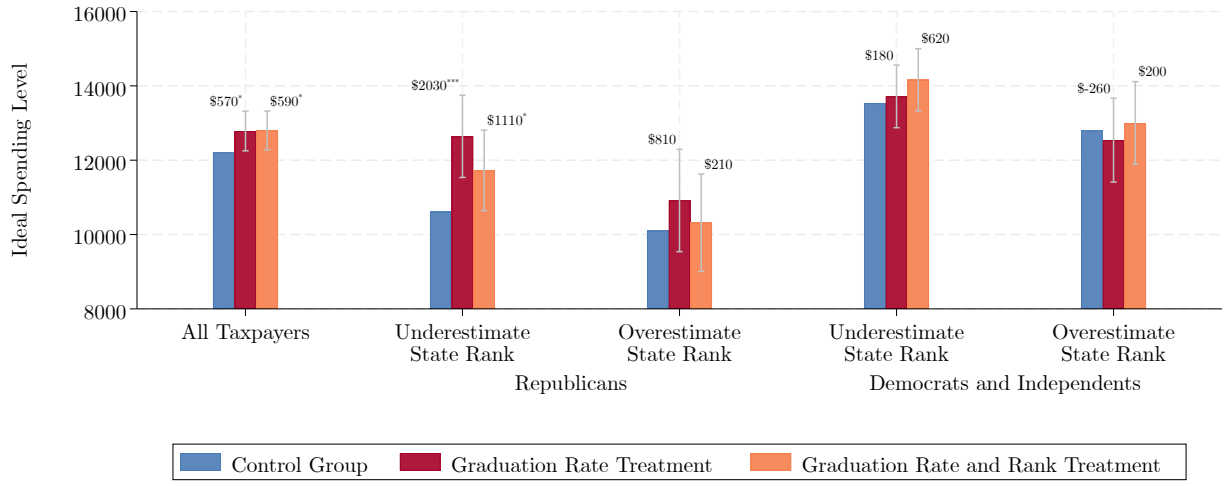

(a) Policy Views




(b) Perceptions

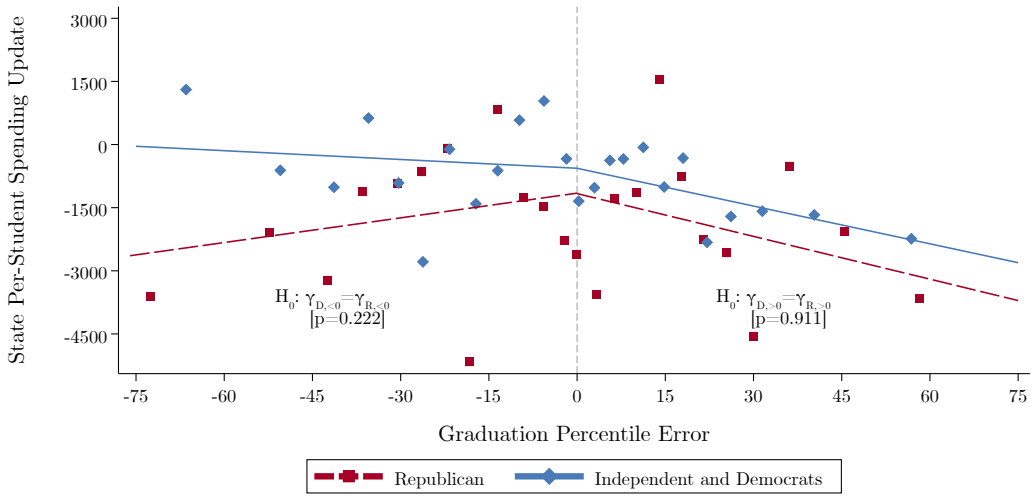
Note: This figure shows the relationships between observable characteristics, policy beliefs and and individuals' survey responses. Panel (a) predicts support for higher education The markers with blue diamonds are estimates from a Poisson regression of the ideal spending level, those with orange circles are estimates from a linear regression on an indicator that the individual 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 individual agrees or strongly agrees that they trust the state to spend tax revenue well on public higher education. Panel (b) predicts perceptions of cost-effectiveness ROI. To make all predictors binary we split each policy belief by above and below average. The three series are signals of perceived cost-effectiveness. The markers with blue diamonds are estimates for indicator variables for underestimating the graduation rate in their state, the markers with orange circles for overestimating the per-student spending on public higher education in their state, and the markers with red squares for underestimating the number of graduates per $10,000 spent on public higher education in their state. Data come from control-group survey responses from the Qualtrics and CloudResearch samples for the first experiment.

Figure A3: Heterogeneity by Partisanship and State Rank Perceptions

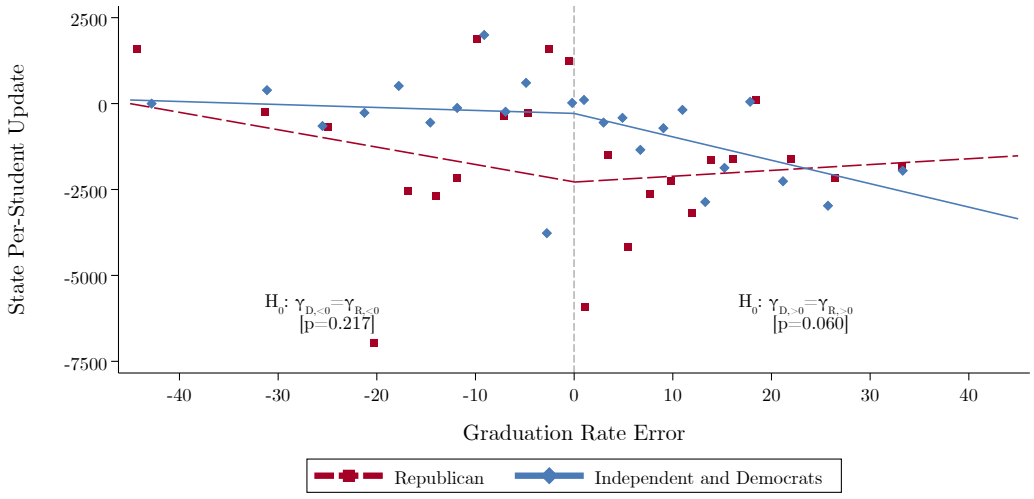



Note: This figure presents stated ideal spending per student by treatment group and characteristics along with 95% confidence intervals on the effects of the two treatments. The sample is the 4,679 individuals who completed surveys through Qualtrics and CloudResearch for the first experiment. *** $p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

Figure A4: Additional Evidence of Partisan Reasoning from Graduation Information



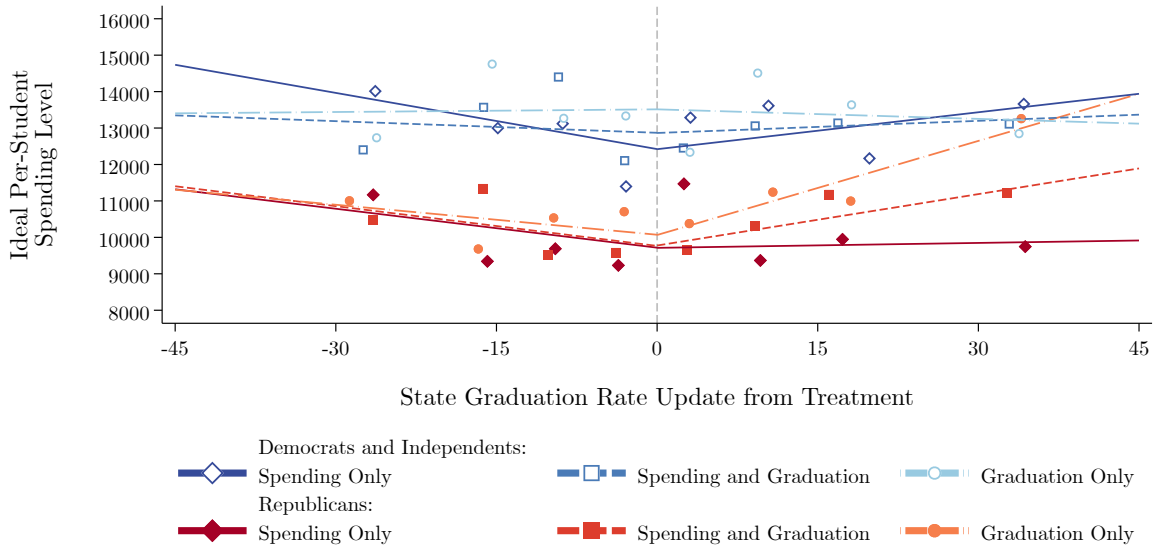

(a) Graduation Rank Information Changes




(b) Other Evidence of Partisan Reasoning from Graduation Rate Information

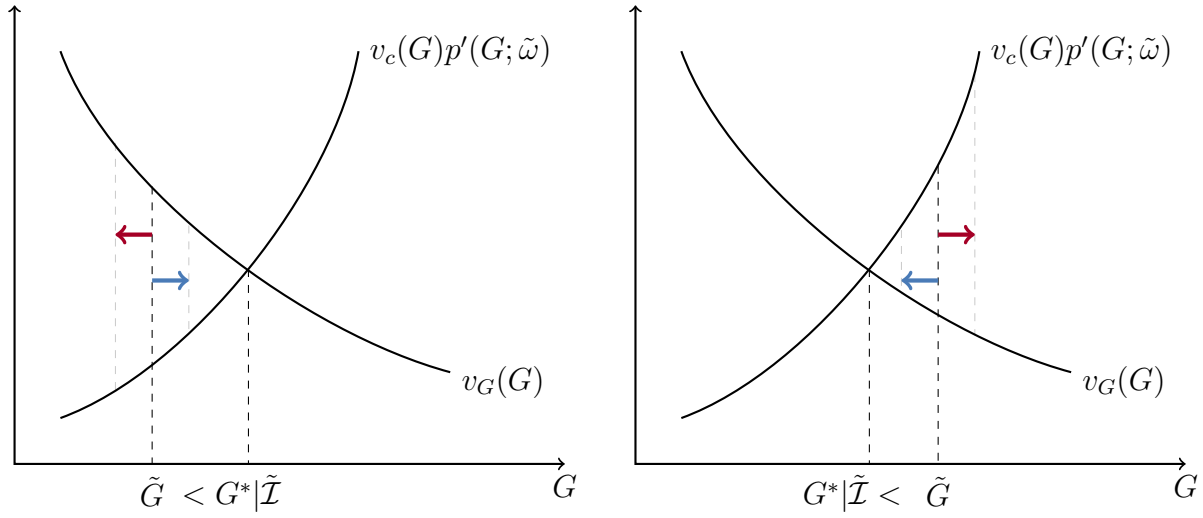
Note: This figure illustrates differences in updating by partisanship and priors. Each panel presents the change in the perceived state per-student spending for individuals with different partisan identity over their belief errors, i.e., the prior perceptions minus the true value. Panel (a) shows updating 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.

Figure A5: The Effect of Graduation and Spending Information by Party and Prior




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 prespecified regression controls. Both panels reflect responses of participants recruited for the second experiment.

Figure A6: Examples of Preference-Based Reasoning from Over- and Under-Provision

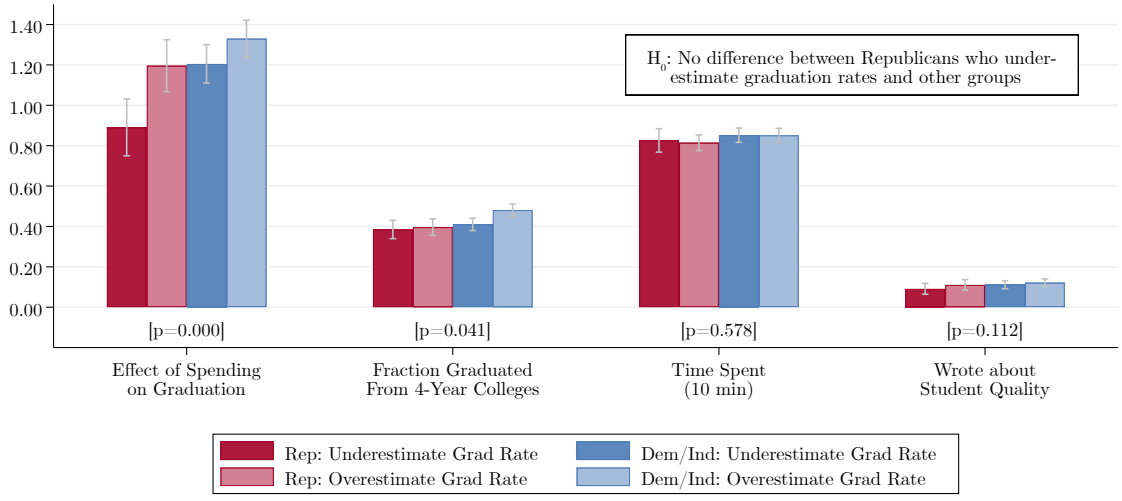



(a) Perceive Over-Provision

(b) Perceive Under-Provision

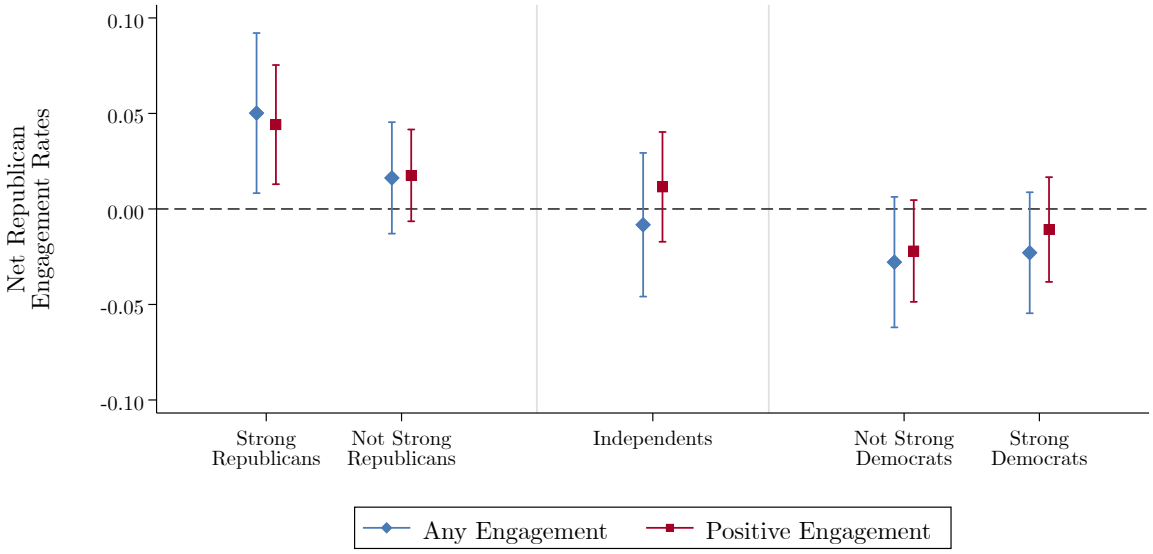
Note: This figure demonstrates how reasoning about spending can change and individuals perceiptions of over- and under-provision. Reasoning that reduces perceive over- or under-provision are depicted with (blue) arrows pointing toward the optima, and reasoning that increases these perceptions with (red) arrows pointing away from the ideal. Analogous intuition applies for reasoning about ROI.

Figure A7: Additional Evidence of Preference-Based Reasoning about ROI



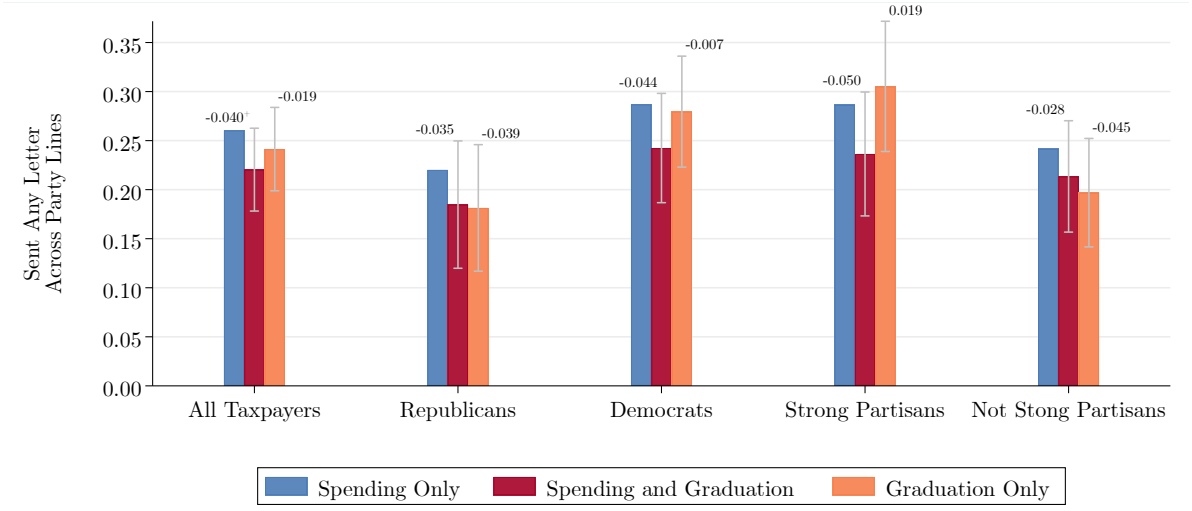

Note: This figure illustrates differences in individual characteristics, beliefs, or actions by partisanship and by prior perceptions. Bars for each group represent the perceived causal effect of spending, the share of individuals with a four-year degree, time spent interacting with information and on the survey, and whether individuals student input quality in their letters. Hypothesis tests report the p-values for a binary regression of each outcome on an indicator for Republicans who underestimate graduation rates. The results reflect responses from all participants recruited for our second experiment from CloudResearch.

Figure A8: Affective Polarization in Public Higher Education

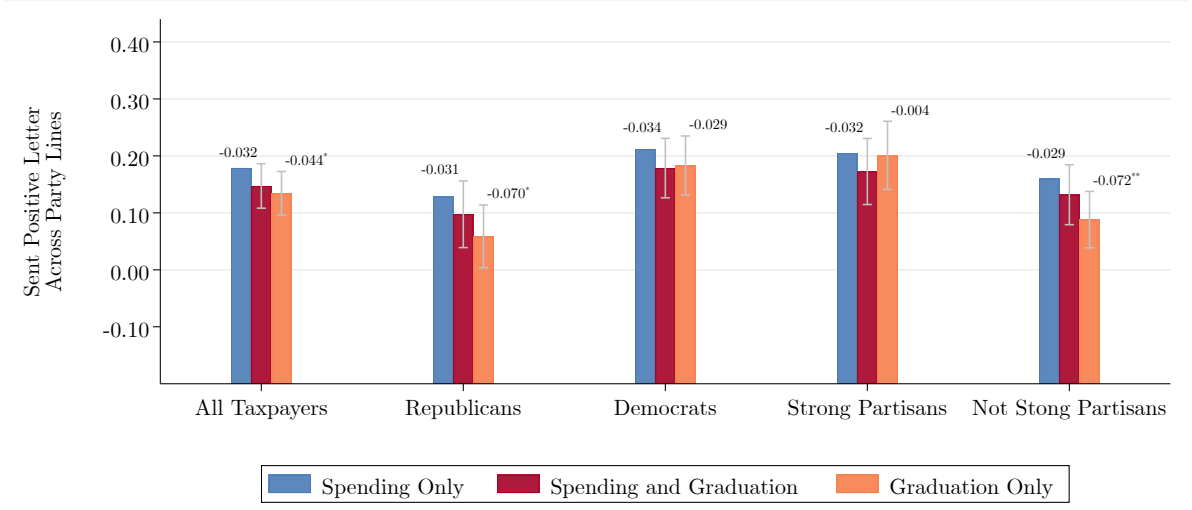



Note: This figure shows two measures of affective polarization. The first series reports the net probability of sending a letter to Republican over Democratic representatives, and the second the net probability of sending a positive letter to Republican over Democratic representatives. For each series we measure the rate of *Net Republican Engagement* as the difference in the likelihood of sending a letter to at least one Republican official compared to at least one Democrat. Both rates are between -1 (only Democrats) and 1 (only Republicans), so in the presence of affective polarization, we would expect positive values of both measures for Republicans and negative values for Democrats. Markers and standard errors come from the constant term in linear probability models with demeaned controls. Sentiment is measured as the average sentiment of words in the letters from the Syuzhet Lexicon, with no letter being zero; a positive letter has sentiment value above zero. Estimates reflect responses of individuals in the control group recruited from Qualtrics and CloudResearch for the first experiment.

Figure A9: 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 characteristics along with 95% confidence intervals on the effects of the two treatments. Panel (a) reports the share that wrote a letter to an elected official from the opposing party. Panel (b) reports the share that wrote a letter with positive Syuzhet sentiment score to to an elected official from the opposing party. Both panels reflect responses from 2,464 individuals who completed surveys for the second experiment and who at least lean toward a political affiliation.

## B. Model and Extensions

### B.1 Rank and Level as Separate Goods

In our main interpretation of the model, we consider the graduation rate in a state and its rank relative to other states as two measures of the level of provision $G$. If, alternatively, we consider these as separate public goods, then let utility be $u_i(c, G, R)$ where $R = F(G)$ is the (percentile) rank of individual $i$'s state relative to other states and is included in the perceived information set $\mathcal{I}$. If we allow $F()$ to be a continuously differentiable distribution function, then the first order condition will be

$$\underbrace{v_G(G^*|\mathcal{I}) + v_R(G^*|\mathcal{I})f(G^*|\mathcal{I})}_{\text{Perceived Marginal Benefit}} = \underbrace{v_c(G^*)p'(G^*;\omega|\mathcal{I})}_{\text{Perceived Marginal Cost}}, \tag{5}$$

where $f(G) = F'(G)$ is the perception of the probability density function of $G$.

In addition to the points made in the body of the paper, if individuals get direct utility from $R$, then receiving information about graduation rates will lead individuals also update their beliefs about the rank. Similar to the discussion about costs, learning that $G > \tilde{G}$ could alternatively reflect either movement along the marginal benefits curve or a shift. A movement along the marginal benefit curve holds $F()$ constant and updates $R$ accordingly, as such it does not change ideal policies. However, if the individual concludes that the distribution of $F()$ is higher (or more dispersed), the marginal benefits curve will shift out, and this reasoning will increase the graduation rate in individuals' ideal policies.[56]

### B.2 Input Quality

In reality, state spending on higher-education is not the only determinant of the number of graduates produced. As such the the total number of graduates divided by the total spending is not the average ROI in a causal sense.[57] To think about how this affects the model's intuitions consider a second variable, input quality, $A$ (such as the incoming academic ability of potential students) that also matters for the level of provision, $G = G(S, A; \omega)$ or $S = p(G; A, \omega)$. If individuals also have a belief about $A$ in information set $\mathcal{I}$, then the new ideal policy will be at

[56] For example, consider an individual who interprets her own state's high graduation rate as a signal that the full distribution of $F$ is higher than initially perceived. Because $\hat{F}(G) < \tilde{F}(g)$, her marginal utility $v_R$ will be higher and her marginal benefit curve will shift out.

[57] One way to think about this concern is what is the intercept in the production function, i.e., the level of provision when spending is zero.

$$\underbrace{v_G(G^*(\mathcal{I}); A)}_{\text{Perceived Marginal Benefit}} = \underbrace{v_c(G^*(\mathcal{I}))p'(G^*(\mathcal{I}); A, \omega)}_{\text{Perceived Marginal Cost}}, \tag{6}$$

if there is an interior solution, or at $G* = G(0, A; \omega) > 0$ if the price of the first *marginal* graduate is greater than the value.

Note that this specification enriches our discussion about perceptions and polarization in two ways. First, because now the marginal costs curve depends on perceived cost-effectiveness, $\omega$, as well as on the perceived input quality, $A$. As such, if one political party tends to think that students are lazy or unprepared, then the marginal cost of producing additional graduates will be very high. Furthermore, it is not unreasonable that for many taxpayers the perceived benefits of graduates, $v_G$ is informed by perceptions of those students' preparedness, post-graduation productivity, or "worthiness" to benefit from public expenditures, all of which are related to $A$.

With these considerations in mind, information about graduation rates could also affect ideal policies if people reason about $A$. Whereas in the simple model learning that graduation rates are higher than perceived could lead to updating about spending levels or about the ROI, now it could also lead taxpayers to conclude that the quality of incoming students is actually higher. This update will shift the marginal cost curve to the right, which will increase the ideal level of provision, all else equal.[58]

### B.3 Constituent Political Communication

Let elected officials, indexed by $j$ represent our individuals, $i$, who have policy beliefs and ideal policies as defined in the prior sections. Officials have (possibly inaccurate) prior perceptions of the ideal policies of their constituents $f_j(G^*) \sim \mathcal{N}(\tilde{\Gamma}_j, \tilde{\sigma}_j^2)$. Officials implement the optimal policy of their (perceived) median voter: $G = \tilde{\Gamma}$. We treat priors as exogenous, so they can account for beliefs that are centered around co-partisan constituents (higher or lower $\tilde{\Gamma}_j$) or for officials who are more or less responsive to additional information (lower or higher $\tilde{\sigma}_j^2$).

When an elected official receives a communication from a constituent, it serves as a signal about the true distribution of constituent preferences. Each letter contains a signal $g_i = G_i^* + \epsilon_i$ with $\epsilon_i \sim \mathcal{N}(0, \sigma_\epsilon^2)$, the signals are imprecise because officials know that constituents may be writing them and expressing preferences based off of inaccurate beliefs

[58] Learning that $A$ is higher might also affect considerations about the slope of the marginal cost curve which would render the change in ideal policies a quantitative question.

$\mathcal{I}_i$ and because they may need to extract policy preferences indirectly from the letter's content and tone. Officials update in a Bayesian manner:

$$\hat{\Gamma} = \tilde{\Gamma} + \frac{\tilde{\sigma}_j^2}{\tilde{\sigma}_j^2 + \sigma_\epsilon^2}\left(g_i - \tilde{\Gamma}\right)$$

where we denoting the weight on the signal $\kappa_j = \frac{\tilde{\sigma}_j^2}{\tilde{\sigma}_j^2 + \sigma_\epsilon^2}$. Note that allowing the policymaker to reason about selection into letter writing which would further deflate $\kappa_j$ since only more extreme policy preferences are worth paying the cost to express.

Constituents weigh the costs and benefits of communicating with the elected official with their own (possibly inaccurate) perceptions. Note that in this model constituents decide whether to send a letter, but not what signal to send. Constituents know that the officials implement the optimal policy of the perceived median voter and thus believe that $\Gamma_j = \hat{G}$. Constituents also have their own perceptions of the strength of this prior relative to the information content of their letters, $\kappa_{i,j}$. Finally, writing letters requires an effort cost which we allow to vary at the individual-by-official level $\alpha_{i,j}$. Combining these pieces, constituents compare the utility of writing or not writing a letter:

$$\begin{aligned} V_{\text{send}} &= \mathbb{E}_\epsilon\left[u_i\left(\hat{G} + \kappa_{i,j}\left(G_i^* - \hat{G}\right) + \kappa_j \epsilon_i\right)\right] - \alpha_{i,j} \\ V_0 &= u_i(\hat{G}) \end{aligned}$$

If we denote $\nu_{i,j}\left(\kappa_{i,j}\left(G_i^* - \hat{G}\right)\right) = \mathbb{E}_\epsilon\left[u\left(\hat{G} + \kappa_{i,j}\left(G_i^* - \hat{G}\right) + \kappa_{i,j}\epsilon_i\right) - u_i(\hat{G})\right]$, then constituents will sent a letter if and only if the expected benefits exceed the costs, i.e., when

$$\nu_{i,j}\left(\kappa_{i,j}\left(G_i^* - \hat{G}\right)\right) > \alpha_{i,j}$$

### B.4 Elected Official Engagement with Constituent Political Communication

We now consider how constituent political communication affects elected official's decisions to engage. Recall that official $j$ holds prior $f_j(G^*) \sim \mathcal{N}(\tilde{\Gamma}_j, \tilde{\sigma}_j^2)$. We decompose the prior mean as

$$\tilde{\Gamma}_j = \Gamma + b_j, \tag{7}$$

where $\Gamma$ is the true median constituent ideal policy and $b_j$ captures distortions in $j$'s prior. This bias may come from selective constituent communication where elected officials are more likely to learn about the preferences of individuals in their own party because of affective polarization, or from constituents communicating based on inaccurate perceptions. With $b_j \neq 0$, elected officials implement policies misaligned with their constituents (Butler and Nickerson, 2011).

Now suppose official $j$ receives an informative signal about constituent preferences from their communications: $s_j = \Gamma + (1-\beta)b_j + \eta_j$ with $\eta_j \sim \mathcal{N}(0, \sigma_\eta^2)$ and $\beta \in [0,1]$. This new signal may not be unbiased because of selection into who chooses to engage with their elected officials as described above. In line with our experiment, we consider a setting where we lessen selection into political communication, implying $\beta$ captures how much of the prior bias the signal corrects. We expect the precision of the signal $(1/\sigma_\eta)$ to be increasing with the number of constituents who communicate their preferences. A Bayesian elected official will update so that:

$$\hat{\Gamma}_j = \tilde{\Gamma}_j + \lambda_j(s_j - \tilde{\Gamma}_j), \quad \lambda_j = \frac{\tilde{\sigma}_j^2}{\tilde{\sigma}_j^2 + \sigma_\eta^2}. \tag{8}$$

where $\lambda_j$ is analogous to $\kappa_j$ but applied to an aggregate signal $s_j$ that reflects the collective communication of constituents (e.g. from a letter-writing campaign) rather than from a single letter. Substituting $\tilde{\Gamma}_j = \Gamma + b_j$ and $s_j = \Gamma + (1-\beta)b_j + \eta_j$ and taking expectations over $\eta_j$ gives:

$$\mathbb{E}[\hat{\Gamma}_j] = \Gamma + (1 - \lambda_j\beta)b_j. \tag{9}$$

The information partially corrects the bias, leading elected officials to be more informed about true preferences in their state. Consistent with the empirical patterns we document, we assume $b_j < 0$: officials underestimate constituent demand for higher-education spending. Under this assumption, corrective signals imply, on average, $\hat{\Gamma} > \tilde{\Gamma}$.

After observing the signal and updating their beliefs, the official decides whether to engage with the policy issue—for example, by reviewing a resolution or responding to a constituent. The benefit of engaging is the perceived gain from moving policy closer to constituent preferences, which is proportional to the belief shift $\hat{\Gamma}_j - \tilde{\Gamma}_j$.[59] Engagement also carries a cost $c_j = \bar{c} + \varphi(1 - m_j)$, where $m_j \in [0,1]$ is official $j'$s party's share of legislative seats and $\varphi > 0$ determines the disadvantage the minority party faces. Minority-party

[59]Since elected officials implement their perceived median voter's ideal policy, the baseline policy before receiving $s_j$ is equal to $\tilde{\Gamma}_j$.

officials face higher costs, reflecting the disillusionment associated with limited ability to move policy. The official engages if

$$\hat{\Gamma}_j - \tilde{\Gamma}_j > \bar{c} + \varphi(1 - m_j). \tag{10}$$

From equation (8), $\hat{\Gamma}_j - \tilde{\Gamma}_j = \lambda_j(s_j - \tilde{\Gamma}_j)$, so the left-hand side is the belief shift induced by the signal, scaled by the weight the official places on it.

The model highlights a key connection between constituent communication from Section B.3 and elected official behavior. The messages that elected officials see are determined both by selection into sending a letter and the information content of the letters. Therefore, constituent reasoning from information that changes $G_i^*$, $\alpha_{i,j}$, and therefore the number of letters has two potential effects: it changes both the signal, $s_j$, and the informativeness of the signal, $\lambda_j$.

## C. Survey Questions and Treatments for Experiments

*Only included in Experiment 2

### C.1 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.[*Sliding scale from 0 and 100 (increments of 1)*]
- What percent of students who enroll in public four-year colleges in **STATE** graduate within six years of enrollment? Use the slider below to indicate your guess. [*Sliding scale from 0 and 100 (increments of 1)*]
- Where does [Participant's 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 **STATE** has the country's lowest graduation rate. [*Sliding scale from 1 and 50 (increments of 1)*]
- In 2019, how many tax dollars did **STATE** spend per student at public four-year colleges? Use the slider below to indicate your guess in $1000s. [*Sliding scale from 0 and 25 (increments of 0.1)*]
- How does **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 **STATE** spends more tax dollars per student than any other state; a rank of 50 means you believe **STATE** spends fewer tax dollars per student than any other state. [*Sliding scale from 1 and 50 (increments of 1)*]

### C.2 Information Treatments

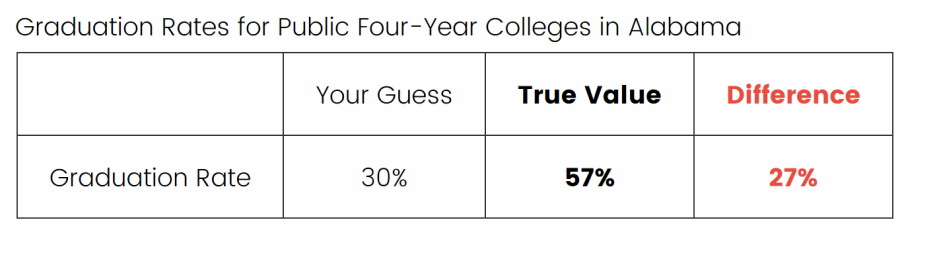
Please take a moment to review these tables and see how close your guesses were to the true values. [*Participants in the first experiment are randomized to see either Figure C1a or Figure C1b, or to not see this screen at all. Participants in the second experiment are randomized to see only Figure C1b, Figure C1b and Figure C1c, or to not see this screen at all.* ]

### C.3 Survey Outcomes

- How much do you think **STATE** should spend per student each year at public four-year colleges (in $1000s)? [*Sliding scale from 0 to 25 (increments of 0.1)*]

Figure C1: Information Treatments

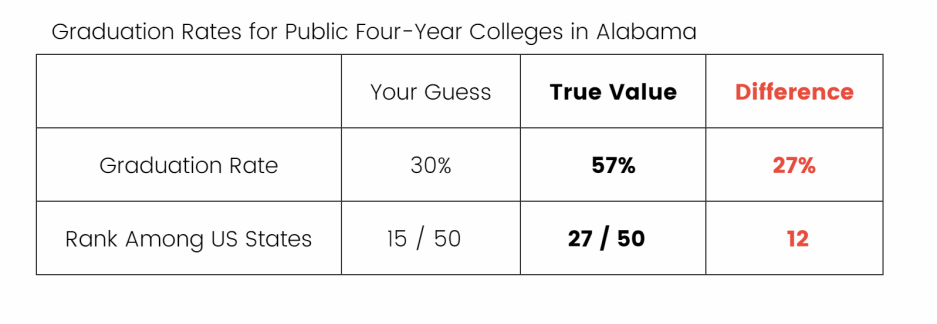
(a) Graduation Rate



Graduation Rates for Public Four-Year Colleges in Alabama

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

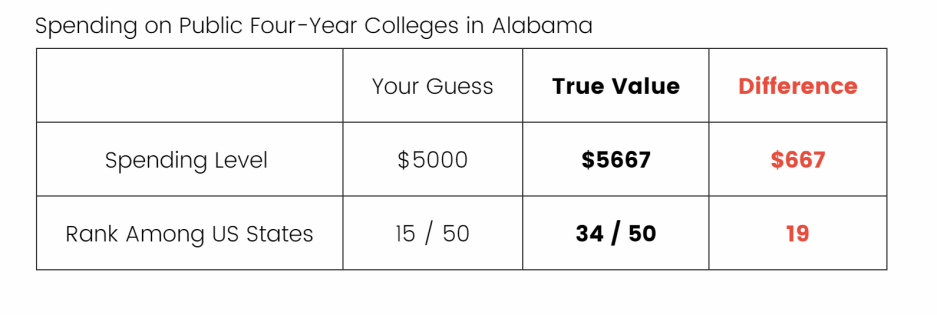
(b) Graduation Rate and Rank



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** |

(c) 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** |

- Imagine **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. [*Sliding scale from -5 to 5 (increments of 0.1)*]

- ...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. [*Sliding scale from -5 to 5 (increments of 0.1)*]

- Now imagine **STATE** collects an additional $1 in tax revenue each year from every resident in the state to spend on public four-year colleges in **STATE**. To what extent do you agree with the following statements regarding this change? ... The average

person in **STATE** would be better off. [*Strongly disagree, Somewhat disagree, Neither agree or disagree, Somewhat agree, Strongly agree*]

- ... I personally would be better off. [*Strongly disagree, Somewhat disagree, Neither agree or disagree, Somewhat agree, Strongly agree*]
- ... 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? ... I trust that public four-year colleges in **STATE** use taxpayer dollars well. [*Strongly disagree, Somewhat disagree, Neither agree or disagree, Somewhat agree, Strongly agree*]
- ... I personally would be better off. [*Strongly disagree, Somewhat disagree, Neither agree or disagree, Somewhat agree, Strongly agree*]
- ... **STATE** should shift the cost of public higher education from taxpayers to students by charging higher tuition. [*Strongly disagree, Somewhat disagree, Neither agree or disagree, Somewhat agree, Strongly agree*]
- ... 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.4 Behavioral Outcomes

- Thank you for sharing your opinions regarding state spending on public four-year colleges in **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 **STATE** state officials. If you wish to make any comments, please provide them here: [*Long text entry*]
- Who would you like us to send these preferences to? Please select at least one. [*The Governor of **STATE**; The Republican leader in the **STATE** House of Representatives; The Democrat leader in the **STATE** House of Representatives; The Republican Leader in the **STATE** Senate; The Democratic Leader in the **STATE** Senate; I do not wish to make any comments*]
- *Thank you for sharing. [for those who wrote: 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 **STATE** should (select least 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... (select at least one) [*it's important for **STATE** to be a leader on public higher education, it's not important for xx to be a leader on public higher education, **STATE**'s spending on higher education generally strengthens the economy, **STATE**'s spending on higher education generally goes to waste, **STATE** is responsible for providing college education for students, **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 **STATE**. As part of this survey you can donate up to $0.25 to higher education in **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 **STATE**. Please use the slider to choose the amount you wish to donate. College name: [*Text entry*]

- Amount: [*Sliding scale from 0 to 0.25 (increments of 0.01)*]

### C.5 Demographic Questions

- To start, select the state where you live: [*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? [*Numerical response*]

- 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? [*Numerical response*]

- 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 **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 **STATE**? [*Yes; No*]
- How likely is it that one of your children will someday attend a public college in **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 **STATE**? [*Yes, I am currently attending a public college in **STATE**, Yes, I have attended a public college in **STATE**; No. I have attended public college, but not in **STATE**; No, I have never attended a public college.*]

### C.6 Additional Questions

- *Before we finish, we're interested in how you think about state spending on higher education. When you said that **STATE** should spend **ANSWER** per student annually on public higher education, what were the main considerations that came to your mind? [*Long text entry*]
- *What do you think the graduation rate and its rank relative to other states says about public higher education in **STATE**? [*Long text entry*]

### 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 **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 **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. [*Sliding scale from 0 to 25 (increments of 0.10)*]

- *Considering the information above, please again provide an estimate as to where you believe **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 **STATE** spends more per student on higher education than all other states; a rank of 50 means you believe **STATE** spends less per student on higher education than any other state. [*Sliding scale from 1 to 50 (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 **STATE** graduate within six years of enrollment. Use the slider below to indicate your guess. [*Sliding scale from 0 to 100 (increments of 1)*]

- *Considering the information above, please again provide an estimate as to where **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 **STATE** has the country's highest graduation rate; a rank of 50 means you believe **STATE** has the country's lowest graduation rate. [*Sliding scale from 1 to 50 (increments of 1)*]

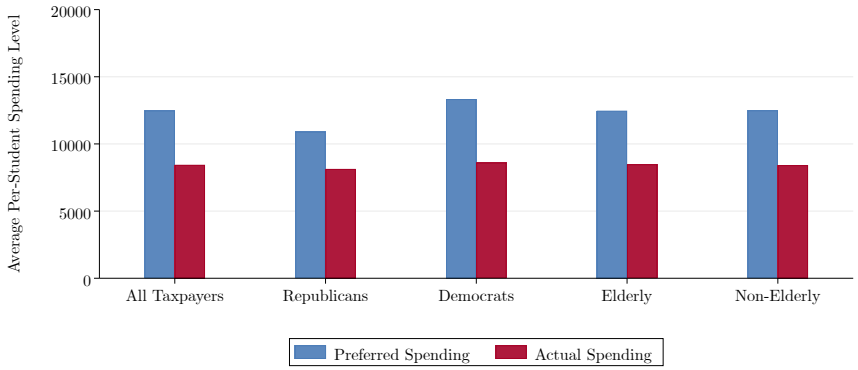
In experiment 3, a set of state politicians, including governors as well as Democratic and Republican leaders of states' houses of representatives and senates, were randomized to receive emails. All of these emails included an invitation to review a draft resolution preventing further reductions in state 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.

### C.8 Experiment 3: *Constituent Demand* Treatment

Dear **OFFICIAL**,

My name is **RESEARCHER**, and I am an economist at the **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.




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**

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**

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, **RESEARCHERS AND AFFILIATIONS**

### C.9 Experiment 3: *Contact Only* Treatment

Dear **OFFICIAL**,

My name is **RESEARCHER**, and I am an economist at the **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**

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, **RESEARCHERS AND AFFILIATIONS**

## D. Mechanisms and Updating Details

This Appendix provides additional information on how we construct and interpret our tests of *why* partisans reason differently. For each of the three broad classes of reasoning (neo-classical, prior-based, and preference-based reasoning), we discuss the evidence below. This is a supplemental discussion, building on Section **??** and based on our estimates presented in Figure 8.

**Neoclassical Reasoning.** Recall that our results in Sections 6.1 and 6.2 show that Republicans who underestimate graduation rates reason differently than all other taxpayers. If individuals who receive the same signal update differently using Bayes Rule, the differences in reasoning must reflect variation in prior precision (and thus information content of the signal). We test for this in two ways. First, because groups with looser attachment to higher education may have more dispersed priors of cost-effectiveness, we explore whether Republicans who underestimate graduation rates are less likely to have four-year college degrees. Second, because groups with more dispersed priors about spending may update more about spending, we directly compare the conditional variance of misperceptions of spending given misperceptions of graduation rates for each group.[60] Panel (b) of Figure 8 depicts differences that are too economically small to explain differences in reasoning, suggesting that the partisan reasoning is not neo-classical.

**Prior-Based Reasoning.** Whereas Neoclassical Reasoning is perfectly rational, if individuals update differently because of prior-based reasoning, it would be for different groups to confirm their own desperate priors. We also test for prior-based reasoning in two ways. First, because prior-based reasoning could lead individuals to update in ways that confirm their priors, we use the second experiment to see whether individuals who receive spending information (which corrects bias on average) update in a way that confirms or adapts their

[60] We calculate this covariance using the semi-parametric method proposed in Fan and Yao (1998).

priors about graduation rates. The third series of Panel (b) shows that learning spending leads individuals to more accurate posteriors about graduation rates—disconfirming their priors.[61] Second, prior-based reasoning could lead individuals of certain groups to ignore information that counters their priors altogether. As such, we test whether Republicans who underestimate graduation rates spend less time engaging with the information and survey, finding no differences.[62] This patterns suggest that the partisan reasoning is also not driven by prior-based reasoning.

**Preference-Based Reasoning.** In contrast to Neoclassical and prior-based reasoning, Panel (a) of Figure 8 shows suggestive evidence of preference-based reasoning related to ROI. If individuals distort their inference process to favor preferred states of the world (see Thaler, Forthcoming), then the partisan reasoning we document could come from fundamental differences in what constitutes preferable states.[63] Because the extent to which learning the graduation rate is higher is good news depends on whether individuals interpret this differences as coming from higher state cost-effectiveness or higher spending, we return to the model to identify possible sources for preference-based reasoning.

We consider three suggestions about what might constitute good or bad news—independent of partisan objectives. First, the theoretical model characterizes which states of the world individuals prefer, and the difference between individuals' perceptions and ideal policies will determine which way they prefer to update. In this case, preference-based reasoning will lead individuals toward inferences where the wedge between their personal perceived marginal benefits of additional graduates and marginal costs is smaller. Exactly how this type of preference-based reasoning will affect individuals will depend on whether they perceive the state is over- or under-producing graduates, as illustrated in Appendix Figure A6. Second, whenever the value of additional graduates is positive, learning the state is less cost-effective means perceiving a worse state of the world, which some individuals may find uncomfortable.[64]

One way that preference-based reasoning could generate the partisan differences we ob-

[61] Note that the statistically significant difference in this case is not indicative of prior-based reasoning.

[62] We estimate time spend on the survey net of expected time spent writing letters. To do this we estimate the relationship between free-response text length and time spend by party, then net out the predicted time spent writing. In an analogous exercise with experiment 1 data we estimate the treatment effects of information provision on survey duration (net of time writing free response text). We find a 0.5 second difference between the effect on Republicans who underestimate graduation rates and other groups.

[63] Note that while partisan goals may inform which states are preferred (as in Schaffner and Roche, 2016), partisan goals would not explain within-party reasoning differences by prior.

[64] If individuals are also drawing inferences about input quality (as explored in Appendix B), then learning that students are better prepared, more committed, or less revelrous may also be good news. Although the free-response text suggest these are relevant concerns for many people, we don't find any evidence that it can explain the cross-group differences.

serve, is if the different groups perceive over- or under-provision. In this case, reasoning in ways that shrink the wedge could lead individuals with the same priors to different conclusions. In Panel (a) of Figure 8 we show that Republicans are twice as likely to perceive over-provision.[65] This pattern can explain the cross-party differences given prior perceptions and the within-party differences by prior perceptions.

To see how preference-based reasoning can explain cross-party differences, consider Republicans and Democrats who have the same perceived level of provision. Upon learning that the graduation rate is higher than perceived, Republicans (who tend to think the level of provision is too high) reason that the state is more cost-effective, moving the ideal policy closer to the perceived. Their alternative is to conclude that the state is spending even more than they would like. Democrats, on the other hand, (who tend to think the level of provision is too low) reason that the state is spending more, moving the perceived policy closer to the ideal. For them the alternative is that the state is more cost-effective but sill under-producing.

Preference-based reasoning can also explain within party differences for Republicans. Consider Republicans who perceive the level of provision is too high. As discussed those who underestimate graduation rates to reason about cost-effectiveness. Those who overestimate graduation rates, on the other hand, conclude that the state is spending less, moving the perceived policy closer to the ideal. The alternative that the state is less cost-effective implies that greater over-spending and may have direct psychic costs if [they like to think it works].

Preference-based reasoning based only on ideal allocations was only one of three possible mechanisms. To assess the role of preference-based reasoning about state cost-effectiveness, we compare individuals' beliefs about the causal effects of spending on higher-education. Panel (a) of Figure A7 shows that all groups except the Republicans who underestimate graduation rates think the causal effect of spending on graduation rates or marginal ROI is large. This insight seems to explain why Democrats who overestimate graduation rates tend to conclude that their states spend less rather than conclude that their state is less cost-effective. Concluding that their own surplus is lower makes sense if updating negatively about state cost-effectiveness is also uncomfortable for the groups that believe the causal effect or marginal ROI is high.

Preference-based reasoning about the causal effect of spending (perceived marginal ROI) could generate the asymmetric reasoning by prior we observe. The first series in Panel (a) of Figure A7 shows that, compared to other groups, Republicans who underestimate graduation

[65] We measure this as whether their perceived level of spending is higher than their ideal level of spending. To keep the sample consistent across the figure we use the sample from the second experiment, but results show the same partisan differences in the control group of experiment one.

rates believe the effect of additional spending on graduation rates is smaller. If low returns on investment constitute bad news independent of the level of provision, preference-based reasoning could explain heterogeneity in responses between those who underestimate graduation rates—and are willing to update up about cost-effectiveness (Republicans)—and those who overestimate graduation rates—and are unwilling to update down (both Republicans and Democrats). These patterns are less consistent with other types of reasoning. Neoclassical reasoning would lead to spending updates proportional to beliefs about the causal effect of spending, but Republicans who underestimate graduation rates do not update about spending despite believing that it does have a positive effect. Prior-based reasoning would reinforce beliefs about these causal effects, but individuals do not update in ways that strengthen these priors.[66]

Finally, participants' letters and open ended responses contain confirmatory evidence of the preference-based reasoning about the ROI. Consistent with Stantcheva (2021), Republicans' concern with waste suggests that *bad news* for Republicans when their tax dollars are "wasted" because they are spent on students who do not graduate. As we would expect with motivated reasoning, these Republicans update in a way that implies waste is lower, attributing higher graduation rates to state is more cost-effective (shift of the marginal cost curve). On the other hand Democrats, Independents, and Republicans who overestimate graduation rates seem to have stronger beliefs in the value (causal impact) of higher-education spending, which perhaps explains why they attribute changes in the graduation rate to proportional changes in spending.

[66]We find an information elasticity of 0.02 [$p = 0.94$] for individuals who overestimate graduation rates and 0.3 [$p = 0.29$] for those who underestimate graduation rates.