

# Sorting fact from fiction when reasoning is motivated\*

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## Abstract

We combine a simple theoretical framework with a survey experiment to investigate how individuals sort fact from fiction and update their assessments in societally important but politicized topics, such as climate change and public health. We show that cognitive ability improves news discernment, and in particular, the ability to make correct assessments that contradict one's prior issue positions. However, when we disaggregate results by topic, higher cognitive ability sometimes amplifies motivated decision-making rather than attenuating it. Our findings suggest a hard–easy pattern: more complex topics elicit greater motivated reasoning; simpler ones elicit less. In addition, overconfidence reduces responsiveness to new information, contributing to the persistence of misperceptions. Finally, higher institutional trust is associated with weaker motivated reasoning, suggesting that institutional quality may play an important role in constraining opinion polarization.

Keywords: fake news, misinformation, cognitive ability, motivated reasoning, overconfidence, institutions

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# 1 Introduction

Citizens today face an unprecedented proliferation of news about important issues. Due to the widespread circulation of fabricated and misleading content, they are commonly advised to fact-check the information they encounter, but the sheer volume of news makes this infeasible. As a result, navigating today’s complex landscape of (mis)information often relies on quick judgments about what is true, made on the spot, and often subject to personal biases that shape one’s perception of truth.

Our study investigates these (possibly biased) decision processes, which are crucial for the formation and evolution of opinions.<sup>1</sup> We present a theory-guided, large-scale online study to investigate how the ability to sort fact from fiction and to learn from new information are influenced by cognitive and psychological factors. Improving our understanding of these decision processes is vital because, despite an increasingly complex news landscape—overflowing with both accurate and misleading information—audiences have become highly opinionated and even polarized on complex issues, from climate change to immigration to public health. Consequently, a widespread inability among citizens to discern fact from falsehood or revise initial judgments may fuel polarization and undermine societal outcomes and democratic decision-making.

Guided by our theoretical framework, we use survey experimental data to analyze how cognitive ability, motivated reasoning, and overconfidence shape news discernment and learning from new information. In a nutshell, motivated reasoning refers to the observed slant in news assessments driven by the motivation to make choices that align with one’s existing issue positions (i.e., directional motives). The participants take a news quiz that provides us with a measure of their baseline discernment ability. To study updating, the quiz is repeated. During this second round, participants observe a noisy but informative report about the correct assessment for each item and may choose to revise their initial assessment. We conduct the study with broadly representative samples from Austria, Germany, and the UK.

Our news quiz focuses on politicized and informationally complex topics: immigration, climate change and environment (hereafter, climate change), inequality, and a fourth topic

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<sup>1</sup>For example, news discernment determines which news is stored in memory and how (e.g., as “true news”). The stored and retrieved information then shapes opinions and their evolution.

at the intersection of public health, science, and controversial (or conspiratorial) content (hereafter, science). Most people have limited information on these topics compared with the ever-growing body of available knowledge, but they may still hold (strong) opinions on them. Their viewpoints may in turn shape how they assess and learn from news. Hence, examining both decision contexts—news discernment and updating from new information—together, as we do, offers a more comprehensive understanding of the mechanisms driving these decisions. To illustrate, consider an individual with a certain viewpoint who tends to judge like-minded news stories as accurate. Does this pattern stem from exposure to mostly one type of news, or does it reflect an active tendency to discount or disregard incongruent information when encountered? Our survey-experimental design allows us to better identify the underlying sources of misperceptions and their persistence across contentious policy domains.

We propose a novel approach to measuring and analyzing motivated reasoning. For each news topic in our quiz, we classify each respondent as either neutral or issue-biased based on their answers to validated survey items from established surveys—related studies draw almost exclusively on US samples and measures of party identification. Our survey-based cognitive ability measure is a validated and commonly used short version of the Raven Advanced Progressive Matrices (APM) test. We view educational attainment as a secondary measure of cognitive ability. The two measures capture different aspects of cognitive ability—while the APM test is associated with fluid intelligence, education is linked to crystallized ability.

In theory, motivated reasoning may have a pernicious effect on news discernment when the correct assessment of news conflicts with a respondent’s viewpoint. Still, cognitive ability improves not only average discernment, but also the ability to make correct assessments that conflict with one’s viewpoint. A fundamental assumption here is that cognitive ability and opinion biases are *independent*; the above results may not hold if higher cognitive ability is associated with stronger issue opinions. Our framework also predicts that overconfidence in one’s discernment ability is an impediment to learning from new information. Such overconfidence may be prevalent<sup>2</sup> and can generate suboptimal political choices and outcomes

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<sup>2</sup>For example, a survey by the Pew Research Center in the US finds that 84% of respondents are (somewhat or very) confident in their ability to recognize fake news.

(Ortoleva and Snowberg, 2015; Kartal and Tyran, 2022).

As hypothesized, cognitive ability is a significant predictor of news discernment, and the ability to make accurate assessments that conflict with one’s existing views increases in both the IQ score (as measured by the APM test) and educational attainment in our data. The counterpart to this statement also holds: the ability to make correct assessments that align with one’s views increases in cognitive ability. These novel results are highly robust and provide evidence that news discernment is malleable,<sup>3</sup> and that higher cognitive ability mitigates the harmful effect of directional motives on discernment.

Next, we study the extent to which directional motives and cognitive ability jointly influence news discernment. As hinted above, respondents do make an effort to be accurate (even when this conflicts with their viewpoint), and the success of this effort increases in cognitive ability. Still, respondents’ news assessments exhibit a significant degree of motivated reasoning—the magnitude of the effect of cognitive ability rivals that of motivated reasoning only if we vary both educational attainment and the IQ score from very low to very high levels.<sup>4,5</sup> We note that our quiz questions are significantly harder than those in previous studies. Taken together with findings from the literature (see, e.g., Pennycook and Rand (2019); Angelucci and Prat (2024)), our results point to a *hard–easy effect*: harder (easier) settings are associated with higher (lower) levels of motivated reasoning. More broadly, in politicized and complex issues, motivated reasoning may play a substantial role in shaping opinion dynamics, exacerbating polarization over time.

Cognitive ability does not seem to moderate the magnitude of motivated reasoning in the aggregate (results disaggregated by news topic are different, as discussed below). We find that higher trust in institutions, higher media consumption, and being a student reduce

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<sup>3</sup>Cognitive ability is malleable, as exemplified by the Flynn effect, i.e., the sustained increase in IQ scores in the 20th century due to societal development. A negative Flynn effect is possible. For example, Dutton et al. (2017) conclude that increasing religious emphasis in the Kuwaiti school curriculum significantly reduced intelligence test scores among 8 to 15 year olds. Socioeconomic disparities also matter in explaining the variation in intelligence (see Concluding Remarks).

<sup>4</sup>To formalize motivated reasoning, consider the respective probability of making a correct news assessment when the correct assessment and the respondent’s issue bias are aligned and when they are in conflict. In our framework, the former is higher than the latter due to directional motives; we denote this difference between the two probabilities as motivated reasoning.

<sup>5</sup>IQ measure, educational attainment, and motivated reasoning are the most important determinants of news discernment. Some demographic factors, such as gender and income, have a limited but robust role.

the magnitude of motivated reasoning.<sup>6</sup> On the contrary, voting for an extremist party is associated with a higher magnitude of motivated reasoning.

In the context of updating from new information, the counterpart to motivated reasoning is motivated updating. In addition to a low willingness to revise answers, we document that respondents do exhibit motivated updating; that is, they are less likely to change their bias-consistent answers in response to conflicting new information. As a result, one-sided news exposure does not seem to be the prevailing explanation for opinion biases: respondents do discount unfavorable news.

Importantly, the aggregate results above conceal significant heterogeneity by topic. In particular, the science topic is distinct from the others in one key respect: discernment does not appear to improve with higher levels of education. In fact, educational attainment increases the magnitude of motivated reasoning in science: respondents with higher education are more likely to let issue bias dictate their quiz answers due to a violation of our assumption that cognitive ability and the strength of issue bias are independent—we document that these two factors are positively correlated in science. In addition, the IQ score increases motivated updating in science. Hence, science attitudes may be more strongly associated with the identity of higher cognitive ability people, thereby increasing their tendency for identity-driven (i.e., motivated) decision making.

These results suggest that motivated reasoning is not simply attenuated by cognitive ability; in certain domains, it can be strengthened by it. This underscores the need for interventions that cultivate *intellectual humility* and awareness of identity-driven decision making.<sup>7</sup> This may be relevant not only for the general public but also for expert communities. Experts are competent and possibly high in cognitive ability, but the depth of their expertise can strengthen the motivation to arrive at identity-consistent conclusions.<sup>8</sup>

Finally, we document that higher IQ has a positive effect, and higher overconfidence

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<sup>6</sup>As most students in our sample are young, the latter result relates to a social psychology literature, dating back to Krosnick and Alwin (1989), which argues that attitudes are highly flexible during early adulthood, but less so afterwards.

<sup>7</sup>See Porter et al. (2022) for an overview of research on intellectual humility.

<sup>8</sup>A well-known study by Tetlock (2005) spanning 20 years evaluates forecasts from experts in different fields and finds that they perform worse than simple statistical extrapolations from existing data. Tetlock argues the results are a “warning that experts are not natural Bayesians”, and it is plausible that they are “egocentric” and “have difficulty taking other points of view seriously.”

(among the weakly overconfident) has a negative effect on updating.<sup>9</sup> In sum, misperceptions largely persist in the second quiz round because of limited self-awareness, cognitive limitations, as well as weaker responsiveness to incongruent new information.

Our experiment on updating mimics real-world information environments in which sources are neither fully reliable nor fully untrustworthy. It also relates to fact-checking, which may sometimes be similarly noisy. Lim (2018) analyzes two major fact-checkers in the US and reports that their agreement rate can be relatively low for statements in an ambiguous range (i.e., those that are deemed “Half True” or “Mostly False”). Our findings highlight the limitations of such corrective information when individuals are not impartial or do not fully trust or correctly process it.<sup>10</sup> Therefore, it is ideal to combine later-stage interventions, such as fact-checking and nudges, with early interventions, such as high-quality and accessible public education that is designed to promote cognitive skills as well as intellectual humility. Overall, both the quality of institutions and trust in them may matter. We found that higher trust in institutions reduces the magnitude of motivated reasoning, which may mitigate opinion polarization in the longer term. On average, participants in Germany perform better in the news quiz than those in Austria and the UK—while all three countries are rich, advanced democracies, Germany ranks higher in well-known institutional and governance rankings.<sup>11</sup>

## 2 Literature

Drawing on Kunda (1990), our framework assumes that respondent decisions are shaped by two primary motivations: accuracy concerns and directional motives. Accuracy concerns reflect a desire to assess information as objectively and accurately as possible. Directional

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<sup>9</sup>The overconfidence measure is the difference between a participant’s guess about their quiz score and the actual score.

<sup>10</sup>Relatedly, Chopra, Haaland and Roth (2022) study how demand for news changes when its content is fact-checked and document muted demand for fact-checking of ideologically aligned news. There is also a debate whether fact-checkers are non-partisan and unbiased. Louis-Sidois (2025) identifies the political affiliation of six main French fact-checkers and reports that these fact-checkers are both less likely to fact-check ideologically close entities and more likely to agree with them.

<sup>11</sup>For example, Germany ranks higher than Austria and the UK in the following rankings and ratings as of 2025: Human Development Index by the UN (also, the inequality-adjusted version), the Economist Democracy Index, V-Dem Democracy Indices, Global State of Democracy Indices, World Press Freedom Index by Reporters Without Borders, Corruption Perceptions Index by Transparency International, Rule of Law Index by the World Justice Project, international (e.g., Moody’s, S&P, Fitch) credit ratings.

motives, in contrast, refer to the motivation to evaluate news in a way that aligns with one’s preexisting views. Hence, directional motives may give rise to motivated reasoning. Given the dramatic rise in ideological and political polarization in the US, an extensive body of research in political science and political psychology has documented the motivated nature of individuals’ perceptions, assessments, and beliefs (Taber and Lodge, 2006; Slothuus and De Vreese, 2010).<sup>12</sup> A related strand of the literature has examined the influence of the spread of fake news and how belief in fake news interacts with motivated reasoning (Allcott and Gentzkow, 2017; Pennycook and Rand, 2019; Angelucci and Prat, 2024).<sup>13</sup>

We advance this literature in various ways. We present a novel, theory-guided framework to study how individuals evaluate news and learn from new information in politicized contexts. Our study focuses on societally important topics that are significantly more complex than those typically studied in everyday political contexts. The magnitude of motivated reasoning observed in our news quiz is considerably higher than estimates reported in closely related work, such as Angelucci and Prat (2024) and Pennycook and Rand (2019). This overall pattern is in line with our theoretical framework: in more complex informational environments, directional motives play a more prominent role in shaping assessments. On a more optimistic note, both IQ (as measured by the APM test) and educational attainment mitigate the adverse effects of motivated reasoning on discernment. In particular, higher cognitive ability promotes the ability to make correct assessments that *conflict* with respondents’ issue biases. To our knowledge, this study is the first to document that IQ and educational attainment jointly produce these effects on news discernment.<sup>14</sup>

At the aggregate level, cognitive ability does not appear to moderate motivated reasoning. However, when disaggregated by topic, the results are surprisingly heterogeneous: cognitive ability may amplify or attenuate motivated reasoning depending on the topic. This finding

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<sup>12</sup>See also Redlawsk (2002); Jerit and Barabas (2012); Bolsen, Druckman and Cook (2014); Flynn, Nyhan and Reifler (2017); Peterson and Iyengar (2021); and the references therein.

<sup>13</sup>See also Nyhan and Reifler (2010); Hart and Nisbet (2012); Berinsky (2017); Flynn, Nyhan and Reifler (2017); Wood and Porter (2019); Ecker et al. (2022).

<sup>14</sup>Pennycook and Rand (2019); Bago, Rand and Pennycook (2020); Assenza and Cardaci (2022); Arechar et al. (2023) conclude that higher performance in the cognitive reflection test (Frederick, 2005) is associated with better news discernment; however, they do not report an effect of educational attainment. Concerning the effect of education on news discernment, Angelucci and Prat (2024); Allcott and Gentzkow (2017) find a positive effect in the US, and Arin, Mazrekaj and Thum (2023) reports a positive effect in Germany but a null effect in the UK. These studies do not have an additional cognitive ability measure.

relates to Kahan (2013); Kahan et al. (2012, 2017), who report that individuals with higher cognitive reflection test scores and higher numeracy skills are more prone to motivated reasoning (however, see Persson et al. (2021) for a replication attempt).<sup>15</sup> Our results provide a more nuanced picture, suggesting that cognitive ability amplifies motivated decision-making (only) in highly ego-relevant contexts. Our study also relates to a growing literature on motivated belief updating in politicized settings (Thaler, 2024; Chopra, Haaland and Roth, 2024). We find that among participants who exhibit motivated updating in response to new (albeit noisy) information, this tendency increases with IQ.

The literature on news discernment has so far paid limited attention to the role of cognitive biases, such as overconfidence. To our knowledge, this study is the first to examine how overconfidence shapes learning from new information and the revision of initial assessments. By combining the analysis of news discernment and updating from new information, our framework presents a more comprehensive account of how opinions form and evolve. Our findings suggest that misperceptions and issue biases persist due to imperfect learning (driven by overconfidence and cognitive limitations) alongside a motivated processing of new information depending on whether it is (in)congruent.

Finally, our study relates to and complements a growing body of work on interventions designed to counter misinformation, including fact-checking, debunking, and accuracy nudges (see for example Pennycook et al., 2020; Henry, Zhuravskaya and Guriev, 2022; Ecker et al., 2022, and references therein). Our findings highlight the importance of combining these tools with (earlier) interventions that foster cognitive skills as well as soft skills, such as intellectual humility and self-awareness.

### 3 Theoretical Framework

There are two states of the world  $S \in \{1, 0\}$  for each news item, where 1 and 0 represent the case in which the news item is true and false, respectively. A news item is true (that is,  $S = 1$ ) with prior probability  $\pi \in (0, 1)$ . We assume that after seeing a news item, respondent  $i$  forms an opinion signal about its veracity, denoted by  $s_i \in \{1, 0\}$ , which has

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<sup>15</sup>In these studies, respondents make assessments on hypothetical scenarios, which is unknown to them.

precision  $q_i$ ; that is,

$$\Pr(s_i = 0|S = 0) = \Pr(s_i = 1|S = 1) = q_i \geq 0.5.$$

As explained below,  $q_i$  is endogenously chosen by  $i$ , resulting in endogenous (potentially malleable) news discernment.<sup>16</sup> The respondent has two choices,  $a_i \in \{1, 0\}$ , where 1 and 0 represent the respective case in which the news item is assessed to be true and false.<sup>17</sup>

*Decision making utilities with directional motives:* Directional motives may influence news assessments in politicized topics. To formalize directional motives, we assume that a news item has a “valence” for respondents who are not neutral on that item’s topic. The valence of a news item for respondent  $i$  is denoted by  $V_i$  and takes one of two values; i.e.,  $V_i \in \{0, 1\}$  with the interpretation that  $i$  has a *preference* for true news with valence  $V_i = 1$  and false news with valence  $V_i = 0$ . Formally, we assume the following utilities for correct assessments:

$$u_i(a_i = 1|S = 1, V_i = 0) = u_i(a_i = 0|S = 0, V_i = 1) = 1 - v_i \quad (1)$$

$$u_i(a_i = 1|S = 1, V_i = 1) = u_i(a_i = 0|S = 0, V_i = 0) = 1, \quad (2)$$

where  $v_i \in [0, 1)$ . To give an example using the notation above, the utility that an anti-immigrant respondent  $i$  derives from correctly guessing that a news item is true (i.e., the utility of  $a_i = 1$  when  $S = 1$ ) is higher if the true news item is anti-immigrant in stance (that is,  $V_i = 1$ , since respondent  $i$  is anti-immigrant) than if it is pro-immigrant (that is,  $V_i = 0$ ). For neutral participants,  $v_i = 0$  and  $V_i$  is irrelevant. We assume without loss of generality that the utility of an incorrect assessment is always 0:<sup>18</sup>

$$u_i(a_i = 1|S = 0) = u_i(a_i = 0|S = 1) = 0. \quad (3)$$

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<sup>16</sup>See ? for a similar theoretical approach in the context of information aggregation.

<sup>17</sup>Our news quiz has two types of questions: true-false questions and fill-in-the-blank items, where respondents select one of two options, 1 and 2. We model respondent decision making assuming (without loss of generality) that the news item is a true-false question. The model readily applies to fill-in-the-blank items, by redefining the state of the world as  $S \in \{1, 2\}$ , where 1 and 2 represent the case in which the correct answer is option 1 and option 2, respectively. We redefine the opinion signal  $s_i \in \{1, 2\}$ , its precision  $q_i$ , and the choice  $a_i \in \{1, 2\}$  correspondingly. For example,  $\Pr(s_i = 1|S = 1) = \Pr(s_i = 2|S = 2) = q_i$ .

<sup>18</sup>Our results are not affected if we relax this assumption and allow the utility of an incorrect assessment to depend on  $V_i$ , analogous to (1) and (2).

This binary decision context is relevant not only in our study but also in practice. For example, it is likely easier for people to store news in memory and recall it in a simple binary (“true” or “false”) format than in a continuous format that requires recalling the degree of confidence they have in the truth of the news.

*Veracity and valence of news:* We assume that  $\Pr(V_i = 1) = 0.5$  and that

$$\Pr(S = 1|V_i = 1) = \Pr(S = 1|V_i = 0) = \pi. \quad (4)$$

Thus, the valence of a news item is not informative about its veracity. These assumptions are made for notational simplicity, provide a useful benchmark for our quiz design, and are without loss of generality.

*Beliefs with directional motives:* Directional motives may be associated with an asymmetry in not only decision making utilities but also beliefs held by respondent  $i$ , depending on the valence of news,  $V_i \in \{0, 1\}$ . For example,  $i$  may hold biased priors such that news with  $V_i = 1$  is ex-ante more likely to be true than news with  $V_i = 0$ , i.e.,  $\Pr(S = 1|V_i = 1) > \pi > \Pr(S = 1|V_i = 0)$ , in contrast to (4) above. In Online Appendix A.1, we extend our framework to generate directional motives through both preferences and priors, and we obtain identical results to those we report below. For simplicity in the main text, we assume away biased priors unless otherwise stated.<sup>19</sup>

*Cost of precision  $q_i$ :* Higher  $q_i \in [0.5, 1]$  is beneficial but has an (effort) cost to  $i$ . We assume that the cost of  $q_i$  is associated with  $i$ 's cognitive ability, which we denote by  $\theta_i \in [\underline{\theta}, \infty)$ , where  $\underline{\theta} > 0$ . In particular, the cost of  $q_i$  is  $\frac{C(q_i)}{\theta_i}$  for  $i$ , where  $C(0.5) = 0$ ,  $C'(0.5) = 0$ , and  $C(\cdot)$  is an increasing and strictly convex function of  $q$ .

It is plausible that the cost  $C(q)$  varies by topic complexity, as discussed further below. In addition,  $C(q)$  may vary across socio-demographic groups or depending on institutional quality, generating within and across country differences in news discernment.

*News discernment under directional motives:* The probability of making a correct assessment (i.e., news discernment) depends on the choice of  $q_i$  and  $a_i$ , which in turn depend on  $V_i$ ,  $v_i$ ,

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<sup>19</sup>We are agnostic about the extent to which these different sources of directional motives matter for news discernment—their theoretical effects are the same in our analysis.

and  $\theta_i$ . Thus,  $V_i$  and  $v_i$  generate directional motives and may shape news discernment by affecting the choice of  $q_i$  and  $a_i \in \{0, 1\}$ . In particular, directional motives may give rise to a *slant* in the assessment of news depending on its valence.

*Choosing  $q_i$  and  $a_i$ :* Respondent  $i$  chooses  $q_i \in [0.5, 1]$ , given  $\theta_i$  and  $v_i$ , to maximize their ex-ante expected utility, i.e., before  $V_i \in \{0, 1\}$  is realized (we relax this assumption in Online Appendix A.3; see below for a discussion). To explain the optimal choice of  $q_i$ , first consider how  $i$  chooses  $a_i \in \{0, 1\}$  after  $q_i$  has been chosen and  $i$  observes  $V_i \in \{0, 1\}$  and  $s_i \in \{0, 1\}$ .

- Assume that the news item is such that  $V_i = 0$ . Given (1)–(3), it is optimal for  $i$  to follow their opinion signal  $s_i = 0$  (i.e., choose  $a_i = s_i = 0$ ) if and only if  $q_i \geq \frac{\pi(1-v_i)}{1-\pi v_i}$ , and it is optimal to follow  $s_i = 1$  and choose  $a_i = s_i = 1$  if and only if  $q_i \geq \frac{1-\pi}{1-\pi v_i}$ .
- Next, assume that  $V_i = 1$ . In this case, it is optimal to follow  $s_i = 0$  and choose  $a_i = 0$  if and only if  $q_i \geq \frac{\pi}{1-v_i+\pi v_i}$ , and it is optimal to follow  $s_i = 1$  if and only if  $q_i \geq \frac{(1-\pi)(1-v_i)}{1-v_i+\pi v_i}$ .

To further simplify exposition in the main text, consider the special case where  $\pi = 0.5$ . Using  $\pi = 0.5$  in our analysis above, it follows that the only strategy compatible with a choice of  $q_i > 0.5$  is such that  $i$  follows  $s_i$  regardless of  $V_i$ —the symmetric-prior case is a special case in that respect. Thus, given (4) and  $\pi = Pr(V_i = 1) = 0.5$ , the ex-ante expected utility of respondent  $i$  equals

$$\frac{1}{2}q_i + \frac{1}{2}q_i(1 - v_i) - \frac{C(q_i)}{\theta_i}$$

provided that  $q_i > 0.5$  is optimal, i.e.,

$$\frac{1}{2}q_i + \frac{1}{2}q_i(1 - v_i) - \frac{C(q_i)}{\theta_i} \geq \frac{1}{2}. \quad (5)$$

The optimal value of  $q_i$  is given by the first-order condition  $C'(q_i) = \frac{\theta_i(2-v_i)}{2}$  if this value is interior and satisfies (5). Otherwise,  $q_i = 0.5$ , and  $i$  always follows their preference (i.e.,  $a_i = V_i$ ), obtaining a utility of 0.5. For  $\theta_i$  sufficiently high, (5) is satisfied, and  $q_i > 0.5$ . Hence, all else equal, news discernment increases in cognitive ability.

*Ex-ante versus ex-post choice of  $q_i$ :* We have assumed that  $q_i$  is determined by an ex-ante utility maximization (e.g., before observing  $V_i$ ), since discernment may be viewed as the outcome of a costly investment (e.g., investment in critical and informed reasoning, as well as in knowledge) prior to the news quiz. However, Proposition 1 is unchanged if we assume that  $q_i$  is chosen during the study (representing the return to reflection and thinking during the study), that is, after observing  $V_i \in \{0, 1\}$ , thus making the choice of  $q_i$  contingent on  $V_i$  (see Proposition 6 in Online Appendix A.3).

*How cognitive ability affects discernment with directional motives:* We investigate the disaggregated effect of cognitive ability,  $\theta_i$ , on news discernment in two separate cases under directional motives. In what we call the “motivated state”, either (a)  $V_i = 1$  and  $S = 1$ ; or (b)  $V_i = 0$  and  $S = 0$ . In this case, the correct assessment about the veracity of a news item aligns with the respondent’s preference and results in a utility of 1 (instead of  $i - v_i$ ), as indicated in (2). The “counter-motivated state” is the counterpart: either (a)  $V_i = 1$  and  $S = 0$ ; or (b)  $V_i = 0$  and  $S = 1$ . In this case, the correct assessment of news conflicts with the respondent’s preference and results in a utility of  $1 - v_i$ , instead of 1.

It is easy to show that given  $v_i > 0$ ,  $i$  is more likely to be correct in the motivated state than in the counter-motivated state. Thus, directional motives may be *pernicious* and result in low accuracy in the counter-motivated state. Nevertheless, we show that cognitive ability improves news discernment in the counter-motivated state. Let  $P_C$  denote the probability of a correct assessment in the counter-motivated state. Given our assumption in the main text that  $\pi = 0.5$ ,

$$P_C = \frac{1}{2} \Pr(a_i = 1 | (V_i = 0) \cap (S = 1)) + \frac{1}{2} \Pr(a_i = 0 | (V_i = 1) \cap (S = 0)).$$

This term equals 0 if  $q_i = 0.5$  and  $q_i$  if  $q_i > 0.5$ .<sup>20</sup> It follows that  $P_C$  increases in  $\theta$ . The

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<sup>20</sup> $P_C$  with arbitrary  $\pi$  and  $\Pr(V_i = 1)$  is given by

$$P_C = \frac{\Pr(a_i = 1 | (V_i = 0) \cap (S = 1))\pi(1 - \Pr(V_i = 1)) + \Pr(a_i = 0 | (V_i = 1) \cap (S = 0))(1 - \pi)\Pr(V_i = 1)}{\pi(1 - \Pr(V_i = 1)) + (1 - \pi)\Pr(V_i = 1)}.$$

probability of a correct assessment in the motivated state, denoted by  $P_M$ , is given by

$$P_M = \frac{1}{2} \Pr(a_i = 1 | (V_i = 1) \cap (S = 1)) + \frac{1}{2} \Pr(a_i = 0 | (V_i = 0) \cap (S = 0)),$$

which equals  $q_i$  if  $q_i > 0.5$  and 1 otherwise. As a result,  $P_M$  increases in  $\theta_i$  if  $q_i > 0.5$ , i.e., for all  $\theta$  sufficiently high so that  $q_i > 0.5$ . Hereafter, “motivated reasoning” refers to the *slant* respondent  $i$  displays in news assessments. That is, motivated reasoning equals  $P_M - P_C$ .<sup>21</sup>

*News discernment,  $P_C$ , and  $P_M$  in a society:* We have shown that all else equal, news discernment and  $P_C$  increase in  $\theta$  ( $P_M$  increases in  $\theta$  for sufficiently high  $\theta$ ). Assume that the density of  $v_i$  in the society is given by  $f(v)$  on the support  $[0, \bar{v}]$  for either direction of preferences. Assuming that  $v$  is distributed *independently* of  $\theta$ , the above results aggregate to the society, as stated in Proposition 1. To see why, consider for example  $P_C$  for given  $v > 0$  and  $\theta$ , which we denote by  $P_C(v, \theta)$ . Then, the expected value of  $P_C$  in the society for given  $\theta$  is

$$P_C(\theta) = \int_0^1 P_C(v, \theta) f(v) dv.$$

Since  $P_C(v, \theta)$  increases in cognitive ability (i.e.,  $\theta$ ),  $P_C(\theta)$  also increases in  $\theta$ .

**Proposition 1 (i) Effect of cognitive ability on news discernment:** *The average probability of an accurate assessment increases in  $\theta$ .* **(ii) Effect of cognitive ability in the counter-motivated state:** *Average  $P_C$  increases in  $\theta$ .* **(iii) Effect of cognitive ability in the motivated state:** *Average  $P_M$  increases in  $\theta$  for  $\theta$  sufficiently high if  $\bar{v} < 1$ .* **(iv) Effect of cognitive ability on motivated reasoning:** *Average  $P_M - P_C$  decreases in  $\theta$ .*

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<sup>21</sup>In the special case with  $\pi = 0.5$ , motivated reasoning,  $P_M - P_C$ , takes one of two values: 0 if  $q_i > 0.5$  and 1 if  $q_i = 0.5$ . However, this is not necessarily true for  $\pi \neq 0.5$  or with biased priors. Other extensions also generate interior levels of motivated reasoning with  $\pi = 0.5$ . An extension studied in Proposition 4 in Online Appendix A.2 allows for a stochastic magnitude of  $v_i$  instead of a deterministic one, as follows: if a respondent’s bias value is  $v \in [0, 1]$ , the *realized* value equals 0 with probability  $p_v(0)$ ,  $v$  with probability  $p(v)$  and 1 with probability  $p_v(1)$ , where  $p(v)$  is constant and  $p_v(0)$  and  $p_v(1)$  are such that the expected value is  $v$ . In this case, the magnitude of motivated reasoning,  $P_M - P_C$ , is always an interior value if  $q_i > 0.5$  at the optimum ( $P_M - P_C = 1$  if  $q_i = 0.5$ , as before). Another extension resulting in interior levels of motivated reasoning involves a stochastic distortion of the perception of  $q_i$  (i.e., underperceiving  $q_i$  with positive probability if  $s_i = 1$  and  $V_i = 0$  or if  $s_i = 0$  and  $V_i = 1$ ), which the respondent is ex-ante unaware of (i.e., at the stage where  $q_i$  is chosen).

Importantly, Proposition 1 may not hold if  $v$  and  $\theta$  are *not* independent, e.g., if  $v$  and  $\theta$  are positively correlated. We will revisit this point while discussing our empirical results. As mentioned above,  $C(q)$  may depend on topic complexity. If Topic 1 and Topic 2 are such that  $C_1(q) > C_2(q)$  for all  $q > 0.5$ , then average discernment is lower, and motivated reasoning,  $P_M - P_C$ , is higher in Topic 1 than in Topic 2. Thus, complexity matters. Also relevant to our empirical findings is that the average  $P_M$  in the society may increase in  $\theta$  for all  $\theta \geq \underline{\theta}$  depending on the distribution of  $v$  (or if  $\underline{\theta}$  is high enough).<sup>22</sup>

Proposition 3 in Online Appendix A extends Proposition 1 to a set of non-symmetric priors. Proposition 4 allows for a stochastic magnitude of  $v$ , as described in Footnote 21. Proposition 5 allows for biased priors such that  $\Pr(S = 1|V_i = 1) > \Pr(S = 1|V_i = 0)$ . Proposition 6 assumes that  $q_i$  is chosen ex-post instead of ex ante, i.e., during the study after observing the news item and its valence,  $V_i \in \{0, 1\}$ .<sup>23</sup>

*Updating news assessments:* In our experiment, participants take the same news quiz again. In each news item, they are shown their initial answer and a noisy but informative binary report about the correct assessment, denoted by  $R \in \{0, 1\}$ , where  $\Pr(R = 0|S = 0) = \Pr(R = 1|S = 1) = r > 0.5$  (in our experiment,  $r = 0.75$ ). We are particularly interested in the effect of *overconfidence* on the revision of initial assessments. Individual  $i$  is overconfident if  $i$  perceives  $q_i$  as  $p_i(q_i)$ , where  $p_i(q) > q$ . Thus, overconfident  $i$  believes that

$$\Pr(s_i = 0|S = 0) = \Pr(s_i = 1|S = 1) = p_i(q_i) > q_i.$$

Overconfidence in  $q_i$  may have a negative impact on learning and updating from new information. As an example, consider the case where  $i$  initially chose  $a_i = 0$  given  $s_i = 0$  and  $V_i = 0$ . If  $i$  obtains the report  $R = 1$ , switching to  $a_i = 1$  is utility maximizing for  $i$  if  $r$  is

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<sup>22</sup>We sketch a sufficient condition as follows. Let  $P_M(v, \theta)$  denote  $P_M$  for given  $v$  and  $\theta$ , and let  $v(\underline{\theta}) > 0$  denote the minimum  $v_i > 0$  such that  $q_i > 0.5$  for  $\theta = \underline{\theta}$ . Note that  $P_M(v, \theta)$  increases in  $\theta \in [\underline{\theta}, \infty)$  for all  $v \in (0, v(\underline{\theta})]$ . Hence, if  $\int_{v(\underline{\theta})}^1 f(v)dv$  is sufficiently small, average  $P_M$  in the society for given  $\theta$ , given by

$$P_M(\theta) = \int_0^1 P_M(v, \theta)f(v)dv,$$

increases in  $\theta \in [\underline{\theta}, \infty)$ . In words, average  $P_M$  in the society increases in cognitive ability if the magnitude of  $v$  is sufficiently small for sufficiently many people.

<sup>23</sup>In general, the monotonicity of  $P_M - P_C$  in  $\theta$  for  $\theta \geq \underline{\theta}$  relies on more stringent conditions than the monotonicity of  $P_C$  (or the average probability of an accurate assessment) in  $\theta$ . For example, the monotonicity of  $P_M - P_C$  in  $\theta$  depends on the sign and magnitude of  $C''(q)$  in Proposition 6, but not the monotonicity of  $P_C$  or average discernment.

sufficiently high, i.e.,  $q_i < \frac{r(1-v_i)}{1+rv_i}$ . However,  $i$  will fail to do so if  $p_i(q_i) > \frac{r(1-v_i)}{1+rv_i} > q_i$ .

**Proposition 2 (Effect of overconfidence on learning)** *The probability of updating from an experimental report and revising an initial assessment decreases in overconfidence.*

Propositions 1 and 2 form the basis of our study hypotheses and research questions, discussed in Section 4.7.

## 4 Study Design

We conducted an online survey experiment guided by our theoretical framework. The survey has several parts, providing us with measures of (i) news discernment; (ii) cognitive ability (i.e.,  $\theta_i$  in our model); (iii) overconfidence (i.e.,  $p_i(q_i) - q_i$ ); and (iv) issue bias (i.e., whether  $v_i = 0$  or  $v_i > 0$ , and in the latter case, the direction of the bias) in each topic in our news quiz.

Invited participants see a brief description of the study, including its expected duration and payment. After consenting to participation, they are directed to our study. Below, we describe our study design in the order presented to participants. The study instructions and questions can be found in Online Appendix F.

### 4.1 Questionnaire on Demographics

Participants answer several screening questions to ensure that the sample in each country is representative of the population along gender, age, education, and region of residence.

### 4.2 News Quiz

The news quiz provides us with a measure of news discernment. It has 16 questions and is incentivized.<sup>24</sup> There are two types of questions: true-false questions and fill-in-the-blank items with two answer options. We sometimes use the latter format to make the correct

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<sup>24</sup>It is explained to participants that two items will be randomly selected to determine their payoff from the news quiz. Participants receive one euro (one pound in the UK) for each correct answer to the selected questions.

answer have a clear bias direction. We also prefer this format for highly topical items that could be too difficult in a true–false format.<sup>25</sup> For each respondent, the order of questions is randomized, and the order of answers is randomized in the fill-in-the-blank items.

The quiz covers four topics, which are politicized and divisive: immigration, climate change, science, and inequality. Specifically, what we call science is in the intersection of science, public health, and controversial or conspiratorial content, and what we call climate change concerns climate change and environment. Within each topic, news items are balanced in the bias direction of correct answers. For example, of the four science-related questions, two have correct answers with a “pro” orientation, while the other two have an “anti” orientation in their correct answers. As mentioned in the theoretical framework, this balanced design serves as a benchmark and aims to prevent spurious effects of directional motives on news discernment. For example, if respondents consistently select answers that align with their viewpoint, they would obtain the same news quiz score in our setting regardless of their orientation. Note that we define the “pro” (“anti”) direction as alignment (conflict) with the mainstream (e.g., elite or expert) discourse in the science topic, i.e., on issues in the intersection of public health, policy, and scientific expertise). That is, the “anti” orientation of a correct quiz answer in science does not equate anti-intellectualism and science rejection and may reflect a measured skepticism toward mainstream or establishment narratives, especially in the face of new technologies or societal shocks.<sup>26</sup> We have four items in each of the immigration, climate change, and science topics, and two items in the inequality topic. Two news items are neutral, i.e., not on politicized topics.

The quiz items were selected from a larger set of forty questions after a pretest with 587 people in Germany and the UK. We applied multiple criteria in the selection of both the pretest and the actual quiz items. We narrowed down the list of pretest questions from more

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<sup>25</sup>For example, consider the following item concerning immigration (in particular, the so-called great replacement theory). “In 2017, a prestigious demographic research organisation made a forecast on the number of children for Muslim and non-Muslim women in the EU between 2015 and 2020. According to the forecast, a typical Muslim woman in the EU has (i) 1 more child (ii) 3 more children than a non-Muslim woman in the EU.” The correct answer is 1 more child. We use the fill-in-the-blank format to make the item less difficult and to make the bias direction of the correct assessment clear.

<sup>26</sup>For example, at the beginning of the Covid pandemic, officials advised against buying masks, claiming that they were ineffective (however, the main reason was the medical shortage of masks). Thus, trust in science and healthy skepticism both matter in a society.

than one hundred questions that we produced or adapted from actual (true and false) news by selecting what in our opinion are highly topical themes and developments. Among them, some are quite controversial and concern, e.g., the Muslim birth rate, water fluoridation, or 5G, which have been the subject of many (true and fake) news. The pretest quiz had more topics than our final news quiz. Having fewer topics in the main study allowed us to ask fewer survey questions to detect issue biases in each topic and reduce study length.<sup>27</sup>

Two important criteria for eliminating pretest questions were (i) a very high or a very low level of difficulty in the pretest, which arguably limits variation across respondents and countries; and (ii) maintaining bias balance in correct assessments in each news topic. We strived to have relatively balanced subtopics within each topic. For example, we dropped the only news on terrorism (deaths), since it concerns a very grim but also rare phenomenon in the context of immigration. We eliminated pretest items that we ex-post found relatively ambiguous in their bias direction. Another objective was to reduce the number of country-specific questions. Therefore, only the immigration topic involves country-specific questions. Inequality questions concern global inequality and poverty.<sup>28</sup> Austrian and German respondents always see the same items, whereas the UK version differs in one item on immigration in which the mentioned statistics concern the UK rather than the EU. Also, we ask an EU-specific item in the UK and a UK-specific item regarding the popularity of the baby name “Muhammad” in the Austrian and German surveys, since similar—true and fake—news circulate very often in Western countries in print and social media.

The news items always cite a source, such as “research published in a prestigious scientific journal,” or “official statistics”, so the correct assessment of a news item cannot change due to new developments.<sup>29</sup> We do not name sources (e.g., scientific journals) as the general population may not know them however prestigious they may be.

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<sup>27</sup>We dropped the topics on gender and Eurocentrism.

<sup>28</sup>We view global inequality and awareness around it to be an important topic. For example, while the most recent wave of globalization since the 1990s has been heavily criticized for legitimate reasons, it is also observed to be associated with substantial reductions in global inequality and poverty. Awareness of this observation could potentially mitigate some of the resentment against it in richer countries.

<sup>29</sup>Published research or official statistic we cite in an item may actually not exist (as is typical of fake news), in which case the news item is naturally false.

### 4.3 Overconfidence measure

After participants complete the news quiz, we ask them to guess their news quiz score (a number from 0 to 16). Our measure of overconfidence is the difference between a participant’s guessed quiz score and their actual score. This measure can be positive, zero, or negative (classified as overconfident, well-calibrated, and underconfident, respectively). Since longer surveys may increase respondent dropout and reduce response quality, we aimed to keep the median study duration below 25 minutes and did not ask participants to report their confidence in every answer (for the same reason, we also did not incentivize this task).

### 4.4 Experimental treatment: Updating from information

Our experiment aims to investigate the effect of overconfidence and other relevant cognitive and psychological factors on learning from new information. In this part, participants retake the news quiz, with the questions presented in the same order as before. In each news item, the participant is reminded of their initial answer and observes a noisy but informative binary report about the correct answer. It is explained that this report shows the correct answer with probability 0.75 and the wrong answer with probability 0.25. The reports are conditionally independent across participants in each news item. After observing the report, the participant can revise their initial assessment. The treatment is incentivized.<sup>30</sup>

We study respondent decisions in the experiment only when reports differ from the initial quiz answers. We chose a precision of 0.75, since it is neither too high nor too low. It is not too low in the sense that each report can be viewed as a “fact check” albeit a noisy one. At the same time, 0.75 is not too high (i.e., the report is false with a nonnegligible probability), and therefore, overconfidence may play a significant role in participants’ decision making.

### 4.5 Survey Measure of Cognitive Ability

After the experiment, respondents take a 12-item version of the Raven’s Advanced Progressive Matrices (APM) test, due to Arthur Jr and Day (1994). This is a validated and

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<sup>30</sup>One item is randomly selected for each participant, and the participant is paid one Euro (one pound in the UK) if their answer to the selected item is correct in the experiment.

commonly used short version of the APM test providing us with a measure of cognitive ability. The order of questions is important in the APM test and fixed by design. The test is incentivized, and participants receive 25 cents for each correct answer (20 pence in the UK). The secondary measure of cognitive ability is educational attainment (on a scale from 1 to 5).

## 4.6 End Survey

This part involves an opinion survey that provides us with a measure of the issue bias of each respondent on each topic included in our news quiz. The measure is based on self-reports, e.g., on the degree of agreement or disagreement with survey statements. We use survey items from established sources (e.g., the World Values Survey). We classify respondent  $i$  as issue-biased (that is,  $v_i > 0$ ) in a topic and specify their (pro or anti) orientation if  $i$ 's self-reports on that topic always point in the same (pro or anti) direction or are neutral, with at least one self-report that is not neutral. Otherwise, we classify  $i$  as neutral (i.e.,  $v_i = 0$ ). See Online Appendix B.1 for details of our classification and summary statistics by topic.

The opinion survey enables us to obtain measures of  $P_C$ ,  $P_M$ , and  $P_M - P_C$ .  $P_C$  ( $P_M$ ) corresponds in our design to a participant's news quiz score in the counter-motivated (motivated) state, that is, their news quiz score from items with correct answers that conflict (align) with their issue biases. Thus, by classifying respondents according to their self-reports in the opinion survey and using the relevant part of the news quiz data, we can obtain measures of  $P_C$ ,  $P_M$ , and  $P_M - P_C$  for each respondent.

In this part, we also measure respondents' ideology (using the 11-point left-right scale) and institutional trust, such as trust in politicians, media, and scientists. Finally, we ask participants additional background questions, such as employment status, household income, party voting choices, and media consumption.

## 4.7 Hypotheses

The key variables of interest for our hypotheses and research questions are the following: (i) news quiz score; (ii)  $P_C$ ; (iii)  $P_M$ ; (iv) the magnitude of motivated reasoning (i.e.,  $P_M - P_C$ );

and (v) decisions in the experiment.

We have three preregistered research hypotheses, obtained from our framework in Section 3. Hypotheses 1 and 2 derive from Proposition 1, and Hypothesis 3 from Proposition 2. Research questions 1 and 2 are based on Proposition 1(iii)-(iv), and not preregistered as hypotheses, since the monotonicity of average  $P_M$  and  $P_M - P_C$  in  $\theta$  relies on more stringent theoretical conditions than the monotonicity of  $P_C$  (see Footnotes 22 and 23). Our first hypothesis concerns average news discernment.

**Hypothesis 1** *The news quiz score increases in cognitive ability.*

Hypothesis 2 concerns  $P_C$ , the news quiz score in the counter-motivated state. As discussed before, directional motives may be particularly pernicious in this state. In the following, we use  $P_C$  and the “counter-motivated news quiz score” interchangeably. To compute the counter-motivated news quiz score for a respondent, we consider only (i) the news topics in which the respondent is classified as biased; and (ii) news items from those topics with correct answers that conflict with the respondent’s issue biases.<sup>31</sup>

**Hypothesis 2** *The counter-motivated news quiz score ( $P_C$ ) increases in cognitive ability.*

Research questions 1 and 2 concern the effect of cognitive ability on  $P_M$  and  $P_M - P_C$ . In the following, we use  $P_M$  and the “motivated news quiz score” interchangeably. We obtain a measure of the motivated news quiz score, considering only (i) the news topics in which the respondent is classified as biased; and (ii) items from those topics with correct answers that align with the respondent’s issue biases (see Section 5.2 for an example of how we compute the motivated and counter-motivated scores).

**Research Question 1** *Does the motivated news quiz score ( $P_M$ ) increase in cognitive ability?*

**Research Question 2** *Does motivated reasoning,  $P_M - P_C$ , decrease in cognitive ability?*

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<sup>31</sup>In our pre-analysis plan, Hypothesis 2 uses the term “the likelihood of making a motivated error”, which corresponds to  $1 - P_C$ , and predicts that the likelihood of making a motivated error decreases in cognitive ability. This is equivalent to the current form of Hypothesis 2, since our preregistration defines the likelihood of making a motivated error as the share of false answers among news quiz items the correct answers to which are inconsistent with the respondents’ biases, which is precisely  $1 - P_C$ .

Hypothesis 3 concerns the effect of overconfidence on the revision of assessments. As mentioned in Section 4.4, we focus only on the case where a respondent’s initial answer differs from the experimental report they receive.

**Hypothesis 3** *The likelihood of updating news quiz answers decreases in overconfidence.*

## 4.8 Data Collection

Citizen-residents of Austria, Germany, and the UK between 18 and 75 years of age were eligible to participate in our study. The online study links were distributed by Marketagent, a commercial survey company, which partners with online panels of respondents in many countries. In total, we have data from 3682 respondents (1234 in Austria, 1268 in Germany, and 1180 in the UK). The samples in Austria, Germany, and the UK closely match the respective general population along age, gender, education, region of residence, as well as the employment and unemployment rates (See Table B4 in Online Appendix B.3).

The study was pre-registered with a pre-analysis plan before it began with a soft launch in June 13, 2023. The next phase of the data collection lasted from September 25 to November 5, 2023. The fixed participation fee is two euros (1.80 pounds in the UK). The average payment including the bonus is approximately five euros.

## 5 Results

We begin with a brief descriptive analysis of the data here and then discuss the evidence for our hypotheses and research questions in the upcoming sections.

For the main analysis sample, we drop the data of participants who are either very fast (indicating speeding through questions and inattention) and those who are very slow suggesting that they may have been distracted by other activities or searched for answers. Specifically, we drop the data of respondents who spent more than 120 minutes (about 5% of the data) and less than 10 minutes (about 7% of the data).<sup>32</sup> Note that all of our main

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<sup>32</sup>We dropped a larger fraction of the data than our expectation indicated in the preregistration, since we underestimated the share of participants who are extremely fast or slow.

results are robust to including all observations in the analysis, as shown in Online Appendix D.1.

The average time to complete the survey in the main analysis sample is 28 minutes, and the median completion time is 23 minutes. The average news quiz score is 8.1 out of 16 (50.5% in percentage terms). On average, the quiz is difficult, but the questions vary in difficulty (see the average score for each quiz question in Table B1 in Online Appendix B.1). The sample is slightly overconfident and guessed that they answered 9.1 items correctly. The news quiz score increases to 9.3 ( i.e. by about 15%) in the experiment.

## 5.1 Analysis for Hypothesis 1

According to Hypothesis 1, the news quiz score increases in cognitive ability. The measures of cognitive ability are the IQ score (as measured by the APM test) and educational attainment.<sup>33</sup> Figure 1 presents binned scatterplots that illustrate the effect of the IQ score (left panel) and educational attainment (right panel) on the news quiz score (normalized in percentage terms), controlling for a broad array of respondent characteristics. Both panels are in line with Hypothesis 1.

Table 1 presents regression estimates of the effect of cognitive ability on the news quiz score in percentage terms. We report OLS regression specifications with different sets of cognitive ability measures (i.e., only the IQ score, only educational attainment, and both), with and without control variables, as well as with and without country and survey month fixed effects.<sup>34</sup> The set of controls include gender, age, income, employment status, indicator variables for being foreign born, having a foreign-born mother, and having a foreign-born father, as well as measures of media use, extremist party voting, divergence from the median position on the left-right scale, and institutional trust.<sup>35</sup>

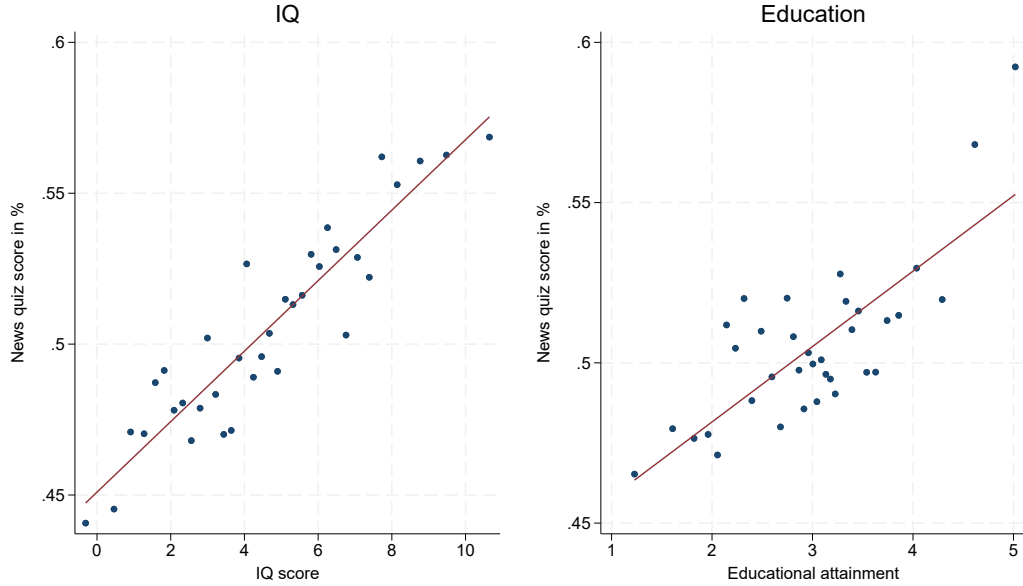
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<sup>33</sup>As mentioned above, education is more associated with crystallized ability and the APM score more with fluid intelligence.

<sup>34</sup>We include survey month fixed effects, since data collection started with a soft launch in June 2024 and continued from September to November.

<sup>35</sup>The measure of divergence from the median position on the left-right scale is the distance of a participant's position on the left-right scale (between 0 to 10) from the median position of the survey sample, which happens to be the center position (i.e., 5) in our data. Media use is the average of TV, radio, newspaper, internet, and social media use in order to stay informed about current events. Institutional trust is the average of trust in politicians, news media, education system, scientists, and social media. Extremist vote is an indicator variable equal to one if the participant voted for a far-right or a far-left party in the last general

Figure 1: Effect of cognitive ability on the news quiz score



*Notes:* The left and right panels of the figure are binned scatterplots showing the respective effect of the IQ score and educational attainment on the news quiz score in percentage terms. The IQ score varies from 0 to 12. Educational attainment varies from 1 to 5. The included controls and fixed effects are the same as in Column 7 of Table 1.

The coefficients of the IQ score and educational attainment are positive and statistically highly significant in each specification they are included in Table 1. There is limited variation in these coefficients across different specifications. Our preferred specification is Column 7, which includes both cognitive ability measures, the full set of controls, and country and survey month fixed effects. In Column 7, a respective increase in the IQ score and educational attainment by one unit increases the share of correct answers to the news quiz by 1.1 and 1.8 percentage points (the IQ score varies from 0 to 12, education from 1 to 5).<sup>36</sup>

Some sociodemographic characteristics, such as age, gender, and income, have a modest but highly significant effect: older males with higher income have a higher news quiz score (See Table C1). On average, German respondents perform better in the quiz. Austria, Germany, and the UK are highly developed and wealthy democracies, but Germany has a higher election of their respective country.

<sup>36</sup>The coefficients for the IQ score and educational attainment are largely unaffected in the full sample including all observations. See Online Appendix D.1.

ranking in well-known institutional and governance rankings, as mentioned in Footnote 11.<sup>37</sup>

Table 1: Effect of cognitive ability on the news quiz score

	IQ			Education			IQ & Education
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
IQ score	0.012*** (0.001)	0.012*** (0.001)	0.012*** (0.001)				0.011*** (0.001)
Education				0.023*** (0.002)	0.026*** (0.003)	0.024*** (0.003)	0.018*** (0.003)
Observations	3227	3227	3227	3227	3227	3227	3227
Controls	no	no	yes	no	no	yes	yes
Month FE	no	yes	yes	no	yes	yes	yes
Country FE	no	yes	yes	no	yes	yes	yes

*Notes:* This table reports estimates of OLS regressions of the news quiz score (normalized in percentage terms) on the IQ score and educational attainment. The IQ score varies from 0 to 12. Educational attainment varies from 1 to 5. The included controls in Columns 3, 6, and 7 are age, gender, income, employment status, and indicator variables for being foreign born, having a foreign born mother, and having a foreign born father, as well as measures of media use, extremist party voting, divergence from the median position on the left-right scale, and institutional trust (see Footnote 35 for the explanations of these variables). See Table C1 in Online Appendix C.1 for the full set of coefficients. Robust standard errors are in parentheses. \*\*\*, \*\* and \* indicate significance at the 1%, 5% and 10% level, respectively.

Table 2 presents the specification in Column 7 of Table 1 for each news topic. The effect of the IQ score and educational attainment mirrors our findings in Table 1, in all topics except science.<sup>38</sup> The coefficients of the IQ score and education are considerably lower in science than in other topics, and these differences are statistically significant.<sup>39</sup> In fact, education has an almost insignificant effect on the news quiz score in science ( $p = 0.10$ ). The underlying reason for this finding is discussed in the next section on motivated reasoning—in a nutshell, we document that educational attainment increases motivated reasoning in the science topic due to a violation of our modeling assumption that  $\theta$  and  $v$  are independent.

<sup>37</sup>Analyzing the quiz data by topic in Tables C2–C6, German participants perform (weakly) better in every topic, except that the UK participants are better in immigration—this is due to the fact that the item about the popularity of the baby name “Muhammad” in England turned out to be much easier for the UK participants—they were 32 pp more likely to be correct than German respondents in that item.

<sup>38</sup>We repeat the analysis in Table 1 separately for each topic in the news quiz on Tables C2–C6.

<sup>39</sup>See Table C7 in Online Appendix C.1.

Table 2: Effect of cognitive ability on the news quiz score by topic

	Science	Climate Ch.	Immigration	Inequality	Neutral
IQ score	0.006*** (0.002)	0.011*** (0.002)	0.015*** (0.001)	0.013*** (0.002)	0.009*** (0.002)
Education	0.008* (0.005)	0.024*** (0.005)	0.015*** (0.005)	0.028*** (0.007)	0.023*** (0.007)
Observations	3227	3227	3227	3227	3227
Controls	yes	yes	yes	yes	yes
Month FE	yes	yes	yes	yes	yes
Country FE	yes	yes	yes	yes	yes

*Notes:* This table reports estimates of OLS regressions of the news quiz score in each topic (normalized in percentage terms) on the IQ score and educational attainment. The IQ score varies from 0 to 12. Educational attainment varies from 1 to 5. See the notes to Table 1 for the full list of control variables. See Tables C2–C6 for the full set of coefficients in every news topic. Robust standard errors are in parentheses. \*\*\*, \*\* and \* indicate significance at the 1%, 5% and 10% level, respectively.

## 5.2 Analysis for Hypotheses 2 and Research Questions 1&2

This section focuses on the effects of directional motives, which is a central focus of our study: such motives arguably impair discernment in the counter-motivated state and may generate or deepen societal divides in the longer run. To obtain measures of the counter-motivated and motivated news quiz scores (i.e.,  $P_C$  and  $P_M$ ), we consider news topics in which a respondent is classified as biased according to their self-reports in the opinion survey, as explained in Section 4.7.<sup>40</sup> If a respondent is classified as biased in a topic, half of the items on that topic have correct answers that are consistent with the respondent’s bias (they concern  $P_M$ ), and the remaining half have bias-inconsistent correct answers (they concern  $P_C$ ) because correct answers are balanced in orientation within every news topic.

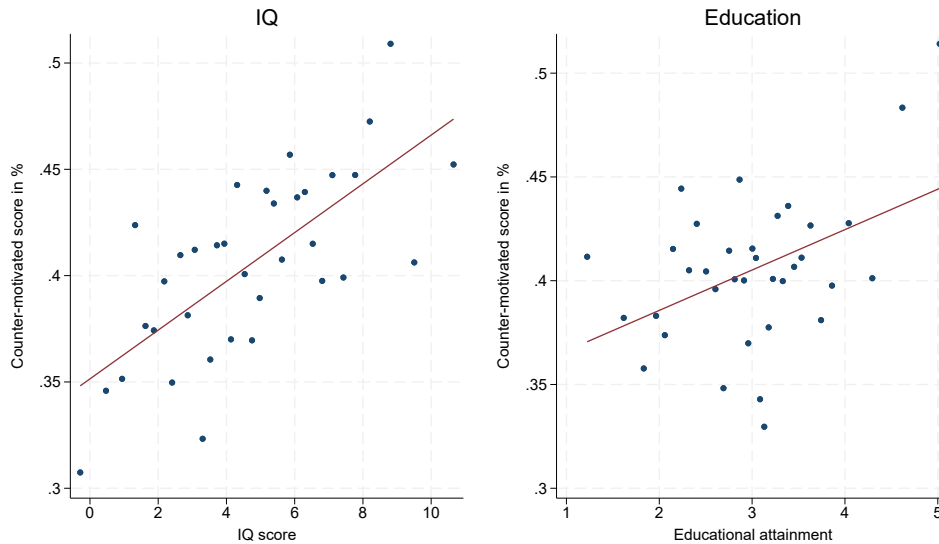
To make the measures of  $P_C$  and  $P_M$  more transparent, consider the following question on the immigration topic asked in the UK: “*True or false? According to the latest UK Census, the share of the Muslim population in the UK is higher than 20%.*”<sup>41</sup> The answer “true” aligns with the argument that there is a high number (e.g., excess) of Muslim immigrants in the UK, and thus has an anti-immigrant stance relative to the answer “false”. However, the correct answer is “false”. Thus, this question is included in the measure of  $P_C$  for a respondent

<sup>40</sup>In Online Appendix D.3, we show the robustness of our results in this section by varying our method of respondent classification. See also Section 5.5.

<sup>41</sup>This is the only question that differs across countries. In Austria and Germany, we replace the “UK” with the “EU”.

classified as anti-immigrant and in  $P_M$  for a respondent classified as pro-immigrant. News quiz items on immigration are not included in  $P_C$  or  $P_M$  for respondents classified as neutral in this topic.

Figure 2: Effect of IQ and education on the counter-motivated news quiz score



*Notes:* The left and right panels of this figure are binned scatterplots showing the respective effect of the IQ score and educational attainment on the counter-motivated news quiz score. The IQ score varies from 0 to 12. Educational attainment varies from 1 to 5. The included controls and fixed effects are the same as in Column 7 of Table 1. See the notes to Table 1 for the full list of variables.

According to Hypothesis 2, the counter-motivated news quiz score ( $P_C$ ) increases in cognitive ability. The left and right panels of Figure 2 are binned scatterplots, showing that an increase in the IQ score or educational attainment increases the counter-motivated score. Comparing this figure to Figure 1 already reveals the adverse effect of directional motives: at a given level of IQ or education, discernment in the counter-motivated state is notably worse than average discernment (40.5% and 50.5%, respectively). Panel I of Table 3 presents regression estimates of the effect of cognitive ability on the counter-motivated news quiz score to test Hypothesis 2. The number of observations is slightly lower than in Table 1, since some respondents have been classified as neutral in all news topics. In all regression specifications, the coefficients of the IQ score and educational attainment are positive, sizeable, and statistically highly significant. Our preferred specification is Column

7, which shows that a respective increase in the IQ score and education by one increases the counter-motivated score by 1.1 and 1.6 percentage points.

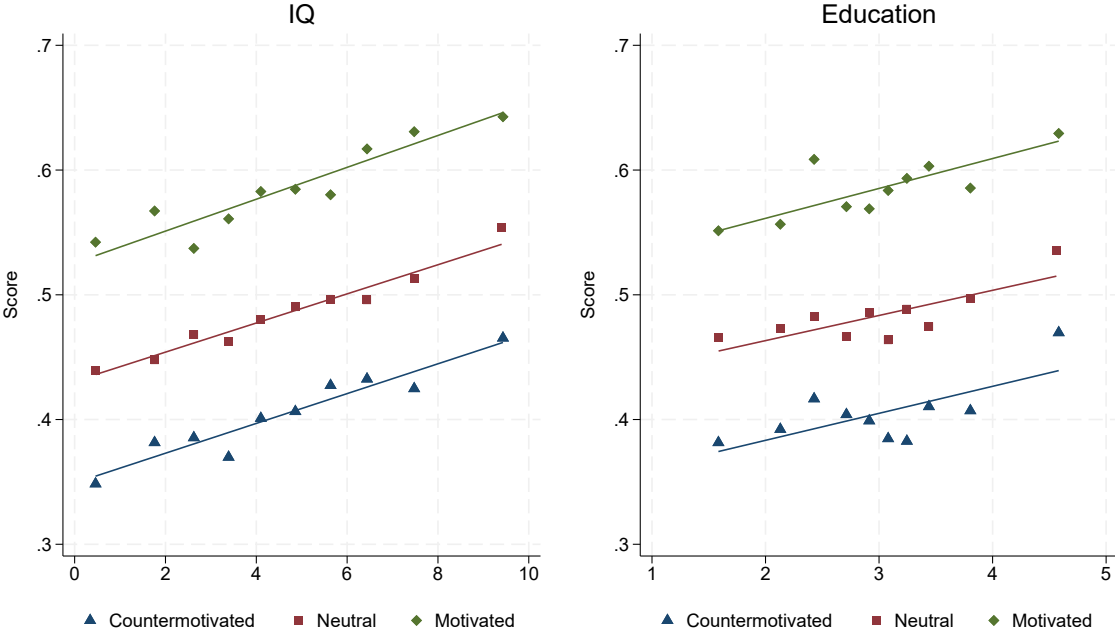
Table 3: Effect of cognitive ability on the counter-motivated and motivated news quiz scores

	IQ			Education			IQ & Education
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
<b>Panel I: <math>P_C</math></b>							
IQ score	0.013*** (0.002)	0.013*** (0.002)	0.012*** (0.002)				0.011*** (0.002)
Education				0.030*** (0.005)	0.030*** (0.005)	0.022*** (0.006)	0.016*** (0.006)
<b>Panel II: <math>P_M</math></b>							
IQ score	0.012*** (0.002)	0.012*** (0.002)	0.013*** (0.002)				0.012*** (0.002)
Education				0.017*** (0.005)	0.019*** (0.005)	0.024*** (0.005)	0.017*** (0.005)
Observations	3112	3112	3112	3112	3112	3112	3112
Controls	no	no	yes	no	no	yes	yes
Month FE	no	yes	yes	no	yes	yes	yes
Country FE	no	yes	yes	no	yes	yes	yes

*Notes:* This table reports estimates of OLS regressions of the counter-motivated news quiz score (in Panel I) and the motivated quiz score (in Panel II) on the IQ score and educational attainment. The IQ score varies from 0 to 12. Educational attainment varies from 1 to 5. See the notes to Table 1 for the full list of controls. The number of observations are lower than in Table 1 as some respondents have been classified as neutral in all news topics. See Tables C8 and C9 in Online Appendix C.2 for all coefficients. Robust standard errors are in parentheses. \*\*\*, \*\* and \* indicate significance at the 1%, 5% and 10% level, respectively.

Research question 1 asks whether the motivated news quiz score ( $P_M$ ) increases in cognitive ability. In theory, it does under certain assumptions, e.g., if the bias  $v$  is sufficiently low for sufficiently many people. The green lines with diamonds in Figure 3 suggest that an increase in the IQ score (on the left panel) or educational attainment (on the right panel) increases the motivated score. This is confirmed in Panel II of Table 3, which presents regression estimates of the effect of cognitive ability on the motivated news quiz score. The coefficients of the IQ score and educational attainment are positive, sizeable, and statistically highly significant in every specification.

Figure 3: Effect of IQ and education on the motivated and counter-motivated quiz scores



Notes: The left and right panels of this figure are binned scatterplots showing the respective effect of the IQ score and educational attainment on the motivated, counter-motivated, and neutral news quiz scores. The IQ score varies from 0 to 12. Educational attainment varies from 1 to 5. The neutral news quiz score refers to a participant’s quiz score in news topics in which they are classified as neutral according to their responses in the opinion survey. The included controls and fixed effects are the same as in Column 7 of Table 1. See the notes to Table 1 for the full list of variables.

Figure 3 also plots the counter-motivated news quiz score ( $P_C$ ) and shows that  $P_M$  is significantly more elevated than  $P_C$ . The gap demonstrates the sizeable magnitude of motivated reasoning—participants are considerably more accurate when the correct answer is congruent. For reference, Figure 3 also displays the “neutral news quiz score,” defined as the news quiz score in topics in which a participant is classified as neutral according to their self-reports in the opinion survey. In theory, this score should be between the motivated score and the counter-motivated score, which is indeed the case.

To summarize so far, participants do try to answer the quiz questions correctly even when the correct assessment is incongruent with their viewpoint, and the success of their effort increases in *both* the IQ score and educational attainment. Still, motivated reasoning manifests its strong presence in Figure 3. To formally document the presence of motivated reasoning

and estimate its magnitude, we combine the motivated and counter-motivated news quiz scores in Table 4. The table presents regression estimates where the dependent variable is a participant’s (motivated or counter-motivated) news quiz score. Each specification involves both cognitive ability measures and an indicator variable called “Motivated”, which equals 1 (0) if the news quiz score refers to the motivated (counter-motivated) score.

Table 4: Joint effect of cognitive ability and motivated reasoning

	Panel A			Panel B		
	(1)	(2)	(3)	(4)	(5)	(6)
Motivated	0.180*** (0.007)	0.180*** (0.007)	0.180*** (0.007)	0.217*** (0.024)	0.217*** (0.024)	0.217*** (0.024)
IQ Score	0.011*** (0.001)	0.011*** (0.001)	0.011*** (0.001)	0.011*** (0.002)	0.011*** (0.002)	0.011*** (0.002)
Education	0.017*** (0.004)	0.017*** (0.004)	0.017*** (0.004)	0.023*** (0.005)	0.024*** (0.005)	0.023*** (0.005)
Motivated×IQ Score				0.001 (0.002)	0.001 (0.002)	0.001 (0.002)
Motivated×Education				-0.013* (0.007)	-0.013* (0.007)	-0.013* (0.007)
Observations	6224	6224	6224	6224	6224	6224
Controls	no	no	yes	no	no	yes
Month FE	no	yes	yes	no	yes	yes
Country FE	no	yes	yes	no	yes	yes

*Notes:* This table reports the results of regressions examining how the news quiz score is influenced by directional motives, IQ score, and educational attainment. Motivated is an indicator variable equal to 1 (0) when the quiz score is  $P_M$  ( $P_C$ ). See the notes to Table 1 for the full list of controls. Robust standard errors clustered by respondent are in parentheses. \*\*\*, \*\* and \* indicate significance at the 1%, 5% and 10% level, respectively.

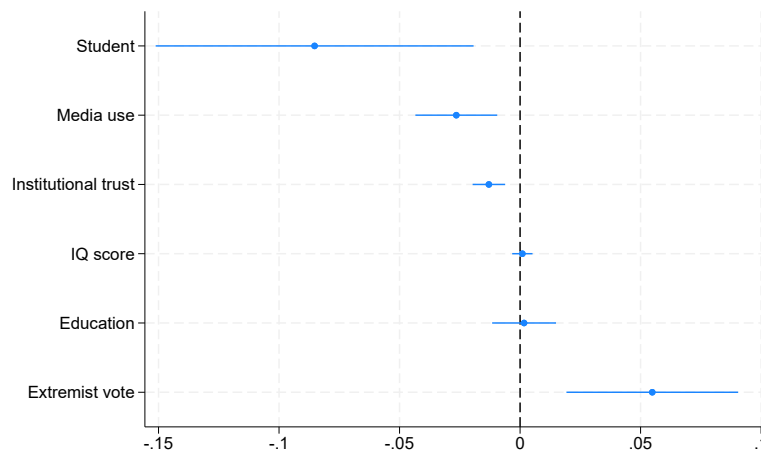
Panel A of Table 4 reports that the magnitude of  $P_M - P_C$  (the coefficient for “Motivated”) is 18 percentage points, which is highly statistically significant. In theory,  $P_M - P_C$  takes a value between 0 and 1. For example, it equals 1 for a respondent whose answers always align with their issue bias (i.e., if  $a_i = V_i$ ) because  $P_M = 1$  and  $P_C = 0$  in this case. On the one hand, the magnitude we report is closer to zero than one, and we have documented that cognitive ability has a positive effect on  $P_M$ . These suggest that most people do not have strong issue biases. On the other hand, directional motives appear as a dominant determinant of news assessments in Table 4—the magnitude of the effect of cognitive ability (measured jointly by the IQ score and educational attainment) rivals that of motivated reasoning *only* when we vary their levels from very low to very high.<sup>42</sup> Finally, note that the estimates of

<sup>42</sup>Table C10 in Online Appendix shows the joint effect of motivated reasoning and cognitive ability on the

the effect of the IQ score and education in Panel A of Table 4 are almost identical to those reported in Column 7 of Table 1.

We now consider Research Question 2. Panel B of Table 4 is analogous to Panel A, except for the addition of the variables, “Motivated×IQ Score” and “Motivated×Education,” in order to investigate whether cognitive ability reduces the degree of motivated reasoning. The coefficient of Motivated×IQ Score is minimal and insignificant. The coefficient of Motivated×Education is always negative and marginally significant, suggesting that education may reduce the magnitude of motivated reasoning.

Figure 4: Correlates of Motivated Reasoning,  $P_M - P_C$



*Notes:* This plot shows the coefficients of statistically significant variables and their confidence intervals estimated from an OLS regression, where the dependent variable is motivated reasoning, i.e.  $P_M - P_C$ , and the included variables are the same as in Column 7 of Table 1. The plot also includes the effect of the IQ score and educational attainment, which are insignificant. Media use is the average of TV, radio, newspaper, internet, and social media use, each measured on a scale from 1 to 5. Institutional trust is the average of trust in politicians, news media, education system, scientists, and social media, measured on a scale from 0 to 10. Extremist vote is a dummy variable. The coefficient for Student is relative to the reference group, Full-time employee.

An alternative method to explore the effect of cognitive ability and other potentially relevant variables on motivated reasoning is to directly use  $P_M - P_C$  as our dependent variable. Figure 4 shows that only four variables are associated with motivated reasoning:

news quiz score by topic, using the specification in Column 3 of Table 4. In every topic, motivated reasoning plays a major role in explaining news assessments. Mirroring our findings in Table 2, the effect of the IQ score and educational attainment on the news quiz score is smaller in science than in other topics, with an insignificant effect of education in science. We elaborate on this point below.

media use, institutional trust, extremist party voting, and being a student. The higher the media use (on a scale from 1-5) and the higher the institutional trust (on a scale from 0-10), the lower the magnitude of motivated reasoning. Perhaps unsurprisingly, motivated reasoning increases in extremist party voting. Students exhibit less motivated reasoning than other employment groups. Since the students in our sample are young, this finding connects to a social psychology literature, dating back to Krosnick and Alwin (1989), which argues that attitudes are highly flexible during early adulthood, but less so afterwards.<sup>43</sup>

Table 5: Effect of cognitive ability on motivated reasoning by topic

	Science	Climate Change	Immigration	Inequality
IQ score	0.007 (0.004)	0.007* (0.004)	0.004 (0.005)	-0.014** (0.006)
Education	0.041*** (0.013)	-0.009 (0.012)	-0.045*** (0.015)	-0.003 (0.019)
Observations	2222	2255	1741	2203
Controls	yes	yes	yes	yes
Month FE	yes	yes	yes	yes
Country FE	yes	yes	yes	yes

*Notes:* This table reports estimates of OLS regressions where the dependent variable is motivated reasoning,  $P_M - P_C$ , in the respective news topic. Robust standard errors are in parentheses. See the notes to Table 1 for the full list of controls. \*\*\*, \*\* and \* indicate significance at the 1%, 5% and 10% level, respectively.

In the aggregate, it appears that the impact of cognitive ability on the magnitude of motivated reasoning is weak or absent. However, the results are surprisingly heterogeneous when we disaggregate data by topic. In particular, Table 5 shows that the effect of education on  $P_M - P_C$  is positive and highly statistically significant in science.<sup>44</sup> Similarly, applying the analysis on Panel B of Table 4 to science, we find that the coefficient of “Motivated×Education” is positive and significant, again confirming that the degree of motivated reasoning increases in education in science (see Table C11). This finding complements our previous results in Tables 2 and C10, which show that the effect of education on the news quiz score is minimal or absent in science, unlike in other news topics. Similarly, educational attainment does not increase the counter-motivated score in science, unlike in other topics.

<sup>43</sup>Also related is a strand of the literature documenting that openness and open-mindedness are negatively correlated with age. See, e.g., Donnellan and Lucas (2008) and Edgcumbe (2022).

<sup>44</sup>Table 5 also indicates a positive effect of the IQ score on motivated reasoning in climate change. However, the coefficient is small and marginally significant. In contrast, educational attainment reduces motivated reasoning in the immigration topic, and the IQ score reduces motivated reasoning in the inequality topic.

We find an analogous result in the updating part of the study, as discussed in more detail in Section 5.4: in the experiment, higher IQ results in a higher degree of motivated decision making in science. Therefore, we conjecture that attitudes on certain topics, such as science, may be more closely associated with the “identity” of individuals with higher cognitive ability, which amplifies their identity-consistent (i.e., motivated) decision making in science. In the language of our theoretical framework, this suggests a positive correlation between  $\theta$  and  $v$  in science: this is strongly supported by our findings in Online Appendix C.5. We also note that individuals with higher cognitive ability might be better equipped to produce or recall evidence for (against) news that are congruent (incongruent), which may be a contributing factor to our findings.

### 5.3 Analysis for Hypothesis 3: Overconfidence and Updating

This section tests Hypothesis 3 about the effect of overconfidence on the updating of news assessments in the experiment. Recall that the overconfidence measure is the difference between a respondent’s news quiz score guess and their actual score. If this measure is positive, negative, or 0, the respondent is said to be overconfident, underconfident, or well-calibrated, respectively. Our measure of updating is the share of revised answers among news quiz items where the respondent’s initial answer differs from the experimental report they observe.

On average, respondents update only 31% of their answers. This appears to be low given that the average news quiz score is only 0.51, and the precision of each experimental report is 0.75. The low share of updating seems to explain the modest increase in the news quiz score (to 0.58).

In Table 6, we test Hypothesis 3 by regressing the share of updated answers on our measure of (over)confidence. Columns 1–3 show that the measure is insignificant in the overall sample. The IQ score and sometimes the news quiz score are statistically significant: the IQ score increases, and the news quiz score decreases the rate of updating. These are intuitive findings; e.g., all else equal, respondents with a higher news quiz score should on average update less than those with a lower score.<sup>45</sup>

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<sup>45</sup>For example, two respondents who overestimate their news quiz score by three may be expected to

Table 6: Effect of overconfidence on updating decisions

	All data			Overconfident or well-calibrated			Underconfident		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(Over)confidence	0.001 (0.002)	0.000 (0.002)	0.000 (0.002)	-0.008*** (0.003)	-0.010*** (0.003)	-0.010*** (0.003)	0.009* (0.005)	0.010* (0.005)	0.010* (0.005)
IQ score		0.011*** (0.002)	0.011*** (0.002)		0.012*** (0.003)	0.012*** (0.003)		0.006 (0.004)	0.005 (0.004)
Education		-0.002 (0.007)	-0.002 (0.007)		0.003 (0.009)	0.003 (0.009)		-0.014 (0.011)	-0.013 (0.012)
News quiz score		-0.109** (0.053)	-0.086 (0.058)		-0.176*** (0.068)	-0.191** (0.075)		-0.031 (0.089)	0.070 (0.098)
Consistent			-0.003 (0.003)			0.002 (0.004)			-0.013** (0.006)
Observations	3227	3227	3227	2192	2192	2192	1035	1035	1035
Controls	no	yes	yes	no	yes	yes	no	yes	yes
Month FE	yes	yes	yes	yes	yes	yes	yes	yes	yes
Country FE	yes	yes	yes	yes	yes	yes	yes	yes	yes

*Notes:* This table reports estimates of OLS regressions where the dependent variable is the share of updated answers among news items in which the respondent’s initial answer differs from the experimental report they observe. Overconfidence is the difference between a respondent’s quiz score guess and the actual score. Additional controls are the same as in Column 7 of Table 1. Robust standard errors are in parentheses. \*\*\*, \*\* and \* indicate significance at the 1%, 5% and 10% levels, respectively.

Next, we split the sample into (i) underconfident respondents; and (ii) overconfident or well-calibrated respondents. A different picture emerges when we split the sample. Focusing on overconfident or well-calibrated respondents (Columns 4-6) in Table 6, the negative effect of overconfidence on updating is evident: an increase in overconfidence by one unit reduces updating by almost 1 pp. However, Columns 7–9 in Table 6 show that the coefficient of the overconfidence measure becomes positive for underconfident respondents, which is marginally significant.

A plausible mechanism behind these contrasting findings with the underconfident and overconfident respondents is as follows. During the experiment, respondents may revise their beliefs about their quiz performance, depending on how often their initial answers and experimental reports match. Therefore, we include an additional explanatory variable in our regressions, which is the total number of experimental reports that match a respondent’s initial answer: we refer to this variable as “answer-report consistency” (abbreviated as “consistent” in Table 6). The coefficient for this variable is negative and statistically significant in the underconfident sample: that is, the higher the number of experimental reports that match the initial answers, the lower the rate of updating among the underconfident,

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behave differently if one has an actual score of 12 and the other has a score of six — the former will arguably revise fewer answers than the latter.

pointing to a confidence boosting effect of answer-report consistency. In contrast, the coefficient for this variable is positive and insignificant in the sample with weakly overconfident respondents.

This asymmetry in the effect of the answer-report consistency variable is consistent with a literature on self-confidence, which documents an asymmetry in learning from good and bad signals about ego relevant attributes—see among others Eil and Rao (2011); Zimmermann (2020); and Möbius et al. (2022). In line with the Dunning-Kruger effect, we find that underconfident participants perform better in the news quiz than the overconfident participants and thus attain a higher level in answer-report consistency (see Figure C1 in Online Appendix C.3). As a result, the underconfident seem to learn from good news about themselves, but the overconfident do not appear to learn from bad news (i.e., relatively low level of answer-signal consistency).<sup>46</sup>

## 5.4 Motivated updating

Respondents with issue biases may exhibit a slant not only in their news assessments but also in their learning from new information in the experiment. Consider the following possible cases in the experiment:

- (i) *Motivated state*: The respondent’s initial answer to a news quiz item is bias-inconsistent, and the observed experimental report is bias-consistent.<sup>47</sup>
- (ii) *Counter-motivated state*: The respondent’s initial answer to a news quiz item is bias-consistent, and the experimental report is bias-inconsistent.

We refer to motivated updating as the increased likelihood of revising news assessments in the motivated state relative to that in the counter-motivated state. To analyze whether participants exhibit motivated updating, we implement an approach similar to our analysis of motivated reasoning. In particular, for each individual we compute the share of updated

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<sup>46</sup>In fact, the coefficients for (over)confidence in Columns 7–9 suggest that underconfident participants have revised their confidence in a way that their confidence ordering has changed, which our confidence measure cannot capture as it is elicited only once before the experiment begins.

<sup>47</sup>Recall that we analyze updating only in cases where the initial answer of the respondent differs from the observed experimental report.

answers in the motivated and counter-motivated states, as described in (i) and (ii) above.<sup>48</sup>

Table C12 presents regression estimates in which the dependent variable is the share of updated answers in the motivated or the counter-motivated state.<sup>49</sup> The estimate for the magnitude of motivated updating is 3.6 percentage points and highly statistically significant in all specifications. This means that the share of updated answers declines by more than 11% in the counter-motivated state relative to the the motivated state.

We now explore the effect of cognitive ability on motivated updating, focusing on the science topic. Recall that cognitive ability does not appear to affect motivated reasoning in the aggregate, but when disaggregated by topic, motivated reasoning increases in educational attainment in science, as shown in Section 5.2.

Table C13 presents regressions of the share of updated answers in science (in the motivated or countermotivated state), interacting the indicator variable “Motivated” with the IQ score and educational attainment (analogous to the approach in Panel B of Table 4). The interaction variable “Motivated×IQ score” has a coefficient of 1.5% ( $p < 0.05$ ). This suggests that the magnitude of motivated updating in science increases in IQ.

Table 7: Effect of cognitive ability on motivated updating by topic  
(only respondents with positive measure of motivated updating)

	Science	Climate Ch.	Immigration	Inequality	All Data
IQ score	0.021*** (0.006)	0.013*** (0.005)	0.012** (0.006)	0.014* (0.009)	0.016*** (0.003)
Education	-0.003 (0.016)	-0.001 (0.014)	0.030* (0.017)	0.006 (0.026)	0.010 (0.008)
Observations	643	887	660	367	1931
Controls	yes	yes	yes	yes	yes
Month FE	yes	yes	yes	yes	yes
Country FE	yes	yes	yes	yes	yes

*Notes:* This table reports estimates of OLS regressions where the dependent variable is motivated updating in a news topic, defined as the difference between the respective shares of updated answers in the motivated state and in the counter-motivated state. Respondents with a strictly negative magnitude of motivated updating are excluded in the respective topic. We use the specification in Column 3 of Table 6. Robust standard errors are in parentheses. \*\*\*, \*\* and \* indicate significance at the 1%, 5% and 10% level, respectively.

<sup>48</sup>By chance (i.e., depending on the report realizations and whether a report matches the initial answer), either the motivated state or the counter-motivated state (or both) may not have any data for a respondent. As a result, many respondents classified as biased have dropped out of this analysis.

<sup>49</sup>This table mirrors Table 4 in the context of updating, except that in some specifications, we include explanatory variables used in Table 6 that may be relevant for updating.

Next, we define motivated updating as the difference between the respective shares of updated answers in the motivated state and the counter-motivated state in a topic; this is analogous to the analysis of  $P_M - P_C$  in Table 5 but now in the context of updating. Table C14 shows that in science, motivated updating increases in IQ. The coefficient for IQ is 1.4%, but  $p = 0.056$  — note that we are down to less than a quarter of the data, at 789 observations, due to data restrictions described above and in Footnote 48.<sup>50</sup> Importantly, the positive effect of IQ on motivated updating is more pronounced and highly significant if our analysis includes *only* respondents with a nonnegative magnitude of motivated updating in science (see Table 7 and Table C15 in the Online Appendix).

Taken together, our results in the main text and our finding in Online Appendix C.5 that  $\theta$  and  $v$  are positively correlated in science suggest that science attitudes are an important component of the identity of respondents with higher cognitive ability, which amplifies their tendency for motivated decision making in both the news quiz and the experiment.

Our results in Sections 5.3 and 5.4 also show that exposure to mostly one kind of news is not the only mechanism underlying issue biases. They also arise because people process new information in a *motivated* manner—favoring what fits their existing views—and also tend to resist changing their initial judgments due to *overconfidence* as well as *cognitive limitations*.

## 5.5 Robustness and Further Analysis

We show the robustness of our results by reproducing Tables 1–7 with the full sample, i.e., without omitting extremely fast or slow submissions (see Online Appendix D.1). All coefficients that are relevant for our main results are at similar levels and remain statistically significant. In Online Appendix D.2, we reproduce our main results by analyzing the two-dimensional data (at the level of the participant and the news item). Once again, our main conclusions are unchanged (in this case, the type of analysis in Tables 5 and 7 cannot be conducted, since  $P_M - P_C$  and its analogue for motivated updating are undefined at the

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<sup>50</sup>We conduct similar analyses for motivated updating in the aggregate data. In Columns 5–8 of Table C12, we add interaction variables to investigate whether the IQ score or education has an effect on the degree of motivated updating—we find a small and marginally significant positive effect of the IQ score in the aggregate. When we regress the magnitude of motivated updating on the IQ score and education, we do not find a significant effect (see the last column of Table C14).

news item level). In Online Appendix D.3, we show the robustness of our results by using three alternative approaches to classify respondents. In that section, we also compare and contrast our results with findings from an analysis where we classify respondents based solely on their self-placement on the left-right scale.<sup>51</sup> In Online Appendix D.4, we use post-double selection Lasso to select the relevant controls and show that our main results are unaltered.

In Online Appendix D.5, we structurally estimate a model that closely follows Angelucci and Prat (2024). Our estimates imply that the magnitude of motivated reasoning ranges from 17% to 21%, depending on the specification, consistent with the results reported in Section 5.2. Angelucci and Prat (2024) estimate a much smaller magnitude of motivated reasoning—around 2%—but their quiz is significantly easier than ours. Taken together, their findings and ours are consistent with a hard–easy effect, whereby harder (easier) questions are associated with higher (lower) levels of motivated reasoning.

In addition, we investigate the potential heterogeneities in our results by country in Online Appendix E. The most important heterogeneity that we observe is that the news quiz score does not increase in education in the UK, unlike in Austria and Germany. According to the OECD (2025), Austria and Germany devote more public funding on overall education per student than the UK, and significantly more public funding per student on both tertiary education and early childhood education.<sup>52</sup> These findings suggest that public investment in education may be an important factor underlying cross-country differences.

## 6 Concluding Remarks

Our study provides a theory-guided empirical analysis of how cognitive ability, motivated reasoning, and overconfidence jointly shape individuals’ ability to distinguish fact from fiction and to revise opinions in response to new information in politicized contexts.

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<sup>51</sup>A sizeable majority of respondents choose neutral values on the left-right scale. It is well-known that placement on the left-right scale is an imperfect measure for capturing specific issue opinions. This is also true in our study. For example, among the left-wing, only 53% are classified as pro-immigrant, with 11% classified as anti-immigrant and 37% classified as neutral. As would be expected, the magnitude of motivated reasoning we find in this case is lower than in other approaches.

<sup>52</sup>See for example Table C1.1 and Figure C1.1 in Education at a Glance 2025 by the OECD: ([https://www.oecd.org/content/dam/oecd/en/publications/reports/2025/09/education-at-a-glance-2025\\_c58fc9ae/1c0d9c79-en.pdf](https://www.oecd.org/content/dam/oecd/en/publications/reports/2025/09/education-at-a-glance-2025_c58fc9ae/1c0d9c79-en.pdf)).

First, we document substantial heterogeneity in individuals’ ability to correctly evaluate factual claims. Both IQ and educational attainment robustly enhance this ability. Importantly, higher cognitive ability and education improve discernment when the correct evaluation conflicts with one’s existing issue opinions (i.e., in the counter-motivated state). A large literature suggests that variation in IQ is associated with persistent inequalities.<sup>53</sup> Taken together, this literature underscores the importance of institutions in mitigating cognitive inequalities by equalizing access to high-quality education and media sources—this is essential in democratic societies where informed opinions are central to collective decision-making. To the extent that cognitive inequalities are shaped by socioeconomic disparities, this perspective aligns closely with the findings of Angelucci and Prat (2024), who document sizeable socioeconomic disparities in the ability to identify true and fake political news stories.

Second, we find that participants exhibit a substantial degree of motivated reasoning, which is not mitigated by higher IQ or education in the aggregate. In some domains, higher cognitive ability may even amplify motivated reasoning, highlighting the importance of cognitive humility when individuals confront contentious or identity-relevant issues. Combining our results with findings in the existing literature suggests a hard–easy effect in motivated reasoning: harder (easier) domains are associated with greater (lesser) motivated reasoning.<sup>54</sup> Moreover, we show that the magnitude of motivated reasoning declines with trust in institutions. These findings imply that the role of democratic institutions extends beyond fostering citizens’ cognitive skills and cognitive humility to building and maintaining institutional trust, which in turn shapes how citizens process politically charged information.

Third, we document a systematic role of miscalibration. Among individuals who overestimate their performance in the news quiz, greater overconfidence is associated with lower responsiveness to new information, suggesting that misinformation is compounded by a low awareness of one’s own limitations. At the same time, higher IQ is positively associated not

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<sup>53</sup>Many studies suggest that the development of a child’s IQ is associated with family socioeconomic status and parental investments, the negative effect of low SES on IQ grows over time, and (early) interventions can have sustained benefits. See for example Turkheimer et al. (2003), Heckman (2006), Cunha et al. (2006), Cunha, Heckman and Schennach (2010), Kendler et al. (2015), Tucker-Drob and Bates (2016), Von Stumm and Plomin (2015), Heckman et al. (2017), Sauce and Matzel (2018), and the references therein. See also Footnote 3 on the malleability of IQ.

<sup>54</sup>Our theoretical framework predicts this effect (on page 14) by varying  $C(q)$  based on issue complexity.

only with baseline accuracy but also with a greater willingness to update initial judgments. The updating experiment further reveals that learning is asymmetric: individuals underreact to new information that conflicts with their issue biases.

Taken together, our findings suggest that politicizing complex, evidence-based topics can have lasting adverse effects on societal cohesion, even though higher cognitive ability helps attenuate the lower accuracy induced by motivated reasoning in the counter-motivated state. More broadly, we contribute to the literature by showing that misinformation and misperceptions are not only a matter of incorrect initial judgments, but also of learning frictions and confidence distortions. These results underscore the limits of corrective information when individuals do not fully trust or correctly evaluate it. Further research is needed to assess how the mechanisms documented here translate into real-world behaviors and outcomes, including communication, news sharing, and their effects on recipients and democratic discourse.

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## A Proofs

For any given pair of  $(\pi, v_i)$ , there are five possible strategies for  $i$ :

*S1*:  $i$  chooses  $q_i > 0.5$  and chooses  $a = s_i$  (i.e., follows the signal).

*S2*:  $i$  chooses  $q_i > 0.5$ , chooses  $a = s_i$  if  $V = 0$ , and chooses  $a = 1$  if  $V = 1$ .

*S3*:  $i$  chooses  $q_i > 0.5$ , chooses  $a = s_i$  if  $V = 1$ , and chooses  $a = 0$  if  $V = 0$ .

*S4*:  $i$  chooses  $q_i = 0.5$  and follows the prior (i.e., chooses  $a = 1$  if  $\pi > 0.5$  and  $a = 0$  if  $\pi < 0.5$ ).

*S5*:  $i$  chooses  $q_i = 0.5$  and follows their preference bias if  $v_i > 0$  (i.e., chooses  $a = 1$  if  $V = 1$  and  $a = 0$  if  $V = 0$ ).

Note that two other potential strategies are ruled out as they are suboptimal based on our characterization in the main text.

*S6*:  $i$  chooses  $q_i > 0.5$ , chooses  $a = s_i$  if  $V = 1$ , and chooses  $a = 0$  if  $V = 0$ .

*S7*:  $i$  chooses  $q_i > 0.5$ , chooses  $a = s_i$  if  $V = 0$ , and chooses  $a = 1$  if  $V = 1$ .

If  $V = 1$  and  $s_i = 0$ , and  $i$  finds it optimal to choose  $a = 0$  as stipulated in *S6*, then  $q_i$  must satisfy  $q_i \geq \frac{\pi}{1-v_i+\pi v_i}$ , as shown in the main text. This implies that if  $V = 0$  and  $s_i = 0$  choosing  $a = 0$  is optimal as  $\frac{\pi}{1-v_i+\pi v_i} \geq \frac{\pi(1-v_i)}{1-\pi v_i}$  (in fact,  $\frac{\pi}{1-v_i+\pi v_i} > \frac{\pi(1-v_i)}{1-\pi v_i}$  for any  $v_i > 0$ ), and thus,  $q_i$  satisfies  $q_i \geq \frac{\pi(1-v_i)}{1-\pi v_i}$ , a contradiction. *S7* can be ruled out in a similar manner. If  $V = 0$  and  $s_i = 1$ , and  $i$  finds it optimal to choose  $a = 1$  as stipulated in *S7*, then  $q_i$  must satisfy  $q_i \geq \frac{1-\pi}{1-\pi v_i}$ , as shown in the main text. This implies that if  $V = 1$  and  $s_i = 1$  choosing  $a = 1$  is optimal as  $\frac{1-\pi}{1-\pi v_i} \geq \frac{(1-\pi)(1-v_i)}{1-v_i+\pi v_i}$  (in fact,  $\frac{1-\pi}{1-\pi v_i} > \frac{(1-\pi)(1-v_i)}{1-v_i+\pi v_i}$  for any  $v_i > 0$ ), and thus,  $q_i$  satisfies  $q_i \geq \frac{(1-\pi)(1-v_i)}{1-v_i+\pi v_i}$ , a contradiction.

By what we have shown above:

- *S1* is optimal only if  $q_i \geq \max \left\{ \frac{\pi}{1-v_i+\pi v_i}, \frac{1-\pi}{1-\pi v_i} \right\}$ .
- *S2* is optimal only if  $q_i \geq \max \left\{ \frac{1-\pi}{1-\pi v_i}, \frac{\pi(1-v_i)}{1-\pi v_i} \right\}$  but  $q_i \leq \frac{\pi}{1-v_i+\pi v_i}$  (so,  $a = 1$  is optimal for  $i$  if  $V = 1$  and  $s_i = 0$ ). For  $\frac{1-\pi}{1-\pi v_i} \leq \frac{\pi}{1-v_i+\pi v_i}$  to hold,  $\pi \geq 0.5$  must hold. Therefore,  $i$  may choose *S2* only if  $\pi \geq 0.5$ .
- *S3* is optimal only if  $q_i \geq \max \left\{ \frac{\pi}{1-v_i+\pi v_i}, \frac{(1-\pi)(1-v_i)}{1-v_i+\pi v_i} \right\}$  but  $q_i \leq \frac{1-\pi}{1-\pi v_i}$  (so,  $a = 0$  is optimal for  $i$  if  $V = 0$  and  $s_i = 1$ ). For  $\frac{\pi}{1-v_i+\pi v_i} \leq \frac{1-\pi}{1-\pi v_i}$  to hold,  $\pi \leq 0.5$  must hold. Therefore,  $i$  may choose *S3* only if  $\pi \leq 0.5$ .

- Choosing  $S4$  over  $S5$  requires  $\frac{\pi}{2} + \frac{\pi(1-v)}{2} \geq \frac{1}{2}$  (i.e.,  $v \leq 2 - \frac{1}{\pi}$ ) if  $\pi \geq 0.5$ , and  $\frac{1-\pi}{2} + \frac{(1-\pi)(1-v)}{2} \geq \frac{1}{2}$  (i.e.,  $v \leq 2 - \frac{1}{1-\pi}$ ) if  $\pi \leq 0.5$ .

From now on, we drop subscript  $i$  to simplify notation. We first consider the setting where  $\pi \geq 0.5$ . By what we have shown above, only  $S1$ ,  $S2$ ,  $S4$ , and  $S5$  are relevant. The analysis with  $\pi < 0.5$  is analogous (with  $S3$  included instead of  $S2$ ), as discussed further below. Fix  $(\pi, v)$ , and let  $q(\theta)$  denote the optimal level of  $q$  given  $\theta$ .

To simplify notation below, we will assume without loss of generality that  $C'(1) = \infty$ .

**Lemma 1** *Assume that  $\pi \geq 0.5$ . There are two ways in which  $i$  chooses  $q(\theta) > 0.5$ . (a)  $q(\theta) \in \left( \max \left\{ \frac{1-\pi}{1-\pi v}, \frac{\pi(1-v)}{1-\pi v} \right\}, \frac{\pi}{1-v+\pi v} \right)$ :  $i$  uses  $S2$ , and  $q(\theta)$  is given by  $C'(q(\theta)) = \frac{\theta(1-\pi v)}{2}$ . (b)  $q(\theta) > \frac{\pi}{1-v+\pi v}$ :  $i$  uses  $S1$ , and  $q(\theta)$  is given by  $C'(q(\theta)) = \frac{\theta(2-v)}{2}$ .*

**Proof:** By what we have shown above, if  $\pi \geq 0.5$ , only  $S1$  and  $S2$  are associated with  $q(\theta) > 0.5$ . The expected utility of  $S2$  is given by

$$\frac{\pi}{2} + \frac{1}{2}(\pi q(1-v) + (1-\pi)q) - \frac{C(q)}{\theta}.$$

This term is maximized at  $q$  that solves  $C'(q) = \frac{\theta(1-\pi v)}{2}$ . As explained above, if  $S2$  is optimal,  $q(\theta)$  must satisfy  $\max \left\{ \frac{1-\pi}{1-\pi v}, \frac{\pi(1-v)}{1-\pi v} \right\} \leq q \leq \frac{\pi}{1-v+\pi v}$ ; otherwise,  $S2$  is dominated. We will now show that if  $S2$  is optimal,  $q(\theta) \notin \left\{ \max \left\{ \frac{1-\pi}{1-\pi v}, \frac{\pi(1-v)}{1-\pi v} \right\}, \frac{\pi}{1-v+\pi v} \right\}$ . First, assume that  $\frac{1-\pi}{1-\pi v} \leq \frac{\pi(1-v)}{1-\pi v}$ . This is the case if  $v \leq 2 - \frac{1}{\pi}$ . Suppose towards a contradiction that  $S2$  is optimal, but  $q(\theta) = \frac{\pi(1-v)}{1-\pi v}$ . In that case, the expected utility of  $S2$  boils down to  $\frac{\pi}{2} + \frac{\pi(1-v)}{2} - \frac{C\left(\frac{\pi(1-v)}{1-\pi v}\right)}{\theta}$ , which is a contradiction as it is strictly lower than  $\frac{\pi}{2} + \frac{\pi(1-v)}{2}$  (i.e., the expected utility of  $S4$ ), since  $q(\theta) > 0.5$  with  $S2$ . Thus, if  $S2$  is optimal,  $q(\theta)$  is strictly greater than  $\frac{\pi(1-v)}{1-\pi v}$ . Next, assume that  $\frac{1-\pi}{1-\pi v} > \frac{\pi(1-v)}{1-\pi v}$  (i.e.,  $v > 2 - \frac{1}{\pi}$ ). Similar to what we have shown above,  $q(\theta)$  cannot equal  $\frac{1-\pi}{1-\pi v}$ . Otherwise, the expected utility of  $S2$  boils down to  $\frac{1}{2} - \frac{C\left(\frac{1-\pi}{1-\pi v}\right)}{\theta}$ , which is strictly lower than  $0.5$  (i.e., the expected utility of  $S5$ ). We next show that  $q(\theta) = \frac{\pi}{1-v+\pi v}$  cannot hold with  $S2$ . Suppose towards a contradiction that  $S2$  is optimal, and  $q(\theta) = \frac{\pi}{1-v+\pi v}$ . Then,  $q(\theta)$  must satisfy  $C'\left(\frac{\pi}{1-v+\pi v}\right) \leq \frac{\theta(1-\pi v)}{2}$ . Note that from  $C'\left(\frac{\pi}{1-v+\pi v}\right) \leq \frac{\theta(1-\pi v)}{2}$ , it follows that  $C'\left(\frac{\pi}{1-v+\pi v}\right) < \frac{\theta(2-v)}{2}$ . As shown below, the optimal level of  $q$  with the strategy  $S1$  satisfies  $C'(q) = \frac{\theta(2-v)}{2}$ . Since  $C'\left(\frac{\pi}{1-v+\pi v}\right) < \frac{\theta(2-v)}{2}$ , and since  $S1$  and  $S2$  generate the exact same utility at  $q = \frac{\pi}{1-v+\pi v}$ ,  $S1$  with a level of  $q$  that satisfies  $C'(q) = \frac{\theta(2-v)}{2}$  strictly dominates  $S2$ , a contradiction. Thus, if  $S2$  is optimal,  $q(\theta) > 0.5$  satisfies  $q(\theta) \in \left( \max \left\{ \frac{1-\pi}{1-\pi v}, \frac{\pi(1-v)}{1-\pi v} \right\}, \frac{\pi}{1-v+\pi v} \right)$  and is given by  $C'(q(\theta)) = \frac{\theta(1-\pi v)}{2}$ . This also implies that  $S2$  is optimal only if  $\pi > 0.5$ .

The expected utility of  $S1$  is given by

$$\frac{1}{2}q + \frac{1}{2}q(1-v) - \frac{C(q)}{\theta}.$$

Thus, the expected utility with  $S1$  is maximized at  $q$  that solves  $C'(q) = \frac{\theta(2-v)}{2}$ . As explained before, if  $S1$  is optimal,  $q(\theta)$  must satisfy  $\frac{\pi}{1-v+\pi v} \leq q(\theta)$ ; otherwise,  $S1$  would be dominated. We will now show that if  $S1$  is optimal,  $\frac{\pi}{1-v+\pi v} < q(\theta)$  must hold. Suppose towards a contradiction that  $S1$  is optimal, and that  $q(\theta) = \frac{\pi}{1-v+\pi v}$ . In that case,  $S1$  and  $S2$  generate the exact same utility, but  $C'(\frac{\pi}{1-v+\pi v}) > \frac{\theta(1-\pi v)}{2}$ . Thus,  $q = \frac{\pi}{1-v+\pi v}$  is too high and dominated by either  $q = 0.5$  or the level of  $q$  that solves  $C'(q) = \frac{\theta(1-\pi v)}{2}$ . Thus, if  $S1$  is optimal,  $q(\theta) > \frac{\pi}{1-v+\pi v}$  and is given by  $C'(q(\theta)) = \frac{\theta(2-v)}{2}$ .

Given Lemma 1, there are three possibilities for  $q(\theta)$  with  $\pi \geq 0.5$ :

- $q(\theta) = 0.5$ .
- $q(\theta) \in \left( \max \left\{ \frac{1-\pi}{1-\pi v}, \frac{\pi(1-v)}{1-\pi v} \right\}, \frac{\pi}{1-v+\pi v} \right)$  and is given by  $C'(q(\theta)) = \frac{\theta(1-\pi v)}{2}$  ( $\pi > 0.5$  must hold).
- $q(\theta) > \frac{\pi}{1-v+\pi v}$  and is given by  $C'(q(\theta)) = \frac{\theta(2-v)}{2}$ .

Since  $\frac{\theta(2-v)}{2}$  and  $\frac{\theta(1-\pi v)}{2}$  are both monotone increasing in  $\theta$ ,  $\frac{\theta(1-\pi v)}{2} < \frac{\theta(2-v)}{2}$  for  $\pi > 0.5$ ,  $C(q)$  is strictly convex in  $q$ , and  $S1$  must implement a strictly higher  $q$  than  $S2$  (i.e.,  $q(\theta) > \frac{\pi}{1-v+\pi v}$  with  $S1$  but  $q(\theta) < \frac{\pi}{1-v+\pi v}$  with  $S2$ ),  $q(\theta)$  is increasing in  $\theta$  for all  $\theta \in [\underline{\theta}, \infty)$ . In particular, for every  $(\pi, v)$  pair, there must exist  $\theta_1, \theta_2 \in [\underline{\theta}, \infty)$  such that  $\underline{\theta} \leq \theta_1 \leq \theta_2$ ; for all  $\theta < \theta_1$ ,  $i$  chooses either  $S4$  or  $S5$  (depending on whether  $v \leq 2 - \frac{1}{\pi}$ ) and  $q(\theta) = 0.5$ ; for all  $\theta \in [\theta_1, \theta_2)$ ,  $i$  chooses  $S2$ , and  $q(\theta) > 0.5$  is given by  $C'(q(\theta)) = \frac{\theta(1-\pi v)}{2}$ ; and for all  $\theta > \theta_2$ ,  $i$  chooses  $S1$ , and  $q(\theta) > 0.5$  is given by  $C'(q(\theta)) = \frac{\theta(2-v)}{2}$ . If  $\underline{\theta} < \theta_1 < \theta_2$  for some  $(\pi, v)$ , then  $i$  must be (a) indifferent between  $S2$  and either  $S4$  or  $S5$  (depending on whether  $v \leq 2 - \frac{1}{\pi}$ ) at  $\theta = \theta_1$ , and (b) indifferent between  $S1$  and  $S2$  at  $\theta = \theta_2$ . In case (a),  $q(\theta_1)$  is not unique: it is given by  $q(\theta_1) = 0.5$  and  $C'(q(\theta_1)) = \frac{\theta_1(1-\pi v)}{2}$ . In case (b),  $q(\theta_2)$  is also not unique: it is given by  $C'(q(\theta_2)) = \frac{\theta_2(1-\pi v)}{2}$  and by  $C'(q(\theta_2)) = \frac{\theta_2(2-v)}{2}$ . If  $\underline{\theta} < \theta_1 = \theta_2$  (e.g., because  $\pi = 0.5$ ),  $i$  is indifferent between  $S1$  and either  $S4$  or  $S5$  at  $\theta = \theta_2$  ( $S2$  is not chosen for  $\theta \in [\underline{\theta}, \infty)$  in this case). If  $\underline{\theta} = \theta_2$  for some  $(\pi, v)$ , then  $i$  chooses  $S1$  for every  $\theta \in [\underline{\theta}, \infty)$ .

**Corollary 1** *Fix  $(\pi, v)$  with  $\pi \geq 0.5$ .  $q(\theta)$  is increasing in  $\theta$  for all  $\theta \in [\underline{\theta}, \infty)$  (strictly for all  $\theta \geq \theta_1$ ).*

See the discussion below for the same result with  $\pi < 0.5$ . The setting with arbitrary  $\pi \in (0, 1)$  is too complex to characterize fully the relationship between  $\theta$  and the probability

of making a correct assessment (in the motivated or the counter-motivated state). However, we state and prove a version of Proposition 1 with an extension to a subset of asymmetric priors. To that aim, let  $\tilde{\pi} > 0.5$  solve

$$C'\left(\frac{\pi}{2\pi - 2 + \frac{1}{\pi}}\right) = \underline{\theta}(1 - \pi).$$

That is,  $\tilde{\pi}$  solves  $C'\left(\frac{\pi}{1-v+\pi v}\right) = \frac{\underline{\theta}(1-\pi v)}{2}$  where  $v = 2 - \frac{1}{\pi}$ . Since  $C'(0.5) = 0$ , it follows that  $\tilde{\pi} > 0.5$ .

**Proposition 3** *There exists a  $\hat{\pi}$  such that  $\hat{\pi} > \tilde{\pi} > 0.5$ , and the following holds for all  $\pi \in [1 - \hat{\pi}, \hat{\pi}]$ : (i) The average probability of an accurate assessment increases in  $\theta$ . (ii) Average  $P_C$  increases in  $\theta$ . (iii) Average  $P_M$  increases in  $\theta$  for  $\theta$  sufficiently high if  $\bar{v} < 1$ . (iv) Average  $P_M - P_C$  decreases in  $\theta$ .*

**Proof:** We begin by assuming that  $\pi > 0.5$  (the case with  $\pi = 0.5$  is already analyzed in the main text). We first prove the result for  $(\pi, v)$  pairs such that  $\pi > 0.5$  and  $v > 2 - \frac{1}{\pi}$ . With such  $(\pi, v)$ , we can actually prove a general result. For every  $(\pi, v)$  pair with  $v > 2 - \frac{1}{\pi}$ , the desired result holds for every  $\pi \in (0, 1)$ . To see why, first note that with  $\pi > 0.5$  and  $v > 2 - \frac{1}{\pi}$ ,  $S4$  is strictly dominated by  $S5$ . Thus, for any  $(\pi, v)$  pair such that  $\pi \geq 0.5$  and  $v > 2 - \frac{1}{\pi}$ , there exist  $\theta_1, \theta_2 \in [\underline{\theta}, \infty)$  such that  $\underline{\theta} \leq \theta_1 \leq \theta_2$ ; for all  $\theta < \theta_1$ ,  $i$  chooses  $S5$  and  $q(\theta) = 0.5$ ; for all  $\theta \in [\theta_1, \theta_2)$ ,  $i$  chooses  $S2$ , and  $q(\theta) > 0.5$  is given by  $C'(q(\theta)) = \frac{\underline{\theta}(1-\pi v)}{2}$ ; and for all  $\theta \geq \theta_2$ ,  $i$  chooses  $S1$ , and  $q(\theta) > 0.5$  is given by  $C'(q(\theta)) = \frac{\underline{\theta}(2-v)}{2}$ .

Consider the average probability of making a correct decision given  $(\pi, v)$  with  $\pi > 0.5$  and  $v > 2 - \frac{1}{\pi}$ . It is given by 0.5 if  $S5$  is used (i.e., for  $\theta < \theta_1$ ),  $\frac{\pi+q(\theta)}{2}$  if  $S2$  is used (i.e., if  $\theta \in [\theta_1, \theta_2)$ ) and  $q(\theta)$  if  $S1$  is used (i.e., if  $\theta \geq \theta_2$ ). Note that in the latter case,  $q(\theta) > \pi$ , since  $S1$  requires  $q(\theta) \geq \frac{\pi}{1-v+\pi v} > \pi$ . Given these and Corollary 1, the average probability of making a correct decision increases in  $\theta$  if  $\pi \geq 0.5$  and  $v > 2 - \frac{1}{\pi}$ . Next,  $P_C$  is given by 0 if  $S5$  is used (i.e., for  $\theta < \theta_1$ ),  $\pi q(\theta)$  if  $S2$  is used (i.e., if  $\theta \in [\theta_1, \theta_2)$ ) and  $q(\theta)$  if  $S1$  is used (i.e., if  $\theta \geq \theta_2$ ). Given these and Corollary 1,  $P_C$  increases in  $\theta$  if  $\pi > 0.5$  and  $v > 2 - \frac{1}{\pi}$ . Finally,  $P_M$  is given by 1 if  $S5$  is used (i.e., for  $\theta < \theta_1$ ),  $(1 - \pi)q(\theta) + \pi$  if  $S2$  is used (i.e., if  $\theta \in [\theta_1, \theta_2)$ ) and  $q(\theta)$  if  $S1$  is used (i.e., if  $\theta \geq \theta_2$ ). Given these and Corollary 1,  $P_M$  increases in  $\theta$  for high enough  $\theta$  (i.e.,  $\theta \geq \theta_2$ ).

We now consider the average probability of making a correct decision,  $P_C$ , and  $P_M$  given  $(\pi, v)$  with  $\pi > 0.5$  and  $v \leq 2 - \frac{1}{\pi}$ . Here, for all  $\theta < \theta_1$ ,  $i$  chooses  $S4$ . Thus, if  $\underline{\theta} < \theta_1 < \theta_2$  (we cannot verify or rule this out for sufficiently high  $\pi$  with  $v \leq 2 - \frac{1}{\pi}$ ),  $P_C$  would not be monotone increasing in  $\theta$ . Nevertheless, there exists a  $\hat{\pi} > \tilde{\pi} > 0.5$  such that  $\theta_1 = \underline{\theta}$  for all  $(\pi, v)$  pairs with  $\pi \in (0.5, \hat{\pi})$  and  $v \leq 2 - \frac{1}{\pi}$ . To see why, note that for  $\underline{\theta}$ ,  $\tilde{\pi}$  and  $v = 2 - \frac{1}{\tilde{\pi}}$ ,  $C'\left(\frac{\tilde{\pi}}{1-v+\tilde{\pi}v}\right) = C'\left(\frac{\tilde{\pi}}{2\tilde{\pi}-2+\frac{1}{\tilde{\pi}}}\right) = \underline{\theta}(1 - \tilde{\pi})$  implies that  $S1$  and  $S2$  generate the same expected

utility at  $q = \frac{\tilde{\pi}}{2\tilde{\pi}-2+\frac{1}{\tilde{\pi}}}$ . Their utility is strictly greater than that of  $S4$ , which equals 0.5 as  $v = 2 - \frac{1}{\tilde{\pi}}$  because at a choice of  $q = 0.5$ ,  $S2$  has a utility identical to that of  $S4$ , but the utility of  $S2$  is maximized at  $q = \frac{\tilde{\pi}}{2\tilde{\pi}-2+\frac{1}{\tilde{\pi}}} > 0.5$  by construction. Since  $C'(\frac{\tilde{\pi}}{2\tilde{\pi}-2+\frac{1}{\tilde{\pi}}}) = \underline{\theta}(1 - \tilde{\pi})$  implies that  $C'(\frac{\tilde{\pi}}{2\tilde{\pi}-2+\frac{1}{\tilde{\pi}}}) < \frac{\underline{\theta}(2-v)}{2} = \frac{\underline{\theta}}{2\tilde{\pi}}$ ,  $S2$  is strictly dominated by  $S1$  with  $q(\theta)$  for all  $\theta \geq \underline{\theta}$ , where  $q(\theta) > \frac{\tilde{\pi}}{2\tilde{\pi}-2+\frac{1}{\tilde{\pi}}} > \tilde{\pi}$  is given by  $C'(q(\theta)) = \frac{\underline{\theta}}{2\tilde{\pi}}$ . In turn,  $S1$  strictly dominates both  $S2$  and  $S4$  for all  $\theta \geq \underline{\theta}$  and  $(\pi, v)$  such that  $\pi \leq \tilde{\pi}$  and  $v \leq 2 - \frac{1}{\pi}$ . We have already proved this for  $\pi = \tilde{\pi}$  and  $v = 2 - \frac{1}{\tilde{\pi}}$ . So, assume that  $\pi \leq \tilde{\pi}$  and  $v \leq 2 - \frac{1}{\pi}$  with at least one strict inequality. It follows that

$$C'\left(\frac{\pi}{1-v+\pi v}\right) < C'\left(\frac{\tilde{\pi}}{2\tilde{\pi}-2+\frac{1}{\tilde{\pi}}}\right) = \underline{\theta}(1 - \tilde{\pi}) < \frac{\underline{\theta}(1 - \pi v)}{2}$$

for all  $\pi \leq \tilde{\pi}$  and  $v \leq 2 - \frac{1}{\pi}$ . Thus,  $S1$  strictly dominates  $S2$  for all  $\theta \geq \underline{\theta}$ ,  $\pi \leq \tilde{\pi}$  and  $v \leq 2 - \frac{1}{\pi}$  by construction. To see why  $S1$  also dominates  $S4$ , first consider the case  $\theta = \underline{\theta}$  where  $\pi < \tilde{\pi}$  and fix  $v = 2 - \frac{1}{\pi}$ . Note that the utility of  $S4$  is unchanged and equals 0.5, strictly lower than the utility of  $S1$  by our construction. Next, fix  $\pi \leq \tilde{\pi}$  and assume that  $v < 2 - \frac{1}{\pi}$ . The decrease in  $v$  from  $2 - \frac{1}{\pi}$  increases the optimal  $q$  and utility of  $S1$  (as  $C'(q) < \frac{\underline{\theta}(2-v)}{2}$ ), but it also increases the utility of  $S4$ . However, the increase in the utility of  $S1$  is higher than the increase in the utility of  $S4$ . To see why, note that the derivative of the maximized utility of  $S1$  with respect to  $v$  is given by

$$-\frac{q}{2} + \left(1 - \frac{v}{2} - \frac{C'(q)}{\theta}\right) \frac{\partial q}{\partial v},$$

which equals  $-\frac{q}{2}$  by the envelope theorem. The derivative of the utility of  $S4$  with respect to  $v$  is given by  $-\frac{\pi}{2}$ . By what we have shown above, the utility of  $S1$  is maximized at  $q > \frac{\pi}{1-v+\pi v}$  for all  $\pi \leq \tilde{\pi}$  and  $v \leq 2 - \frac{1}{\pi}$ . Thus, a decrease in  $v$  increases  $S1$  by more than  $S4$ . As a result,  $S1$  is strictly optimal if  $\pi \leq \tilde{\pi}$  and  $v \leq 2 - \frac{1}{\pi}$  with  $q(\theta)$  given by  $C'(q(\theta)) = \frac{\underline{\theta}(2-v)}{2}$ . By continuity, there must exist a  $\hat{\pi} > \tilde{\pi}$  such that  $i$  is indifferent between  $S1$  and  $S2$  (and  $S4$  is dominated) for  $\theta = \underline{\theta}$ ,  $\hat{\pi}$  and  $v = 2 - \frac{1}{\hat{\pi}}$  and  $i$  strictly prefers  $S1$  over  $S2$  for all  $\theta \geq \underline{\theta}$ ,  $\pi \in [\tilde{\pi}, \hat{\pi})$  and  $v = 2 - \frac{1}{\pi}$  (i.e.,  $\theta_1 = \theta_2 = \underline{\theta}$ , and  $\hat{\pi} = \max\{\pi | \theta_2 = \underline{\theta} \text{ with } v = 2 - \frac{1}{\pi}\}$ ). It follows that  $S1$  is optimal for all  $\theta \geq \underline{\theta}$ ,  $\pi \leq \hat{\pi}$  and  $v \leq 2 - \frac{1}{\pi}$ . To show this, we fix  $\pi \in [\tilde{\pi}, \hat{\pi})$  and first note that a decrease in  $v$  from  $2 - \frac{1}{\pi}$  increases the maximized utility of  $S1$  by more than the maximized utility of  $S2$ . To see why, note that the derivative of the maximized utility of  $S2$  with respect to  $v$  is given by

$$-\frac{\pi q}{2} + \left(\frac{1 - \pi v}{2} - \frac{C'(q)}{\theta}\right) \frac{\partial q}{\partial v},$$

which equals  $-\frac{\pi q}{2}$  by the envelope theorem and is higher than  $-\frac{q}{2}$ , i.e., the derivative of the

utility of S1 with respect to  $v$  (recall that the optimal  $q$  with S1 is always strictly higher than the optimal  $q$  with S2). Thus, a decrease in  $v$  increases S1 by more than S2. As shown above, a decrease in  $v$  increases S1 by more than S4. Hence, we have shown that  $\theta_1 = \theta_2 = \underline{\theta}$  for all  $(\pi, v)$  pairs with  $\pi \in (0.5, \hat{\pi})$  and  $v \leq 2 - \frac{1}{\pi}$ . Finally, consider the probability of a correct assessment,  $P_C$ , and  $P_M$ . All three are given by  $q(\theta) > 0.5$  for  $\theta \geq \underline{\theta}$  and thus strictly increasing in  $\theta$  for  $v \leq 2 - \frac{1}{\pi}$ . Taken together, our results above imply that the average probability of making a correct decision and the average  $P_C$  in society are increasing in  $\theta$ , and the average  $P_M - P_C$  is decreasing in  $\theta$ . Furthermore, by what we have shown above, there exists  $\theta(v)$  such that for all  $\theta \geq \theta(v)$  and  $v \leq \bar{v}$ , S1 is chosen and  $P_M = q(\theta) > 0.5$ . Thus, average  $P_M$  in society increases in  $\theta$  for  $\theta$  sufficiently high.

## A.1 Extension to biased priors

Let  $\pi_1$  ( $\pi_0$ ) denote the perceived probability that the news item is correct if  $V = 1$ ; i.e.,  $\pi_1 = \Pr(S = 1|V = 1)$  ( $\pi_0 = \Pr(S = 1|V = 0)$ ). Throughout, we assume that  $\pi_1 > \pi_0$ . In addition, for tractability of the true accuracy of participants, we assume that  $\pi_0 \leq \pi_{true} \leq \pi_1$ .

**Proposition 4** *Assume that  $\pi_0 \leq \pi_{true} \leq \pi_1$  with  $\pi_1 > \pi_0$ . If  $\pi_0 < 0.5 \leq \pi_1$ , the following holds: (i) The average probability of making a correct assessment increases in  $\theta$ . (ii)  $P_C$  increases in  $\theta$ . (iii)  $P_M$  increases in  $\theta$  for high enough  $\theta$ . Otherwise, there exists a  $\hat{\pi} > 0.5$  such that the analogous results hold for all  $\pi_{true} \in (1 - \hat{\pi}, \hat{\pi})$ .*

**Proof:** We assume without loss of generality that  $\pi_{true} \geq 0.5$ . For any given pair of  $(\pi, v)$ , there are again five possible strategies for  $i$ :

S1:  $i$  chooses  $q > 0.5$  and chooses  $a = s$  (i.e., follows the signal).

S2:  $i$  chooses  $q > 0.5$ , chooses  $a = s$  if  $V = 0$ , and chooses  $a = 1$  if  $V = 1$ .

S3:  $i$  chooses  $q > 0.5$ , chooses  $a = s$  if  $V = 1$ , and chooses  $a = 0$  if  $V = 0$ .

S4:  $i$  chooses  $q = 0.5$  and follows the prior (i.e., chooses  $a = 1$  if  $\pi_1 > 0.5$  and  $V = 1$  or if  $\pi_0 > 0.5$  and  $V = 0$ ; and  $a = 0$  otherwise).

S5:  $i$  chooses  $q = 0.5$  and follows their preference bias if  $v > 0$  (i.e., chooses  $a = 1$  if  $V = 1$  and  $a = 0$  if  $V = 0$ ).

- S1 is optimal only if  $q \geq \max \left\{ \frac{\pi_1}{1-v+\pi_1 v}, \frac{1-\pi_1}{1-\pi_1 v} \right\}$ .
- S2 is optimal only if  $q \geq \max \left\{ \frac{1-\pi_0}{1-\pi_0 v}, \frac{\pi_0(1-v)}{1-\pi_0 v} \right\}$  and  $q \leq \frac{\pi_1}{1-v+\pi_1 v}$  (so,  $a = 1$  is optimal if  $V = 1$  and  $s = 0$ ). For  $\frac{1-\pi_0}{1-\pi_0 v} \leq \frac{\pi_1}{1-v+\pi_1 v}$  to hold,  $\pi_1 > 0.5$  must hold. Therefore,  $i$  may choose S2 only if  $\pi_1 > 0.5$ .

- $S3$  is optimal only if  $q \geq \max \left\{ \frac{\pi_1}{1-v+\pi_1 v}, \frac{(1-\pi_1)(1-v)}{1-v+\pi_1 v} \right\}$  and  $q \leq \frac{1-\pi_0}{1-\pi_0 v}$  (so,  $a = 0$  is optimal if  $V = 0$  and  $s = 1$ ). For  $\frac{\pi}{1-v+\pi v_i} \leq \frac{1-\pi_0}{1-\pi_0 v}$  to hold,  $\pi_0 < 0.5$  must hold. Therefore,  $i$  may choose  $S3$  only if  $\pi_0 < 0.5$ .
- Choosing  $S4$  over  $S5$  requires  $\frac{\pi_1}{2} + \frac{\pi_0(1-v)}{2} \geq \frac{\pi_1}{2} + \frac{(1-\pi_0)}{2}$  (i.e.,  $v \leq 2 - \frac{1}{\pi_0}$ ) if  $\pi_0 > 0.5$ , and  $\frac{(1-\pi_1)(1-v)}{2} + \frac{1-\pi_0}{2} \geq \frac{\pi_1}{2} + \frac{(1-\pi_0)}{2}$  (i.e.,  $v \leq 2 - \frac{1}{1-\pi_1}$ ) if  $\pi_1 < 0.5$ .  $S4$  and  $S5$  are equivalent if  $\pi_1 \geq 0.5$  and  $\pi_0 \leq 0.5$ .

Fix  $(\pi_1, \pi_0, \pi_{true}, v)$  and let  $q(\theta)$  denote the optimal level of  $q$  given  $\theta$ . We first consider the case where  $\pi_0 \geq 0.5$ . By what we have shown above, only  $S1$ ,  $S2$ ,  $S4$ , and  $S5$  are relevant (i.e.,  $S3$  is not chosen as  $\pi_0 < 0.5$  does not hold). Based on the characterization above and an analogue of Lemma 1, there are three possibilities for  $q(\theta)$ .

- $q(\theta) = 0.5$ .
- $q(\theta) \in \left( \max \left\{ \frac{1-\pi_0}{1-\pi_0 v}, \frac{\pi_0(1-v)}{1-\pi_0 v} \right\}, \frac{\pi_1}{1-v+\pi_1 v} \right)$  and given by  $C'(q(\theta)) = \frac{\theta(1-\pi_0 v)}{2}$ .
- $q(\theta) > \frac{\pi_1}{1-v+\pi_1 v}$  and given by  $C'(q(\theta)) = \frac{\theta(2-v(1-\pi_1+\pi_0))}{2}$ .

Given that  $\frac{\theta(2-(1-\pi_1+\pi_0)v)}{2}$  and  $\frac{\theta(1-\pi_0 v)}{2}$  are both monotone increasing in  $\theta$ ,  $C(q)$  is strictly convex in  $q$ , and  $S1$  must implement a strictly higher  $q$  than  $S2$  (i.e.,  $q(\theta) > \frac{\pi_1}{1-v+\pi_1 v}$  with  $S1$  but  $q(\theta) < \frac{\pi_1}{1-v+\pi_1 v}$  with  $S2$ ),  $q(\theta)$  is increasing in  $\theta$  for all  $\theta \in [\underline{\theta}, \infty)$ .

First, consider the case where  $v > 2 - \frac{1}{\pi_0}$ . Since  $\pi_0 \geq 0.5$  and  $v > 2 - \frac{1}{\pi_0}$ ,  $S4$  is strictly dominated by  $S5$ . Thus, for  $\pi_0 \geq 0.5$  and  $v > 2 - \frac{1}{\pi_0}$ , there exist  $\theta_1, \theta_2 \in [\underline{\theta}, \infty)$  such that  $\underline{\theta} \leq \theta_1 \leq \theta_2$ ; for all  $\theta < \theta_1$ ,  $i$  chooses  $S5$  and  $q(\theta) = 0.5$ ; for all  $\theta \in [\theta_1, \theta_2)$ ,  $i$  chooses  $S2$ , and  $q(\theta) > 0.5$  is given by  $C'(q(\theta)) = \frac{\theta(1-\pi v)}{2}$ ; and for all  $\theta \geq \theta_2$ ,  $i$  chooses  $S1$ , and  $q(\theta) > 0.5$  is given by  $C'(q(\theta)) = \frac{\theta(2-v(1-\pi_1+\pi_0))}{2}$ . The true average probability of making a correct decision is given by  $\frac{\pi_{true}}{2} + \frac{(1-\pi_{true})}{2} = 0.5$  if  $S5$  is used (i.e., for  $\theta < \theta_1$ ),  $\frac{\pi_{true}+q(\theta)}{2}$  if  $S2$  is used (i.e., if  $\theta \in [\theta_1, \theta_2)$ ) and  $q(\theta)$  if  $S1$  is used (i.e., if  $\theta \geq \theta_2$ ). Note that in the latter case,  $q(\theta) > \pi_{true}$ , since  $S1$  requires  $q(\theta) \geq \frac{\pi_1}{1-v+\pi_1 v} > \pi$ . Given these and Corollary 1, the average probability of making a correct decision increases in  $\theta$ . Next,  $P_C$  is given by 0 if  $S5$  is used (i.e., for  $\theta < \theta_1$ ),  $\pi_{true}q(\theta)$  if  $S2$  is used (i.e., if  $\theta \in [\theta_1, \theta_2)$ ) and  $q(\theta)$  if  $S1$  is used (i.e., if  $\theta \geq \theta_2$ ). Thus,  $P_C$  increases in  $\theta$  as well. Finally,  $P_M$  is given by 1 if  $S5$  is used (i.e., for  $\theta < \theta_1$ ),  $(1 - \pi_{true})q(\theta) + \pi_{true}$  if  $S2$  is used (i.e., if  $\theta \in [\theta_1, \theta_2)$ ) and  $q(\theta)$  if  $S1$  is used (i.e., if  $\theta \geq \theta_2$ ). As a result,  $P_M$  increases in  $\theta$  for high enough  $\theta$  (i.e.,  $\theta \geq \theta_2$ ).

Next, consider the case where  $v \leq 2 - \frac{1}{\pi_0}$ . Fixing  $\pi_0 \in [0.5, \tilde{\pi}]$ , for all  $\pi_1 \in (\pi_0, \tilde{\pi}]$  we have that  $C'(\frac{\pi_1}{1-v+\pi_1 v}) < C'(\frac{\tilde{\pi}}{2\tilde{\pi}-2+\frac{1}{\tilde{\pi}}}) = \underline{\theta}(1 - \tilde{\pi}) < \frac{\underline{\theta}(1-\tilde{\pi}v)}{2} < \frac{\underline{\theta}(1-\pi_0 v)}{2}$  for all  $\theta \geq \underline{\theta}$  and  $v \leq 2 - \frac{1}{\pi_0}$ . Moreover,  $\frac{\underline{\theta}(1-\pi_0 v)}{2} < \frac{\underline{\theta}(2-v(1-\pi_1+\pi_0))}{2}$  for all  $\pi_1 \in (\pi_0, \tilde{\pi}]$  and  $\theta \geq \underline{\theta}$  and  $v \leq 2 - \frac{1}{\pi_0}$ . Thus,  $S1$  generates a strictly higher utility than  $S2$  for all  $\theta \geq \underline{\theta}$ ,  $v \leq 2 - \frac{1}{\pi_0}$ , and  $\pi_1 \in (\pi_0, \tilde{\pi}]$ . Similar to

what we showed above in the proof of Proposition 1, the utility of S2 for  $\pi_1 \in (\pi_0, \tilde{\pi}]$  at  $\theta \geq \underline{\theta}$  and  $v = 2 - \frac{1}{\pi_0}$  is strictly greater than the utility of S4, which equals  $\frac{\pi_1}{2} + \frac{\pi_0(1-v)}{2} = \frac{\pi_1}{2} + \frac{(1-\pi_0)}{2}$ . This is because at a choice of  $q = 0.5$ , S2 has a utility identical to that of S4, however given that  $C'(\frac{\pi_1}{1-v+\pi_1v}) < \frac{\theta(1-\pi_0v)}{2}$  for  $\pi_1 \in (\pi_0, \tilde{\pi}]$  at  $\theta \geq \underline{\theta}$   $v = 2 - \frac{1}{\pi_0}$ , S2 generates a strictly higher utility at  $q > 0.5$ . This in turn is dominated by S1 by what we have shown. Thus, for all  $\pi_1 \in (\pi_0, \tilde{\pi}]$  and  $\theta \geq \underline{\theta}$ , S1 dominates S4 also for  $v < 2 - \frac{1}{\pi_0}$ . This is because the increase in the maximized utility of S1 due to decreasing  $v$  is higher than the increase in the utility of S4. To see why, note that the derivative of the maximized utility of S1 with respect to  $v$  is given by

$$-\frac{q(1-\pi_1+\pi_0)}{2} + \left(1 - \frac{(1-\pi_1+\pi_0)v}{2} - \frac{C'(q)}{\theta}\right) \frac{\partial q}{\partial v},$$

which equals  $-\frac{(1-\pi_1+\pi_0)q}{2}$  by the envelope theorem, which is strictly lower than  $-\frac{\pi_0}{2}$ , the derivative of the utility of S4 with respect to  $v$ . By what we have shown above, the optimal value of  $q$  with S1 is given by  $q > \frac{\pi_1}{1-v+\pi_1v} \geq \pi_1$  for all  $\pi_1 \leq \tilde{\pi}$  and  $v \leq 2 - \frac{1}{\pi_0}$ , because S1 is the optimal strategy played in that case. Thus, a decrease in  $v$  increases the utility of S1 by more than that of S4. As a result, we have shown that  $i$  strictly prefers S1 over S2 and S4 for all  $\pi_0 \in [0.5, \tilde{\pi})$  and  $\pi_1 \in (\pi_0, \tilde{\pi}]$  with  $v \leq 2 - \frac{1}{\pi_0}$ .

This implies that there must exist a  $\hat{\pi} > \tilde{\pi}$  such that  $i$  prefers S1 over S2 and S4 for all  $\pi_0 \in [\tilde{\pi}, \hat{\pi})$ ,  $\pi_1 \in (\pi_0, \hat{\pi}]$ ,  $\theta \geq \underline{\theta}$ , and  $v \leq 2 - \frac{1}{\pi_0}$ . To show this, we start from the benchmark case above with  $\pi_0 = \hat{\pi} = \pi_1 = \pi_{true}$ . Recall that  $\hat{\pi} > \tilde{\pi}$  is such that  $i$  is indifferent between S1 and S2 (and S4 is dominated) for  $\theta = \underline{\theta}$ ,  $\pi_0 = \hat{\pi} = \pi_1 = \pi_{true}$  and  $v = 2 - \frac{1}{\hat{\pi}}$ , and  $i$  strictly prefers S1 over S2 for all  $\theta \geq \underline{\theta}$ ,  $\pi \in [\tilde{\pi}, \hat{\pi})$  and  $v = 2 - \frac{1}{\pi}$ . Let's first consider the effect of setting  $\pi_1 = \hat{\pi}$  and reducing  $\pi_0$  to a level such that  $\pi_0 \in [0.5, \hat{\pi})$  with  $v = 2 - \frac{1}{\pi_0}$ . The utility of both S1 and S2 increases (with S4 always dominated by S2), however the utility of S1 increases by more than the increase in the utility of S2. To see why, note that the derivative of the maximized utility of S1 with respect to  $\pi_0$  (setting  $v = 2 - \frac{1}{\pi_0}$ ) is given by  $-q \left(1 + \frac{1-\pi_1}{2\pi_0^2}\right)$ , whereas the derivative of the maximized utility of S2 with respect to  $\pi_0$  (with  $v = 2 - \frac{1}{\pi_0}$ ) is given by  $-q$ . Since  $q$  is always strictly higher with S1 than with S2, the former term is strictly lower than the latter. Thus, S1 is strictly preferred for  $\pi_1 = \hat{\pi}$ ,  $\pi_0 \in [0.5, \hat{\pi})$ , and  $v = 2 - \frac{1}{\pi_0}$ . The argument directly extends to any  $\pi_1 \in (\tilde{\pi}, \hat{\pi})$ , with  $\pi_0 \in [0.5, \pi_1)$ , and  $v = 2 - \frac{1}{\pi_0}$ . Finally, we consider  $\pi_1 \in (\tilde{\pi}, \hat{\pi}]$ , with  $\pi_0 \in [0.5, \pi_1)$ , and  $v < 2 - \frac{1}{\pi_0}$ , i.e., the effect of a decrease in  $v$ . A decrease in  $v$  from  $2 - \frac{1}{\pi_0}$  increases the optimal  $q$  and utility of S1 as we have shown above, but it also increases the utility of S2 and S4. However, the increase in the utility of S1 is higher than the increase in the utility of S2 or S4. As mentioned above, the derivative of the maximized utility of S1 with respect to  $v$  is given by  $-\frac{(1-\pi_1+\pi_0)q}{2}$ , whereas the derivative of the utility of S4 with respect to  $v$  equals  $-\frac{\pi_0}{2}$ , and the derivative of the maximized utility of S2 with respect to  $v$  equals  $-\frac{\pi_0q}{2}$ . As explained above,  $q > \frac{\pi_1}{1-v+\pi_1v} \geq \pi_1$

for all  $\pi_1 \leq \tilde{\pi}$  and  $v \leq 2 - \frac{1}{\pi_0}$  and ???. As a result, S1 remains the optimal strategy for  $\pi_1 \in (\tilde{\pi}, \hat{\pi}]$ , with  $\pi_0 \in [0.5, \pi_1)$ , and  $v \leq 2 - \frac{1}{\pi_0}$ .

Finally, we consider the case where  $\pi_1 > 0.5 > \pi_0$ . We distinguish between two cases: the case where  $\pi_1 > 1 - \pi_0$ , and the case where  $\pi_1 \leq 1 - \pi_0$ . We first consider the case where  $\pi_1 > 1 - \pi_0$ . In this case, only S1, S2, S4, and S5 are relevant. Note that S4 and S5 are equivalent in this case and result in a true accuracy of 0.5. To see why S3 is not chosen, first note that according to S3,  $q_i > 0.5$ , and  $i$  chooses  $a = s_i$  if  $V = 1$ . This implies that  $q_i \geq \frac{\pi_1}{1-v+\pi_1v}$  must hold. Note that  $\frac{\pi_1}{1-v+\pi_1v} > \frac{1-\pi_0}{1-\pi_0v}$  since  $\pi_1 > 1 - \pi_0$ . Thus,  $q_i > \frac{1-\pi_0}{1-\pi_0v}$ . However, S3 requires that  $q_i \leq \frac{1-\pi_0}{1-\pi_0v}$  for  $i$  to always choose  $a = 0$  if  $V = 0$ , a contradiction. Based on the characterization above and an analogue of Lemma 1, there are three possible regions for  $q(\theta)$  with  $\pi_1 > 0.5 > \pi_0$ . Either

- $q(\theta) = 0.5$ ; or
- $q(\theta) \in \left( \frac{1-\pi_0}{1-\pi_0v}, \frac{\pi_1}{1-v+\pi_1v} \right)$  and given by  $C'(q(\theta)) = \frac{\theta(1-\pi_0v)}{2}$ ; or
- $q(\theta) > \frac{\pi_1}{1-v+\pi_1v}$  and given by  $C'(q(\theta)) = \frac{\theta(2-v(1-\pi_1+\pi_0))}{2}$ .

Given that  $\frac{\theta(2-(1-\pi_1+\pi_0)v)}{2}$  and  $\frac{\theta(1-\pi_0v)}{2}$  are both monotone increasing in  $\theta$ ,  $C(q)$  is strictly convex in  $q$ , and S1 must implement a strictly higher  $q$  than S2 (i.e.,  $q(\theta) > \frac{\pi_1}{1-v+\pi_1v}$  with S1 but  $q(\theta) < \frac{\pi_1}{1-v+\pi_1v}$  with S2),  $q(\theta)$  is increasing in  $\theta$  for all  $\theta \in [\underline{\theta}, \infty)$ . In particular, there exist  $\theta_1, \theta_2 \in [\underline{\theta}, \infty)$  such that  $\underline{\theta} \leq \theta_1 \leq \theta_2$ ; for all  $\theta < \theta_1$ ,  $i$  chooses S4 (equivalent to S5) and  $q(\theta) = 0.5$ ; for all  $\theta \in [\theta_1, \theta_2)$ ,  $i$  chooses S2, and  $q(\theta) > 0.5$  is given by  $C'(q(\theta)) = \frac{\theta(1-\pi_0v)}{2}$ ; and for all  $\theta \geq \theta_2$ ,  $i$  chooses S1, and  $q(\theta) > 0.5$  is given by  $C'(q(\theta)) = \frac{\theta(2-v(1-\pi_1+\pi_0))}{2}$ . Given these, the “true” average probability of making a correct decision is given by 0.5 for  $\theta < \theta_1$ ,  $\frac{\pi_{true}+q(\theta)}{2}$  for  $\theta \in [\theta_1, \theta_2)$ , and  $q(\theta)$  for  $\theta \geq \theta_2$  (note that  $\frac{\pi_{true}+q(\theta)}{2} < q(\theta)$  since  $q(\theta) \geq \pi_1 > \pi_{true}$ ). Thus, it increases in  $\theta$ . Next,  $P_C$  is given by 0 if S4 is used (i.e., for  $\theta < \theta_1$ ),  $\pi_{true}q(\theta)$  if S2 is used (i.e., if  $\theta \in [\theta_1, \theta_2)$ ) and  $q(\theta)$  if S1 is used (i.e., if  $\theta \geq \theta_2$ ). As a result,  $P_C$  increases in  $\theta$  if  $\pi_1 > 0.5 > \pi_0$ , and  $\pi_1 > 1 - \pi_0$ . Finally,  $P_M$  is given by 1 if S4 is used (i.e., for  $\theta < \theta_1$ ),  $(1 - \pi_{true})q(\theta) + \pi_{true}$  if S2 is used (i.e., if  $\theta \in [\theta_1, \theta_2)$ ) and  $q(\theta)$  if S1 is used (i.e., if  $\theta \geq \theta_2$ ). Hence,  $P_M$  increases in  $\theta$  for high enough  $\theta$  (i.e.,  $\theta \geq \theta_2$ ).

We now consider the case where  $\pi_1 \leq 1 - \pi_0$ . In this case, only S1, S3, S4, and S5 are relevant (if  $\pi_1 = 1 - \pi_0$ , only S1, S4, and S5 are relevant). As before, S4 and S5 are equivalent and result in a true accuracy of 0.5. To see why S2 is not chosen, first note that according to S2,  $q_i > 0.5$ , and  $i$  chooses  $a = s_i$  if  $V = 0$ . This implies that  $q > \frac{1-\pi_0}{1-\pi_0v}$  must hold if S2 is optimal. Since  $1 - \pi_0 \geq \pi_1$ ,  $\frac{1-\pi_0}{1-\pi_0v} > \frac{\pi_1}{1-v+\pi_1v}$ . Thus,  $q_i > \frac{\pi_1}{1-v+\pi_1v}$ , contradicting that S2 will be played. Based on the characterization above and an analogue of Lemma 1, there are three possible regions for  $q(\theta)$  with  $\pi_1 > 0.5 > \pi_0$ . Either

- $q(\theta) = 0.5$ ; or

- $q(\theta) \in \left( \frac{\pi_1}{1-v+\pi_1 v}, \frac{1-\pi_0}{1-\pi_0 v} \right)$  and given by  $C'(q(\theta)) = \frac{\theta(1-(1-\pi_1)v)}{2}$ ;
- $q(\theta) > \frac{1-\pi_0}{1-\pi_0 v}$  and given by  $C'(q(\theta)) = \frac{\theta(2-v(1-\pi_1+\pi_0))}{2}$ .

Since  $\frac{\theta(2-(1-\pi_1+\pi_0)v)}{2}$  and  $\frac{\theta(1-(1-\pi_1)v)}{2}$  are both monotone increasing in  $\theta$ ,  $C(q)$  is strictly convex in  $q$ , and  $S1$  must implement a strictly higher  $q$  than  $S3$  (i.e.,  $q(\theta) > \frac{1-\pi_0}{1-\pi_0 v}$  with  $S1$  but  $q(\theta) < \frac{1-\pi_0}{1-\pi_0 v}$  with  $S3$ ),  $q(\theta)$  is increasing in  $\theta$  for all  $\theta \in [\underline{\theta}, \infty)$ . In particular, there exist  $\theta_1, \theta_2 \in [\underline{\theta}, \infty)$  such that  $\underline{\theta} \leq \theta_1 \leq \theta_2$ ; for all  $\theta < \theta_1$ ,  $i$  chooses  $S4$  (equivalent to  $S5$ ) and  $q(\theta) = 0.5$ ; for all  $\theta \in [\theta_1, \theta_2)$ ,  $i$  chooses  $S3$ , and  $q(\theta) > 0.5$  is given by  $C'(q(\theta)) = \frac{\theta(1-(1-\pi_1)v)}{2}$ ; and for all  $\theta \geq \theta_2$ ,  $i$  chooses  $S1$ , and  $q(\theta) > 0.5$  is given by  $C'(q(\theta)) = \frac{\theta(2-v(1-\pi_1+\pi_0))}{2}$ . Given these, for  $\pi_1 > 0.5 > \pi_0$ , the “true” average probability of making a correct decision and  $P_C$  increase in  $\theta$  for all  $\theta \geq \underline{\theta}$ .  $P_M$  increases in  $\theta$  for high enough  $\theta$ .

## A.2 Extension to stochastic preference bias

In this section, we assume that the magnitude of the preference bias (not its direction) is stochastic in the following simple manner: a respondent with a stochastic preference bias  $v$  has a realized bias  $\tilde{v}$  equal to 0 with probability  $p_v(0)$ ,  $\tilde{v} = v$  with probability  $p(v)$ , and  $\tilde{v} = 1$  with probability  $p_v(1)$ . For simplicity, we keep  $p(v)$  fixed over all  $v \in [0, \bar{v}]$ , whereas  $p_v(0)$  and  $p_v(1)$  are such that the expected level of preference bias equals  $v$ ; i.e.,  $p_v(0)$  is given by  $v = \frac{1-p_v(0)-p(v)}{1-p(v)}$ . Thus,  $p_v(0)$  is decreasing in  $v$ . Results are unaffected if  $p_v(0)$ ,  $p(v)$  and  $p_v(1)$  are all fixed for  $v \in [0, \bar{v}]$ .

**Proposition 5** *Consider the setting with stochastic preference bias. There exists a  $\hat{\pi}$  such that  $\hat{\pi} > 0.5$ , and the following holds for all  $\pi \in [1 - \hat{\pi}, \hat{\pi}]$ . (i) The average probability of making a correct assessment increases in  $\theta$ . (ii)  $P_C$  increases in  $\theta$ . (iii)  $P_M$  increases in  $\theta$  for high enough  $\theta$ .*

**Proof:** For any given pair of  $(\pi, v)$ , here are the possible strategies for  $i$ :

$S1'$ :  $i$  chooses  $S1$  if  $\tilde{v} < 1$  and  $S5$  if  $\tilde{v} = 1$ .

$S2'$ :  $i$  chooses  $S1$  if  $\tilde{v} = 0$ ;  $S2$  if  $\tilde{v} = v$ , and  $S5$  if  $\tilde{v} = 1$ .

$S2''$ :  $i$  chooses  $S4$  if  $\tilde{v} = 0$ ,  $S2$  if  $\tilde{v} = v$  and  $S5$  if  $\tilde{v} = 1$ .

$S3'$ :  $i$  chooses  $S1$  if  $\tilde{v} = 0$ ;  $S3$  if  $\tilde{v} = v$ , and  $S5$  if  $\tilde{v} = 1$ .

$S3''$ :  $i$  chooses  $S4$  if  $\tilde{v} = 0$ ;  $S3$  if  $\tilde{v} = v$ , and  $S5$  if  $\tilde{v} = 1$ .

$S4'$ :  $i$  chooses  $S4$  if  $\tilde{v} < 1$  and  $S5$  if  $\tilde{v} = 1$ .

$S5'$ :  $i$  chooses  $S4$  if  $\tilde{v} = 0$  and  $S5$  if  $\tilde{v} > 0$ .

Note that the following possible strategies are dominated.

$S6'$ :  $i$  chooses  $S1$  if  $\tilde{v} = 0$ ;  $S4$  if  $\tilde{v} = v$ ; and  $S5$  if  $\tilde{v} = 1$ .

$S7'$ :  $i$  chooses  $S1$  if  $\tilde{v} = 0$  and  $S5$  if  $\tilde{v} > 0$ .

If  $S6'$  is chosen, then  $q \geq \pi$  must hold if  $\pi \geq 0.5$  and  $q \geq 1 - \pi$  must hold if  $\pi \leq 0.5$  (otherwise,  $S1$  is not optimal with  $\tilde{v} = 0$ ). This implies that fixing  $\tilde{v} = v$ ,  $S1$ ,  $S2$  or  $S3$  dominates  $S4$ , i.e., either  $S1'$ , or  $S2'$  or  $S3'$  dominates  $S6'$ . In a similar vein,  $S7'$  is dominated. If  $S7'$  is chosen, then  $q \geq \pi$  must hold if  $\pi \geq 0.5$  and  $q \geq 1 - \pi$  must hold if  $\pi \leq 0.5$  (otherwise,  $S1$  is not optimal with  $\tilde{v} = 0$ ). This implies that fixing  $\tilde{v} = v$ ,  $S1$ ,  $S2$  or  $S3$  dominates  $S4$ . Thus, either  $S1'$ , or  $S2'$  or  $S3'$  dominates  $S6'$ .

- $S1'$  requires  $q \geq \max \left\{ \frac{\pi}{1-v+\pi v}, \frac{1-\pi}{1-\pi v} \right\}$  for  $\tilde{v} \in \{0, v\}$ .
- $S2'$  requires  $q \geq \max \left\{ \frac{1-\pi}{1-\pi v}, \frac{\pi(1-v)}{1-\pi v} \right\}$  for  $\tilde{v} = \{0, v\}$ , but  $q \leq \frac{\pi}{1-v+\pi v}$  for  $\tilde{v} = v$ .
- $S2''$  requires  $q \geq \max \left\{ \frac{1-\pi}{1-\pi v}, \frac{\pi(1-v)}{1-\pi v} \right\}$  for  $\tilde{v} = v$ , but  $q \leq \pi$ .
- $S3'$  requires that  $q \geq \max \left\{ \frac{\pi}{1-v+\pi v}, \frac{(1-\pi)(1-v)}{1-v+\pi v} \right\}$  for  $\tilde{v} = \{0, v\}$ , but  $q \leq \frac{1-\pi}{1-\pi v}$  for  $\tilde{v} = v$ .
- $S3''$  requires that  $q \geq \max \left\{ \frac{\pi}{1-v+\pi v}, \frac{(1-\pi)(1-v)}{1-v+\pi v} \right\}$  for  $\tilde{v} = v$ , but  $q \leq 1 - \pi$ .
- Choosing  $S4'$  over  $S5'$  requires  $\frac{\pi}{2} + \frac{\pi(1-v)}{2} \geq \frac{1}{2}$  (i.e.,  $v \leq 2 - \frac{1}{\pi}$ ) if  $\pi \geq 0.5$ , and  $\frac{1-\pi}{2} + \frac{(1-\pi)(1-v)}{2} \geq \frac{1}{2}$  (i.e.,  $v \leq 2 - \frac{1}{1-\pi}$ ) if  $\pi \leq 0.5$ .

We consider the setting where  $\pi \geq 0.5$ . By what we have shown above, only  $S1'$ ,  $S2'$ ,  $S2''$ ,  $S4'$ , and  $S5'$  are relevant. The analysis with  $\pi < 0.5$  is analogous (with  $S3'$  included instead of  $S2'$ ). Fix  $(\pi, v)$ , and let  $q(\theta)$  denote the optimal level of  $q$  given  $\theta$ . Consider the case where  $v \leq 2 - \frac{1}{\pi}$ , which implies that  $\pi \geq 0.5$  and  $\frac{1-\pi}{1-\pi v} \leq \frac{\pi(1-v)}{1-\pi v}$ . There are four possibilities for  $q(\theta)$ : (i)  $q(\theta) = 0.5$ ; (ii)  $q(\theta) \in \left( \frac{\pi(1-v)}{1-\pi v}, \pi \right)$  and given by  $C'(q(\theta)) = \frac{\theta p(v)(1-\pi v)}{2}$ ; (iii)  $q(\theta) \in \left( \pi, \frac{\pi}{1-v+\pi v} \right)$  and given by  $C'(q(\theta)) = \theta \left( p_v(0) + \frac{p(v)(1-\pi v)}{2} \right)$ ; or (iv)  $q(\theta) > \frac{\pi}{1-v+\pi v}$  and given by  $C'(q(\theta)) = \theta \left( p_v(0) + \frac{p(v)(2-v)}{2} \right)$ .

Next, consider the case where  $v > 2 - \frac{1}{\pi}$ . In this case, we further distinguish between two cases:  $v \in \left( 2 - \frac{1}{\pi}, \frac{2}{\pi} - \frac{1}{\pi^2} \right)$  and  $v \geq \frac{2}{\pi} - \frac{1}{\pi^2}$ . First, assume that  $v \geq \frac{2}{\pi} - \frac{1}{\pi^2}$ . In this case,  $\pi \leq \frac{1-\pi}{1-\pi v}$ . Therefore,  $S2''$  is not possible. Thus, there are three possibilities for  $q(\theta)$ : (i)  $q(\theta) = 0.5$ ; (ii)  $q(\theta) \in \left( \frac{1-\pi}{1-\pi v}, \frac{\pi}{1-v+\pi v} \right)$  and given by  $C'(q(\theta)) = \theta \left( p_v(0) + \frac{p(v)(1-\pi v)}{2} \right)$ ; and (iii)  $q(\theta) > \frac{\pi}{1-v+\pi v}$  and given by  $C'(q(\theta)) = \theta \left( p_v(0) + \frac{p(v)(2-v)}{2} \right)$ . Next, assume that  $v \in \left( 2 - \frac{1}{\pi}, \frac{2}{\pi} - \frac{1}{\pi^2} \right)$ . In this case,  $\pi > \frac{1-\pi}{1-\pi v}$ . Therefore, there are four possibilities for  $q(\theta)$ : (i)  $q(\theta) = 0.5$ ; (ii)  $q(\theta) \in \left( \frac{1-\pi}{1-\pi v}, \pi \right)$  and given by  $C'(q(\theta)) = \frac{\theta p(v)(1-\pi v)}{2}$ ; (iii)  $q(\theta) \in \left( \pi, \frac{\pi}{1-v+\pi v} \right)$  and given by  $C'(q(\theta)) = \theta \left( p_v(0) + \frac{p(v)(1-\pi v)}{2} \right)$ ; and (iv)  $q(\theta) > \frac{\pi}{1-v+\pi v}$  and given by  $C'(q(\theta)) = \theta \left( p_v(0) + \frac{p(v)(2-v)}{2} \right)$ .

Given what we show above,  $q(\theta)$  is increasing in  $\theta$  for all  $\theta \in [\underline{\theta}, \infty)$  regardless of whether  $v \leq 2 - \frac{1}{\pi}$  or  $v > 2 - \frac{1}{\pi}$ . To continue, we focus without loss of generality on the case

where  $v \leq 2 - \frac{1}{\pi}$  with  $\pi \geq 0.5$ . We show that there exists a  $\hat{\pi}$  such that  $\hat{\pi} > 0.5$ , and the desired result holds for all  $\pi \in [1 - \hat{\pi}, \hat{\pi}]$ . (As in the case above with deterministic  $v$ , it is more straightforward to show the desired result with  $v > 2 - \frac{1}{\pi}$ ). First, let  $\pi' \geq 0.5$  solve  $C'(\frac{\pi'}{2\pi'-2+\frac{1}{\pi'}}) = \underline{\theta}(p_v(0) + p(v)(1 - \pi'))$  and let  $\pi'' \geq 0.5$  solve  $C'(\pi'') = \underline{\theta}p(v)(1 - \pi'')$ . We define  $\tilde{\pi} = \min\{\pi', \pi''\}$ . It follows that  $\tilde{\pi} > 0.5$ ,  $C'(\frac{\tilde{\pi}}{2\tilde{\pi}-2+\frac{1}{\tilde{\pi}}}) \leq \underline{\theta}(p_v(0) + p(v)(1 - \tilde{\pi}))$ , and  $C'(\tilde{\pi}) \leq \underline{\theta}p(v)(1 - \tilde{\pi})$ . Thus,  $C'(\frac{\tilde{\pi}}{2\tilde{\pi}-2+\frac{1}{\tilde{\pi}}}) < \underline{\theta}(p_v(0) + \frac{p(v)}{2\tilde{\pi}})$ . Thus,  $S1'$  and  $S2'$  have the same utility at  $q = \frac{\tilde{\pi}}{2\tilde{\pi}-2+\frac{1}{\tilde{\pi}}}$ , but the maximized utility of  $S1'$  is strictly greater than that of  $S2'$ . In turn,  $S2'$  dominates  $S2''$  because  $S2'$  and  $S2''$  generate the same utility at  $q = \tilde{\pi}$ , but  $C'(\tilde{\pi}) \leq \underline{\theta}p(v)(1 - \tilde{\pi})$  and  $C'(\tilde{\pi}) < \underline{\theta}(p_v(0) + p(v)(1 - \tilde{\pi}))$ . Finally,  $S2''$  dominates  $S4'$  and  $S5'$  at  $\pi = \tilde{\pi}$  and  $v = 2 - \frac{1}{\tilde{\pi}}$  because  $S2''$  with  $q = 0.5$  is equivalent to  $S4$  and  $S5$ , but  $C'(\tilde{\pi}) \leq \underline{\theta}p(v)(1 - \tilde{\pi})$  implies that  $q = \tilde{\pi}$  strictly dominates  $q = 0.5$ . All of this holds for all  $\theta \geq \underline{\theta}$ ,  $\pi \leq \tilde{\pi}$  and  $v \leq 2 - \frac{1}{\pi}$ . Note that for  $\theta \geq \underline{\theta}$ ,  $\pi \leq \tilde{\pi}$  and  $v \leq 2 - \frac{1}{\pi}$ , we have  $C'(\frac{\pi}{1-v+\pi v}) \leq C'(\frac{\tilde{\pi}}{2\tilde{\pi}-2+\frac{1}{\tilde{\pi}}}) \leq \theta(p_v(0) + p(v)(1 - \tilde{\pi})) \leq \theta(p_v(0) + \frac{p(v)(1-\pi v)}{2})$  as  $p_v(0)$  is decreasing in  $v$ . Moreover,  $C(\pi) \leq C'(\tilde{\pi}) \leq \theta p(v)(1 - \tilde{\pi}) \leq \theta \frac{p(v)(1-\pi v)}{2}$ , and  $C'(\frac{\pi}{1-v+\pi v}) < \theta \left( p_v(0) + \frac{p(v)(2-v)}{2} \right)$ . Thus,  $S1'$  dominates  $S2'$ , which in turn dominates  $S2''$ . The proof for showing that  $S1'$  dominates  $S4'$  with  $\pi \leq \tilde{\pi}$  and  $v \leq 2 - \frac{1}{\pi}$  is analogous to the proof for showing that  $S1$  dominates  $S4$  in Proposition 1. As in the proof of Proposition 1, we can extend this and show the existence of a  $\hat{\pi} > \tilde{\pi}$  such that  $S1$  is optimal for all  $\theta \geq \underline{\theta}$ ,  $\pi \leq \hat{\pi}$  and  $v \leq 2 - \frac{1}{\pi}$ . Finally, consider the average probability of making a correct decision,  $P_C$ , and  $P_M$ . The average probability of making a correct decision is given by  $(p_v(0) + p(v))q(\theta) + \frac{p_v(1)}{2}$ .  $P_C$  is given by  $(p_v(0) + p(v))q(\theta)$ .  $P_M$  is given by  $(p_v(0) + p(v))q(\theta) + p_v(1)$ . As  $q(\theta)$  is strictly increasing in  $\theta$ , all three are strictly increasing in  $\theta$ .

### A.3 Ex-post choice of $q_i$

**Proposition 6** *There exists a  $\hat{\pi} > 0.5$  such that the following holds for all  $\pi \in [1 - \hat{\pi}, \hat{\pi}]$ : (i) The average probability of an accurate assessment increases in  $\theta$ . (ii) Average  $P_C$  increases in  $\theta$ . (iii) Average  $P_M$  increases in  $\theta$  for high enough  $\theta$ . (iv)  $P_M - P_C$  decreases in  $\theta$  for every  $v > 0$  if  $C'''$  is strictly positive and sufficiently high.*

**Proof:** As before, we assume without loss of generality that  $\pi \geq 0.5$ .

First, consider the case where  $V = 1$ . Let  $q_1$  denote the choice of  $q$  when  $V = 1$ . The expected utility of  $i$  if  $q_1 = 0.5$  and  $V = 1$  is  $\pi$  because in this case it is optimal to follow the prior and always choose  $a_i = 1$ . Thus, if  $q_1 > 0.5$  at the optimum,  $q_1$  maximizes

$$\pi q_1 + (1 - \pi)(1 - v)q_1 - \frac{C(q)}{\theta},$$

and must satisfy

$$\pi q_1 + (1 - \pi)(1 - v)q_1 - \frac{C(q)}{\theta} \geq \pi.$$

In particular, the optimal level of  $q_1$  is given by  $C'(q) = \theta(1 - (1 - \pi)v)$ , where  $q_1 > 0.5$ . Thus,  $q_1$  is weakly increasing in  $\theta$ . More generally, all else equal there exists a  $\theta_1 \geq \underline{\theta}$  such that  $q_1 = 0.5$  is optimal for all  $\theta < \theta_1$  and  $q_1 > 0.5$  at the optimum for  $\theta \geq \theta_1$ . This implies that

$$\Pr(a_i = 0 | V = 1 \cap S = 0) = \begin{cases} 0 & \text{if } \theta < \theta_1 \text{ (i.e. } q_1 = 0.5) \\ q_1 & \text{if } \theta \geq \theta_1 \text{ (i.e. } q_1 > 0.5). \end{cases}$$

In addition,

$$\Pr(a_i = 1 | V = 1 \cap S = 1) = \begin{cases} 1 & \text{if } \theta < \theta_1 \text{ (i.e. } q_1 = 0.5) \\ q_1 & \text{if } \theta \geq \theta_1 \text{ (i.e. } q_1 > 0.5). \end{cases}$$

The latter case (i.e.  $V = 1$  and  $S = 1$ ) is in the motivated state, and the former is in the counter-motivated state. Note that all else equal  $\Pr(a_i = 1 | V = 1 \cap S = 0)$  increases in  $\theta \geq \underline{\theta}$ , and  $\Pr(a_i = 1 | V = 1 \cap S = 1)$  increases in  $\theta$  for  $\theta \geq \theta_1$ . If  $q_1 > 0.5$  at the optimum, then  $q_1 > \pi$  must be satisfied. Otherwise, it would be dominated by a choice of 0.5. Thus, average accuracy conditional on  $V_1$  also increases in  $\theta \geq \underline{\theta}$ .

Second, consider the case where  $V = 0$ . Let  $q_0$  denote the choice of  $q$  when  $V = 0$ . Note that the expected utility of  $i$  if  $q_0 = 0.5$  and  $V = 0$  is  $\max\{\}$  because it is optimal to choose  $a_i = 1$  if  $v \leq 2 - \frac{1}{\pi}$  (in this case, the utility of  $q_0 = 0.5$  is  $\pi(1 - v)$ ) and to choose  $a_i = 0$  if  $v > 2 - \frac{1}{\pi}$  (in this case, the utility of  $q_0 = 0.5$  is  $(1 - \pi)$ ). Thus, if  $q_0 > 0.5$  at the optimum,  $q_0$  maximizes

$$\pi(1 - v)q_0 + (1 - \pi)q_0 - \frac{C(q_0)}{\theta},$$

and satisfies

$$\pi(1 - v)q_0 + (1 - \pi)q_0 - \frac{C(q_0)}{\theta} \geq \max\{\pi(1 - v), (1 - \pi)\}.$$

In that case, the optimal level of  $q_0$  is given by  $C'(q) = \theta(1 - (\pi v))$ , where  $q_0 > 0.5$ . Thus,  $q_0$  is weakly increasing in  $\theta$ . More generally, all else equal there exists a  $\theta_0 \geq \underline{\theta}$  such that  $q_0 = 0.5$  is optimal for all  $\theta < \theta_0$  and  $q_0 > 0.5$  at the optimum for  $\theta \geq \theta_0$ . (i) First, assume that  $v \leq 2 - \frac{1}{\pi}$ . The above results imply that

$$\Pr(a_i = 1 | V = 0 \cap S = 1) = \begin{cases} 1 & \text{if } \theta < \theta_0 \text{ (i.e. } q_0 = 0.5) \\ q_0 & \text{if } \theta \geq \theta_0 \text{ (i.e. } q_0 > 0.5). \end{cases}$$

In addition,

$$\Pr(a_i = 0|V = 0 \cap S = 0) = \begin{cases} 0 & \text{if } \theta < \theta_0 \text{ (i.e. } q_0 = 0.5) \\ q_0 & \text{if } \theta \geq \theta_0 \text{ (i.e. } q_0 > 0.5). \end{cases}$$

(ii) Second, assume that  $v > 2 - \frac{1}{\pi}$ . The above results imply that

$$\Pr(a_i = 1|V = 0 \cap S = 1) = \begin{cases} 0 & \text{if } \theta < \theta_0 \text{ (i.e. } q_0 = 0.5) \\ q_0 & \text{if } \theta \geq \theta_0 \text{ (i.e. } q_0 > 0.5). \end{cases}$$

In addition,

$$\Pr(a_i = 0|V = 0 \cap S = 0) = \begin{cases} 1 & \text{if } \theta < \theta_0 \text{ (i.e. } q_0 = 0.5) \\ q_0 & \text{if } \theta \geq \theta_0 \text{ (i.e. } q_0 > 0.5). \end{cases}$$

It is clear that in case (ii), that is, if  $v > 2 - \frac{1}{\pi}$ ,  $\Pr(a_i = 1|V = 0 \cap S = 1)$  increases in  $\theta \geq \underline{\theta}$ , and  $\Pr(a_i = 1|V = 1 \cap S = 1)$  increases in  $\theta$  for  $\theta \geq \theta_0$ . In particular, taken together with our results conditional on  $V = 1$ ,  $P_C$  and the average probability of an accurate assessment increases in  $\theta \geq \underline{\theta}$  (and  $P_M$  increases in  $\theta$  for  $\theta$  sufficiently high) for all  $\pi \geq 0.5$  provided that  $v > 2 - \frac{1}{\pi}$ . However, if  $v \leq 2 - \frac{1}{\pi}$  and  $q_0 = 0.5$  for  $\theta = \underline{\theta}$ , this is not clear. Therefore, we will show that there exists a  $\hat{\pi} > 0.5$  such that  $P_C$  and the average probability of an accurate assessment increases in  $\theta \geq \underline{\theta}$  for all  $\pi \in [0.5, \hat{\pi}]$ . We derive  $\hat{\pi}$  as follows. Let  $q_0^0(\underline{\theta})$  maximize  $q - C(q)/\underline{\theta}$ . That is,  $q_0^0(\underline{\theta})$  is given by  $C'(q_0^0(\underline{\theta})) = \underline{\theta}$ , and maximizes the utility of  $i$  with  $v = 0$  provided that  $\pi \leq q_0^0(\underline{\theta}) - \frac{C(q_0^0(\underline{\theta}))}{\underline{\theta}}$ . Next, set

$$\hat{\pi} = q_0^0(\underline{\theta}) - \frac{C(q_0^0(\underline{\theta}))}{\underline{\theta}}.$$

We will show that for every  $\pi \in [0.5, \hat{\pi}]$  and  $v \leq 2 - \frac{1}{\pi}$ . First, consider  $\pi < \hat{\pi}$  with  $v = 0$ . Given  $\pi < \hat{\pi}$ ,  $q_0^0(\underline{\theta})$  strictly dominates a choice of  $q_0 = 0.5$ . Hence, at the optimum  $q_0 > 0.5$  must hold for  $\pi \in [0.5, \hat{\pi}]$  and  $v = 0$ . Next, fix  $\pi \in [0.5, \hat{\pi})$  and consider  $v \in (0, 2 - \frac{1}{\pi}]$ . If  $q_0 > 0.5$  at the optimum, it maximizes

$$\pi(1-v)q_0 + (1-\pi)q_0 - \frac{C(q)}{\theta},$$

and must satisfy

$$\pi(1-v)q_0 + (1-\pi)q_0 - \frac{C(q_0)}{\theta} \geq \max\{\pi(1-v), (1-\pi)\} = \pi(1-v).$$

The latter equality follows because  $v < 2 - 1/\pi$  by hypothesis. Note that  $q_0^0(\underline{\theta})$  dominates

0.5 in the choice of  $q_0$ , i.e.,

$$\pi(1-v)q_0^0(\underline{\theta}) + (1-\pi)q_0^0(\underline{\theta}) - \frac{C(q_0^0(\underline{\theta}))}{\theta} > \pi(1-v),$$

since a decrease in  $\pi$  and increase in  $v$  from 0 to a positive level (weakly lower than  $2 - 1/\pi$ ) reduces  $\pi(1-v)$  on the right hand side by more than the reduction in  $\pi(1-v)q_0^0(\underline{\theta})$  on the left hand side. Hence, the level of  $q_0$  that solves  $C'(q_0) = \underline{\theta}(1-v)$  is optimal and satisfies  $q_0 > 0.5$ . Thus,  $P_C$  and the average probability of an accurate assessment increases in  $\theta \geq \underline{\theta}$  (and  $P_M$  increases in  $\theta$  for  $\theta$  sufficiently high) for all  $\pi \in [0.5, \hat{\pi}]$  and  $v \leq 2 - \frac{1}{\pi}$ . As discussed above already,  $P_C$  and the average probability of an accurate assessment increases in  $\theta \geq \underline{\theta}$  (and  $P_M$  increases in  $\theta$  for  $\theta$  sufficiently high) for all  $\pi \geq 0.5$  provided that  $v > 2 - \frac{1}{\pi}$ . Hence, we proved (i)-(iii).

Finally, we consider the relationship between the magnitude of motivated reasoning,  $P_M - P_C$  and  $\theta$ . Fixing  $\pi \in [0.5, \hat{\pi}]$  and  $v$ , there are two possibilities (by construction,  $q_0 > 0.5$  for all  $\theta$ ): (i)  $q_1 > 0.5$  for all  $\theta$ ; and (ii)  $q_1 = 0.5$  for  $\theta$  below some threshold  $\tilde{\theta} > \underline{\theta}$  and  $q_1 > 0.5$  otherwise. When  $q_0 > 0.5$  and  $q_1 > 0.5$  at some  $\theta$ ,  $P_M - P_C$  equals  $q_1 - q_0$ . In turn, the relationship between  $q_1 - q_0$  and  $\theta$  depends on the sign of  $\frac{dq_1}{d\theta} - \frac{dq_0}{d\theta} = \frac{1-(1-\pi)v}{C''(q_1)} - \frac{1-\pi v}{C''(q_0)}$ . For  $q_1 - q_0$  to be decreasing in  $\theta$ ,  $C'''$  must be strictly positive and sufficiently high.

## B Survey Design and Sample Characteristics

### B.1 Classification of the correct answers of the news quiz questions

Below, we explain our bias (i.e., “pro” or “anti”) classification of the correct answer of each news item reported in Table B1. Note that in many questions, the classification of the correct answer is relative to the false answer. ChatGPT’s bias classification of each answer is in line with our classification.

**Immigration** In immigration, the “pro” (“anti”) direction refers to positive (negative) views about the effect of immigrants on the labor market, economy, and society.

(1) According to the forecast of Pew Research Center, a typical Muslim woman in the EU has *one more child* than a non-Muslim woman in the EU. Thus, the correct assessment is “**pro**” relative to the other answer option (i.e., *3 more children*), since critics of Muslim immigration often argue that the fertility rate among Muslims is excessive.

(2) It is *true* that Muhammad was the most popular first name for newborn boys in several regions of England in 2020 according to the Office for National Statistics. The correct assessment is “**anti**” as it aligns with the claim that the Muslim fertility rate is excessive.

(3) It is *false* that the share of Muslim population in the UK is higher than 20%. Thus, the correct assessment is “**pro**” relative to the other answer option, which aligns with the claim that there is an excess of (Muslim) immigrants.

(4) *38%* of migrants (not *18%*) in the EU born outside the EU have a low level of education (at most 8-10 years of schooling). Thus, the correct assessment is “**anti**” as it aligns with the claim that many non-EU born immigrants are less educated, less skilled, and therefore less likely to socially and economically integrate.

**Climate change and environment** The “pro” (“anti”) bias direction refers to a concern (a lack of concern) for climate change and environmental degradation, as well as support for (opposition to) potentially costly measures to address them.

(1) According to recent research, average sea levels increased by about *8 cm* (not *18 cm*) between 1993 and 2019. We classify the correct assessment as “**anti**”, since it is less alarming than the false answer about the current effects of climate change.

(2) It is *true* that the melting of ancient Arctic ice may release radioactive materials and ancient microbes, and endanger human health according to studies published in prestigious scientific journals. The correct assessment is “**pro**” as it is alarming news about the potential consequences of climate change.

(3) A survey of top climate scientists in 2021 found that *82%* (not *58%*) of them expect

to see catastrophic changes in their lifetimes due to climate change. The correct answer is “**pro**” as it indicates a much greater concern about the effects of climate change.

(4) According to recent research, air pollution levels and premature deaths due to air pollution have *decreased considerably* in Europe since 1990. The correct answer is “**anti**” as it indicates a positive development regarding the state of the environment in Europe.

**Science** The “pro” (“anti”) bias direction aligns (conflicts) with the *mainstream* (in particular, the elite and expert) discourse on various topics in the intersection of public health and policy and scientific expertise. Importantly, the “anti” orientation does not equate anti-intellectualism or a wholesale rejection of science but may reflect a measured skepticism toward mainstream or establishment narratives, especially in the face of emerging or rapidly developing new technologies or societal shocks.

(1) The health effects of the high radio frequencies used in the latest mobile network technology (5G) *have not been adequately studied* according to the scientific report prepared for the European Parliament in 2021. The correct assessment is then “**anti**” both relative to the other answer option and because the roll-out of 5G is accompanied by the establishment narrative that public health and safety are a priority in policy making.

(2) It is *true* that a book by a leading scientist documents that scientists in the US deliberately infected more than 1,000 people (from stigmatized groups) with hepatitis between 1942 and 1972. We classify the correct assessment as “**anti**”, since it highlights a serious and large-scale ethical violation by scientists, and conflicts with the establishment narrative.

(3) It is *false* that 40% of surveyed physicians believe that a cure for various forms of cancer already exists but is withheld from the public to increase healthcare industry profits. The American Medical Association does not (and would arguably never) ask this question to physicians.<sup>55</sup> We classify the correct assessment as “**pro**”, since if it were true, it would imply substantial distrust towards the medical establishment from within.

(4) It is *false* that a substantial body of scientific evidence shows that water fluoridation (i.e., adding fluoride to tap water in controlled amounts) reduces cognitive ability. We classify the correct assessment as “**pro**”, since it aligns with the establishment narrative that public health and safety is a priority in policy design and implementation. Water fluoridation was already a source of conspiracy theories in the US in 1950s.

**Inequality and Poverty** The “anti” orientation aligns with the view that existing inequalities are too high, harmful, and should be addressed (e.g., by redistribution), whereas the “pro” orientation views inequality as a natural or necessary part of economic systems and

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<sup>55</sup>There are very few surveys that ask a similar or related question to the general US population. In the most recent one published by Oliver and Wood in *JAMA Internal Medicine* in 2014, 37% of people agreed that the FDA is intentionally suppressing natural cures for cancer because of drug company pressure.

dismisses or downplays its negative aspects, such as poverty (e.g., because “a rising tide lifts all boats”).

(1) The number of people in the world living in extreme poverty substantially *decreased* (rather than *increased*), suggesting a successful (global) economic system. Therefore, we classify the correct answer to the first question on inequality as “**pro**” rather than “anti”.

(2) As *half* (rather than *a quarter*) of the world population lives each day on less than what £7 can buy (in 2023 in the UK), suggesting a very high level of global poverty and global inequality, we classify the correct assessment to the second inequality question as “**anti**”.

Table B1: News Quiz by topic

Questions	Initial score	Updated score	Correct answer	Slant of correct answer
<b>Immigration</b>				
1) In 2017, a prestigious demographic research organisation made a forecast on the number of children for Muslim and non-Muslim women in the EU between 2015 and 2020. According to the forecast, a typical Muslim woman in the EU has: a. 1 more child b. 3 more children than a non-Muslim woman in the EU.	0.35	0.46	a	Pro
2) True or false? According to official statistics, Muhammad was the most popular first name for newborn boys in several regions of England in 2020.	0.44	0.53	True	Anti
3) True or false? According to the latest UK Census, the share of Muslim population in the UK is higher than 20%.	0.35	0.48	False	Pro
4) According to official statistics, a.38% b.18% of migrants in the EU born outside the EU have a low level of education (at most 8-10 years of schooling)	0.67	0.71	a	Anti
<b>Climate Change &amp; Environment</b>				
1) According to recent research published in a prestigious scientific journal, average sea levels increased by about a.18 cm b.8 cm between 1993 and 2019.	0.73	0.74	b	Anti
2) True or false? According to studies published in prestigious scientific journals, the melting of ancient Arctic ice may release radioactive materials and ancient microbes, and endanger human health.	0.63	0.69	True	Pro
3) A survey of top climate scientists in 2021 found that a.82% b.58% of them expect to see catastrophic changes in their lifetimes due to climate change	0.39	0.50	a	Pro
4) In Europe, since 1990, air pollution levels and premature deaths due to air pollution have a. decreased considerably b. remained stable	0.31	0.45	a	Anti
<b>Science (i.e., public health and policy and scientific expertise)</b>				
1) A scientific report prepared for the European Parliament in 2021 states that the health effects of the high radio frequencies used in the latest mobile network technology (5G) a.have been well studied and proven to be safe. b.have not been adequately studied.	0.54	0.59	b	Anti
2) True or false? A recent book by a leading scientist documents that scientists in the US deliberately infected more than 1,000 people with hepatitis (from stigmatized groups, such as conscientious objectors, prison inmates, the mentally ill, and developmentally disabled adults and children) between 1942 and 1972.	0.54	0.59	True	Anti
3) True or false? According to a recent survey by the American Medical Association, around 40% of physicians believe that a cure for various forms of cancer already exists but is withheld from the public to increase healthcare industry profits.	0.49	0.57	False	Pro
4) Factual Information: Many countries used water fluoridation (adding fluoride to tap water in controlled amounts) to prevent tooth decay. Question: Is the following statement true or false? A substantial body of scientific evidence shows that water fluoridation reduces cognitive ability	0.68	0.71	False	Pro
<b>Inequality &amp; Poverty</b>				
1) The World Bank defines “extreme poverty” as living each day on less than what £2.20 can buy in the UK. In the last 25 years, the number of people in the world living in extreme poverty substantially a. decreased b. increased	0.16	0.30	a	Pro
2) According to the World Bank, about a. a quarter b.a half of the world population lives each day on less than what £7 can buy in the UK.	0.60	0.67	b	Anti
<b>Neutral</b>				
1) True or false? There is overwhelming scientific evidence that a gluten-free diet is healthier for the average individual.	0.60	0.63	False	
2) True or false? The tallest person in recorded history is a man with a height of 2.84 m.	0.55	0.63	False	

## B.2 Participant classification

As can be seen in Table B3, the opinion survey questions are on a scale from 1–5, 1–6, or 1–7. When the scale is from 1–7, we set 4 as the neutral answer with a value of 0 in our participant classification. When the scale is from 1–5, we set 3 as the neutral response with a value of 0. Finally, when the scale is from 1–6, 3 and 4 are neutral responses and assigned a value of 0.

We recode participant answers that are not neutral, assigning them a value of -1 or 1 depending on their orientation. To give an example, in the topic of immigration, each self-report that is “pro” (“anti”) according to our description above is assigned a value of -1 (1). Let  $A_{ij} \in \{-1, 0, 1\}$  denote the orientation of respondent  $i$ ’s self-report in an opinion survey question  $j$  on immigration, with  $N$  as the total number of opinion survey questions on immigration. Recall that  $A_{ij} = 0$  for neutral answers; that is,  $A_{ij} = 0$  if  $i$ ’s self-report is 3 (3 or 4) [4] on a scale from 1–5 (1–6) [1–7]. Then, we classify  $i$  as “pro”, “anti”, or “neutral” in the topic of immigration, as follows:

$$C_i^{immigration} = \begin{cases} \text{anti} & \text{if } \sum_{j=1}^N A_{ij} > 0 \text{ and } A_{ij} \geq 0 \forall j \\ \text{pro} & \text{if } \sum_{j=1}^N A_{ij} < 0 \text{ and } A_{ij} \leq 0 \forall j \\ \text{neutral} & \text{otherwise.} \end{cases}$$

The classification in other topics is analogous. Our analysis in the main text is based on this classification. Table B2 shows the classification of respondents by topic. The categories “pro” and “anti” show the share of participants classified as “pro” and “anti” in each of the four topics, according to our definitions in each topic in Section B.1.

Table B2: Classification based on opinion survey self-reports

Classification	Immigration	Climate	Science	Inequality
Pro	25.8	49.0	38.3	16.3
Neutral	46.0	30.1	31.1	31.7
Anti	28.2	20.9	30.6	52.0
Total	100.0	100.0	100.0	100.0

Table B3: Opinion survey questions by topic

Topic	Statement	Scale
Climate/Environment	Protecting the environment should be given priority, even if it causes slower economic growth and some loss of jobs. vs Economic growth and creating jobs should be the top priority, even if the environment suffers to some extent. ( $A_{ij} = -1$ if 1-3 is chosen.)	1-7
Immigration	Immigrants take jobs away from the British. vs Immigrants do not take jobs away from the British. ( $A_{ij} = 1$ if 1-3 is chosen.)	1-7
Climate/Environment	I am very worried about climate change. vs I am not at all worried about climate change. ( $A_{ij} = -1$ if 1-3 is chosen.)	1-7
Immigration	UK's cultural life is enriched by migrants coming to live here from other countries. vs UK's cultural life is undermined by migrants coming to live here from other countries. ( $A_{ij} = -1$ if 1-3 is chosen.)	1-7
Inequality	The government should take measures to reduce differences in income levels. ( $A_{ij} = 1$ if 1-2 is chosen.)	1-5 (agree strongly-disagree strongly)
Climate/Environment	Many of the claims about environmental threats are exaggerated. ( $A_{ij} = 1$ if 1-2 is chosen.)	1-5 (agree strongly-disagree strongly)
Inequality	Large differences in people's incomes are acceptable to properly reward differences in talent and effort. ( $A_{ij} = -1$ if 1-2 is chosen.)	1-5 (agree strongly-disagree strongly)
Immigration	Immigrants make crime problems in the UK worse. ( $A_{ij} = 1$ if 1-2 is chosen.)	1-5 (agree strongly-disagree strongly)
Science/Conspiracy	A small secret group of people is responsible for making all major decisions in world politics. ( $A_{ij} = 1$ if 1-2 is chosen.)	1-5 (agree strongly-disagree strongly)
Immigration	Immigrants are generally good for the UK's economy. ( $A_{ij} = -1$ if 1-2 is chosen.)	1-5 (agree strongly-disagree strongly)
Inequality	The money and wealth in the UK should be more evenly distributed among people. ( $A_{ij} = 1$ if 1-2 is chosen.)	1-5 (agree strongly-disagree strongly)
Immigration	When jobs are scarce, employers should give priority to British people over immigrants. ( $A_{ij} = 1$ if 1-2 is chosen.)	1-5 (agree strongly-disagree strongly)
Science/Conspiracy	We can no longer trust scientists on controversial scientific and technological issues because they depend more and more on money from industry. ( $A_{ij} = 1$ if 1-2 is chosen.)	1-5 (agree strongly-disagree strongly)
Science/Conspiracy	Viruses have been produced in government laboratories to control our freedom. ( $A_{ij} = -1$ if 1-2 is chosen.)	1-6 (very unlikely-very likely)
Climate/Environment	Climate change is for the most part caused by natural cycles rather than human activities. ( $A_{ij} = -1$ if 1-2 is chosen.)	1-6 (very unlikely-very likely)

### B.3 Sample Characteristics

Below, we present summary statistics from our study (in the column “Sample”) alongside statistics in the general population (in the column “Population”) in each country. Data sources are as follows: Statistics Austria and Eurostat for Austria, German Federal Statistical Office and Eurostat for Germany, and Office of National Statistics for the UK.

Table B4: Comparison of the Sample and Population Characteristics by Country

<b>Category</b>	<b>Sample</b>	<b>Population</b>	<b>Difference</b>
<b>Austria</b>			
Male	49.8	50	0.2
Female	50.2	50	-0.2
18-29	19	19.2	0.2
30-39	18.7	18.6	-0.1
40-49	17.7	17.9	0.2
50-59	20.5	20.4	-0.1
60-75	24.1	23.9	-0.2
With Matura	33.4	33.5	0.1
Tertiary education	15.6	16.6	1.0
Employed	73.4	74.0	0.6
Unemployed	3.5	4.8	-1.3
Vienna	22.2	21.6	-0.6
Niederösterreich	18.6	17.5	-1.1
Oberösterreich	16.6	15.5	-1.1
Kärnten	6.2	7.5	1.3
Steiermark	13.9	14.2	0.3
Tirol	8.5	8.8	0.3
Salzburg	6.2	6.2	0.0
Burgenland	3.3	3.8	0.5
Vorarlberg	4.4	4.9	0.5
<b>Germany</b>			
Male	50.2	50	-0.2
Female	49.8	50	0.2

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**Table B4 – continued from the previous page**

<b>Category</b>	<b>Sample</b>	<b>Population</b>	<b>Difference</b>
18-29	18.1	16.2	-1.9
30-39	17.9	18.1	0.2
40-49	16.4	17.8	1.4
50-59	21.6	22.2	0.6
60-75	25.9	25.9	0.0
With Abitur	27.0	30.0	3.0
Tertiary education	19.2	20.2	1.0
Employed	73.3	76.8	-3.5
Unemployed	4.7	3.1	1.6
Baden-Württemberg	13.4	11.6	-1.8
Bayern	16.0	16.1	0.1
Berlin	4.5	5.5	1.0
Brandenburg	3.0	3.6	0.6
Bremen	0.8	0.6	-0.2
Hamburg	2.3	2.3	0.0
Hessen	7.6	8.5	0.9
Mecklenburg-Vorpommern	1.9	2.0	0.1
Niedersachsen	9.6	8.9	-0.7
Nordrhein-Westfalen	21.5	20.7	-0.8
Rheinland-Pfalz	5.0	4.4	-0.6
Saarland	1.2	1.4	0.2
Sachsen	4.7	5.4	0.7
Sachsen-Anhalt	2.6	3.0	0.4
Schleswig-Holstein	3.5	3.4	-0.1
Thüringen	2.5	2.6	0.1
<b>United Kingdom</b>			
Male	49.0	47.5	-1.5
Female	51.0	52.5	1.5
18-29	20.8	17.9	-2.9
30-39	19.1	19.4	0.3
40-49	17.7	18.7	1.0
50-59	19.2	19.3	0.1

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**Table B4 – continued from the previous page**

<b>Category</b>	<b>Sample</b>	<b>Population</b>	<b>Difference</b>
60-75	23.2	24.7	1.5
College or university degree	34.8	38.6	3.8
Employed	70.5	74.9	-4.4
Unemployed	7.5	3.8	3.7
North East	4.4	5.2	0.8
North West	12.4	12.4	0.0
Yorkshire and The Humber	9.2	9.5	0.3
East Midlands	8.2	7.2	-1.0
West Midlands	10.0	7.8	-2.2
East of England	10.6	7.5	-3.1
London	14.8	16.7	1.9
South East	15.6	12.7	-2.9
South West	9.6	9.0	-0.6
Wales	5.2	4.7	-0.5
Scotland	8.1	5.6	-2.5
Northern Ireland	2.8	1.8	-1.0

## **C Data Appendix**

### **C.1 Additional Analysis for Hypothesis 1**

Table C1: Effect of cognitive ability on the news quiz score (all coefficients)

	IQ			Education			IQ & Education
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
IQ score	0.012*** (0.001)	0.012*** (0.001)	0.012*** (0.001)				0.011*** (0.001)
education				0.023*** (0.002)	0.026*** (0.003)	0.024*** (0.003)	0.018*** (0.003)
media use			0.002 (0.003)			0.010*** (0.003)	0.003 (0.003)
trust			0.001 (0.001)			0.001 (0.001)	0.000 (0.001)
age			0.001*** (0.000)			0.001** (0.000)	0.001*** (0.000)
female			-0.027*** (0.005)			-0.034*** (0.005)	-0.030*** (0.005)
diverse gender			-0.004 (0.029)			-0.004 (0.034)	-0.001 (0.029)
high income			0.029*** (0.006)			0.025*** (0.006)	0.021*** (0.006)
unreported income			0.007 (0.007)			0.005 (0.007)	0.005 (0.007)
part-time			-0.006 (0.007)			-0.004 (0.008)	-0.003 (0.007)
self-employed			0.022** (0.010)			0.023** (0.011)	0.021** (0.010)
unemployed			0.001 (0.010)			0.007 (0.010)	0.006 (0.010)
student			0.000 (0.013)			0.010 (0.013)	0.005 (0.013)
not working			0.001 (0.009)			0.013 (0.009)	0.010 (0.009)
retired			-0.007 (0.008)			-0.008 (0.008)	-0.004 (0.008)
Germany		0.017*** (0.006)	0.015*** (0.006)		0.019*** (0.006)	0.016*** (0.006)	0.019*** (0.006)
UK		-0.002 (0.006)	-0.007 (0.007)		-0.019*** (0.007)	-0.024*** (0.007)	-0.011 (0.007)
foreign-born			-0.011 (0.013)			-0.013 (0.013)	-0.012 (0.012)
mother fb			-0.019* (0.011)			-0.018* (0.011)	-0.023** (0.010)
father fb			0.008 (0.009)			0.003 (0.009)	0.007 (0.009)
median div			0.007*** (0.001)			0.006*** (0.002)	0.006*** (0.001)
extremist vote			-0.018*** (0.007)			-0.025*** (0.007)	-0.017** (0.007)
Observations	3227	3227	3227	3227	3227	3227	3227
Controls	no	no	yes	no	no	yes	yes
Month FE	no	yes	yes	no	yes	yes	yes
Country FE	no	yes	yes	no	yes	yes	yes

*Notes:* This table reports estimates of OLS regressions where the dependent variable is the news quiz score. IQ score varies from 0 to 12. Educational attainment varies from 1 to 5. The omitted categories for gender, income, employment status, and country are male, low-income, full-time employee, and Austria, respectively. Respondents were allowed not to report income (denoted by “unreported income”). The variable “mother fb” (“father fb”) refers to having a foreign born mother (father). The variable “extremist vote” refers to voting for an extremist party, “trust” to institutional trust, and “median div” to divergence from the median position on the left-right scale (see Footnote 35 in the main text for the explanations of these variables). Robust standard errors are in parentheses. \*\*\*, \*\* and \* indicate significance at the 1%, 5% and 10% level, respectively.

Table C2: Effect of cognitive ability on the news quiz score in science (all coefficients)

	IQ			Education			IQ & Education
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
IQ score	0.005*** (0.001)	0.005*** (0.001)	0.007*** (0.002)				0.006*** (0.002)
education				0.001 (0.004)	0.004 (0.005)	0.012** (0.005)	0.008* (0.005)
media use			0.007 (0.006)			0.011* (0.006)	0.008 (0.006)
trust			0.000 (0.002)			-0.001 (0.002)	-0.001 (0.002)
age			0.002*** (0.000)			0.002*** (0.000)	0.002*** (0.000)
female			0.007 (0.008)			0.003 (0.008)	0.005 (0.008)
diverse gender			0.144*** (0.054)			0.144*** (0.055)	0.146*** (0.055)
high income			-0.007 (0.010)			-0.008 (0.010)	-0.010 (0.010)
unreported income			-0.005 (0.012)			-0.006 (0.012)	-0.006 (0.012)
part-time			0.018 (0.014)			0.019 (0.014)	0.020 (0.014)
self-employed			0.050*** (0.018)			0.051*** (0.019)	0.050*** (0.018)
unemployed			-0.003 (0.020)			0.000 (0.020)	-0.001 (0.020)
student			-0.009 (0.025)			-0.004 (0.025)	-0.007 (0.025)
not working			0.008 (0.016)			0.014 (0.017)	0.012 (0.017)
retired			0.008 (0.014)			0.008 (0.014)	0.009 (0.014)
Germany		0.012 (0.010)	0.002 (0.010)		0.011 (0.010)	0.002 (0.010)	0.004 (0.010)
UK		-0.020* (0.012)	-0.032** (0.013)		-0.026** (0.012)	-0.041*** (0.013)	-0.034*** (0.013)
foreign-born			-0.049** (0.024)			-0.050** (0.024)	-0.049** (0.024)
mother fb			0.006 (0.021)			0.006 (0.020)	0.004 (0.021)
father fb			0.015 (0.017)			0.012 (0.017)	0.014 (0.017)
median dev			0.000 (0.003)			0.000 (0.003)	0.000 (0.003)
extremist vote			0.002 (0.013)			-0.002 (0.013)	0.003 (0.013)
Observations	3227	3227	3227	3227	3227	3227	3227
Controls	no	no	yes	no	no	yes	yes
Month FE	no	yes	yes	no	yes	yes	yes
Country FE	no	yes	yes	no	yes	yes	yes

*Notes:* This table reports estimates of OLS regressions where the dependent variable is the news quiz score in science. IQ score varies from 0 to 12. Educational attainment varies from 1 to 5. The omitted categories for gender, income, employment status, and country are male, low-income, full-time employee, and Austria, respectively. Respondents were allowed not to report income (denoted by “unreported income”). The variable “mother fb” (“father fb”) refers to having a foreign born mother (father). The variable “extremist vote” refers to voting for an extremist party, “trust” to institutional trust, and “median div” to divergence from the median position on the left-right scale (see Footnote 35 in the main text for the explanations of these variables). Robust standard errors are in parentheses. \*\*\*, \*\* and \* indicate significance at the 1%, 5% and 10% level, respectively.

Table C3: Effect of cognitive ability on news quiz score in immigration (all coefficients)

	IQ			Education			IQ & Education
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
IQ score	0.016*** (0.001)	0.017*** (0.001)	0.016*** (0.001)				0.015*** (0.001)
education				0.031*** (0.004)	0.027*** (0.005)	0.024*** (0.005)	0.015*** (0.005)
media use			-0.002 (0.006)			0.009 (0.006)	-0.001 (0.006)
trust			0.002 (0.002)			0.003 (0.002)	0.002 (0.002)
age			0.000 (0.000)			0.000 (0.000)	0.000 (0.000)
female			-0.063*** (0.008)			-0.070*** (0.008)	-0.065*** (0.008)
diverse gender			-0.102* (0.055)			-0.104* (0.055)	-0.100* (0.054)
high income			0.027*** (0.010)			0.026** (0.010)	0.021** (0.010)
unreported income			-0.001 (0.012)			-0.002 (0.012)	-0.003 (0.012)
part-time			0.002 (0.014)			0.003 (0.014)	0.005 (0.014)
self-employed			0.029 (0.018)			0.031* (0.019)	0.029 (0.018)
unemployed			0.020 (0.019)			0.025 (0.019)	0.024 (0.019)
student			0.019 (0.025)			0.031 (0.025)	0.023 (0.025)
not working			0.016 (0.016)			0.027 (0.017)	0.024 (0.016)
retired			0.004 (0.014)			0.001 (0.014)	0.006 (0.013)
Germany		0.010 (0.010)	0.008 (0.010)		0.010 (0.010)	0.007 (0.010)	0.012 (0.010)
UK		0.074*** (0.012)	0.067*** (0.012)		0.051*** (0.012)	0.045*** (0.013)	0.064*** (0.012)
foreign-born			0.023 (0.025)			0.020 (0.025)	0.021 (0.024)
mother fb			-0.035 (0.021)			-0.032 (0.021)	-0.038* (0.021)
father fb			0.011 (0.018)			0.006 (0.018)	0.011 (0.018)
median dev			0.011*** (0.003)			0.010*** (0.003)	0.010*** (0.003)
extremist vote			-0.023* (0.012)			-0.033*** (0.013)	-0.022* (0.012)
Observations	3227	3227	3227	3227	3227	3227	3227
Controls	no	no	yes	no	no	yes	yes
Month FE	no	yes	yes	no	yes	yes	yes
Country FE	no	yes	yes	no	yes	yes	yes

*Notes:* This table reports estimates of OLS regressions where the dependent variable is the news quiz score in immigration. IQ score varies from 0 to 12. Educational attainment varies from 1 to 5. The omitted categories for gender, income, employment status, and country are male, low-income, full-time employee, and Austria, respectively. Respondents were allowed not to report income (denoted by “unreported income”). The variable “mother fb” (“father fb”) refers to having a foreign born mother (father). The variable “extremist vote” refers to voting for an extremist party, “trust” to institutional trust, and “median div” to divergence from the median position on the left-right scale (see Footnote 35 in the main text for the explanations of these variables). Robust standard errors are in parentheses. \*\*\*, \*\* and \* indicate significance at the 1%, 5% and 10% level, respectively.

Table C4: Effect of cognitive ability on news quiz score in climate change (all coefficients)

	IQ			Education			IQ & Education
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
IQ score	0.016*** (0.001)	0.015*** (0.002)	0.013*** (0.002)				0.011*** (0.002)
education				0.037*** (0.004)	0.041*** (0.005)	0.030*** (0.005)	0.024*** (0.005)
media use			-0.003 (0.006)			0.005 (0.006)	-0.001 (0.006)
trust			0.001 (0.002)			0.001 (0.002)	0.000 (0.002)
age			0.000 (0.000)			-0.001 (0.000)	0.000 (0.000)
female			-0.020** (0.009)			-0.027*** (0.009)	-0.024*** (0.008)
diverse gender			0.041 (0.073)			0.042 (0.080)	0.045 (0.075)
high income			0.057*** (0.010)			0.051*** (0.010)	0.047*** (0.010)
unreported income			0.015 (0.013)			0.013 (0.013)	0.012 (0.013)
part-time			-0.038*** (0.014)			-0.035** (0.014)	-0.034** (0.014)
self-employed			-0.007 (0.020)			-0.006 (0.021)	-0.007 (0.020)
unemployed			-0.008 (0.021)			-0.001 (0.021)	-0.002 (0.021)
student			0.018 (0.023)			0.030 (0.023)	0.024 (0.023)
not working			-0.024 (0.017)			-0.010 (0.017)	-0.013 (0.017)
retired			-0.031** (0.014)			-0.031** (0.014)	-0.028** (0.014)
Germany		0.028*** (0.010)	0.034*** (0.010)		0.033*** (0.010)	0.036*** (0.011)	0.039*** (0.010)
UK		0.005 (0.012)	0.010 (0.013)		-0.016 (0.012)	-0.009 (0.012)	0.005 (0.013)
foreign-born			-0.005 (0.022)			-0.008 (0.022)	-0.007 (0.022)
mother fb			-0.037** (0.017)			-0.037** (0.017)	-0.041** (0.017)
father fb			0.017 (0.017)			0.012 (0.016)	0.016 (0.016)
median dev			0.012*** (0.003)			0.011*** (0.003)	0.011*** (0.003)
extremist vote			-0.030** (0.014)			-0.037*** (0.014)	-0.029** (0.014)
Observations	3227	3227	3227	3227	3227	3227	3227
Controls	no	no	yes	no	no	yes	yes
Month FE	no	yes	yes	no	yes	yes	yes
Country FE	no	yes	yes	no	yes	yes	yes

*Notes:* This table reports estimates of OLS regressions where the dependent variable is the news quiz score in climate change. IQ score varies from 0 to 12. Educational attainment varies from 1 to 5. The omitted categories for gender, income, employment status, and country are male, low-income, full-time employee, and Austria, respectively. Respondents were allowed not to report income (denoted by “unreported income”). The variable “mother fb” (“father fb”) refers to having a foreign born mother (father). The variable “extremist vote” refers to voting for an extremist party, “trust” to institutional trust, and “median div” to divergence from the median position on the left-right scale (see Footnote 35 in the main text for the explanations of these variables). Robust standard errors are in parentheses. \*\*\*, \*\* and \* indicate significance at the 1%, 5% and 10% level, respectively.

Table C5: Effect of cognitive ability on news quiz score in inequality (all coefficients)

	IQ			Education			IQ & Education
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
IQ score	0.016*** (0.002)	0.015*** (0.002)	0.014*** (0.002)				0.013*** (0.002)
education				0.036*** (0.006)	0.039*** (0.006)	0.035*** (0.006)	0.028*** (0.007)
media use			0.005 (0.008)			0.015* (0.008)	0.008 (0.008)
trust			0.007** (0.003)			0.006* (0.003)	0.005* (0.003)
age			0.000 (0.001)			-0.001 (0.001)	0.000 (0.001)
female			-0.048*** (0.011)			-0.057*** (0.011)	-0.053*** (0.011)
diverse gender			-0.019 (0.095)			-0.018 (0.099)	-0.015 (0.095)
high income			0.019 (0.013)			0.012 (0.013)	0.008 (0.013)
unreported income			-0.011 (0.015)			-0.013 (0.015)	-0.014 (0.015)
part-time			0.016 (0.017)			0.020 (0.018)	0.022 (0.017)
self-employed			0.038 (0.024)			0.039* (0.024)	0.037 (0.023)
unemployed			0.009 (0.025)			0.018 (0.025)	0.017 (0.025)
student			-0.020 (0.032)			-0.007 (0.032)	-0.013 (0.032)
not working			-0.029 (0.022)			-0.013 (0.022)	-0.016 (0.022)
retired			0.004 (0.018)			0.004 (0.018)	0.008 (0.018)
Germany		0.001 (0.013)	-0.002 (0.013)		0.006 (0.013)	0.001 (0.013)	0.005 (0.013)
UK		-0.021 (0.015)	-0.022 (0.016)		-0.042*** (0.015)	-0.042*** (0.016)	-0.027* (0.016)
foreign-born			0.019 (0.030)			0.016 (0.030)	0.017 (0.030)
mother fb			-0.031 (0.024)			-0.031 (0.024)	-0.035 (0.024)
father fb			0.001 (0.023)			-0.004 (0.023)	0.000 (0.023)
median dev			0.006 (0.004)			0.004 (0.004)	0.004 (0.003)
extremist vote			-0.004 (0.017)			-0.012 (0.017)	-0.003 (0.017)
Observations	3227	3227	3227	3227	3227	3227	3227
Controls	no	no	yes	no	no	yes	yes
Month FE	no	yes	yes	no	yes	yes	yes
Country FE	no	yes	yes	no	yes	yes	yes

*Notes:* This table reports estimates of OLS regressions where the dependent variable is the news quiz score in inequality. IQ score varies from 0 to 12. Educational attainment varies from 1 to 5. The omitted categories for gender, income, employment status, and country are male, low-income, full-time employee, and Austria, respectively. Respondents were allowed not to report income (denoted by “unreported income”). The variable “mother fb” (“father fb”) refers to having a foreign born mother (father). The variable “extremist vote” refers to voting for an extremist party, “trust” to institutional trust, and “median div” to divergence from the median position on the left-right scale (see Footnote 35 in the main text for the explanations of these variables). Robust standard errors are in parentheses. \*\*\*, \*\* and \* indicate significance at the 1%, 5% and 10% level, respectively.

Table C6: Effect of cognitive ability on news quiz score in neutral questions (all coefficients)

	IQ			Education			IQ & Education
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
IQ score	0.011*** (0.002)	0.009*** (0.002)	0.010*** (0.002)				0.009*** (0.002)
education				0.008 (0.007)	0.022*** (0.007)	0.028*** (0.007)	0.023*** (0.007)
media use			0.005 (0.009)			0.013 (0.009)	0.007 (0.009)
trust			-0.006* (0.004)			-0.007* (0.004)	-0.007** (0.004)
age			0.003*** (0.001)			0.002*** (0.001)	0.003*** (0.001)
female			-0.018 (0.013)			-0.024* (0.013)	-0.022* (0.013)
diverse gender			-0.180*** (0.069)			-0.179*** (0.065)	-0.176*** (0.064)
high income			0.055*** (0.015)			0.049*** (0.015)	0.046*** (0.015)
unreported income			0.049*** (0.019)			0.047** (0.019)	0.046** (0.019)
part-time			-0.030 (0.021)			-0.027 (0.021)	-0.026 (0.021)
self-employed			-0.009 (0.029)			-0.009 (0.029)	-0.010 (0.029)
unemployed			-0.018 (0.032)			-0.011 (0.032)	-0.012 (0.032)
student			-0.034 (0.037)			-0.024 (0.037)	-0.028 (0.037)
not working			0.040 (0.026)			0.052** (0.026)	0.050* (0.026)
retired			-0.022 (0.021)			-0.021 (0.021)	-0.018 (0.021)
Germany		0.036** (0.015)	0.034** (0.016)		0.039** (0.015)	0.036** (0.016)	0.039** (0.016)
UK		-0.113*** (0.018)	-0.127*** (0.019)		-0.126*** (0.018)	-0.142*** (0.019)	-0.131*** (0.019)
foreign-born			-0.040 (0.034)			-0.043 (0.034)	-0.042 (0.034)
mother fb			0.008 (0.027)			0.007 (0.027)	0.004 (0.027)
father fb			-0.027 (0.025)			-0.031 (0.025)	-0.028 (0.025)
median dev			0.001 (0.004)			0.000 (0.004)	0.000 (0.004)
extremist vote			-0.036* (0.021)			-0.041** (0.021)	-0.035* (0.021)
Observations	3227	3227	3227	3227	3227	3227	3227
Controls	no	no	yes	no	no	yes	yes
Month FE	no	yes	yes	no	yes	yes	yes
Country FE	no	yes	yes	no	yes	yes	yes

*Notes:* This table reports estimates of OLS regressions where the dependent variable is the news quiz score in neutral questions. IQ score varies from 0 to 12. Educational attainment varies from 1 to 5. The omitted categories for gender, income, employment status, and country are male, low-income, full-time employee, and Austria, respectively. Respondents were allowed not to report income (denoted by “unreported income”). The variable “mother fb” (“father fb”) refers to having a foreign born mother (father). The variable “extremist vote” refers to voting for an extremist party, “trust” to institutional trust, and “median div” to divergence from the median position on the left-right scale (see Footnote 35 in the main text for the explanations of these variables). Robust standard errors are in parentheses. \*\*\*, \*\* and \* indicate significance at the 1%, 5% and 10% level, respectively.

Table C7: Heterogeneous effects of cognitive ability by news topic

	IQ			Education			IQ & Education
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
IQ score	0.005*** (0.002)	0.004*** (0.001)	0.004*** (0.001)				0.004*** (0.001)
Education				0.001 (0.005)	0.005 (0.005)	0.004 (0.005)	0.002 (0.005)
Clim × IQ score	0.011*** (0.002)	0.011*** (0.002)	0.011*** (0.002)				0.009*** (0.002)
Immi × IQ score	0.011*** (0.002)	0.011*** (0.002)	0.011*** (0.002)				0.010*** (0.002)
Ineq × IQ score	0.011*** (0.002)	0.011*** (0.002)	0.011*** (0.002)				0.009*** (0.002)
Clim × Education				0.036*** (0.007)	0.036*** (0.006)	0.036*** (0.006)	0.030*** (0.006)
Immi × Education				0.029*** (0.007)	0.029*** (0.006)	0.029*** (0.006)	0.024*** (0.006)
Ineq × Education				0.035*** (0.007)	0.035*** (0.007)	0.035*** (0.007)	0.030*** (0.008)
Observations	3227	3227	3227	3227	3227	3227	3227
Controls	no	no	yes	no	no	yes	yes
Month FE	no	yes	yes	no	yes	yes	yes
Country FE	no	yes	yes	no	yes	yes	yes

*Notes:* This table reports the results of random effects regressions in which the dependent variable is the news quiz score by topic for each participant. The baseline quiz score is the score in science. In the interaction terms, “Immi” refers to the immigration theme, “Clim” to climate change, and “Ineq” to inequality. IQ score varies from 0 to 12. Educational attainment varies from 1 to 5. See the notes to Table 1 for the full list of control variables. Robust standard errors are in parentheses. \*\*\*, \*\* and \* indicate significance at the 1%, 5% and 10% level, respectively.

## C.2 Additional Analysis for Hypotheses 2 and Research Questions 1 & 2

Here, we reproduce Table 3 with coefficients omitted in the main text. We also present tables referred to in the main text in Section 5.3.

Table C8: Effect of cognitive ability on counter-motivated quiz score (all coefficients)

	IQ			Education			IQ & Education
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
IQ score	0.013*** (0.002)	0.013*** (0.002)	0.012*** (0.002)				0.011*** (0.002)
education				0.030*** (0.005)	0.030*** (0.005)	0.022*** (0.006)	0.016*** (0.006)
media use			0.014* (0.007)			0.006 (0.007)	0.012* (0.007)
trust			-0.008*** (0.003)			-0.008*** (0.003)	-0.007** (0.003)
age			-0.001 (0.000)			0.000 (0.000)	-0.001 (0.000)
female			0.033*** (0.010)			0.038*** (0.010)	0.035*** (0.010)
diverse gender			-0.022 (0.090)			-0.026 (0.089)	-0.026 (0.091)
high-income			-0.033*** (0.012)			-0.031*** (0.012)	-0.027** (0.012)
unreported income			-0.009 (0.014)			-0.007 (0.014)	-0.007 (0.014)
part-time			-0.006 (0.015)			-0.008 (0.015)	-0.009 (0.015)
self-employed			-0.017 (0.022)			-0.017 (0.022)	-0.016 (0.022)
unemployed			-0.005 (0.024)			-0.008 (0.024)	-0.008 (0.024)
student			-0.048* (0.027)			-0.057** (0.027)	-0.052* (0.028)
not working			0.012 (0.017)			0.003 (0.017)	0.005 (0.017)
retired			0.003 (0.016)			0.004 (0.016)	0.001 (0.016)
Germany		-0.006 (0.011)	-0.006 (0.012)		-0.009 (0.011)	-0.006 (0.012)	-0.010 (0.012)
UK		-0.016 (0.013)	-0.013 (0.014)		0.001 (0.013)	0.003 (0.014)	-0.010 (0.014)
foreign-born			0.035 (0.026)			0.036 (0.026)	0.035 (0.026)
mother fb			0.008 (0.022)			0.008 (0.022)	0.011 (0.022)
father fb			-0.038* (0.020)			-0.034* (0.020)	-0.037* (0.020)
median dev			-0.005 (0.003)			-0.004 (0.003)	-0.004 (0.003)
extremist vote			0.038*** (0.014)			0.045*** (0.014)	0.038*** (0.014)
Observations	3112	3112	3112	3112	3112	3112	3112
Controls	no	no	yes	no	no	yes	yes
Month FE	no	yes	yes	no	yes	yes	yes
Country FE	no	yes	yes	no	yes	yes	yes

*Notes:* This table reports estimates of OLS regressions where the dependent variable is the counter-motivated news quiz score. IQ score varies from 0 to 12. Educational attainment varies from 1 to 5. The omitted categories for gender, income, employment status, and country are male, low-income, full-time employee, and Austria, respectively. Respondents were allowed not to report income (denoted by “unreported income”). The variable “mother fb” (“father fb”) refers to having a foreign born mother (father). The variable “extremist vote” refers to voting for an extremist party, “trust” to institutional trust, and “median div” to divergence from the median position on the left-right scale (see Footnote 35 in the main text for the explanations of these variables). Robust standard errors are in parentheses. \*\*\*, \*\* and \* indicate significance at the 1%, 5% and 10% level, respectively.

Table C9: Effect of cognitive ability on motivated quiz score (all coefficients)

	IQ			Education			IQ & Education
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
IQ score	0.012*** (0.002)	0.012*** (0.002)	0.013*** (0.002)				0.012*** (0.002)
education				0.017*** (0.005)	0.019*** (0.005)	0.024*** (0.005)	0.017*** (0.005)
media use			0.013* (0.007)			0.021*** (0.007)	0.014** (0.007)
trust			-0.005* (0.003)			-0.005* (0.003)	-0.006** (0.003)
age			0.001 (0.000)			0.000 (0.000)	0.001* (0.000)
female			-0.025** (0.010)			-0.031*** (0.010)	-0.027*** (0.010)
diverse gender			0.001 (0.064)			0.005 (0.074)	0.004 (0.065)
high-income			0.008 (0.011)			0.005 (0.011)	0.001 (0.011)
unreported income			-0.001 (0.014)			-0.003 (0.014)	-0.003 (0.014)
part-time			-0.012 (0.015)			-0.010 (0.015)	-0.009 (0.015)
self-employed			0.061*** (0.021)			0.062*** (0.021)	0.061*** (0.021)
unemployed			-0.004 (0.024)			0.000 (0.023)	0.000 (0.023)
student			-0.038 (0.026)			-0.028 (0.027)	-0.033 (0.026)
not working			0.006 (0.018)			0.017 (0.019)	0.014 (0.019)
retired			-0.007 (0.016)			-0.008 (0.016)	-0.004 (0.016)
Germany		0.016 (0.011)	0.012 (0.012)		0.016 (0.012)	0.012 (0.012)	0.016 (0.012)
UK		-0.003 (0.013)	-0.008 (0.014)		-0.019 (0.013)	-0.025* (0.014)	-0.011 (0.014)
foreign-born			0.008 (0.027)			0.006 (0.027)	0.007 (0.026)
mother fb			-0.053** (0.023)			-0.053** (0.023)	-0.056** (0.023)
father fb			0.031 (0.021)			0.026 (0.021)	0.029 (0.021)
median dev			0.007** (0.003)			0.006** (0.003)	0.007** (0.003)
extremist vote			0.017 (0.015)			0.009 (0.015)	0.017 (0.015)
Observations	3112	3112	3112	3112	3112	3112	3112
Controls	no	no	yes	no	no	yes	yes
Month FE	no	yes	yes	no	yes	yes	yes
Country FE	no	yes	yes	no	yes	yes	yes

*Notes:* This table reports estimates of OLS regressions where the dependent variable is the motivated news quiz score. IQ score varies from 0 to 12. Educational attainment varies from 1 to 5. The omitted categories for gender, income, employment status, and country are male, low-income, full-time employee, and Austria, respectively. Respondents were allowed not to report income (denoted by “unreported income”). The variable “mother fb” (“father fb”) refers to having a foreign born mother (father). The variable “extremist vote” refers to voting for an extremist party, “trust” to institutional trust, and “median div” to divergence from the median position on the left-right scale (see Footnote 35 in the main text for the explanations of these variables). Robust standard errors are in parentheses. \*\*\*, \*\* and \* indicate significance at the 1%, 5% and 10% level, respectively.

Table C10: Joint effect of cognitive ability and motivated reasoning by topic

	Science	Climate Change	Immigration	Inequality
Motivated	0.232*** (0.011)	0.090*** (0.010)	0.215*** (0.013)	0.289*** (0.016)
IQ score	0.007*** (0.002)	0.013*** (0.002)	0.018*** (0.002)	0.013*** (0.002)
Education	0.008 (0.006)	0.024*** (0.006)	0.020*** (0.006)	0.029*** (0.008)
Observations	4444	4510	3482	4406
Controls	yes	yes	yes	yes
Month FE	yes	yes	yes	yes
Country FE	yes	yes	yes	yes

*Notes:* Table reports the results of random effects regressions of the news quiz score in each topic with the full set of controls and fixed effects. Motivated is a dummy variable, which equals 1 (0) if the score refers to the motivated (counter-motivated) score in the respective topic. Robust standard errors clustered by respondent are in parentheses. \*\*\*, \*\* and \* indicate significance at the 1%, 5% and 10% level, respectively.

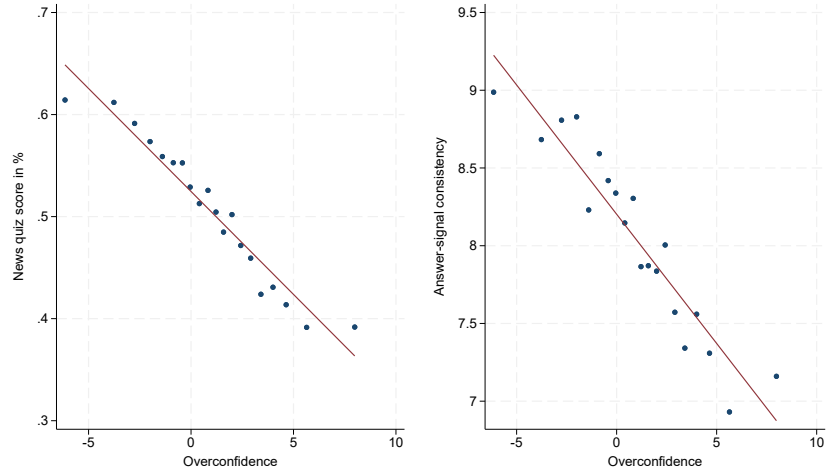
Table C11: Joint effect of cognitive ability and motivated reasoning in science (with interaction terms)

	(1)	(2)	(3)
Motivated	0.114*** (0.038)	0.114*** (0.038)	0.114*** (0.039)
IQ score	0.002 (0.003)	0.002 (0.003)	0.003 (0.003)
Education	-0.016* (0.008)	-0.014* (0.008)	-0.006 (0.009)
Motivated $\times$ IQ score	0.007* (0.004)	0.007* (0.004)	0.007* (0.004)
Motivated $\times$ Education	0.028** (0.012)	0.028** (0.012)	0.028** (0.012)
Observations	4444	4444	4444
Controls	no	no	yes
Month FE	no	yes	yes
Country FE	yes	yes	yes

*Notes:* This table reports the results of random effects regressions of the (motivated or countermotivated) news quiz score in science. Motivated is a dummy variable, which equals 1 (0) if the score refers to the motivated (countermotivated) score. Robust standard errors clustered by respondent are in parentheses. \*\*\*, \*\* and \* indicate significance at the 1%, 5% and 10% level, respectively.

### C.3 Additional Analysis for Section 5.3

Figure C1: Overconfidence, News quiz score, and Answer-report Consistency



*Notes:* The left and the right panels show how the overconfidence measure relates to the news quiz score and answer-report consistency, respectively. The included controls are the same as in Column 3 of Table 6 except for the omission of the news quiz score and answer-report consistency from controls (they are the dependent variables in this analysis).

## C.4 Additional Analysis for Section 5.4

Table C12: Joint effect of cognitive ability and motivated updating on decisions

	Panel A				Panel B			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Motivated	0.036*** (0.008)	0.036*** (0.008)	0.036*** (0.008)	0.036*** (0.008)	0.027 (0.027)	0.027 (0.027)	0.027 (0.027)	0.027 (0.027)
IQ score		0.011*** (0.003)	0.011*** (0.003)	0.012*** (0.003)	0.005* (0.003)	0.008*** (0.003)	0.009*** (0.003)	0.009*** (0.003)
Education		-0.007 (0.008)	-0.007 (0.008)	-0.007 (0.008)	0.009 (0.009)	-0.004 (0.009)	-0.004 (0.009)	-0.004 (0.009)
Motivated × IQ score					0.005* (0.003)	0.005* (0.003)	0.005* (0.003)	0.005* (0.003)
Motivated × Education					-0.006 (0.008)	-0.006 (0.008)	-0.006 (0.008)	-0.006 (0.008)
Overconfidence			0.002 (0.002)	0.002 (0.003)			0.002 (0.002)	0.002 (0.003)
News quiz score				0.002 (0.072)				0.002 (0.072)
consistent				-0.003 (0.004)				-0.003 (0.004)
Observations	4980	4980	4980	4980	4980	4980	4980	4980
Controls	no	yes	yes	yes	no	yes	yes	yes
Month FE	no	yes	yes	yes	no	yes	yes	yes
Country FE	no	yes	yes	yes	no	yes	yes	yes

*Notes:* This table reports estimates of regressions where the dependent variable is the share of updated answers. Motivated is an indicator variable, which equals 1 (0) if the share of updated answers is in the motivated (counter-motivated) state. See the notes to Table 1 for the full list of control variables. Robust standard errors are in parentheses. \*\*\*, \*\* and \* indicate significance at the 1%, 5% and 10% level, respectively.

Table C13: Joint effect of cognitive ability and motivated updating in science (with interaction terms)

	(1)	(2)	(3)	(4)
Motivated	0.012 (0.060)	0.012 (0.060)	0.012 (0.060)	0.012 (0.060)
IQ score	0.001 (0.006)	0.003 (0.006)	0.003 (0.006)	0.003 (0.006)
Education	0.023 (0.018)	0.013 (0.019)	0.012 (0.019)	0.012 (0.019)
Motivated $\times$ IQ score	0.015** (0.007)	0.015** (0.007)	0.015** (0.007)	0.015** (0.007)
Motivated $\times$ Education	-0.028 (0.018)	-0.028 (0.018)	-0.028 (0.018)	-0.028 (0.018)
Overconfidence			0.003 (0.004)	0.004 (0.004)
News quiz score				0.035 (0.058)
Consistent				0.007 (0.007)
Observations	1578	1578	1578	1578
Controls	yes	yes	yes	yes
Month FE	yes	yes	yes	yes
Country FE	yes	yes	yes	yes

*Notes:* This table reports estimates of regressions of the share of updated answers in science, where “Motivated” is an indicator variable, which equals 1 in the motivated state. Robust standard errors clustered by individual are in parentheses. \*\*\*, \*\* and \* indicate significance at the 1%, 5% and 10% level, respectively.

Table C14: Effect of cognitive ability on motivated updating by topic

	Science	Climate Change	Immigration	Inequality	All Data
IQ score	0.014* (0.007)	0.002 (0.006)	0.002 (0.007)	0.003 (0.010)	0.007 (0.003)
Education	-0.031 (0.021)	-0.011 (0.019)	0.012 (0.021)	-0.010 (0.030)	0.002 (0.009)
Observations	789	1055	798	397	2490
Controls	yes	yes	yes	yes	yes
Month FE	yes	yes	yes	yes	yes
Country FE	yes	yes	yes	yes	yes

*Notes:* This table reports estimates of OLS regressions where the dependent variable is motivated updating in a news topic, defined as the difference between the respective share of updated answers in the motivated and counter-motivated states. We use the specification in Column 3 of Table 6. **Note that the F-statistic is insignificant for “All Data”, which implies that the IQ score coefficient is also insignificant.** Robust standard errors are in parentheses. \*\*\*, \*\* and \* indicate significance at the 1%, 5% and 10% level, respectively.

Table C15: Joint effect of cognitive ability and motivated updating in science (with interaction terms and respondents with positive measure of motivated updating)

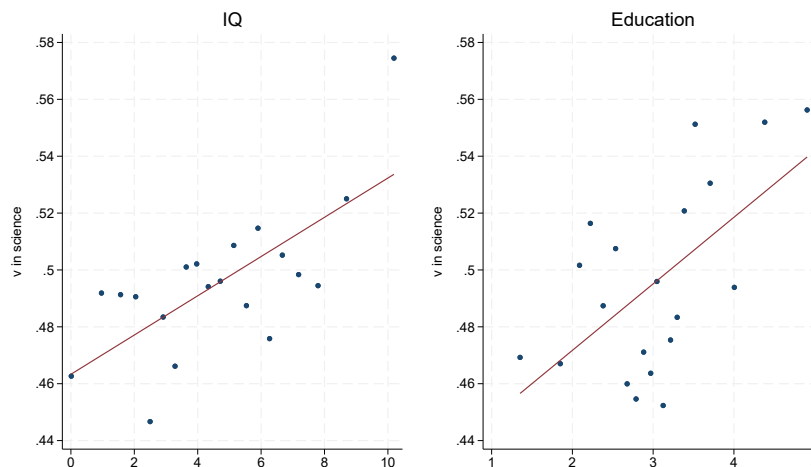
	(1)	(2)	(3)	(4)
Motivated	0.105** (0.044)	0.105** (0.045)	0.105** (0.045)	0.105** (0.045)
IQ score	-0.004 (0.006)	-0.001 (0.006)	0.000 (0.006)	-0.001 (0.006)
Education	0.016 (0.018)	0.000 (0.020)	0.000 (0.020)	-0.001 (0.020)
Motivated × IQ score	0.023*** (0.005)	0.023*** (0.005)	0.023*** (0.005)	0.023*** (0.005)
Motivated × Education	-0.010 (0.013)	-0.010 (0.013)	-0.010 (0.013)	-0.010 (0.014)
Overconfidence			0.003 (0.004)	0.004 (0.005)
Science quiz score				0.029 (0.067)
Consistent				0.004 (0.009)
Observations	1286	1286	1286	1286
Controls	yes	yes	yes	yes
Month FE	yes	yes	yes	yes
Country FE	yes	yes	yes	yes

*Notes:* This table reports estimates of regressions of the share of updated answers in science, where “Motivated” is an indicator variable, which equals 1 in the motivated state. We consider only respondents with a positive measure of motivated updating. Robust standard errors clustered by individual are in parentheses. \*\*\*, \*\* and \* indicate significance at the 1%, 5% and 10% level, respectively.

## C.5 Relationship between $\theta$ and $v$ in Science Topic

We have found that the magnitude of motivated reasoning and the magnitude of motivated updating both increase in cognitive ability in science. This possibly stems from a violation of our assumption that  $\theta$  and  $v$  are independent. To investigate whether this is the case, we first obtain a measure of  $v$  for every respondent classified as biased in science. There are three opinion survey questions on science (see Table B3). In each, we find the absolute value of the difference between a respondent’s self-report and the midpoint of the question’s scale—recall that for a respondent to be classified as biased, their answers must (weakly) point in the same direction.<sup>56</sup> We divide each value by the midpoint of the respective survey question so that the value is between 0 and 1. Our measure of  $v$  in science is then the average of these three values, which is between 0 and 1.

Figure C2: Cognitive ability and  $v$  in science



*Notes:* The left and right panels of the figure are binned scatterplots showing the relationship between cognitive ability and the measure of  $v \in (0, 1]$  in science for people classified as biased in science. The IQ score varies from 0 to 12. Educational attainment varies from 1 to 5. The included controls and fixed effects are the same as in Figure 1.

The left and right panels of Figure C2 are binned scatterplots, showing that an increase in the IQ score or educational attainment is associated with an increase in  $v$  in science. Table C16 presents regressions of  $v$  in science on cognitive ability. In all regression specifications, the coefficients of the IQ score and educational attainment are positive, sizeable, and statistically highly significant. Our preferred specification is Column 7, which shows that  $v$  increases in both the IQ score and education.

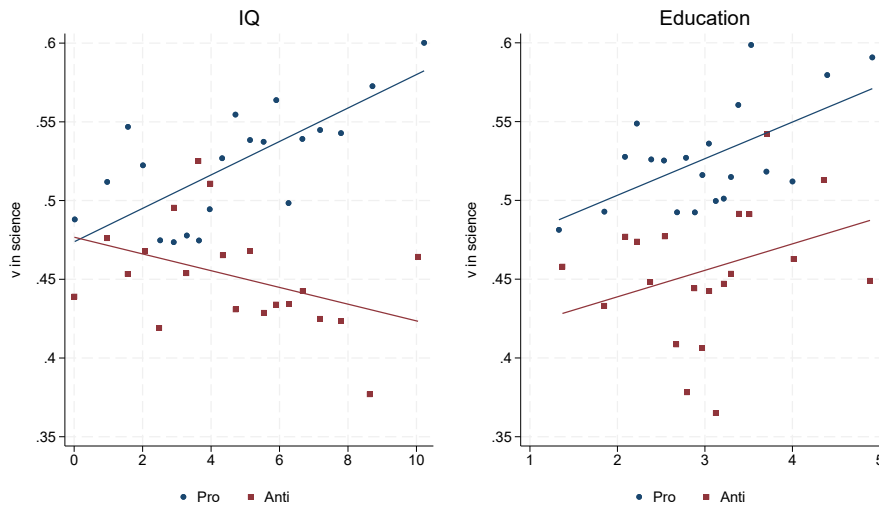
<sup>56</sup>The midpoint is 3 in two survey questions with a scale from 1–5, and 3.5 in one survey question, which has a scale from 1–6.

Table C16: Relationship between cognitive ability and the measure of  $v$  in science

	IQ			Education			IQ & Education
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
IQ score	0.008*** (0.002)	0.009*** (0.002)	0.007*** (0.002)				0.006*** (0.002)
Education				0.016*** (0.006)	0.021*** (0.006)	0.023*** (0.006)	0.020*** (0.006)
Observations	2222	2222	2222	2222	2222	2222	2222
Controls	no	no	yes	no	no	yes	yes
Month FE	no	yes	yes	no	yes	yes	yes
Country FE	no	yes	yes	no	yes	yes	yes

*Notes:* This table reports estimates of OLS regressions of the measure of  $v$  among participants classified as being biased on the IQ score and educational attainment. The measure of  $v$  varies from 0 to 1. The IQ score varies from 0 to 12. Education varies from 1 to 5. See the notes to Table 1 for the full list of controls. Robust standard errors are in parentheses. \*\*\*, \*\* and \* indicate significance at the 1%, 5% and 10% level, respectively.

Figure C3: Cognitive ability and  $v$  in science by type



*Notes:* The left and right panels of the figure are binned scatterplots showing the relationship between cognitive ability and the measure of  $v \in (0, 1]$  in science for people classified as “pro” or “anti” in science. The IQ score varies from 0 to 12. Educational attainment varies from 1 to 5. The included controls and fixed effects are the same as in Figure 1.

We note that the positive association between IQ and  $v$  seems to be primarily due to “pro” types, as suggested by Figure C3. At higher IQ levels, respondents are much more likely to be “pro” than “anti”, and the strong positive association between IQ and  $v$  exhibited by “pro” types dominates the negative association on the part of “anti” types.

## D Robustness

### D.1 Analysis including all observations

Table D1: Effect of cognitive ability on news quiz score

	IQ			Education			IQ & Education
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
IQ score	0.012*** (0.001)	0.012*** (0.001)	0.012*** (0.001)				0.011*** (0.001)
Education				0.023*** (0.002)	0.025*** (0.002)	0.024*** (0.003)	0.018*** (0.003)
Observations	3682	3682	3682	3682	3682	3682	3682
Controls	no	no	yes	no	no	yes	yes
Month FE	no	yes	yes	no	yes	yes	yes
Country FE	no	yes	yes	no	yes	yes	yes

*Notes:* This table reports estimates of OLS regressions of the news quiz score on the IQ score and educational attainment. The IQ score varies from 0 to 12. Educational attainment varies from 1 to 5. See the notes to Table 1 for the full list of controls. Robust standard errors are in parentheses. \*\*\*, \*\* and \* indicate significance at the 1%, 5% and 10% level, respectively.

Table D2: Effect of cognitive ability on news quiz score by topic

	Science	Climate Ch.	Immigration	Inequality	Neutral
IQ score	0.007*** (0.001)	0.011*** (0.001)	0.013*** (0.001)	0.010*** (0.002)	0.011*** (0.002)
Education	0.010** (0.005)	0.021*** (0.005)	0.016*** (0.005)	0.023*** (0.006)	0.025*** (0.007)
Observations	3682	3682	3682	3682	3682
Controls	yes	yes	yes	yes	yes
Month FE	yes	yes	yes	yes	yes
Country FE	yes	yes	yes	yes	yes

*Notes:* This table reports estimates of OLS regressions of the news quiz score in each topic (normalized in percentage terms) on the IQ score and educational attainment. The IQ score varies from 0 to 12. Educational attainment varies from 1 to 5. See the notes to Table 1 for the full list of control variables. Robust standard errors are in parentheses. \*\*\*, \*\* and \* indicate significance at the 1%, 5% and 10% level, respectively.

Table D3: Effect of cognitive ability on the counter-motivated and motivated news quiz scores

	IQ			Education			IQ & Education
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
<b>Panel I: <math>P_C</math></b>							
IQ score	0.012*** (0.002)	0.012*** (0.002)	0.011*** (0.002)				0.010*** (0.002)
Education				0.026*** (0.005)	0.026*** (0.005)	0.018*** (0.005)	0.012** (0.005)
<b>Panel II: <math>P_M</math></b>							
IQ score	0.012*** (0.002)	0.012*** (0.002)	0.012*** (0.002)				0.012*** (0.002)
Education				0.016*** (0.005)	0.018*** (0.005)	0.022*** (0.005)	0.015*** (0.005)
Observations	3526	3526	3526	3526	3526	3526	3526
Controls	no	no	yes	no	no	yes	yes
Month FE	no	yes	yes	no	yes	yes	yes
Country FE	no	yes	yes	no	yes	yes	yes

*Notes:* This table reports estimates of OLS regressions of the counter-motivated and motivated news quiz scores on the IQ score and educational attainment. The IQ score varies from 0 to 12. Educational attainment varies from 1 to 5. See the notes to Table 1 for the full list of controls. Robust standard errors are in parentheses. \*\*\*, \*\* and \* indicate significance at the 1%, 5% and 10% level, respectively.

Table D4: Joint effect of cognitive ability and motivated reasoning

	Panel A			Panel B		
	(1)	(2)	(3)	(4)	(5)	(6)
Motivated	0.179*** (0.006)	0.179*** (0.006)	0.179*** (0.006)	0.207*** (0.023)	0.207*** (0.023)	0.207*** (0.023)
IQ score	0.011*** (0.001)	0.011*** (0.001)	0.011*** (0.001)	0.011*** (0.002)	0.011*** (0.002)	0.011*** (0.002)
Education	0.014*** (0.003)	0.015*** (0.003)	0.013*** (0.004)	0.020*** (0.005)	0.020*** (0.005)	0.019*** (0.005)
Motivated×IQ score				0.001 (0.002)	0.001 (0.002)	0.001 (0.002)
Motivated×Education				-0.010 (0.007)	-0.010 (0.007)	-0.010 (0.007)
Observations	7052	7052	7052	7052	7052	7052
Controls	no	no	yes	no	no	yes
Month FE	no	yes	yes	no	yes	yes
Country FE	no	yes	yes	no	yes	yes

*Notes:* This table reports the results of random effects regressions examining how the news quiz score is influenced by directional motives, IQ score, and educational attainment. Motivated is an indicator variable equal to 1 (0) when the score refers to motivated (counter-motivated) news questions. See the notes to Table 1 for the full list of controls. Robust standard errors clustered by respondent are in parentheses. \*\*\*, \*\* and \* indicate significance at the 1%, 5% and 10% level, respectively.

Table D5: Effect of cognitive ability on motivated reasoning by topic

	Science	Climate Change	Immigration	Inequality
IQ score	0.004 (0.004)	0.008** (0.004)	0.004 (0.005)	-0.008 (0.006)
Education	0.037*** (0.013)	-0.009 (0.012)	-0.040*** (0.015)	-0.003 (0.018)
Observations	2511	2518	1908	2444
Controls	yes	yes	yes	yes
Month FE	yes	yes	yes	yes
Country FE	yes	yes	yes	yes

*Notes:* This table reports estimates of OLS regressions where the dependent variable is motivated reasoning,  $P_M - P_C$ , in the respective news topic. Robust standard errors are in parentheses. \*\*\*, \*\* and \* indicate significance at the 1%, 5% and 10% level, respectively.

Table D6: Effect of overconfidence on updating decisions

	All data			Overconfident or well-calibrated			Underconfident		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(Over)confidence	0.001 (0.002)	0.002 (0.002)	0.002 (0.002)	-0.008*** (0.003)	-0.008*** (0.003)	-0.008*** (0.003)	0.010** (0.005)	0.011** (0.005)	0.011** (0.005)
Observations	3682	3682	3682	2461	2461	2461	1221	1221	1221
Controls	no	yes	yes	no	yes	yes	no	yes	yes
Month FE	yes	yes	yes	yes	yes	yes	yes	yes	yes
Country FE	yes	yes	yes	yes	yes	yes	yes	yes	yes

*Notes:* This table reports estimates of OLS regressions where the dependent variable is the share of updated answers among news items where the respondent's initial answer differs from the experimental report they observe. Overconfidence is the difference between a respondent's elicited news quiz score and the actual score. Included variables in each specification are the same as in Table 7. Robust standard errors are in parentheses. \*\*\*, \*\* and \* indicate significance at the 1%, 5% and 10% levels, respectively.

Table D7: Effect of cognitive ability on motivated updating by topic  
(only respondents with positive measure of motivated updating)

	Science	Climate Ch.	Immigration	Inequality	All Data
IQ score	0.020*** (0.005)	0.014*** (0.004)	0.013** (0.005)	0.018** (0.008)	0.017*** (0.002)
Education	-0.003 (0.014)	0.005 (0.013)	0.028* (0.016)	0.004 (0.024)	0.010 (0.007)
Observations	734	1003	733	406	2165
Controls	yes	yes	yes	yes	yes
Month FE	yes	yes	yes	yes	yes
Country FE	yes	yes	yes	yes	yes

*Notes:* This table reports estimates of OLS regressions where the dependent variable is motivated updating in a news topic, defined as the difference between the respective shares of updated answers in the motivated state and in the counter-motivated state. Respondents with a strictly negative magnitude of motivated updating are excluded in the respective topic. We use the specification in Column 3 of Table 6. Robust standard errors are in parentheses. \*\*\*, \*\* and \* indicate significance at the 1%, 5% and 10% level, respectively.

## D.2 Analysis of data at the participant and item level

As mentioned in Section 5.5,  $P_M - P_C$  is not defined at the item level, Tables 5 and 7 do not apply in this analysis. For brevity, we focus on Tables 1, 3, 4, and 6.

Table D8: Effect of cognitive ability on news quiz score

	IQ			Education			IQ & Education
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
IQ score	0.012*** (0.001)	0.012*** (0.001)	0.012*** (0.001)				0.011*** (0.001)
Education				0.023*** (0.003)	0.026*** (0.003)	0.024*** (0.003)	0.018*** (0.003)
Observations	51632	51632	51632	51632	51632	51632	51632
Controls	no	no	yes	no	no	yes	yes
Month FE	no	yes	yes	no	yes	yes	yes
Country FE	no	yes	yes	no	yes	yes	yes

*Notes:* This table reports estimates of logit regressions of news quiz answers on the IQ score and educational attainment. The IQ score varies from 0 to 12. Educational attainment varies from 1 to 5. See the notes to Table 1 for the full list of controls. Robust standard errors are in parentheses. \*\*\*, \*\* and \* indicate significance at the 1%, 5% and 10% level, respectively.

Table D9: Effect of cognitive ability on counter-motivated and motivated news quiz scores

	IQ			Education			IQ & Education
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
<b>Panel I: <math>P_C</math></b>							
IQ score	0.013*** (0.001)	0.013*** (0.001)	0.011*** (0.001)				0.010*** (0.002)
Education				0.033*** (0.004)	0.033*** (0.004)	0.025*** (0.005)	0.020*** (0.005)
<b>Panel II: <math>P_M</math></b>							
IQ score	0.014*** (0.001)	0.014*** (0.002)	0.014*** (0.002)				0.013*** (0.002)
Education				0.020*** (0.005)	0.022*** (0.005)	0.025*** (0.005)	0.018*** (0.005)
Observations	14639	14639	14639	14639	14639	14639	14639
Controls	no	no	yes	no	no	yes	yes
Month FE	no	yes	yes	no	yes	yes	yes
Country FE	no	yes	yes	no	yes	yes	yes

*Notes:* This table reports estimates of logit regressions of news quiz answers in the counter-motivated state and motivated state on the IQ score and educational attainment. The IQ score varies from 0 to 12. Educational attainment varies from 1 to 5. See the notes to Table 1 for the full list of controls. Robust standard errors are in parentheses. \*\*\*, \*\* and \* indicate significance at the 1%, 5% and 10% level, respectively.

Table D10: Joint effect of cognitive ability and motivated reasoning

	Panel A			Panel B		
	(1)	(2)	(3)	(4)	(5)	(6)
Motivated	0.189*** (0.006)	0.189*** (0.006)	0.189*** (0.006)	0.193*** (0.006)	0.193*** (0.006)	0.193*** (0.006)
IQ score	0.012*** (0.001)	0.012*** (0.001)	0.012*** (0.001)	0.012*** (0.001)	0.012*** (0.001)	0.012*** (0.001)
Education	0.019*** (0.003)	0.020*** (0.003)	0.019*** (0.003)	0.019*** (0.003)	0.020*** (0.003)	0.019*** (0.003)
Motivated×IQ score				ns	ns	ns
Motivated×Education				-,**	-,**	-,**
Observations	29278	29278	29278	29278	29278	29278
Controls	no	no	yes	no	no	yes
Month FE	no	yes	yes	no	yes	yes
Country FE	no	yes	yes	no	yes	yes

*Notes:* The first three rows of this table reports the marginal effects from logit regressions where the dependent variable is 1 if the quiz answer is correct and 0 otherwise. Motivated is an indicator variable equal to 1 (0) when the correct quiz answer aligns (conflicts) with the issue bias of the respondent. See the notes to Table 1 for the full list of controls. The last two rows in Panel B presents the sign and the significance level of coefficients of significant interaction terms. Robust standard errors clustered by respondent are in parentheses. \*\*\*, \*\* and \* indicate significance at the 1%, 5% and 10% level, respectively.

Table D11: Effect of overconfidence on updating decisions

	All data			Overconfident or well-calibrated			Underconfident		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(Over)confidence	-0.001 (0.002)	-0.001 (0.002)	-0.001 (0.002)	-0.008*** (0.003)	-0.010*** (0.003)	-0.010*** (0.003)	0.010* (0.006)	0.011* (0.006)	0.011* (0.006)
Observations	25688	25688	25688	18133	18133	18133	7555	7555	7555
Controls	no	yes	yes	no	yes	yes	no	yes	yes
Month FE	yes	yes	yes	yes	yes	yes	yes	yes	yes
Country FE	yes	yes	yes	yes	yes	yes	yes	yes	yes

*Notes:* This table reports estimates of probit regressions where the dependent variable is the updating decision among news items where the respondent’s initial answer differs from the experimental report they observe. Overconfidence is the difference between a respondent’s elicited news quiz score and the actual score. Included variables in each specification are the same as in Table 7. Robust standard errors are in parentheses. \*\*\*, \*\* and \* indicate significance at the 1%, 5% and 10% levels, respectively.

### D.3 Varying bias classification

As a robustness check of our results, we change the set of self-reports coded as neutral in the opinion survey. For questions on a respective scale from 1–5, 1–6, and 1–7, we recode  $\{2, 3, 4\}$ ,  $\{3, 4\}$  and  $\{3, 4, 5\}$  as neutral answers in our first variation (Column I or Panel I in Tables D12–D14). In a second variation, we set the respective set of neutral values to  $\{2, 3, 4\}$ ,  $\{2, 3, 4, 5\}$  and  $\{2, 3, 4, 5, 6\}$  (Column II or Panel II in Tables D12–D14). In a third variation, we classify self-reports within  $\mu_j \pm \sigma_j$  as neutral for the opinion survey question  $j$ , where  $\mu_j$  and  $\sigma_j$  refer to the mean and the standard deviation of the self-reports in question  $j$  (Column III or Panel III in Tables D12–D14). We present versions of Tables 3–5 and 7 under these variations in Tables D12–D14, and show that our main findings are robust. Finally, we compare and contrast our results with a fourth variation, where we classify respondents only according to their placement on the left-right scale from 0–10 (Column IV or Panel IV in Tables D12–D14). In particular, we classify self-reports in  $\{4, 5, 6\}$  as neutral; self-reports in  $\{0, 1, 2, 3\}$  as “pro” in immigration, climate change, and science, and “anti” in inequality; and self-reports in  $\{7, 8, 9, 10\}$  as “anti” in immigration, climate change, and science, and “pro” in inequality. While many of our main results still hold with this classification based on placement on the left-right scale, there are various differences showing that our classification based on opinion survey answers is much more precise and informative. An important reason for this is that a large majority of respondents choose neutral values  $\{4, 5, 6\}$  on the left-right scale. It is also well-known that placement on the left-right scale may not correctly capture issue opinions. This is also true in our study. For example, among the left-wing, 11% are classified as anti-immigrant, and 53% are classified as pro-immigrant, with 37% classified as neutral.

Table D12: Effect of cognitive ability on counter-motivated and motivated news quiz scores

	Counter-motivated score				Motivated score			
	(I)	(II)	(III)	(IV)	(I)	(II)	(III)	(IV)
IQ	0.008*** (0.002)	0.008*** (0.002)	0.010*** (0.002)	0.008*** (0.002)	0.015*** (0.002)	0.014*** (0.002)	0.012*** (0.002)	0.018*** (0.002)
Education	0.018*** (0.006)	0.018*** (0.006)	0.019*** (0.006)	0.015** (0.006)	0.017*** (0.005)	0.023*** (0.006)	0.017*** (0.006)	0.028*** (0.007)
Observations	3059	2689	3033	1299	3059	2689	3033	1299
Controls	yes	yes	yes	yes	yes	yes	yes	yes
Month FE	yes	yes	yes	yes	yes	yes	yes	yes
Country FE	yes	yes	yes	yes	yes	yes	yes	yes

*Notes:* This table reports estimates of OLS regressions of the counter-motivated and motivated news quiz scores on the IQ score and educational attainment. Each column corresponds to the variation in bias classification described in the text. The IQ score varies from 0 to 12. Educational attainment varies from 1 to 5. See the notes to Table 1 for the full list of controls. Robust standard errors are in parentheses. \*\*\*, \*\* and \* indicate significance at the 1%, 5% and 10% level, respectively.

Table D13: Joint effect of cognitive ability and motivated reasoning

	Panel A				Panel B			
	(I)	(II)	(III)	(IV)	(I)	(II)	(III)	(IV)
Motivated	0.174*** (0.007)	0.231*** (0.008)	0.177*** (0.007)	0.091*** (0.008)	0.200*** (0.024)	0.249*** (0.027)	0.234*** (0.024)	0.020 (0.027)
IQ	0.011*** (0.001)	0.011*** (0.001)	0.011*** (0.001)	0.013*** (0.001)	0.009*** (0.002)	0.009*** (0.002)	0.011*** (0.002)	0.007*** (0.002)
Motivated × IQ					0.005** (0.002)	0.004 (0.003)	0.000 (0.002)	0.012*** (0.003)
Education	0.018*** (0.004)	0.021*** (0.004)	0.018*** (0.004)	0.021*** (0.005)	0.026*** (0.005)	0.027*** (0.006)	0.028*** (0.005)	0.020*** (0.006)
Motivated × Education					-0.016** (0.007)	-0.012 (0.008)	-0.020*** (0.007)	0.004 (0.008)
Observations	3059	2689	3033	1299	3059	2689	3033	1299
Controls	yes	yes	yes	yes	yes	yes	yes	yes
Month FE	yes	yes	yes	yes	yes	yes	yes	yes
Country FE	yes	yes	yes	yes	yes	yes	yes	yes

*Notes:* This table reports estimates of OLS regressions of the counter-motivated and motivated news quiz scores on the IQ score and educational attainment. Each column corresponds to the variation in bias classification described in the text. The IQ score varies from 0 to 12. Educational attainment varies from 1 to 5. See the notes to Table 1 for the full list of controls. Robust standard errors are in parentheses. \*\*\*, \*\* and \* indicate significance at the 1%, 5% and 10% level, respectively.

Table D14: Effect of cognitive ability on motivated updating by topic  
(only respondents with positive measure of motivated updating)

	Science	Climate Ch.	Immigration	Inequality	All Data
<b>Panel I</b>					
IQ score	0.025*** (0.005)	0.010** (0.005)	0.009* (0.005)	0.000 (0.012)	0.014*** (0.003)
Education	-0.005 (0.015)	0.012 (0.014)	0.025 (0.017)	0.044 (0.036)	0.007 (0.008)
Observations	645	884	763	240	1900
<b>Panel II</b>					
IQ score	0.023*** (0.006)	0.011* (0.006)	0.011* (0.006)	0.000 (0.012)	0.006* (0.004)
Education	0.007 (0.017)	-0.001 (0.018)	0.020 (0.020)	0.044 (0.036)	0.003 (0.012)
Observations	468	547	592	240	1871
<b>Panel III</b>					
IQ score	0.024*** (0.006)	0.009* (0.005)	0.008 (0.005)	-0.002 (0.010)	0.006* (0.003)
Education	0.009 (0.015)	0.007 (0.014)	0.026 (0.017)	0.034 (0.030)	0.005 (0.010)
Observations	569	824	776	275	2361
<b>Panel IV</b>					
IQ score	0.018*** (0.007)	0.011* (0.006)	0.007 (0.007)	0.019 (0.012)	0.013*** (0.003)
Education	-0.017 (0.017)	-0.004 (0.019)	0.033 (0.022)	-0.050 (0.040)	-0.004 (0.009)
Observations	401	460	445	208	915
Controls	yes	yes	yes	yes	yes
Month FE	yes	yes	yes	yes	yes
Country FE	yes	yes	yes	yes	yes

*Notes:* This table reports estimates of OLS regressions where the dependent variable is motivated updating in a news topic, defined as the difference between the respective shares of updated answers in the motivated state and in the counter-motivated state. Respondents with a strictly negative magnitude of motivated updating are excluded in the respective topic. We use the specification in Column 3 of Table 6. Robust standard errors are in parentheses. \*\*\*, \*\* and \* indicate significance at the 1%, 5% and 10% level, respectively.

## D.4 Lasso Regressions

Table D15: Effect of cognitive ability on news quiz score

	IQ	Education	IQ & Education
	(1)	(2)	(3)
IQ score	0.010*** (0.001)		0.009*** (0.001)
Education		0.020*** (0.003)	0.016*** (0.003)
Observations	3227	3227	3227
Controls	yes	yes	yes
Month FE	yes	yes	yes
Country FE	yes	yes	yes

*Notes:* This table reports estimates of Lasso regressions of the news quiz score on the IQ score and educational attainment. Robust standard errors are in parentheses. \*\*\*, \*\* and \* indicate significance at the 1%, 5% and 10% level, respectively.

Table D16: Effect of cognitive ability on news quiz score by topic

	Immigration	Climate Ch.	Science	Inequality	Neutral
IQ score	0.013*** (0.002)	0.010*** (0.002)	0.004*** (0.002)	0.011*** (0.002)	0.006*** (0.002)
Education	0.014*** (0.005)	0.021*** (0.005)	0.005 (0.005)	0.025*** (0.007)	0.019** (0.007)
Observations	3227	3227	3227	3227	3227
Controls	yes	yes	yes	yes	yes
Month FE	yes	yes	yes	yes	yes
Country FE	yes	yes	yes	yes	yes

*Notes:* This table reports estimates of Lasso regressions of the news quiz score in each topic on the IQ score and educational attainment. Robust standard errors are in parentheses. \*\*\*, \*\* and \* indicate significance at the 1%, 5% and 10% level, respectively.

Table D17: Effect of cognitive ability on the counter-motivated and motivated news quiz scores

	Motivated			Countermotivated		
	IQ	Education	IQ & Education	IQ	Education	IQ & Education
	(1)	(2)	(3)	(4)	(5)	(6)
IQ score	0.011*** (0.002)		0.010*** (0.002)	0.009*** (0.002)		0.009*** (0.002)
Education		0.021*** (0.005)	0.015*** (0.005)		0.018*** (0.006)	0.013** (0.006)
Observations	3112	3112	3112	3112	3112	3112
Controls	yes	yes	yes	yes	yes	yes
Month FE	yes	yes	yes	yes	yes	yes
Country FE	yes	yes	yes	yes	yes	yes

*Notes:* This table reports estimates of Lasso regressions of the counter-motivated and motivated news quiz scores on the IQ score and educational attainment. Robust standard errors are in parentheses. \*\*\*, \*\* and \* indicate significance at the 1%, 5% and 10% level, respectively.

Table D18: Joint effect of cognitive ability and motivated reasoning

	Panel A	Panel B
	(1)	(2)
Motivated	0.180*** (0.006)	0.217*** (0.023)
IQ Score	0.009*** (0.001)	0.009*** (0.002)
Motivated $\times$ IQ score		0.001 (0.002)
Education	0.015*** (0.004)	0.021*** (0.005)
Motivated $\times$ Education		-0.013* (0.007)
Observations	6224	6224
Controls	yes	yes
Month FE	yes	yes
Country FE	yes	yes

*Notes:* This table reports the results of Lasso regressions examining how the news quiz score is influenced by directional motives, IQ score, and educational attainment. Robust standard errors clustered by respondent are in parentheses. \*\*\*, \*\* and \* indicate significance at the 1%, 5% and 10% level, respectively.

Table D19: Effect of cognitive ability on motivated reasoning by topic

	Immigration	Climate Change	Science	Inequality
IQ score	0.008 (0.005)	0.006 (0.004)	0.006 (0.005)	-0.017*** (0.006)
Education	-0.034** (0.015)	-0.008 (0.012)	0.036*** (0.013)	-0.001 (0.019)
Observations	1741	2255	2222	2203
Controls	yes	yes	yes	yes
Month FE	yes	yes	yes	yes
Country FE	yes	yes	yes	yes

*Notes:* This table reports estimates of Lasso regressions where the dependent variable is motivated reasoning,  $P_M - P_C$ , in the respective news topic. Robust standard errors are in parentheses. \*\*\*, \*\* and \* indicate significance at the 1%, 5% and 10% level, respectively.

Table D20: Effect of overconfidence on updating decisions

	All data	Overconfident or well-calibrated	Underconfident
	(1)	(2)	(3)
Overconfidence	-0.001 (0.002) 0.008***	-0.010*** (0.003) 0.009***	0.009* (0.005) 0.004
Observations	3227	2192	1035
Controls	yes	yes	yes
Month FE	yes	yes	yes
Country FE	yes	yes	yes

*Notes:* This table reports estimates of Lasso regressions where the dependent variable is the share of updated answers among news items where the respondent's initial answer differs from the experimental report they observe. Robust standard errors are in parentheses. \*\*\*, \*\* and \* indicate significance at the 1%, 5% and 10% levels, respectively.

Table D21: Effect of cognitive ability on motivated updating by topic  
(only respondents with positive measure of motivated updating)

	Science	Climate Ch.	Immigration	Inequality	All Data
IQ	0.019*** (0.006)	0.010** (0.005)	0.011* (0.006)	0.012 (0.009)	0.015*** (0.003)
Education	-0.002 (0.015)	-0.002 (0.014)	0.022 (0.017)	0.015 (0.025)	0.010 (0.008)
Observations	643	887	660	367	1931
Controls	yes	yes	yes	yes	yes
Month FE	yes	yes	yes	yes	yes
Country FE	yes	yes	yes	yes	yes

*Notes:* This table reports estimates of Lasso regressions where the dependent variable is motivated updating in a news topic, defined as the difference between the respective shares of updated answers in the motivated state and in the counter-motivated state. Robust standard errors are in parentheses. \*\*\*, \*\* and \* indicate significance at the 1%, 5% and 10% level, respectively.

## D.5 Structural Estimation

The model we estimate is very similar to the one estimated by Angelucci and Prat (2024), except that we allow for both motivated priors and preference biases in our framework (Angelucci and Prat considers only motivated priors).

### D.5.1 Empirical Model

Each participant  $i = 1, \dots, I$  answers  $J$  true-false questions. Let  $q_{ij} \in (0, 1)$  denote participant  $i$ 's (subjective) belief that item  $j = 1, \dots, J$  is true, i.e.,

$$q_{ij} \equiv \Pr[\tau_j = 1 \mid \mathcal{I}_{ij}],$$

where  $S_j \in \{0, 1\}$  denotes the veracity of  $j$  and  $\mathcal{I}_{ij}$  is  $i$ 's opinion (and/or information) about  $j$ . We transform  $q_{ij}$  into log-odds

$$z_{ij} = \log\left(\frac{q_{ij}}{1 - q_{ij}}\right),$$

which we refer to as beliefs. We model these beliefs as

$$z_{ij} \equiv \lambda_i + \gamma_j + (2S_j - 1)\theta_i + \alpha V_{ij} + \varepsilon_{ij}, \quad (6)$$

where  $\gamma_j$  measures how easily identifiable the veracity of question  $j$  is,  $\theta_i$  denotes participant  $i$ 's discernment ability, and  $\lambda_i$  captures  $i$ 's systematic skepticism or credulity, as in Angelucci and Prat (2024).

$V_{ij}$  denotes the valence of question  $j$  for participant  $i$ —see (1) and (2) in the main text. The interpretation is that  $i$  prefers  $j$  to be true if  $V_{ij} = 1$  (false if  $V_{ij} = -1$ ), with  $V_{ij} = 0$  indicating the neutrality of the respondent or the news item. The parameter  $\alpha$  thus measures how valence shifts prior beliefs, as in Angelucci and Prat (2024). Finally,  $\varepsilon_{ij} \sim F(\cdot)$  is an idiosyncratic belief

shock.

As we assumed in (1)–(2) in the main text, participants’ utility from a correct assessment depends on whether they are in the motivated, neutral, or counter-motivated state. Hence,  $i$ ’s assessments are influenced by both their belief and whether they are in the motivated, neutral, or counter-motivated state—this is where our estimation modifies Angelucci and Prat (2024). In particular, participant  $i$  will answer  $y_{ij} = 1$  (true) if and only if

$$z_{ij} \geq \bar{z}_i(V_{ij}), \quad (7)$$

where the belief threshold  $\bar{z}_i(V_{ij})$  is given by

$$\bar{z}_i(V_{ij}) = \log(1 - v_i) \cdot V_{ij} \quad (8)$$

for  $v_i \sim U(0, \bar{v})$  and  $\bar{v} \leq 1$ . As explained in the main text, the variable  $v_i$  is participant  $i$ ’s relative discount of the utility from a correct assessment in the counter-motivated state.

Let  $\rho_{ij}$  denote the probability that participant  $i$  gives the answer  $y_{ij} = 1$  (true) to question  $j$ . Combining equations (6)–(8), this probability can be expressed as

$$\begin{aligned} \rho_{ij} &= \Pr[z_{ij} \geq \bar{z}_i(V_{ij})] \\ &= \Pr[\lambda_i + \gamma_j + \theta_{ij} + \alpha V_{ij} + \varepsilon_{ij} \geq \log(1 - v_i) \cdot V_{ij}] \\ &= \Pr[\varepsilon_{ij} \geq -(\lambda_i + \gamma_j + \theta_{ij} + \tilde{\alpha}_i V_{ij})] \\ &= 1 - F(-(\lambda_i + \gamma_j + \theta_{ij} + \tilde{\alpha}_i V_{ij})), \end{aligned} \quad (9)$$

where  $\tilde{\alpha}_i = \alpha - \log(1 - v_i)$  and  $F(\cdot)$  is the CDF of  $\varepsilon_{ij}$ .

Equation (9) shows that our model with a motivated decision rule can be transformed into a standard discrete choice model with adjusted beliefs  $\tilde{z}_{ij}$  as follows.

$$\tilde{z}_{ij} = \lambda_i + \gamma_j + \theta_{ij} + \tilde{\alpha}_i V_{ij} + \varepsilon_{ij},$$

where  $\tilde{\alpha}_i = \alpha - \log(1 - v_i)$ , as shown above.

### D.5.2 Estimation

To bring the model above to the data, we impose additional assumptions. First, we model the individual-specific discernment parameter as

$$\theta_i = x_i \beta + \varepsilon_i, \quad \varepsilon_i \sim \mathcal{N}(0, \sigma_\theta^2),$$

where  $x_i$  is a vector of socioeconomic and demographic covariates, including IQ and educational attainment. Second, we model the component  $\lambda_i$  as a random effect, i.e.,

$$\lambda_i \sim \mathcal{N}(0, \sigma_\lambda^2),$$

where  $\sigma_\lambda^2$  is to be estimated. Finally, we impose distributional assumptions on the idiosyncratic belief shocks. We assume that  $\varepsilon_{ij}$  is i.i.d. across individuals and questions. Depending on the specification, we assume that either  $\varepsilon_{ij} \sim \mathcal{N}(0, 1)$  (probit) or  $\varepsilon_{ij} \sim \text{Logistic}(0, 1)$  (logit).

Given these, the adjusted belief  $\tilde{z}_{ij}$  can be written as

$$\begin{aligned}\tilde{z}_{ij} &= \lambda_i + \gamma_j + (2\tau_j - 1)(x_i\beta + \varepsilon_i) + (\alpha - \log(1 - v_i))V_{ij} + \varepsilon_{ij} \\ &= \sigma_\lambda\nu_{i,1} + \gamma_j + (2\tau_j - 1)(x_i\beta + \sigma_\theta\nu_{i,2}) + (\alpha - \log(1 - \bar{v}\nu_{i,3}))V_{ij} + \varepsilon_{ij},\end{aligned}\quad (10)$$

where  $\nu_{i,1}$  and  $\nu_{i,2}$  are standard normal random variables, and  $\nu_{i,3}$  is uniformly distributed on  $[0, 1]$ .

Let  $\Psi$  denote the parameter vector to be estimated, i.e.,  $\Psi = (\gamma, \beta, \alpha, \bar{v}, \sigma_\lambda^2, \sigma_\theta^2)$ . Let  $y = (y_1, \dots, y_I)$  denote the observed answers, with  $y_i = (y_{i1}, \dots, y_{iJ})$ . Conditional on  $\nu_i = (\nu_{i,1}, \nu_{i,2}, \nu_{i,3})$ , the choice probabilities are

$$\rho_{ij}(\Psi, \nu_i) = F(\mu_{ij}(\Psi, \nu_i)),$$

and

$$p(y_i | \Psi, \nu_i) = \prod_{j=1}^J [F(\mu_{ij})]^{y_{ij}} [1 - F(\mu_{ij})]^{1-y_{ij}}.$$

Integrating over  $\nu_i$  yields the likelihood function

$$p(y | \Psi) = \prod_{i=1}^I \int p(y_i | \Psi, \nu_i) p_\nu(\nu_i) d\nu_i. \quad (11)$$

We approximate the integral in (11) using Monte Carlo integration. The simulated log-likelihood is

$$\log \hat{p}(y | \Psi) = \sum_{i=1}^I \log \left( \frac{1}{R} \sum_{r=1}^R p(y_i | \Psi, \nu_i^{(r)}) \right), \quad (12)$$

where  $\nu_i^{(r)}$  are i.i.d. draws from  $F_\nu(\cdot)$ , and  $R$  is the number of draws. We estimate the parameter vector  $\Psi = (\gamma, \beta, \alpha, \bar{v}, \sigma_\lambda^2, \sigma_\theta^2)$  using maximum simulated likelihood estimation (MSLE).

Since our news quiz involves two types of questions (true-false and fill-in-the-blank items), we use three versions of the data in the estimation: only true-false questions, all questions including fill-in-the-blank items treated as if the correct answer option is in the statement (i.e., as if all fill-in-the-blank items are true statements), and all questions including fill-in-the-blank items treated as if the wrong answer option is in the statement (i.e., as if all fill-in-the-blank items are false statements). To give an example, consider the following fill-in-the-blank item:

A scientific report prepared for the European Parliament in 2021 states that the health effects of the high radio frequencies used in the latest mobile network technology (5G)

- have been well studied and proven to be safe.
- have not been adequately studied.

In what we call the “true version” of the data, we analyze this question as if it were the following:

True or false? A scientific report prepared for the European Parliament in 2021 states that the health effects of the high radio frequencies used in the latest mobile network technology (5G) have not been adequately studied.

Thus, a correct (wrong) answer to the original question is re-coded as a true (false) answer to the adjusted question, which in turn is the correct (wrong) answer of the adjusted question. In what we call the “false version” of the data, we analyze this question as if it were the following:

True or false? A scientific report prepared for the European Parliament in 2021 states that the health effects of the high radio frequencies used in the latest mobile network technology (5G) have been well studied and proven to be safe.

Thus, a correct (wrong) answer to the original question is coded as a false (true) answer to the adjusted question, which in turn is the correct (wrong) answer of the adjusted question. As Figure D2 shows, our estimation results do not differ across these variations.

We estimate two specifications: the full model described above and a simpler model, where  $\sigma_\theta^2 = \sigma_\lambda^2 = 0$ . Our results are very similar across specifications. The full model may exhibit flat likelihood regions when only true-false questions are used. Therefore, we present the results of both models with three versions of our data: only true-false questions, all questions (true version), and all questions (false version).

### D.5.3 Analysis of Quiz Performance

Given the estimated parameters  $\hat{\Psi}$ , the predicted probability that participant  $i$  answers question  $j$  with true is

$$\hat{\rho}_{ij} = \int \rho_{ij}(\hat{\Psi}, \nu_i) dF_\nu(\nu_i).$$

The probability of a correct answer by  $i$  to question  $j$  is

$$\hat{\pi}_{ij} = \hat{\rho}_{ij}^{\mathbb{1}_{jT}} (1 - \hat{\rho}_{ij})^{1 - \mathbb{1}_{jT}}.$$

Thus, the average quiz performance is given by

$$\bar{\pi} = \frac{1}{IJ} \sum_{j=1}^J \sum_{i=1}^I \hat{\pi}_{ij}.$$

By integrating over the empirical distribution of  $x_i$  conditional on specific socioeconomic characteristics and by manipulating  $V_{ij}$ , we can evaluate the quiz performance of subgroups and the impact of motivated reasoning.

### D.5.4 Results

Figures D1 and D2 report the association between the predicted probability of giving a correct answer and participant characteristics, such as IQ, education, gender, age, and income (the estimation includes the full set of control variables and fixed effects specified in the notes to Table 1 in the main text). They also show the effect of being in the motivated or the countermotivated

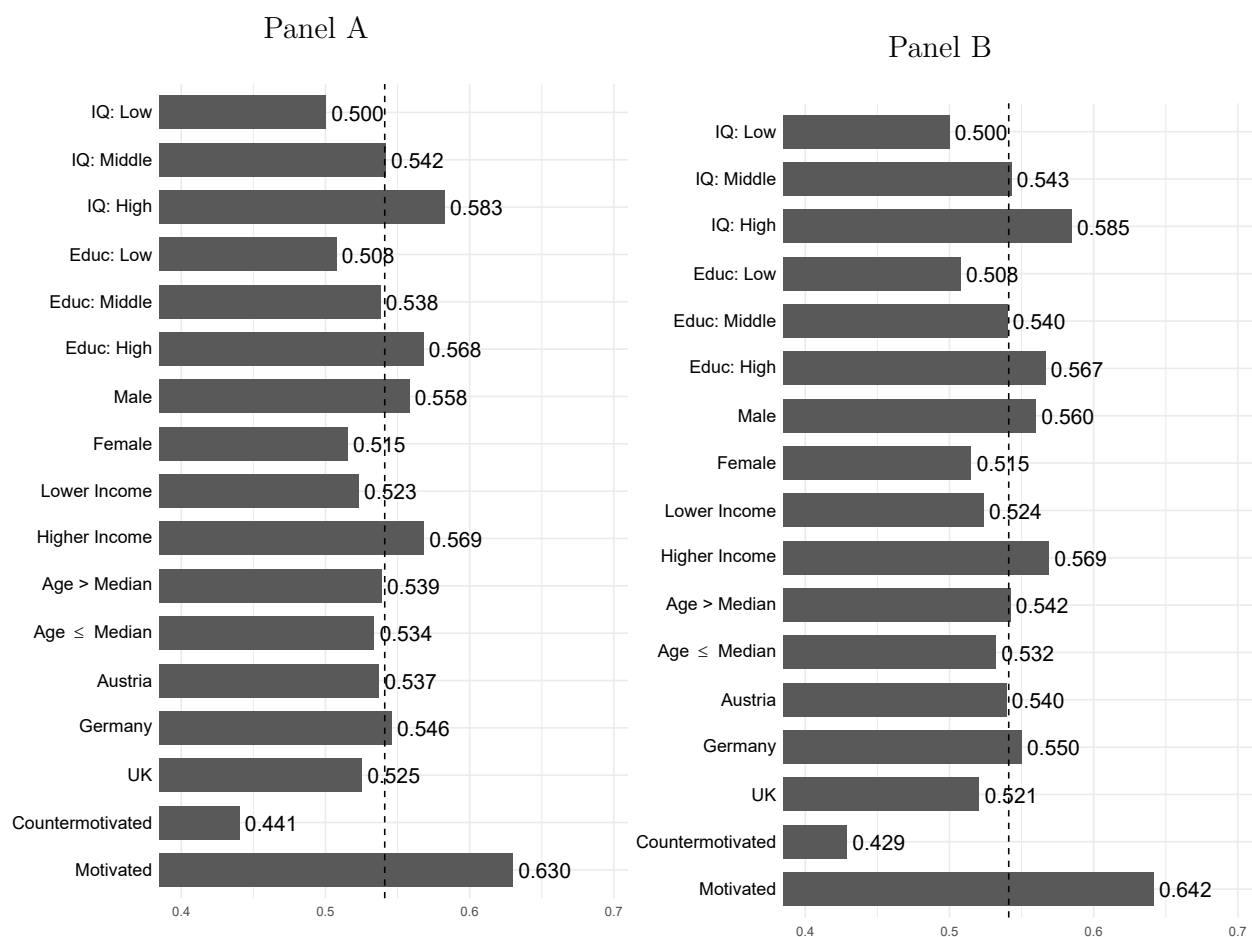
state on the predicted probability. In the figures, we assume that  $\varepsilon_{ij} \sim \mathcal{N}(0, 1)$  (probit). The results are robust to assuming that  $\varepsilon_{ij} \sim \text{Logistic}(0, 1)$  (logit).

Figure D1 presents the results estimated from the full model in Panel A and from the simpler model in Panel B, using the data of only true-false questions. Results are similar across panels. For example, in both panels an average individual with higher IQ (i.e., in the upper tercile) is more than 8 pp more likely to give the correct answer than one with lower IQ. Similarly, in both panels an average individual with higher education (i.e., in the upper tercile) is about 6 pp more likely to give the correct answer than one with lower education. In addition, an average individual is about 19 pp more likely to give a correct answer in the motivated state than in the countermotivated state. We also replicate our findings in Section 5.1 on the effect of income, gender, (to a lesser extent) age, and country.

Figure D2 presents the results using the full model and the data of all quiz questions. In Panel A (B), fill-in-the-blank items are treated as if the correct (wrong) answer option is part of the news statement, i.e., we analyze data as if all fill-in-the-blank items are true (false) statements in Panel A (B). We use the full model in both panels. Results are similar across panels (also, across Figures D1 and D2). In both panels, an average individual with higher IQ (i.e., in the upper tercile) is more than 8 pp more likely to give the correct answer than one with lower IQ. Similarly, an average individual with higher education (i.e., in the upper tercile) is about 6 pp more likely to give the correct answer than one with lower education. Finally, an average individual is close to 17 pp more likely to give a correct answer in the motivated state than in the countermotivated state.

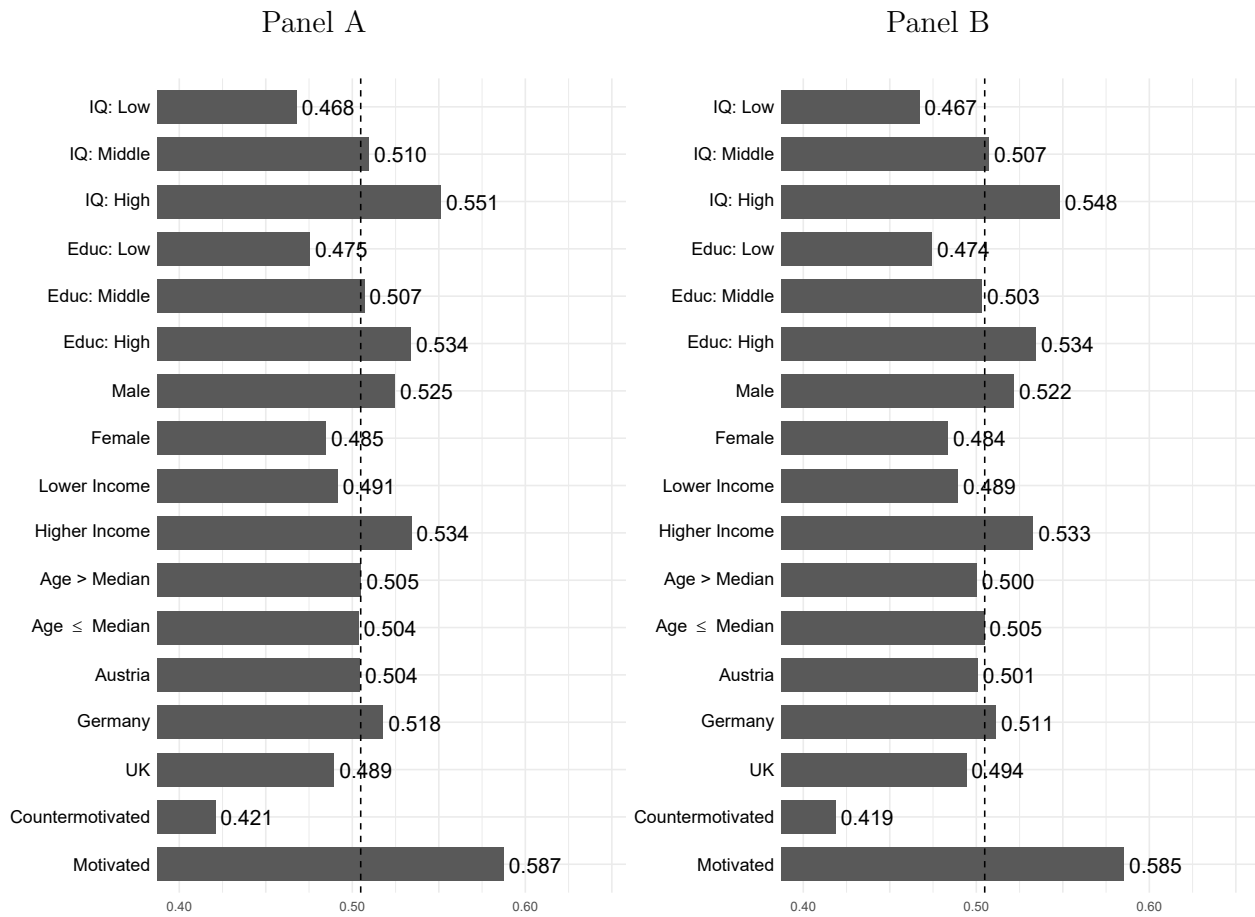
To conclude, the estimation results are consistent with our findings in the main text. In particular, we replicate our finding about the sizeable magnitude of motivated reasoning and cognitive ability in Section 5.2.

Figure D1: Estimation results with true-false questions



*Notes:* This figure shows the probability that individuals belonging to various subgroups of the population give a correct answer to a true-false question estimating the full model in Panel A and the simpler model in Panel B. Each panel also reports the probability of giving the correct answer in the motivated state and the countermotivated state. In both panels, the vertical bar corresponds to the population average. The estimations include the full set of controls and fixed effects (see notes to Table 1 for included variables).

Figure D2: Estimation results with all questions



*Notes:* This figure shows the probability that individuals belonging to various subgroups of the population give a correct answer to a quiz question using all quiz data. Panel A uses the true data version, and Panel B uses the false version (see Online Appendix D.5.3 for the detailed descriptions of the true and false versions). Each panel also reports the probability of giving the correct answer in the motivated state and the countermotivated state. In both panels, the vertical bar corresponds to the population average. The estimations include the full set of controls and fixed effects (see notes to Table 1 for included variables).

## E Heterogeneity by Country

Table E1: Effect of cognitive ability on news quiz score

	IQ			Education			IQ & Education
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
IQ score	0.013*** (0.001)	0.013*** (0.001)	0.012*** (0.001)				0.011*** (0.001)
Germany × IQ score	0.000 (0.002)	0.000 (0.002)	0.000 (0.002)				-0.001 (0.002)
UK × IQ Score	-0.003 (0.002)	-0.003 (0.002)	-0.001 (0.002)				0.000 (0.002)
Education				0.042*** (0.006)	0.042*** (0.006)	0.038*** (0.006)	0.030*** (0.006)
Germany × Education				-0.007 (0.007)	-0.007 (0.007)	-0.008 (0.007)	-0.008 (0.007)
UK × Education				-0.033*** (0.007)	-0.033*** (0.007)	-0.028*** (0.007)	-0.024*** (0.007)
Observations	3227	3227	3227	3227	3227	3227	3227
Controls	no	no	yes	no	no	yes	yes
Month FE	no	yes	yes	no	yes	yes	yes
Country FE	no	yes	yes	no	yes	yes	yes

*Notes:* This table reports estimates of OLS regressions of the news quiz score on the IQ score and educational attainment. The coefficients for IQ\*Country and Education\*Country indicate the difference in the effect of IQ and education for Country compared to Austria. Robust standard errors are in parentheses. \*\*\*, \*\* and \* indicate significance at the 1%, 5% and 10% level, respectively.

Table E2: Effect of cognitive ability on news quiz score by topic

	Immigration	Climate Ch.	Science	Inequality	Neutral
IQ score	0.016*** (0.002)	0.014*** (0.003)	0.002 (0.002)	0.015*** (0.003)	0.010*** (0.004)
Germany $\times$ IQ score	0.000 (0.003)	-0.003 (0.003)	0.005 (0.003)	-0.004 (0.004)	-0.005 (0.005)
UK $\times$ IQ score	-0.003 (0.004)	-0.004 (0.004)	0.009** (0.004)	-0.003 (0.005)	0.000 (0.006)
Education	0.044*** (0.009)	0.020* (0.010)	0.020** (0.009)	0.047*** (0.013)	0.023* (0.014)
Germany $\times$ Education	-0.028** (0.012)	0.010 (0.013)	-0.010 (0.012)	-0.025 (0.017)	0.020 (0.018)
UK $\times$ Education	-0.054*** (0.012)	-0.003 (0.013)	-0.020* (0.012)	-0.032** (0.016)	-0.020 (0.018)
Observations	3227	3227	3227	3227	3227
Controls	yes	yes	yes	yes	yes
Month FE	yes	yes	yes	yes	yes
Country FE	yes	yes	yes	yes	yes

*Notes:* This table reports estimates of OLS regressions of the news quiz score in each topic on the IQ score and educational attainment. The coefficients for Country\*IQ score and Country\*Education indicate the difference in the effect of IQ and education for Country compared to Austria. Robust standard errors are in parentheses. \*\*\*, \*\* and \* indicate significance at the 1%, 5% and 10% level, respectively.

Table E3: Effect of cognitive ability on the counter-motivated and motivated news quiz scores

	IQ			Education			IQ & Education
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
<b>Panel I: <math>P_C</math></b>							
IQ score	0.016*** (0.003)	0.016*** (0.003)	0.014*** (0.003)				0.013*** (0.003)
Germany $\times$ IQ score	-0.007* (0.004)	-0.007* (0.004)	-0.006* (0.004)				-0.007* (0.004)
UK $\times$ IQ score	-0.002 (0.004)	-0.002 (0.004)	0.000 (0.004)				0.000 (0.004)
Education				0.037*** (0.010)	0.036*** (0.010)	0.028*** (0.010)	0.018* (0.011)
Germany $\times$ Education				-0.002 (0.013)	-0.001 (0.013)	-0.002 (0.013)	0.004 (0.014)
UK $\times$ Education				-0.013 (0.013)	-0.013 (0.013)	-0.014 (0.013)	-0.010 (0.014)
<b>Panel II: <math>P_M</math></b>							
IQ score	0.012*** (0.003)	0.012*** (0.003)	0.013*** (0.003)				0.011*** (0.003)
Germany $\times$ IQ score	0.005 (0.004)	0.005 (0.004)	0.004 (0.004)				0.004 (0.004)
UK $\times$ IQ score	-0.004 (0.004)	-0.004 (0.004)	-0.005 (0.004)				-0.002 (0.004)
Education				0.047*** (0.010)	0.046*** (0.010)	0.045*** (0.010)	0.038*** (0.010)
Germany $\times$ Education				-0.010 (0.013)	-0.009 (0.013)	-0.008 (0.013)	-0.011 (0.013)
UK $\times$ Education				-0.057*** (0.013)	-0.057*** (0.013)	-0.047*** (0.013)	-0.043*** (0.013)
Observations	3112	3112	3112	3112	3112	3112	3112
Controls	no	no	yes	no	no	yes	yes
Month FE	no	yes	yes	no	yes	yes	yes
Country FE	no	yes	yes	no	yes	yes	yes

*Notes:* This table reports estimates of OLS regressions of the counter-motivated and motivated news quiz scores on the IQ score and educational attainment. The coefficients for Country\*IQ score and Country\*Education indicate the difference in the effect of IQ and education for Country compared to Austria. Robust standard errors are in parentheses. \*\*\*, \*\* and \* indicate significance at the 1%, 5% and 10% level, respectively.

Table E4: Joint effect of cognitive ability and motivated reasoning

	Panel A			Panel B		
	(1)	(2)	(3)	(4)	(5)	(6)
Motivated	0.180*** (0.007)	0.180*** (0.007)	0.180*** (0.007)	0.218*** (0.027)	0.218*** (0.027)	0.218*** (0.027)
IQ score	0.011*** (0.001)	0.011*** (0.001)	0.011*** (0.001)	0.011*** (0.002)	0.011*** (0.002)	0.011*** (0.002)
Motivated × IQ score				0.000 (0.002)	0.000 (0.002)	0.000 (0.002)
Education	0.017*** (0.004)	0.017*** (0.004)	0.017*** (0.004)	0.023*** (0.005)	0.023*** (0.005)	0.022*** (0.005)
Motivated × Education				-0.011 (0.008)	-0.011 (0.008)	-0.011 (0.008)
Germany		0.016** (0.008)	0.013 (0.008)	0.015 (0.011)	0.013 (0.011)	0.010 (0.011)
UK		0.004 (0.009)	-0.001 (0.010)	0.020* (0.011)	0.016 (0.012)	0.010 (0.013)
Motivated × Germany				0.005 (0.016)	0.005 (0.016)	0.005 (0.016)
Motivated × UK				-0.022 (0.017)	-0.022 (0.017)	-0.022 (0.017)
Observations	6224	6224	6224	6224	6224	6224
Controls	no	no	yes	no	no	yes
Month FE	no	yes	yes	no	yes	yes
Country FE	no	yes	yes	no	yes	yes

*Notes:* This table reports the results of random effects regressions examining how the news quiz score is influenced by directional motives, IQ score, and educational attainment. The coefficient for Motivated\*Country indicates the difference in the effect of directional motives for Country compared to Austria. Robust standard errors clustered by respondent are in parentheses. \*\*\*, \*\* and \* indicate significance at the 1%, 5% and 10% level, respectively.

Table E5: Effect of cognitive ability on motivated reasoning by topic

	Immigration	Climate Change	Science	Inequality
IQ score	-0.001 (0.008)	0.002 (0.006)	0.010 (0.007)	-0.022** (0.010)
Germany $\times$ IQ score	0.001 (0.011)	0.015* (0.008)	0.001 (0.010)	0.020 (0.013)
UK $\times$ IQ score	0.014 (0.012)	-0.003 (0.009)	-0.013 (0.011)	0.006 (0.014)
Education	-0.020 (0.033)	0.016 (0.021)	0.016 (0.025)	-0.012 (0.040)
Germany $\times$ Education	0.001 (0.040)	-0.035 (0.029)	0.045 (0.032)	0.020 (0.050)
UK $\times$ Education	-0.064 (0.040)	-0.033 (0.029)	0.021 (0.032)	0.003 (0.050)
Observations	1741	2255	2222	2203
Controls	yes	yes	yes	yes
Month FE	yes	yes	yes	yes
Country FE	yes	yes	yes	yes

*Notes:* This table reports estimates of OLS regressions where the dependent variable is motivated reasoning,  $P_M - P_C$ , in the respective news topic. The coefficients for Country\*IQ score and Country\*Education indicate the difference in the effect of IQ score and education for Country compared to Austria. Robust standard errors are in parentheses. \*\*\*, \*\* and \* indicate significance at the 1%, 5% and 10% level, respectively.

Table E6: Effect of overconfidence on updating decisions

	All data			Overconfident or well-calibrated			Underconfident		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(Over)confidence	0.002 (0.003)	0.002 (0.003)	0.001 (0.003)	-0.004 (0.004)	-0.006 (0.005)	-0.006 (0.005)	0.009 (0.009)	0.013 (0.009)	0.012 (0.009)
Germany $\times$ (Over)confidence	-0.006 (0.004)	-0.007** (0.004)	-0.007** (0.004)	-0.012* (0.006)	-0.012* (0.006)	-0.012* (0.006)	-0.002 (0.012)	-0.005 (0.012)	-0.004 (0.012)
UK $\times$ (Over)confidence	0.002 (0.004)	0.001 (0.004)	0.001 (0.004)	-0.003 (0.007)	-0.001 (0.007)	-0.001 (0.007)	0.002 (0.014)	-0.002 (0.014)	-0.001 (0.013)
Observations	3227	3227	3227	2192	2192	2192	1035	1035	1035
Controls	no	yes	yes	no	yes	yes	no	yes	yes
Month FE	yes	yes	yes	yes	yes	yes	yes	yes	yes
Country FE	yes	yes	yes	yes	yes	yes	yes	yes	yes

*Notes:* This table reports estimates of OLS regressions where the dependent variable is the share of updated answers among news items where the respondent's initial answer differs from the experimental report they observe. The coefficients for Country\*Overconfidence indicate the difference in the effect of overconfidence for Country compared to Austria. Robust standard errors are in parentheses. \*\*\*, \*\* and \* indicate significance at the 1%, 5% and 10% levels, respectively.

Table E7: Effect of cognitive ability on motivated updating by topic  
(only respondents with positive measure of motivated updating)

	Science	Climate Change	Immigration	Inequality
IQ score	0.016* (0.009)	0.010 (0.007)	0.009 (0.010)	0.015 (0.014)
Germany $\times$ IQ score	0.004 (0.013)	0.005 (0.011)	0.003 (0.014)	0.000 (0.022)
UK $\times$ IQ score	0.009 (0.013)	0.002 (0.011)	0.005 (0.013)	-0.007 (0.018)
Education	-0.019 (0.035)	0.005 (0.029)	0.070 (0.044)	0.011 (0.060)
Germany $\times$ Education	0.016 (0.043)	-0.006 (0.038)	-0.055 (0.050)	0.027 (0.078)
UK $\times$ Education	0.020 (0.041)	-0.011 (0.034)	-0.041 (0.050)	-0.033 (0.068)
Observations	643	887	660	367
Controls	yes	yes	yes	yes
Month FE	yes	yes	yes	yes
Country FE	yes	yes	yes	yes

*Notes:* This table reports estimates of OLS regressions where the dependent variable is motivated updating in a news topic, defined as the difference between the respective shares of updated answers in the motivated state and in the counter-motivated state. The coefficients for Country\*IQ score and Country\*Education indicate the difference in the effect of IQ score and education for Country compared to Austria Robust standard errors are in parentheses. \*\*\*, \*\* and \* indicate significance at the 1%, 5% and 10% level, respectively.

## F Instructions and questions

In this section, we present the instructions and the questions in each part of the study in English (UK study). The answers are coded inside parentheses as they appear in the dataset.



## Fake News Project

### Sample:

- Country: UK

### Part 1: Warm up/ Screening

1. You are invited to participate in a study by a group of researchers from several universities. By completing this survey, you will contribute to our knowledge as a society.

The survey consists of several parts and takes (on average) about 25 minutes. **Please read each question carefully and answer it truthfully and to the best of your ability.**

There will be an opportunity to receive a **bonus payment** (up to **£5.40**) on top of the **base payment** during this survey. The bonus payment depends on your answers to some of our survey questions, as we will explain later. You will be compensated for your participation only if you complete the entire survey.

Your participation in this study is voluntary, and you can withdraw from the study at any point. Your data will be stored on secured servers and will be kept confidential. Results may include summary data, but you will remain fully anonymous. If you have any questions about this study, you may contact us at [edoardo.cefala@wu.ac.at](mailto:edoardo.cefala@wu.ac.at).

Thank you very much for your time and support!

- a. Yes, I would like to participate in this study and confirm that I am a citizen and resident of the UK, and I am 18 years of age or older.
  - b. No, I would not like to participate. (end of survey)
2. What is your **gender**? (single choice)
    - a. Male
    - b. Female
    - c. Other
  3. What is your **age**? (single choice, input of number)
    - a. <...> years

If <18 >>> end of survey  
If >75 >>> end of survey
  4. Were you **born in the UK**? (single choice)
    - a. Yes (>>> Q6)
    - b. No

Only respondents who were not born in the UK:

5. **Where** were you **born**? (single choice)
- a. France
  - b. Germany
  - c. India
  - d. Ireland
  - e. Italy
  - f. Lithuania
  - g. Pakistan
  - h. Poland
  - i. Portugal
  - j. Rumania
  - k. Spain
  - l. USA
  - m. Elsewhere

All respondents:

6. Are you a **resident of the UK**? (single choice)
- a. Yes
  - b. No (end of survey)
7. In which **region** of the UK do you live? (single choice)
- a. North East
  - b. North West
  - c. Yorkshire and The Humber
  - d. East Midlands
  - e. West Midlands
  - f. East of England
  - g. London
  - h. South East
  - i. South West
  - j. Wales
  - k. Scotland
  - l. Northern Ireland
8. Which category best describes your **highest level of education**? (single choice)
- a. Less than secondary school
  - b. Secondary school up to 16 years (O-levels, CSE, GCSE, etc.)
  - c. Higher or secondary or further education (A-levels, BTEC, etc.)
  - d. College or university degree (BA, BSc, etc.)
  - e. Post-graduate degree (MA, MSc, PhD, etc.)
9. Was your **mother born** in the **UK**? (single choice)
- a. Yes (>>> Q11)
  - b. No

Mother was not born in the UK:

10. **Where** was your **mother born**? (single choice)

- a. France
- b. Germany
- c. India
- d. Ireland
- e. Italy
- f. Lithuania
- g. Pakistan
- h. Poland
- i. Portugal
- j. Rumania
- k. Spain
- l. USA
- m. Elsewhere

All respondents:

11. Was your **father born** in the **UK**? (single choice)

- a. Yes (>>> Q13)
- b. No

Father was not born in the UK:

12. **Where** was your **father born**? (single choice)

- a. France
- b. Germany
- c. India
- d. Ireland
- e. Italy
- f. Lithuania
- g. Pakistan
- h. Poland
- i. Portugal
- j. Rumania
- k. Spain
- l. USA
- m. Elsewhere

## Part 2: News Quiz

All respondents:

13. In the next part of the study, you will see **16 “news items”**. For each, we ask you to choose between two answers: **one is correct and the other is not**.

In order for your choices to be most helpful to us, it is very important that you answer your best guess. **Even though you may find some of the news items difficult, it is vital for our research that you try your best and do not consult external sources or other people.** Thank you very much!

You will receive a base payment of **£1.8** for completing this study irrespective of your answers. In addition, **two “news items”** will be selected randomly to determine your **bonus payment for this part of the study**. For each item selected for payment, you will receive a bonus of **£1** if you choose the correct answer.

14. In the next screen, you will be shown the first news item. Please read it carefully and **choose the answer that you consider correct**.

Please proceed to the next news item when you are done.

Start of random order of questions
------------------------------------

15. In 2017, a prestigious demographic research organisation made a forecast on the **number of children for Muslim and non-Muslim women in the EU** between 2015 and 2020. According to the forecast, a typical Muslim woman in the EU has
- a. 1 more child
  - b. 3 more children
- than a non-Muslim one. (single choice, random order of items)
16. True or false? According to official statistics, **Muhammad** was the **most popular first name for newborn boys** in several regions of England in 2020. (single choice)
- a. True
  - b. False
17. True or false? According to the latest UK Census, the share of Muslim population in the UK is **higher than 20%**. (single choice)
- a. True
  - b. False
18. According to official statistics,
- a. 38%
  - b. 18%
- of **migrants in the EU born outside the EU** have a low level of education (at most 8-10 years of schooling). (single choice, random order of items)
19. According to recent research published in a prestigious scientific journal, **average sea levels increased** by about
- a. 18 cm
  - b. 8 cm
- between 1993 and 2019. (single choice, random order of items)
20. True or false? According to studies published in prestigious scientific journals, the **melting of ancient Arctic ice** may release **radioactive materials and ancient microbes**, and endanger human health.
- a. True

- b. False
21. A survey of **top climate scientists** in 2021 found that
- a. 82%
  - b. 58%
- of them expect to see **catastrophic changes in their lifetimes** due to **climate change**. (single choice, random order of items)
22. In Europe, **since 1990, air pollution levels** and **premature deaths** due to air pollution have
- a. **decreased considerably**
  - b. remained stable
- according to recent research. (single choice, random order of items)
23. A scientific report prepared for the European Parliament in 2021 states that the **health effects** of the high radio frequencies used in the latest mobile network technology (**5G**) (single choice, random order of items)
- a. have been well studied and proven to be safe.
  - b. **have not been adequately studied.**
24. True or false? A recent book by a leading scientist documents that **scientists in the US deliberately infected more than 1,000 people with hepatitis** (from stigmatized groups, such as conscientious objectors, prison inmates, the mentally ill, and developmentally disabled adults and children) between 1942 and 1972. (single choice)
- a. True
  - b. False
25. True or false? According to a recent survey by the *American Medical Association*, around **40% of physicians** believe that a **cure** for various forms of **cancer already exists** but is **withheld** from the public to increase healthcare industry profits. (single choice)
- a. True
  - b. False
26. **Factual Information:** Many countries used **water fluoridation** (adding fluoride to tap water in controlled amounts) to prevent tooth decay.
- Question:** Is the following statement true or false? A substantial body of scientific evidence shows that **water fluoridation** reduces cognitive ability. (single choice)
- a. True
  - b. False
27. The *World Bank* defines “extreme poverty” as living each day on less than what £2.20 can buy in the UK. In the **last 25 years**, the number of people in the **world living in extreme poverty** substantially (single choice, random order of items)
- a. **decreased**
  - b. increased
28. According to the *World Bank*, about
- a. a quarter
  - b. **a half**
- of the **world population** lives each day on **less than what £7** can buy in the UK. (single choice, random order of items)

29. True or false? There is overwhelming scientific evidence that a **gluten-free diet** is **healthier** for the average individual. (single choice)
- True
  - False
30. True or false? The **tallest person** in recorded history is a man with a height of **2.84 m**. (single choice)
- True
  - False

End of random order of questions

31. Thank you for your answers!

Please give your best guess: **how many** of the 16 news items **did you answer correctly?** (input of number, min. 0 – max. 16)

- <...> correct

32. Now, think about **100 typical people in the UK** who saw the same news items. Where do you think you **rank** in terms of the number of correct answers?

For example:

- If you think you did **better** than everyone else did, you should answer **1**.
  - If you think you did **worse** than everyone else did, you should answer **100**. (input of number, min. 1 – max. 100)
- <...>

### Part 3: Updating

33. In this part, you will see a “**report**” for each one of the 16 news items above. Each **report** gives you some information about the **correct answer**.

For example, consider the question: *True or false? The star of the latest Marilyn Monroe movie Blonde said that the ghost of Monroe was on the film set with her.*

The **report** for the above example will show either “**True**” or “**False**”. Importantly, **reports are informative but not always correct**. The report shows the **correct answer with 75% chance** and the **wrong answer with 25% chance**.

To illustrate, the correct answer in the above example is “**True**”. Therefore, the report will show:

- True in 3 out of 4 cases,
- False in 1 out of 4 cases.

Once you see each report, **you may change your initial answer or keep it**.

**For this part of the study, one news item** will be selected randomly for **bonus payment**. If your final answer is correct, you will receive **£1**.

Please click to see the first news item, your initial answer, and the report for that item.

- <Erklärungstext>

Programming: In the following, repeat each news item with the respondent's initial answer and the report. Keep order the same.

2 Screens pro "news item":

Screen 1:

In 2017, a prestigious demographic research organisation made a forecast on the **number of children for Muslim and non-Muslim women in the EU** between 2015 and 2020. According to the forecast, a typical Muslim woman in the EU has

- b. 1 more child
- c. 3 more children

than a non-Muslim one. (single choice, random order of items)

You answered "[PROG]"

To see what the **report** says click here: "See report"

**Reminder:** the report shows the **correct answer in 3 out of 4 cases** and the **false answer in 1 out of 4 cases**.

Screen 2:

In 2017, a prestigious demographic research organisation made a forecast on the **number of children for Muslim and non-Muslim women in the EU** between 2015 and 2020. According to the forecast, a typical Muslim woman in the EU has

- a. 1 more child
- b. 3 more children

than a non-Muslim one. (single choice, random order of items)

You answered "[PROG]"

The report says: "[PROG]" [PROG = correct/ green answer from block News Quiz with probability 75% and wrong answer with probability 25%]

**Reminder:** the report shows the **correct answer in 3 out of 4 cases** and the **false answer in 1 out of 4 cases**.

You may now change your answer above if you wish.

PROG:

- ➔ Respondents can now change their answers (was not possible during screen 1)
- ➔ In each question, each report is a new random draw for each participant.

34. In 2017, a prestigious demographic research organisation made a forecast on the **number of children for Muslim and non-Muslim women in the EU** between 2015 and 2020. According to the forecast, a typical Muslim woman in the EU has

- a. 1 more child
- b. 3 more children

than a non-Muslim one. (single choice, random order of items)

35. True or false? According to official statistics, **Muhammad** was the **most popular first name** for **newborn boys** in several regions of England in 2020. (single choice)

- a. True
  - b. False
36. True or false? According to the latest UK Census, the share of Muslim population in the UK is **higher than 20%**. (single choice)
- a. True
  - b. False
37. According to official statistics,
- a. 38%
  - b. 18%
- of **migrants in the EU born outside the EU** have a low level of education (at most 8-10 years of schooling). (single choice, random order of items)
38. According to recent research published in a prestigious scientific journal, **average sea levels increased** by about
- a. 18 cm
  - b. 8 cm
- between 1993 and 2019. (single choice, random order of items)
39. True or false? According to studies published in prestigious scientific journals, the **melting of ancient Arctic ice** may release **radioactive materials and ancient microbes**, and endanger human health.
- a. True
  - b. False
40. A survey of **top climate scientists** in 2021 found that
- a. 82%
  - b. 58%
- of them expect to see **catastrophic changes in their lifetimes** due to **climate change**. (single choice, random order of items)
41. In Europe, **since 1990, air pollution levels and premature deaths** due to air pollution have
- a. decreased considerably
  - b. remained stable
- according to recent research. (single choice, random order of items)
42. A scientific report prepared for the European Parliament in 2021 states that the **health effects** of the high radio frequencies used in the latest mobile network technology (**5G**) (single choice, random order of items)
- a. have been well studied and proven to be safe.
  - b. have not been adequately studied.
43. True or false? A recent book by a leading scientist documents that **scientists in the US deliberately infected more than 1,000 people with hepatitis** (from stigmatized groups, such as conscientious objectors, prison inmates, the mentally ill, and developmentally disabled adults and children) between 1942 and 1972. (single choice)
- a. True
  - b. False
44. True or false? According to a recent survey by the *American Medical Association*, around **40% of physicians** believe that a **cure** for various forms of **cancer already exists** but is **withheld** from the public to increase healthcare industry profits. (single choice)

- a. True
- b. False

45. **Factual Information:** Many countries used **water fluoridation** (adding fluoride to tap water in controlled amounts) to prevent tooth decay.

**Question:** Is the following statement true or false? A substantial body of scientific evidence shows that **water fluoridation** reduces cognitive ability. (single choice)

- a. True
- b. False

46. The *World Bank* defines “extreme poverty” as living each day on less than what £2.20 can buy in the UK. In the **last 25 years**, the number of people in the **world living in extreme poverty** substantially (single choice, random order of items)

- a. decreased
- b. increased

47. According to the *World Bank*, about

- a. a quarter
- b. a half

of the **world population** lives each day on **less than what £7** can buy in the UK. (single choice, random order of items)

48. True or false? There is overwhelming scientific evidence that a **gluten-free diet** is **healthier** for the average individual. (single choice)

- a. True
- b. False

49. True or false? The **tallest person** in recorded history is a man with a height of **2.84 m**. (single choice)

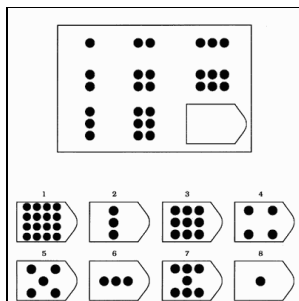
- a. True
- b. False

#### Part 4: Raven's Progressive Matrices

50. In this part, you will be asked to solve a series of **puzzles**. Please note that **it is vital for our research that you try your best to solve each puzzle**. We will **not** be able to use the responses if participants speed through this part, since their answers may not reflect their true abilities. Therefore, **we would be very grateful if you spend time on each puzzle and answer to the best of your ability**. Thank you very much!

Each puzzle in this part consists of eight images, with one image missing. Please **identify the missing image** that completes the pattern in each puzzle.

For example, examine the following sequence of images:



In the example above, the correct answer is image 3 as this image best completes the pattern.

There are **12 puzzles in total**. You will receive a **bonus of 20 Pence for each correct answer**.

[These questions are subject to copyright.]

### Part 5: Opinion Survey

51. Thank you for your answers!

The questions in the next part concern **your opinions and attitudes** on various issues. These are questions for which there are no right or wrong answers.

Start of random order of questions

52. In **politics**, people sometimes talk of “**left**” and “**right**”. Where would you place yourself on a scale from 0 to 10, where 0 means the left and 10 means the right? (Polaritätenprofil 11-stufig)

a. 0 = left o o o o o o o o o o 10 = right

53. Please indicate on a scale from 0 to 10 how much you personally **trust** each of the **institutions** below. 0 means you do not trust an institution at all, and 10 means you have complete trust. (Matrix questions, random order of items)

- a. The education system
- b. The news media
- c. Scientists
- d. Politicians
- e. Social Media

Labels:

- 0 = no trust at all
- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10 = complete trust

54. Below you see **opposing views** on various issues. How would you place **your views** on this scale? (Polaritätenprofil, 7-stufig, random order of items)
- Protecting the environment should be given priority, even if it causes slower economic growth and some loss of jobs. O O O O O O Economic growth and creating jobs should be the top priority, even if the environment suffers to some extent.
  - Immigrants take jobs away from the British. O O O O O O Immigrants do not take jobs away from the British.
  - I am very worried about climate change. O O O O O O I am not at all worried about climate change.
  - UK's cultural life is enriched by migrants coming to live here from other countries. O O O O O O UK's cultural life is undermined by migrants coming to live here from other countries.
55. For each of the following **statements**, can you please indicate how strongly you **agree or disagree** with the statement? (Matrix question, random order of items)
- The government should take measures to reduce differences in income levels.
  - Many of the claims about environmental threats are exaggerated.
  - Large differences in people's incomes are acceptable to properly reward differences in talent and effort.
  - Immigrants make crime problems in the UK worse.
  - A small secret group of people is responsible for making all major decisions in world politics.
  - Immigrants are generally good for the UK's economy.
  - The money and wealth in the UK should be more evenly distributed among people.
  - When jobs are scarce, employers should give priority to British people over immigrants.
  - We can no longer trust scientists on controversial scientific and technological issues because they depend more and more on money from industry.

Labels:

- agree strongly
- agree
- neither agree nor disagree
- disagree
- disagree strongly

56. In your opinion, on a scale from 1 to 6, 1 meaning "very unlikely" and 6 meaning "very likely", **how likely or unlikely** is it that the following statements are **true**? (Matrix questions, random order of items)
- Viruses have been produced in government laboratories to control our freedom.
  - Climate change is for the most part caused by natural cycles rather than human activities.

Labels:

- 1 = very unlikely
- 2
- 3
- 4
- 5
- 6 = very likely

End of random order of questions
----------------------------------

## Part 6: Demographics

57. This is the final part of the survey. In this part, we will ask you a few questions about yourself.

What is your **annual TOTAL HOUSEHOLD income before taxes**? (single choice)

- a. £ 0 – 9 999
- b. £ 10 000 – 19 999
- c. £ 20 000 – 29 999
- d. £ 30 000 – 39 999
- e. £ 40 000 – 49 999
- f. £ 50 000 – 59 999
- g. £ 60 000 – 79 999
- h. £ 80 000 – 99 999
- i. £ 100 000 – 119 999
- j. £120 000 and over
- k. No answer

58. What is your current **employment status**? (single choice)

- a. Full-time employee
- b. Part-time employee
- c. Self-employed or small business owner
- d. Unemployed and looking for work
- e. Student
- f. Not currently working and not looking for work
- g. Retiree

59. Did you **vote** in the last **UK general election** in December 2019?

- a. Yes
- b. No (>>> Q73)

Respondents who voted:

60. **Which party** did you vote for in that election? (single choice)

- a. Conservative
- b. Labour
- c. Liberal Democrat
- d. Scottish National Party (SNP)
- e. Plaid Cymru
- f. United Kingdom Independence Party (UKIP)
- g. Green Party
- h. Brexit Party (now Reform UK)
- i. British National Party
- j. Other
- k. No answer

All respondents:

61. Is there a particular political **party you feel closer to** than all the other parties? (single choice)

- a. Yes
- b. No (>>> Q75)

Respondents who favor a political party

62. **Which** one? (single choice)

- a. Conservative
- b. Labour
- c. Liberal Democrat
- d. Scottish National Party (SNP)
- e. Plaid Cymru
- f. United Kingdom Independence Party (UKIP)
- g. Green Party

- h. Brexit Party (now Reform UK)
- i. British National Party
- j. Other
- k. No answer

All respondents:

63. People learn what is going on in this country and the world from various **sources**. For each of the following sources, please indicate **how often you use them to stay informed**. (Matrix question, random order of items)
- a. TV
  - b. Newspapers (print or online)
  - c. Radio
  - d. Internet (blogs, forums, etc.)
  - e. Social Media (Facebook, Twitter, etc.)

Labels:

- Always
- Often
- Sometimes
- Rarely
- Never

64. **Thank you very much** for your participation in our study!

You have answered X questions (out of 16) correctly the first time you took the news quiz. Two questions were randomly selected to determine your bonus payment for that part. Your bonus payment for that part is **£X**.

You answered X questions (out of 16) correctly the second time you took the news quiz. One question was randomly selected to determine your bonus payment for that part. Your bonus payment for that part is **£X**.

You answered X image puzzles correctly. Your bonus equals  $0.20 \times X = \mathbf{£X}$  for that part.

**In total your bonus payment will be £X.** Please note that it can take up to a couple of weeks for your user account to be credited with this bonus payment.