Partisan Perceptual Bias and the Information Environment

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February 4, 2011

Abstract

Perceptual bias occurs when factual beliefs deviate from reality. Democrats and Republicans are thought to be especially susceptible to biased information processing. And yet, we know little about the pervasiveness of perceptual bias outside the domain of "performance issues" (e.g., unemployment or inflation rates) or how individual-level partisan motivation interacts with the information environment. We investigate these issues in a study that examines more than two hundred survey questions on a wide range of topics spanning two decades. Using multivariate statistical analyses as well as counterfactual comparisons, we demonstrate that people see the world in a manner that is consistent with their political views. The result is a selective pattern of learning in which partisans have higher levels of knowledge for facts that confirm their world view and lower levels of knowledge for facts that challenge them. This basic relationship is exaggerated on topics receiving high levels of media coverage.

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The ability to accurately perceive changes in the political world is a common benchmark for gauging the quality of citizen decision making. If unemployment increases or if the crime rate goes down, the expectation is that people of all political stripes—that is, Democrats *and* Republicans—update their beliefs and use the new information to form their political preferences (e.g. Holbrook and Garand 1996). From the vantage point of aggregate-level studies, this is what happens. Citizens react to new information in a sensible way, leading to parallel movements in public opinion among subgroups of the population, such as men and women, whites and blacks, and even Democrats and Republicans (Page and Shapiro 1992; also see Erikson, MacKuen, and Stimson 2002). However, this conclusion is challenged by a growing body of research at the individual-level, which shows that different people interpret the same, ostensibly neutral information differently (e.g., Gaines et al., 2007; Shapiro and Bloch-Elkon 2008). Importantly, this second line of research is buttressed by experimental work, which finds that once people have an opinion about an issue or candidate, they do not process new information about these objects in an even-handed fashion (Redlawsk 2002; Taber and Lodge 2006). Instead, they denigrate and counter argue claims that challenge their existing opinions.

It seems plausible that information carried in the mass media—both the amount of news coverage about a topic and the partisan relevance of that information—might influence the degree of perceptual bias in public opinion (Dunaway 2008; Goidel and Langley 1996; Hetherington 1996). Yet, scholars have largely ignored the environmental determinants of partisan biases in information processing. As a result, it is unclear whether perceptual bias occurs *because* there is extensive media coverage of particular topics or *in spite of* that coverage. We investigate this question in a study that combines media content analyses with survey data. Our analyses show that partisan perceptual bias is rooted in the supply of information as well as psychological processes that make learning some facts more difficult than others. Even though

aggregate levels of knowledge increase as information in the mass media becomes more available, Democrats and Republicans learn at different rates depending on whether the information they encounter squares with their partisan predilections.

The Role of the Information Environment in Perceptual Bias

Existing research on political learning documents an important role for the information environment (e.g., Barabas and Jerit 2009; Nicholson 2003; Price and Czilli 1996; also see Leighley 2004). In particular, the level of knowledge moves in tandem with the amount of politically relevant information in the mass media. Increases in the volume of news coverage may even eliminate "knowledge gaps," which refer to disparities in knowledge between people with high and low socioeconomic status (Curran et al. 2009; Jerit, Barabas, and Bolsen 2006). At a conceptual level, these findings illustrate the role of *opportunity* in learning about politics. As information becomes more available (e.g., through increased news coverage of current events), the level of political knowledge in society rises.

And yet, when it comes to certain topics, perceptual bias abounds. For example, Democrats and Republicans offer different answers to objective questions pertaining to the unemployment rate, inflation, crime, and the deficit (e.g., Bartels 2002; Conover, Feldman, and Knight 1986; 1987; Shani 2009). The mass media routinely cover these issues, so it is unlikely that perceptual bias is due to the lack of information. Instead, the culprit may be individual-level *motivation*—or the tendency for partisans to see the world in a manner that is consistent with their political views. Support for this phenomenon dates as far back as *The American Voter* (Campbell et al. 1960), but a flurry of new evidence has accumulated in recent years (Gaines et al. 2007; Liscio and Hayes 2010; Nyhan and Reifler 2010; but see Blais et al. 2010).

Even though the case for perceptual bias is strong, several important questions remain unanswered. First, the existing literature tends to focus on "performance" issues, such as crime, inflation, unemployment, and the deficit. This decision makes sense from an analytical standpoint; trends in such indicators can be objectively established and they often have clear implications for the party in power. However, we know little about the prevalence of bias beyond these topics. If partisans have an incentive to distort "actual-world information" in the direction of "preferred-world states" (Parker-Stephen 2010), then perceptual bias might exist on a much wider range of issues. Indeed, the implied mechanism—partisan motivated reasoning—suggests that we should observe perceptual bias whenever a fact has "partisan relevance" (i.e., whenever a fact has positive or negative implications for one's party). The well-documented increase in partisan polarization among elites has "penetrated the public's psyche" (Shapiro and Bloch-Elkon 2008, 122), resulting in an ever-important role for partisanship in public opinion—including people's perception of routine political events. Our study goes beyond the usual array of issues to search for biases in partisan learning on dozens of topics from the 1990s and 2000s.

A second unanswered question pertains to the role of the information environment. Notwithstanding the positive relationship between news coverage and aggregate levels of knowledge, high levels of media coverage may intensify, rather than eliminate, perceptual bias. Most political concepts are "hot," which is to say that the typical person knows how they feel about objects such as President Obama, tax cuts, or the death penalty (Taber and Lodge 2006). Indeed, a person's likes and dislikes often come to mind *before* conscious awareness of the object's other characteristics (e.g., that Obama is the president, a Democrat, and a former senator). These "hot cognitions" in turn motivate people to defend their preexisting opinions and bias subsequent information processing. Two pathologies in particular are expected to occur: a confirmation bias and a disconfirmation bias (Taber and Lodge 2006). The first process refers to

the tendency to seek out attitude-confirming information; the second refers to the heightened level of skepticism that is brought to bear on information that runs contrary to one's political priors.

Both processes are likely to be exacerbated by extensive media coverage. That is because the contemporary news environment makes it easy for partisans to seek out news that reinforces their political beliefs (Garrett 2009; Iyengar and Hahn 2009; Morris 2005; Stroud 2008). And when given a choice, people seek out attitude-confirming, rather than attitude-disconfirming, information (Taber and Lodge 2006; Redlawsk 2002). They also have better memory for pro- rather than contra-attitudinal information (Lodge and Hamill 1986), a phenomenon that reinforces the selective incorporation of facts. Even if people cannot entirely avoid news sources that challenge their views, the disconfirmation bias predicts that they will scrutinize, counter argue, and reject such information flows. In this way, motivation and opportunity may interact in a manner that has gone undetected by scholars examining one or the other factor in isolation.

The previous discussion leads to the following series of expectations. All else equal, we expect that on topics that have partisan relevance, Democrats and Republicans will exhibit selective learning. They will be more likely to learn politically congenial facts and less likely to learn facts that challenge their partisan leanings (H_1). We further expect that high levels of media coverage will exacerbate partisan perceptual bias. When media coverage is plentiful, individuals will be especially receptive to information that is consistent with their partisan world view, thereby resulting in higher levels of knowledge for facts that are congenial with this world view. These same people will be overly skeptical of facts that challenge their political priors, resulting in lower levels of knowledge for information that runs contrary to their partisan predispositions. Thus, levels of partisan perceptual bias should be highest when there is both an individual-level motivation to treat facts selectively and when the environment facilitates motivated reasoning by making information plentiful (H_2).

Data and Measures

A study of partisan bias and the information environment requires two types of data. First, we need survey measures of political knowledge on a wide range of topics. Second, for each of these topics, we need measures of the amount of news coverage in the days and weeks leading up to the survey. Such data are not common. Most scholars study political knowledge by examining individual-level data (e.g., Delli Carpini and Keeter 1996; Dow 2009; Gilens 2001; Luskin 1990) or mass media content (Jerit 2006), but not both (see Barabas and Jerit 2009; Jerit, Barabas, Bolsen 2006; Nicholson 2003; Price and Czilli 1996 for exceptions).

We extend the data collection efforts of Barabas and Jerit (2009), who assembled nearly two dozen national public opinion surveys containing over 100 knowledge questions along with data regarding media coverage of those topics. We add to the original dataset in three important ways. First, we nearly doubled the number of surveys, going from 23 to 43 opinion polls. In particular, we added new surveys from the 2000s, allowing us to examine events occurring under a Democratic and Republican administration (Clinton and Bush, respectively). Second, while the original study focused almost exclusively on policy-specific knowledge, the expanded dataset includes questions on a variety of topics, involving both domestic and foreign policy. Some of the questions have to do with specific programs, policies, and problems (i.e., they are "policy-specific" knowledge items), while others are more general in nature (i.e., they ask about party control or "people and players"). Lastly, we coded all of the knowledge questions in our dataset (n=205) for their degree of partisan relevance (more on the coding process below).[1]

[1] Because any given survey may include multiple questions, there are a total of 205 knowledge items across the 43 surveys in our dataset (for details, see the Reviewer Appendix).

Nearly all of the questions in our dataset pertain to topics that were in the news in the weeks and months leading up to the survey, which makes them especially useful for studying perceptual bias. We also limit our attention to purely factual questions. This is a departure from previous studies which analyze items having various degrees of "facticity" (e.g., Shani 2009). For example, in addition to studying people's perceptions of the national economy (e.g., unemployment, inflation) and the crime rate, Shani (2009) examines perceptions of the nation's security, moral climate, and position in the world. Answers to the latter questions are bound to reflect partisan bias because responses are influenced by inherent differences in the world views and values of the major parties (Gerber and Green 1999; also see Petrocik 1996).

Along with the usual array of individual-level factors that are included in studies of political knowledge (e.g., education, income, age, gender, and race), we also will include measures of a person's partisanship. In most of our surveys this question reads, "In politics today, do you consider yourself a Republican, Democrat, or Independent?" For each of the 43 surveys, we created dummy variables for the partisan groups, coding Republicans or Democrats if they self-identify in each manner versus all other response (coded as zero).[2]

Media Coverage

We combine the survey data with content analysis of these same topics in the national news. More specifically, we analyze the full text transcripts of a variety media outlets during the six weeks prior to the first day of each survey.[3] The data collection effort builds upon the content

[2] Unfortunately, these surveys do not ask about the strength of a person's party identification.

[3] The choice of a six week period was deliberate. The knowledge items were designed in response to political developments that had been in the news during this period of time. Media reports for all the sources were obtained from Lexis-Nexis.

analysis from Barabas and Jerit (2009), so for approximately half of the topics analyzed here, we examine three sources (the *Associated Press, USA Today*, and *CBS Evening News*). For the rest of the issues, the content analysis includes a more representative collection of outlets (CBS, NBC, ABC, CNN, MSNBC, Fox, *New York Times*, *USA Today*, and the *St. Petersburg Times*). As it turns out, the results are nearly identical across the two halves of our data.[4]

Once we identified the relevant sample of news stories in each media outlet, we tallied the total number of articles mentioning the correct answer during the content analysis period.[5] A simple story count captured the essence of what we sought to measure—namely, the amount of coverage devoted to a particular issue.

Partisan-Relevant Facts

Our primary concern is the degree of perceptual bias on factual questions about politics and whether the information environment makes that bias worse. In order to explore these issues, we characterized each of the questions in our database according to whether it had "partisan relevance." That is, would the typical Democrat or Republican identify the topic as a partisan issue, and if so, was there any sort of barrier or incentive to learn the information in question?

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[4] We believe this pattern lends credence to our approach—i.e., content analyzing some of the most prominent national news sources as a way of providing an overall view of the information environment. In the results we present below, we combine our cases and use a dummy variable to control for differences across the two subsets of our data.

[5] A story was considered relevant if it discussed the issue underlying the knowledge question. Intercoder reliability analyses indicate high levels of agreement for identifying relevant articles (kappa = .71) and identifying articles containing the correct answer (kappa = .84). According to Cicchetti and Sparrow (1981), a value of kappa above .6 is good; .75 or higher is excellent.

Working independently, two coders scored each knowledge question on two dimensions. First, they assessed whether the question made a reference, explicit or implicit, to either the Democratic party or the Republican party.[6] Second, the coders determined whether the substance of the question had positive or negative implications for the party referenced in the question. Our expectation was that partisans would have higher levels of knowledge for facts that cast their party in a positive light; conversely, we expected that they would have lower levels of knowledge for facts that cast their party in a negative light.

We provide a few examples to make these coding decisions more concrete. Consider a question that was asked in February 1999: "In his State of the Union address, President Clinton also made some proposals regarding the Social Security program. Based on what you've seen or heard in the news recently, tell me whether or not the President proposed …Using a part of the federal budget surplus to help make the Social Security program financially sound?" The correct answer to this question is "yes." The question was coded as making a reference to a Democratic actor because it mentioned President Bill Clinton. It also was scored as having positive implications for the party because the President made a proposal to shore up a program that has been long favored by Democrats (Petrocik 1996; also see Egan 2009). On the other side of the spectrum, the following question was asked in April, 2004: "You may also have heard news about the Bush Administration's new cost estimates of the Medicare prescription drug law that was passed in December 2003. From what you've seen or heard in the news, were these new cost estimates higher or lower than previously released estimates?" The correct answer was "higher"

[6] A question made an *explicit* reference when it mentioned a partisan group or actor by name. It made an *implicit* partisan reference if it invoked a group, symbol, or issue associated with one of the two parties (Petrocik 1996). See the Reviewer Appendix for the complete coding instrument.

so this question was coded as making a reference to a Republican actor and having negative implications for that party. In both examples, the item asks about an objective fact which can have either a positive or negative implication for the party in question.

Other cases in our dataset—such as questions having to do with a vaccine protecting women against cervical cancer, the lawsuit against the tobacco companies, or the conflict between Serbians and ethnic Albanians—were coded as having no implications, positive or negative, for either of the two parties. A little more than a third of the questions in our dataset (n=75) fell into this category. The remaining questions were coded as having partisan relevance. For these cases, the coding procedures yield a series of dummy variables that indicate whether a question invokes one of the two parties and whether the topic has positive or negative implications for that partisan actor or group (e.g., Democratic-Positive, Democratic-Negative, Republican-Positive, Republican-Negative).[7] In the next section, we examine whether Democrats and Republicans show evidence of perceptual bias when it comes to learning about these topics.

Empirical Results

We begin by showing aggregate levels of knowledge for Democrats and Republicans across all issues and then across topics that have been coded as having positive or negative implications for each party. Table 1 displays the results.

Table 1 about here.

[7] In other words, each question is scored as pertaining to either the Democratic or Republican parties (but not both). Agreement between coders was high (kappa for explicit mention was 1.0; kappa for implicit mention was .94; kappa for positive or negative implications was .89).

Focusing on the left side of the table, which shows aggregate levels of knowledge across all the questions in our dataset, there is strong support for Hypothesis 1. For both Democrats and Republicans, levels of knowledge are higher for topics that cast a person's party in a positive light. We observe the opposite pattern when it comes to question topics that have negative implications for the party in question.

More specifically, the overall proportion correct for Democrats is .41 (with a 95% confidence interval ranging from .40 to .41 shown in brackets). For question topics that have positive implications for the Democratic party, that figure rises to .45 (95% C.I. = .44 to .45). Conversely, on questions that were coded as having negative implications for the party, knowledge among Democrats drops to .35 (95% C.I. = .34 to .36). To illustrate this general pattern, consider a series of questions about Clinton's 1999 State of the Union address. On this topic, 43% of Democrats knew that in his speech Clinton proposed tax credits to help people pay for long-term health care for the elderly and disabled. Far fewer (27%) knew that Clinton was *not* planning to ask seniors with higher incomes to pay more for Medicare (i.e., he was *not* going to propose means testing for Medicare, a policy that many Democrats favor). In other words, it was "easier" for Democrats to learn the first fact (tax credits) because it was consistent with party policy (e.g., Petrocik 1996). The second fact (rejecting the idea of making the wealthy pay more for Medicare) was less consistent with party policy and therefore much harder to learn.

The same relationship is present among Republican respondents. Across all the questions in our dataset, the proportion correct is .43 (95% C.I. = .43 to .44). For politically congenial topics, knowledge among Republicans rises to .52 (95% C.I. = .52 to .53). For topics with negative implications for the party, the level of knowledge among Republicans remains at .43 (95% C.I. = .41 to .44). A pair of questions from a January 2003 survey illustrates this pattern. Seventy-two percent of Republicans knew that President Bush won the approval of Congress to

use military force against Iraq. However, when these same respondents were asked if the Bush Administration publicly released evidence that Iraq was involved in the planning and funding of the September 11th terrorist attacks, only 39% could correctly state that the administration did not do this. Both facts were covered in the mass media, but only the first fact portrayed the Bush administration in a positive light. Thus, partisans appear to treat information in a biased manner: they are willing to learn facts that are consistent with their world view but are more resistant to learning information that challenges their partisan predispositions.

According to Hypothesis 2 partisan perceptual bias will be exacerbated by high levels of media coverage. Extensive news coverage provides an opportunity to engage in the selective processing of information such as the confirmation and disconfirmation biases. We examine support for this hypothesis in the right side of Table 1, which presents levels of knowledge for partisan groups under conditions of high media coverage.[8]

Across the topics receiving high coverage, the overall proportion correct for Democrats is .45 (95% C.I. = .45 to .46). This figure represents a four point increase over the proportion correct for all the topics in our dataset (that value was .41). Any optimism regarding the ability of people to learn from extensive news coverage must be tempered by the next two columns, which show strong evidence of perceptual bias. For topics that were coded as having positive implications for the party and which also had high levels of media coverage, knowledge among Democrats increases to .51 (95% C.I. = .50 to .52). However, when the media shines the spotlight on topics that portray the party in a negative light, the proportion correct drops to .39 (95% C.I. = .38 to .41). A similar pattern is observed for Republicans. Across all topics receiving high media coverage, the proportion correct is .50 (95% C.I. = .49 to .50). That value rises to .53

[8]High coverage corresponds to cases that are above the median in terms of the number of stories.

(95% C.I. = .52 to .54) for topics that have positive implications for the party and drops to .49 (95% C.I. = .46 to .52) for negative topics.

By way of putting the figures from Table 1 in context, consider topics that were coded as having no partisan relevance (results not shown). Our argument implies that differences in knowledge between Democrats and Republicans should be minimal because there is no motivation to treat information selectively. This is exactly what we find, with the average level of knowledge for Democrats at .38 (.38 to .39), slightly below Republicans at .42 (.42 to .43) and Independents at .39 (.39 to .39). On topics that receive low levels of coverage—that is, when neither motivation nor opportunity is operating to facilitate bias—the three groups become indistinguishable (Democrats = .31 [.31 to .32]; Republicans = .32 [.31 to .32]; Independents = .32 [.31 to .32]). All told, the aggregate patterns largely support Hypotheses 1 and 2.

Probit Analysis

The differences in the means are suggestive, but it is important to show that the patterns can survive the introduction of control variables. After all, the two major political parties appeal to different constituencies. Knowledge differentials may reflect pre-existing socio-economic cleavages rather than biased information processing. To guard against this possibility and other inferential threats, we conducted a multivariate analysis in which the outcome of interest is correctly answering the knowledge question (coded as "1") versus any other response ("0").

The model includes the usual individual-level predictors of knowledge (education, income, gender, age, and race; see Delli Carpini and Keeter 1996). Differences in knowledge across surveys, due either to the clustering of respondents in particular media environments or variation in question topic, are captured by a series of fixed effects terms. Our main interest in the model lies in the triple interaction between partisanship (operationalized using a dummy variable for Democratic or Republican identifiers), a partisan relevance indicator, and the

number of news stories devoted to the topic. In particular, we will determine if partisans have higher (lower) levels of knowledge on topics that were judged to be consistent (inconsistent) with their world view (H_1). We also will examine whether partisan perceptual bias becomes greater in situations with high media coverage (H_2).

Constructing models to test our theoretical predictions requires two triple interactions for each party group—one for "positive" issues and one for "negative" issues—for a total of four interaction terms. We also include all the underlying constituent terms (Brambor, Clark, Golder 2006), which in our case amounts to seventeen other variables. Complicating matters further, the signs and statistical significance of interaction terms can be difficult to interpret, especially in nonlinear models (Kam and Franzese 2007; Fredrich 1982). The recommendation from Brambor et al. (2006) and others is to illustrate effects and confidence intervals at various levels of key independent variables. Following that advice, we relegate our tables to the Reviewer Appendix and instead focus on the predicted probabilities generated from those models. [9]

We begin by examining knowledge on topics with the typical level of coverage. Consistent with H_1, partisans displayed a pattern of selective learning. Holding media coverage at its average level, the predicted probability of a Democrat providing the correct answer on "friendly" topic is .46 (.45 to .47). For topics that challenge the Democratic world view, the corresponding predicted probability is .36 (.35 to .37). An identical pattern was observed for Republicans. They have a .48 chance (.47 to .49) of providing the correct answer on topics that have positive implications for their party. On negative issues, that probability is lower, at .34 (.32 to .36).

[9] In our models, the implicit baseline is an Independent on topics that do not have any partisan implications and receive no media coverage.

According to H_2, partisan perceptual bias should become magnified as news coverage increases. Figure 1 Panel A displays the model-based patterns of political learning for Democrats on topics that have partisan relevance across low and high levels of media coverage.[10] For topics that have no partisan implications (positive or negative) and no news coverage, the typical Democratic has a predicted correct response of .39 (95% C.I. from .38 to .39; all entries are in blue shading to denote Democratic identifiers). This model-based estimate is slightly below the raw mean reported for Democrats on all issues and levels of media coverage in Table 1. The low proportion correct should not be surprising (e.g., Converse 1990), and it is only a few points above what would be expected by chance on an item with three answer choices.[11] The key test of H_2 comes as we move across the figure from left to right.

Figure 1 about here.

The second entry in Figure 1 Panel A shows the level of knowledge for Democrats on a "friendly" topic that receives low levels of news coverage. The predicted probability of offering the correct response is .43, with a confidence interval that ranges from .41 to .44. For "negative" issues with low levels of coverage, the predicted probability of offering the correct answer drops to .35 (95% CI from .34 to .36). As we predicted (i.e., H_1), Democrats are sensitive to the partisan implications of particular facts, with significantly higher levels of knowledge for facts that are consistent with their world view and lower levels of knowledge for information that challenges their priors.

[10] Low and high corresponds to two standard deviations below and above the mean for an otherwise average respondent. In this case, "low" corresponds to no media coverage.

[11] Across all the questions in our dataset, the modal number of answer choices is three.

Consistent with H_2, the pattern is more dramatic for issues that receive high levels of news coverage. In this situation, the predicted probability of offering the correct response is .58 for topics that cast the Democratic party in a positive light. This represents a 19 percentage point effect and it is statistically significant relative to the no coverage/positive issue scenario (i.e., the confidence interval of .55 to .60 does not overlap any of the other estimates). For topics that have negative implications for the Democratic party, the predicted probability of providing the correct answer is .40 (.38 to .43). On its face, this effect seems less dramatic than the positive case, but bear in mind what Panel A shows. For topics with negative implications for the party, levels of knowledge among Democrats hardly budge even as media coverage increases to its highest levels.

Republicans display an almost identical pattern (shown in Panel B with red shading). The baseline estimate of correct responses for Republicans is .38 (95% CI from .37 to .39). For partisan relevant facts that receive low levels of coverage, the degree of perceptual bias is modest. For positive topics the estimate is higher (.42), and for negative ones it is lower (.33), with both estimates differing significantly from the baseline scenario. Like the pattern in Panel A, however, when media coverage is high, Republicans show a proclivity for learning facts that are consistent with their priors. In this situation, the probability of providing a correct answer is .65 (.63 to .68), which represents a 27 percentage point increase over the baseline case. For negative topics, the predicted proportion correct is .37 (.33 to .42). Here the limited number of cases in this category (see Table 1) results in an unusually large confidence interval. Once again, though, the general pattern is consistent with our theoretical argument. Republicans are seemingly impervious to information flows when the news conveys facts that run contrary to their partisan world view (i.e., the estimate in the high coverage scenario is indistinguishable from the low coverage case).

So far, the statistical analyses support our expectations. For the typical "positive" and "negative" topic (i.e., one that receives average levels of news coverage), there is a modest, but statistically significant, level of perceptual bias. This pattern is consistent with H_1 and it supports the contention that Democrats and Republicans are motivated to see the world in a particular way. However, as predicted by H_2, perceptual bias is greatest when individual-level motivation is combined with opportunity. That is, we observe the highest degree of partisan bias on topics that receive extensive media coverage—a pattern that underscores the role of the information environment in facilitating the processes of motivated reasoning.

We probed the robustness of our results in a series of auxiliary analyses (not reported here). In those models, we included controls for the probability of guessing the correct answer as well as the quartile rank of a difficulty measure from a random effects logisitic item response model. In both cases, we obtained results that were similar to the ones reported above. Likewise, we obtained similar findings when we log the media measure or use multilevel models instead of clustered standard errors.[12] Lastly, we found no significant differences in levels of knowledge (for either Democrats or Republicans) with alternative partisan relevance terms that account only for the source cue (e.g., was there an explicit or implicit reference to the party?). That is, differences in knowledge only emerge once we take into account the party referent *and* the positive or negative implications of the information.

Even though the results support our hypotheses, several remaining issues give us pause. Given the way we have operationalized partisan relevance, the comparisons in our figures are across different topics (e.g., Democratic-Positive, Democratic-Negative, Republican-Positive, Republican-Negative). There were no significant differences in question difficulty across these four categories, but concerns about media endogeneity remain (i.e., is the amount of news

[12] See Arceneaux and Nickerson (2009) for more on the equivalence of the two techniques.

coverage driven by preexisting levels of partisan bias on particular subsets of issues?). Barabas and Jerit (2009) explored this question in a subset of the data and found little cause for concern. Here we examine the data to see if there are systematic patterns in which topics receive media attention, with particular attention to whether the partisan relevance indicators predict level of coverage. Although there is a tendency for policy-specific questions and harder topics to receive less coverage ($p < .05$), the partisan relevance indicators are almost always insignificant predictors of the amount of coverage (average $p = .51$).

A second potential weakness has to do with the probit analysis, which relies on between-subjects comparisons and therefore is vulnerable to omitted variable bias (e.g., media exposure, discussion, interest). Fortunately, we can confront this inferential threat head on. Recall that in any given survey, respondents were asked multiple questions on the same topic. In other words, we have we have *repeated* observations for individual survey respondents, allowing us to make within-subjects comparisons. Thus, what was a statistical nuisance in the preceding models—a problem we dealt with by clustering on individuals—becomes a source of analytical leverage in our final set of analyses.

Within-Survey/Within-Subjects Illustration

We begin by illustrating the within-survey/within-subjects (WS/WS) technique and showing how it can be used to estimate the causal effect of media coverage on knowledge (see Barabas and Jerit 2009). Panel A in Figure 2 demonstrates the technique using two questions about the Iraq War in early 2003. Between January 3-6, Princeton Survey Research Associates conducted a national telephone survey with 1,204 randomly selected adults. Panel A shows two of the questions in that survey. The first question, which did not receive any news coverage in the sources we studied, asked "Now thinking about more recent events, please tell me whether—as far as you know—each of the following happened or did not happen over the past few

months? (First,) as far as you know… Did Saddam Hussein publicly threaten to use chemical or biological weapons against Israel if attacked by the United States?" (The correct answer was "no.") The other question in the battery used the same introduction and asked: "Did President Bush win the approval of Congress to use military force against Iraq?" The correct answer to this question was "yes" and the fact appeared twenty times in news stories in the weeks before the survey. We refer to the item receiving media coverage as the "treatment" case; the question receiving no coverage represents the "control" case.[13]

Figure 2 about here.

Panel A shows the proportions correct for each item by partisan subgroup. Overall it confirms basic pattern reported in Barabas and Jerit (2009): higher levels of political knowledge for topics that receive more media coverage. Across Democrats and Republicans, levels of knowledge for the untreated items (whether Saddam Hussein publicly threatened Israel) hover around 25 percent and are statistically indistinguishable from one another. By contrast, levels of knowledge for the treated item (was Bush action on Iraq approved by Congress) are higher. In this example, the difference in coverage is twenty stories (i.e., twenty on the treatment case minus zero on the control case).[14]

Since the same respondents were asked both questions in the same survey, it is possible to subtract each person's response on the question receiving coverage (the "treatment" condition) from that same person's response without any coverage (the "control" condition). Panel A shows

[13] In this situation, the "control" event did not happen and hence there was no coverage. This is not always the case, however (i.e., there are instances in which "non-events" receive coverage).

[14] In the rest of the sample, there is substantial variation in the coverage difference across treatment and control cases (min=1 news story difference; max= 454 stories).

two "treatment effects," one for each partisan group. For Democrats (shown in blue), comparing the treatment and control items results in a 28 percentage point treatment effect (53 – 25 = 28 points with a confidence interval of 21 to 25). For Republicans (shown in red), the learning rate is 49 percentage points (with a confidence interval of 42 to 55), which corresponds to difference between 72 (treatment) and 24 (control). Thus, both partisan groups learned on the item with coverage, but learning for the Republicans was especially dramatic—exactly what we would expect on a politically "congenial" topic.[15]

Panel B shows an instance when Republicans are *less* likely to learn facts that are inconsistent with their ideological world view. From June 25-28, 2004, NBC News and the Wall Street Journal fielded telephone survey of 1,025 adults. A random half of the survey was asked, "Based on what you have learned, please tell me whether you believe each of the following is true or is not true." The first item shown in Panel B asked whether "Saddam Hussein represented a threat to the United States?" The second asked whether "Iraq was connected to the September eleventh terrorist attacks?" The first fact (coded as congenial to Republicans) was covered 22 times in the mass media while the second (coded as having negative implications for the Republican party) was covered more than seven times as much (161 stories). Despite the extensive media coverage, we expected Republicans to resist learning the second fact.[16]

Panel B shows that Democrats were 14 percentage points more likely to answer correctly on the treatment case than the control case (61 minus 47 for a difference of 14 with an interval of 2 to 26). In contrast, Republicans move from 84 percent correct on the control case to only 38

[15] Figure 2 displays aggregate patterns, but they are constructed from a dataset in which the unit of analysis is the survey respondent. Later we will focus on individual-level patterns of learning.

[16] This fact was covered in 22 stories, but it is the baseline case because it had less coverage.

percent correct on the treatment item. Not too surprisingly, this substantial negative treatment effect is statistically significant (-46 points with a range of -56 to -36). Consistent with H_2, on this comparison Republicans found it difficult to accept a fact inconsistent with their priors even though there was coverage of the fact in the mass media.

In Panel C we provide one last illustration. In 2005 the Pew Research Center and the Council on Foreign Relations jointly sponsored a survey about America's place in the world. The survey was conducted by Princeton Survey Research Associates from October 12-24 and a random subset of the 2,006 sample was asked, "As far as you know, does South Africa now have nuclear weapons, or not?" Respondents were asked the same questions about Great Britain and North Korea.[17] All three countries had nuclear weapons at the time of the survey, but there was variation in how the media covered these facts (with no coverage of South African or Great Britain and a substantial amount of coverage of North Korea).[18] This series of questions did not implicate one party or the other so the items were scored as having no partisan relevance. As a result, we expected to observe a similar pattern across both partisan groups—low levels of knowledge for the two items that received no coverage and higher levels of knowledge for the fact that was covered.

Panel C demonstrates that this is indeed what happens. Forty-seven percent of Democrats respond correctly that South Africa and Great Britain have nuclear weapons. Given the true/false nature of the question, the level of knowledge is not much different than what might be expected

[17] The order of the questions for these cases and virtually all the others we study was randomized to minimize question order effects.

[18] North Korea spent the early part of the 21st century trying to acquire nuclear weapons. In early 2005 intelligence officials reported that they had indeed built several nuclear armaments.

by chance. The pattern changes with the question about North Korea. Roughly three quarters of Democratic respondents knew the correct answer. This represents a 27 percentage point improvement over the South Africa (or Great Britain) item and that difference is statistically significant (the learning effect ranges from 15 to 38). There is a similar pattern for Republicans: knowledge is lower on the items without coverage and increases substantially on the item with coverage. For both partisan groups, responses to the South Africa and Great Britain items hover around what one would expect from a coin flip, while knowledge for the North Korea fact increases significantly (by about 26 percentage points). Thus, partisan bias fails to manifest where we least expect it. On topics with little or no partisan implications, people of all political backgrounds learn readily when the environment supplies information.

Within-Survey/Within-Subjects Analysis

We take advantage of the fact that each respondent was asked multiple questions about the same topic and create an *individual-level* measure of "learning." This dependent variable is coded "1" if a person answered a question incorrectly in the control condition but gave a correct response in the treatment condition. Individuals are given a score of "-1" if they had the opposite pattern (i.e., they answered the control question correctly, but answered the treatment question incorrectly). Those who answered both questions correctly or incorrectly are coded as "0."[19]

Once again, we are interested in the triple interaction between partisanship, the partisan relevance of a particular topic, and the amount of news coverage. Given the three point ordinal nature of the dependent variable, we use an ordered probit specification. Our main interest is in the category of "learning" (i.e., changing from an incorrect answer on the control question to a

[19] The distribution of this variable is as follows: 23% coded 1, 63% coded 0, and 14% coded -1. See the Reviewer Appendix for illustrations of how to calculate treatment effects.

correct response on the treatment item). The independent variables consist of the usual individual-level controls (e.g., Delli Carpini and Keeter 1996) along with our environmental measures (the volume of coverage and indicators for partisan relevance). Like the previous analysis, the models include fixed effects for each survey (to account for differences in subject matter, time periods, etc.), and the standard errors are clustered to account for repeated observations of individuals who have multiple comparisons.

As with our earlier models, interpretation of the ordered probit coefficients is not straightforward and so we move directly to predicted probabilities. (Interested readers should consult the Reviewer Appendix for the coefficient estimates.) The effects are illustrated in Figure 3, which use the Clarify (King et al. 2000) program to simulate the changes in the predicted probabilities for various scenarios of interest. The entries represent the probability of learning (i.e., changing from an incorrect to a correct answer across the treatment and control items). Recall, we predict that learning will be more likely on topics that are consistent with one's partisan world view and that learning will be inhibited on topics that challenge a person's priors. We also expect increasing media coverage to exacerbate this general pattern of bias.

Using the definitions above, the average treatment effect (i.e., knowledge gain) in the baseline scenario is 22 percentage points (mean=.22, 95% CI .22 to .24). Figure 3 Panel A shows the comparisons for Democrats on positive and negative topics at varying levels of media coverage.[20] In the baseline scenario (no partisan implications and low coverage), the treatment effect for Democrats does not differ appreciably from the overall mean (.23 with a confidence

[20] These scenarios correspond to differences in the number of stories between the treatment and control cases. "Low" represents a one story difference; "high" corresponds to a two standard deviation increase above the mean.

interval ranging from .22 to .24). The same is true for "congenial" topics that receive low coverage; here the mean is .21 with a confidence interval from .20 to .22. However, on politically uncongenial topics, the average learning effect is only 13 percentage points (mean = .13, with a range of .12 to .14).

Figure 3 about here.

The remainder of Figure 3 Panel A shows the results for cases with high coverage. When it comes to topics that are congenial to the Democrats and receive high levels of news coverage, the estimated learning effect is substantial (mean = .35; range of .33 to .37). However, for topics that have negative implications and receive extensive coverage, the learning effects are modest. In fact, the predicted learning rate of .23 does not differ appreciably from the baseline case (a pattern that is reminiscent of Figure 1). All in all, then, Panel A generally supports H_2.

Panel B shows the results for Republicans, and here there is strong support for the notion that higher levels of media coverage exacerbate partisan bias. In the baseline scenario, the treatment effect is .23 (.23 to .24). Republicans display some anomalous behavior when it comes to partisan facts that receive low coverage. For "friendly" topics the learning effect is actually lower than it is in the baseline case (mean =.22 with a range of .21 to .23). And in the case of topics that carry negative implications for the party, the learning effect is seemingly larger (mean = .26). However, the confidence interval (.24 to .29) indicates that the effect is indistinguishable from the baseline case. The important point, from our perspective, is that under a scenario with high levels of media coverage, partisan motivation operates in the expected manner—that is, there are substantial learning effects for topics that are consistent with the Republican world view (mean =.25 with a range of .23 to .26) and miniscule learning effect for topics that are likely to challenge a Republican's priors (mean =.09 with a range of .07 to .11).

Across the various analyses presented here, our results have been remarkably consistent. People are motivated to see the world in a manner that is consistent with their political views. This results in a selective pattern of learning in which partisans have higher levels of knowledge for facts that confirm their world view and lower levels of knowledge for facts that challenge them. This basic pattern is exaggerated on topics receiving extensive news coverage.

Conclusion

Our analyses show that the information environment interacts with individual-level motivation in a powerful way. When individual-level motivation is absent (i.e., on topics that do not have any partisan implications), greater amounts of news coverage generally translate into higher levels of political knowledge. However, when a topic has implications for one of the two parties, increasing the level of media coverage makes partisan perceptual bias worse. In these instances, there is an even stronger proclivity for learning politically congenial facts and a reluctance to accept uncongenial ones. Our results suggest that extraordinary levels of media coverage may be required for partisans to incorporate information that runs contrary to their political views.

At the same time, these findings should be viewed with caution for several reasons. First, we view the confirmation and disconfirmation biases (Taber and Lodge 2006) as logical candidates for our causal mechanism, but other processes may be operating. For example, a partisan who is confronted with an uncomfortable fact about his party might become anxious, which could in turn lead to higher, not lower, levels of knowledge (Markus, Neuman, and MacKuen 2000). As another example, research has shown that negative information has a greater effect on public opinion than positive information (Lau 1985). One might expect, then, that stories with negative implications for one's party might have a greater impact on knowledge than

stories with positive implications. We found some support for this proposition (e.g., Republicans in Figure 3), but it was modest.

A second limitation with the present study has to do with how we operationalize partisan relevance. Each of the 205 questions in our study was coded as being "friendly" or "unfriendly" to the Democrats or the Republicans (leading to the four-fold characterization of Democratic-Positive, Democratic-Negative, Republican-Positive, or Republican-Negative). While this coding scheme helped us accommodate the large number of knowledge items in our database, it has some weaknesses. In particular, the coding scheme implicitly assumes that partisans think solely in terms of their *own* party when it comes to the positive or negative implications of political information. This assumption is consistent with work showing that when given a choice, people seek out information about their own, rather than the opposing, party (Lau and Redlawsk 2006). It also is supported by psychological studies showing that people are differentially sensitive to stimuli that are "self-relevant" and that they privilege the processing of such stimuli (Markus and Wurf 1987). However, some recent studies report that people pay attention to developments that affect the other party, especially negative developments (e.g., Lebo and Cassino 2007).

Despite these caveats, our study contributes to the literature in several important ways. A burgeoning array of experimental work shows that partisans do not treat information in an even-handed manner (Redlawsk 2002; Lodge and Taber 2005; Taber and Lodge 2006).[21] And yet, the evidentiary basis for this claim is much thinner once we leave the context of the lab. Most existing work has focused on "performance issues" where one would expect partisans to differ. We know relatively little about the presence of bias on the plethora of topics that appear

[21] There is an even longer tradition of studying this topic in psychology (Lord, Ross, and Lepper 1979; also see Ditto and Lopez 1992 or Edwards and Smith 1996).

in the news on a daily basis—stories about a recent presidential speech, a piece of legislation weaving its way through Congress, an unexpected action taken by a foreign leader, or a government report on an important policy problem. These sorts of routine political events form the raw ingredients of public opinion.[22]

We also contribute to the literature by examining an important, but largely unexplored, potential source of perceptual bias: messages that emanate from the mass media. Given the public's reliance on partisan elites for information about politics (Key 1961; Page and Shapiro 1992; Zaller 1992), the mass media are likely to have an important influence on the degree of perceptual bias in public opinion. The contemporary media environment all but creates the conditions for perceptual bias, making it easy for partisans to seek out news that reinforces their political beliefs while avoiding sources that challenge them (Garrett 2009; Iyengar and Hahn 2009; Morris 2005; Stroud 2008). While past studies have shown that the volume of news coverage is positively related to the level of knowledge in society, our results raise the unsettling possibility that on certain topics extensive news coverage may elevate the degree of perceptual bias in public opinion.

[22] Some scholars critique the study of civics facts on the grounds that such questions privilege national level politics (Lupia 2006), or that they are relevant to particular subgroups, such as wealthy men (Stolle and Gidengil 2010). The questions in our study pertain to a wide array of developments at the state and federal level and they cover many different political issues.

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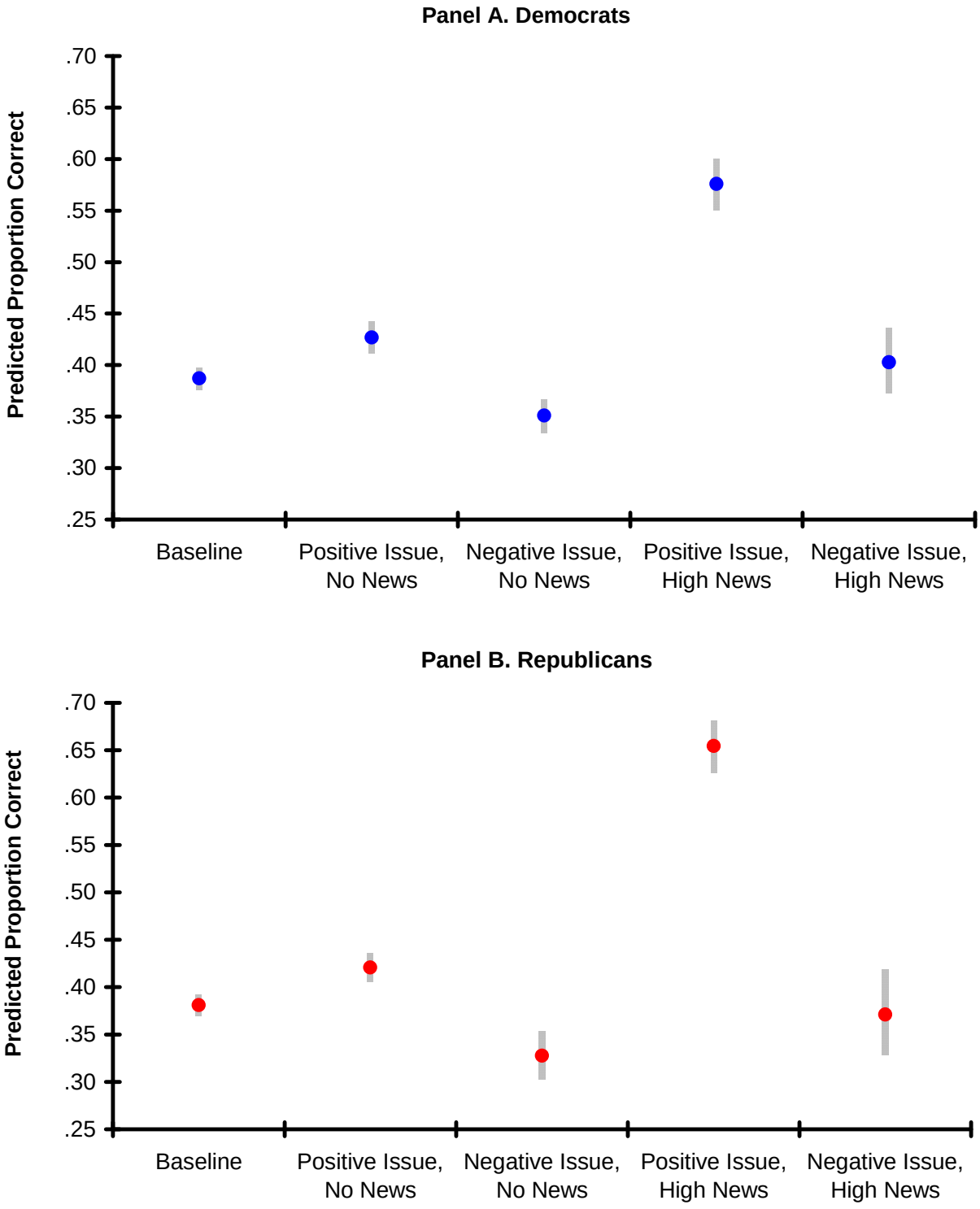
Table 1. Levels of Knowledge across Partisan Groups

	All Question Topics			Topics Receiving High Media Coverage		
	All Topics	**Positive Implications for Party**	**Negative Implications for Party**	**All Topics**	**Positive Implications for Party**	**Negative Implications for Party**
Democrats	.41 [.40 .41]	.45 [.44 .45]	.35 [.34 .36]	.45 [.45 .46]	.51 [.50 .52]	.39 [.38 .41]
Number of questions in category	205	51	29	105	26	17
Number of respondents	73,898	18,573	9,283	39,238	8,497	5,365
Republicans	.43 [.43 .44]	.52 [.52 .53]	.43 [.41 .44]	.50 [.49 .50]	.53 [.52 .54]	.49 [.46 .52]
Number of questions in category	205	38	12	105	28	3
Number of respondents	66,764	13,206	3,800	35,837	7,265	1,447

Note. Cell entries indicate average levels of knowledge for each subgroup with 95% confidence interval appearing in brackets.

Figure 1. Levels of Knowledge by Issue Motivation and News Coverage



Note: The entries are predicted probabilities from a probit model with the dependent variable 1=correct and 0=otherwise. See the appendix for the coefficient estimates.

Figure 2. Illustrations of Within-Survey/Within-Subjects Comparisons

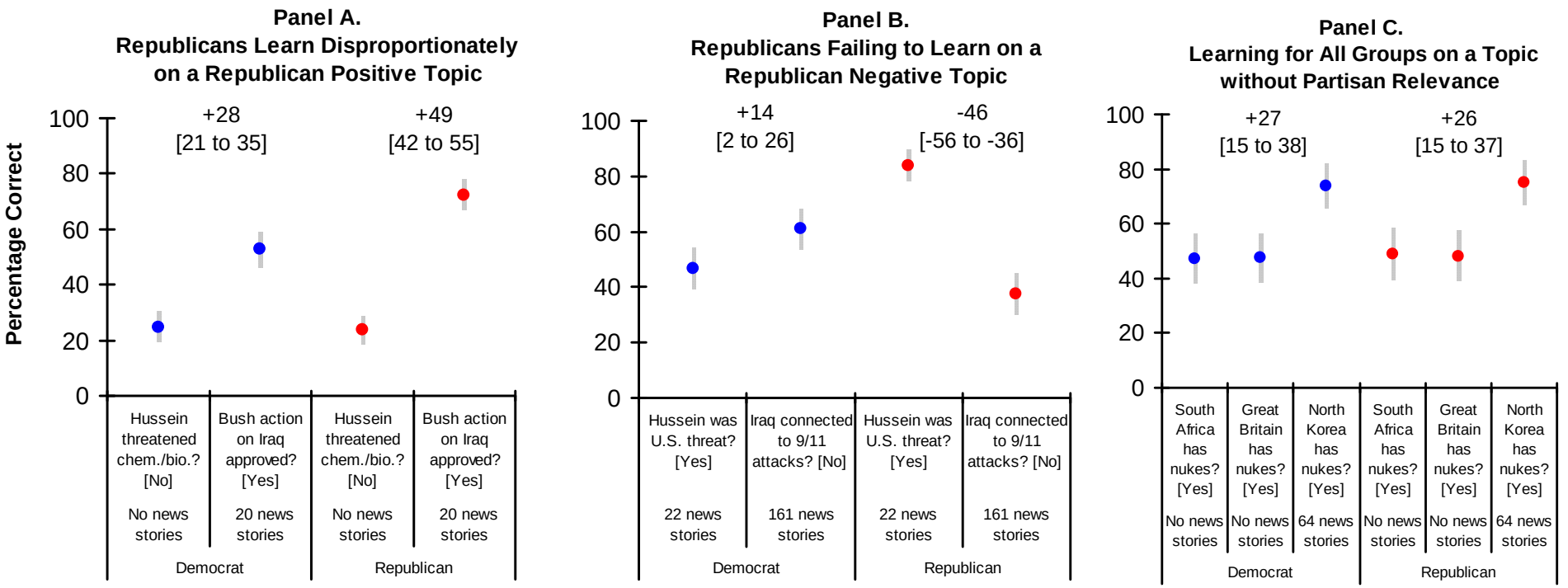
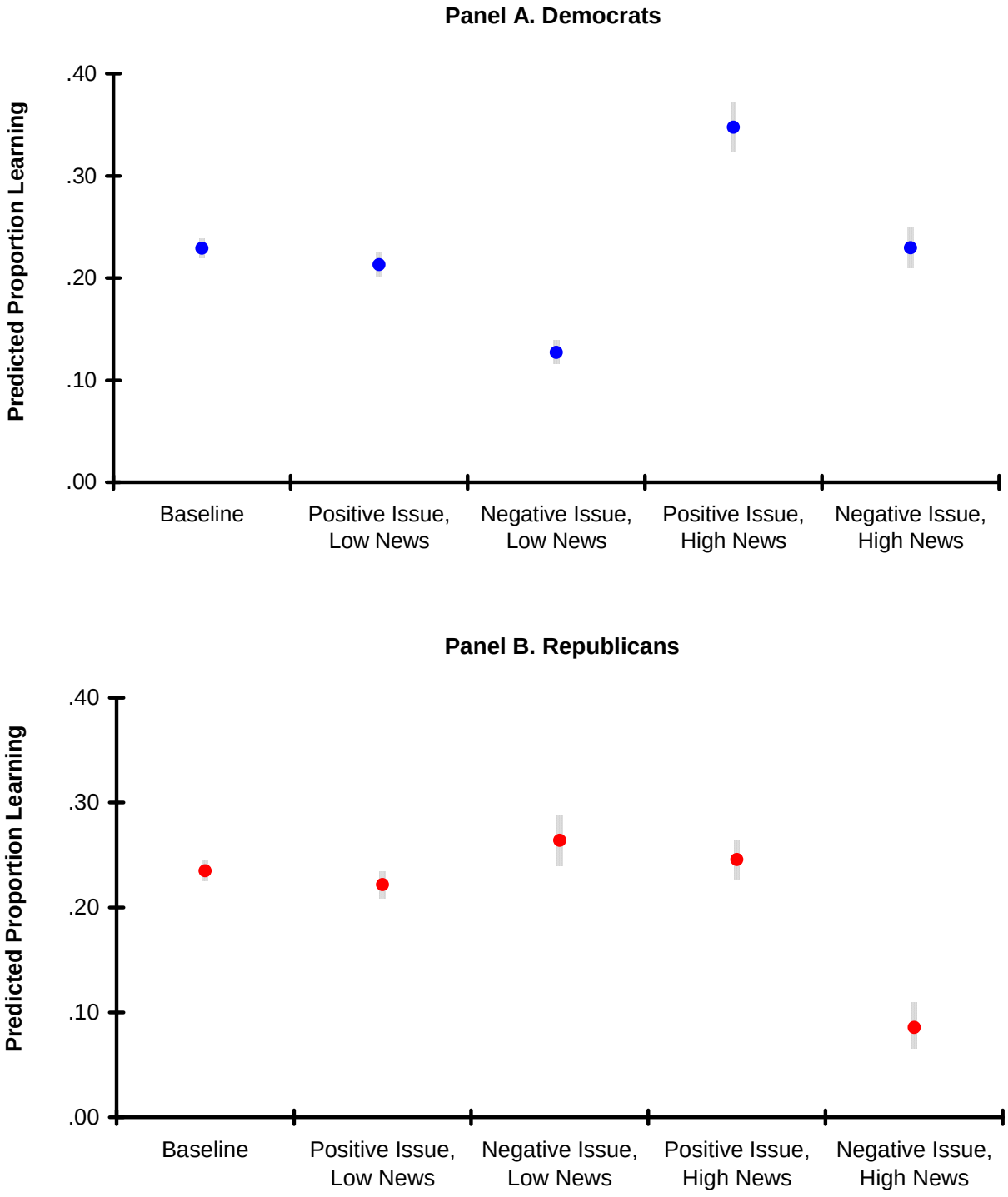


Figure 3. Patterns of Learning across Variations in Issue Motivation and News Coverage



Note: The entries are predicted probabilities for the top category (1=learning) from an ordered probit model. See the text for details and the appendix for the coefficient estimates.