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THE PEOPLE AND THE EXPERTS

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ABSTRACT

Are speculators driving up oil prices? Should we raise energy prices to slow global warming? The present study takes a small number of such questions and compares the views of economic experts with those of the public. This comparison uses a panel of more than 2000 respondents from YouGov with the views of the panel of experts from the Initiative on Global Markets at the Chicago Booth School. We found that most of the US population is at best modestly informed about major economic questions and policies. The low level of knowledge is generally associated with the intrusion of ideological, political, and religious views that challenge or deny the current economic consensus. The intruding factors are highly heterogeneous across questions and sub-populations and are much more diverse than the narrowness of public political discourse would suggest. Many of these findings have been established for scientific subjects, but they appear to be equally important for economic views.

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I. Introduction

a. *Background*

Are speculators driving up oil prices? What is the best investment strategy? Should we raise energy prices to slow global warming? These are hotly debated topics in the press and around the dinner table. The purpose of this study is to take a small number of such questions and compare the views of economic experts with those of the public. We are interested in the extent of alignment, as well as the differences that might arise along educational, demographic, religious, and ideological lines. If we take expert opinion as current knowledge about key questions (such as whether investing in a single company is riskier than investing in a stock mutual fund), we can then measure the accuracy of the public's knowledge as well as the demographic, religious, and ideological determinants of the public's views on economic issues. Accurate knowledge of economics is essential for making informed decisions about daily lives and livelihoods as well as helping people be informed and engaged citizens.

The major conclusions are the following. Most of the US population is not well informed about major economic questions and policies. Their low level of knowledge is generally associated with intrusion of ideological, political, and religious views that challenge or deny the current economic and scientific consensus. The intruding factors influencing public opinion and public error are highly heterogeneous across different questions and sub-populations and are much more diverse than the narrowness of public political discourse would suggest. Many of these findings have been established for scientific subjects, such as those involving evolution and global warming. They appear to be equally important for economic views such as policies on climate change, trends in inequality, and the role of speculation in oil price changes.

b. *Existing studies on economic knowledge*

There is a substantial literature on public opinion on economic affairs. A few studies are closely related to this one and will be sketched. Most studies were interested in either economic *knowledge* (sometimes called economic or financial literacy) or the views on e*conomic policy* questions. These can be labelled positive knowledge and normative views, respectively. Most studies

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examine a sample of US adults, but a few also compare the public with economic experts.

We review four key studies to give a flavor for approaches. Alan S. Blinder and Alan B. Krueger (2004) conducted a telephone survey of 1,002 adults.[2] The questions largely concerned economic policies. The study showed, and we confirm below, that the determinants of responses were highly question-specific. They constructed a "knowledge" variable similar to the one developed below and found similar results on the state of economic knowledge of the public. They concluded that ideology plays a stronger role in shaping public opinion on policy issues than either self-interest or knowledge. They found that the real representative agent (as measured by the average response to their survey) stands in stark contrast to informed, nonideological, and completely self-interested *homo economicus*.

Another study of financial literacy among the young (Annamaria Lusardi, Olivia S. Mitchell, and Vilsa Curto, 2010, LMC) was part of a standard approach to scientific and financial literacy that has been a staple of research on this topic in recent years. LMC used the National Longitudinal Survey of Youth with questions on about interest rate compounding, inflation, and risk diversification. Demographic characteristics were important as were educational variables, but R^2 values were low on all specifications.

A third study, "Assessing the economic knowledge and economic opinions of adults," was by William B. Walstad and Ken Rebeck (2002). The authors took data from five national surveys – 1992, 1994, 1996, 1998, and 1999 – and created a pooled data set on various economic issues. They used an approach that we follow below in creating a synthetic knowledge variable (EKNOW in their study) equal to the average number of correct responses to the economic knowledge questions in all surveys. They then tested the policy views of respondents on questions such as free trade or supply and demand. They found that a higher EKNOW was the only significant determinant of "correct" answers on all six economic policy questions. This finding is definitely not consistent with our results.

Two studies specifically examine the Booth IGM US Economic Experts Panel, which is also used here. One study (Roger Gordon and Gordon B. Dahl, 2013) examines the views of the Booth Panel to determine the sources of disagreement. Another study by Paola Sapienza and Luigi Zingales (2013) used a similar approach to the present one in comparing the results of the

[2] The Blinder-Kreuger survey reported a 26% response rate – about five times what a similar survey would get today.

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Booth experts with a panel of US adults. They compared the views on twenty questions that were answered by the Booth panel with those of a general population telephone survey[3] (but not using the same survey instrument for both groups, as here). They find that the public differs from experts on more technical questions and on questions where economists have more consensus. They interpret these results as reflecting different interpretations of questions of the two groups rather than superior knowledge of economists. They caution against using economic expert opinions as a policy tool. The major difference between the Sapienza-Zingales study and the present study is that their questions tended to be much more technical than the present ones (for example, they included "Fannie and Freddie do not rebate subsidies through lower interest rates," which seems unlikely to be common dinner-table conversation).

The present study adds to the existing literature on economic literacy. It follows the path of others in comparing experts with the public. It adds several new elements. One addition is to add a set of non-economic knowledge questions – those involving knowledge of key science findings – as an independent measure of respondents' general technical knowledge. A second contribution is to draw upon the new field of online panels, which is likely to become a major source of low-cost and easily gathered data in many areas. The use of an online panel leads to a third important innovation: a large array of personal characteristics can be gathered about such panels whereas it is infeasible to collect these data in one-time surveys.

II. Major Findings

We begin with the major conclusions that follow.

First, we found that the level of economic, financial, and scientific literacy of the American public is modest at best. In our survey, for example, we found that only 38% of the public correctly knew the difference between monetary and fiscal policy, which is important for public understanding of economic policy. Closer to home are important facts about investments for, say, retirement. Here, the public is reasonably well informed about the importance of diversification, where we found that 53% of the public believes correctly that holding a portfolio of stocks is safer than a single stock. On the

[3] According to the Online Appendix to Luigi Guiso, Paola Sapienza, and Luigi Zingales (2013), the survey was a random-digit dial telephone sample of about 1,000 respondents with a complex design. No response rate is reported.

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other hand, only 22% correctly believe that bond prices fall when interest rates rise.

Second, we calculated variables that summarize the general knowledge of respondents. One was a variable called "*ECONSCORE*" that rates the economic knowledge or literacy of the public sample. *ECONSCORE* equals the average correct score on 8 largely factual economic questions. We define "correct" as ones that correspond to the opinions of the Booth panel of expert economists. We found that 74% have an average score that is positive, meaning that their answers are on average correct.

We also constructed a broader index, *TOTALSCORE*, which added four scientific questions and three economic questions to *ECONSCORE*. (These indexes are described in detail below, along with definitions of the components of each score.) We found that the public does better than a random selection 67% of the time on *TOTALSCORE*.

Third, we found that economic and scientific knowledge are usually better predicted by non-knowledge variables such as religion, politics, and ideology than education and other indicators of knowledge or experience. The influence of ideology and religion will hardly be a shock to most observers, but the degree to which non-knowledge variables dominate answers may be more surprising. Additionally, these non-knowledge factors tend to completely outweigh formal education when predictors are selected using a stepwise regression algorithm.

Additionally, we looked at those personal characteristics or attitudinal variables which were statistically most significant for each of the 15 component variables of *TOTALSCORE*. Most of the significant variables were ideological, political, or religious. We estimated 5 significant coefficients each for the 15 components of *TOTALSCORE* for a total of 75 coefficients. Of these, 25 were related to ideology or politics; 13 were knowledge-related (such as COLLEGE SCIENCE or EDUCATION); and 11 related to religion (such as BORN AGAIN). Surprisingly, the level of educational attainment seldom appeared among the top factors for any of the questions in *TOTALSCORE*.

Fourth, it is clear that the views of the public on many economic questions are weakly held and often inconsistent. Here are three ways to see this. On average, 25% respond "Don't know" to questions. Second, about 15% of respondents change their mind depending on whether the question is reversed or not, a phenomenon known as agreement or acquiescence bias. Third, in a parallel experiment with a repeated survey over time, we found that respondents tend to provide different answers on all economic questions

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when answering on different occasions. All these indications of weakly held views are discussed below.

III.Description of the Study

a. Survey design

We designed a survey that focused on several economic, financial, and scientific questions that have been used in previous surveys to test public knowledge. The survey was distributed to two groups: the "Booth panel" and the "public panel." These groups are described in detail in the next section. The survey contained several categories of questions. Most of these were simplified versions of questions that had been asked previously of the Booth panel (such as the role of speculators in oil-price volatility). Another group of questions were ones that were designed to flesh out the views and knowledge of the public panel on economic issues.

The final group was scientific questions. These were drawn from standard surveys on scientific literacy (such as whether antibiotics kill viruses) and were included to get a reading on the general knowledge of members of the public panel about a technical but unrelated field. We also included a group of questions on science and religion because of the importance of religion in views on many scientific questions. Unlike prior studies, we administered identical questions to both the experts and the public, so the differences between groups cannot be attributed to minor wording differences.

Tables 1A and 1B provide the list of major survey variables in five categories: (a) five factual economic questions, (b) six analytical economic questions, (c) four scientific questions, (d) three questions on religion and science, and (e) seven economic policy questions. We will analyze the differences between expert and public views on these as well as the determinants of the economic and scientific views.

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Category of question	*Name*	*Question text*
Factual		
	Bond prices	What happens to the price of a bond when interest rates rise?
	Diversify	Investing in a single company is riskier than investing in a stock mutual fund
	Fiscal/monetary	Would a change federal spending or tax rates be considered a part of fiscal policy or of monetary policy?
	History inequality	Has economic inequality (differences in income and wealth between rich and poor people) increased or decreased over the past 50 years?
	Top tax rates	What is the top federal income tax rate?
Analytical		
	AI	The increased use of robots and artificial intelligence will probably increase unemployment substantially over the twenty years or so.
	Athletes	If athletes in top college basketball and football programs were paid their dollar value to their colleges, they would earn much more than their scholarships.
	Free trade	Free international trade increases productivity and offers consumers better choices, and in the long run these gains far outweigh negative effects on domestic employment.
	Sources of inequality	Differences in individual incomes primarily reflect differences in personal skills and work efforts.
	Minimum wage	A major increase in the minimum wage will decrease employment.
	Oil volatility	Large movements in monthly oil prices, either up or down, are driven primarily speculators, as opposed to changes in the current (and planned) supply or demand for oil.

Table 1A. List of factual and analytical economic questions

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Category of question	*Name*	*Question text*
Scientific		
	Antibiotics	Antibiotics only kill bacteria, not viruses.
	Big bang	The universe began with a huge explosion billions of years ago.
	Continents	Continents have been moving their location for millions of years and will continue to move.
	Evolution	Human beings developed over millions of years from less advanced forms of life.
Religion and science		
	God communicates	God communicates with humankind in the sense that we may expect to receive an answer to our prayers.
	Religion/science	The teachings of doctors and scientists are more reliable than those of my religion.
	Science/politics	Most scientific findings today are based on data and objective analysis.
Economic policy		
	Climate priority	The U.S. federal government should spend at least as much on slowing climate change as it does on national defense.
	Fossil-fuel tax	The U.S. should tax the use of fossil fuels like oil and coal to slow global warming.
	Emissions price CO2	Sound policy would significantly increase the currently near-zero price of emissions of carbon dioxide and other greenhouse gases.
	Lottery	Lotteries such as Powerball are beneficial to society because they provide revenues to states.
	Profits	It is best for society if companies' only goal is the profitability of their operations.
	Soft drinks	A large tax should be put on soft drinks with added sugar because the higher prices will reduce obesity.
	Too much money	Society puts too much emphasis on money and wealth today.

Table 1B. List of economic policy and scientific questions

Finally, we asked a broad set of personal background questions. These included basic demographics (age, race, education, etc.), economic information (employment status, personal finance), as well as religious and political views (such as whether a person described themselves as "born again" and their vote in last three presidential elections). An important benefit of online panels is the availability of a rich set of personal background questions that have already been collected and would be too time-consuming for a one-shot survey. Table 2 provides a list of the major personal background questions (and sometimes sub-questions) that were available for members of the public panel.

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Category	Number of questions	Examples
Demographic	23	Age, race, birth order
Economic attitudes	24	Minimum wage, oil speculation
Science questions	7	Antibiotics, evolution
Education	8	Highest degree, college major
Personal finance	6	Earnings, value of accounts
Political attitudes	9	Presidential vote, ideology
Religion	5	Church attendance, born again

Table 2. Major personal background variables for the YouGov panel

b. Participants

The survey was distributed to two groups: the public sample was drawn from YouGov's US panel, while the second was a survey of the Booth panel of US economic experts. The questions for both groups were designed by the authors, while the survey for both groups was conducted by YouGov.

Public sample

The "public" sample consists of 2056 individuals drawn from the YouGov US panel. The YouGov panel is an opt-in sample, and all interviews are conducted online. These features ensure rapid turnaround and low cost, but they also risk imparting selection bias to the resulting sample. Consequently, YouGov relies upon systematic selection and weighting adjustments that correct for differences between panel participants and the US population.

There are two critical elements for improving the representativeness of opt-in panels. The first is how panelists are selected for a survey. Opt-in panels tend to be older, more educated, and less racially diverse than the population as a whole. These biases are typical of all types of samples today, although they are probably more exaggerated in opt-in panels. However, this bias can be eliminated by selecting a subset of panelists to match known population characteristics using stratified sampling (or "quotas"). For the present survey, quota cells were created using the cross-classification of age (18-29, 30-44, 45-64, and 65+), gender (male and female), race (white, Black, Hispanic, and other), and education (high school or less, some college, college graduates, and advanced degrees). The target sample size in each cell was proportional to its frequency in the 2019 American Community Survey.

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The second critical element is the construction and application of sample weights (post-stratification weighting). Although quota-based sampling is intended to generate a sample that is broadly representative of the target population, in practice the quota cells do not match the population distribution exactly, and additionally we wish to balance the sample on variables other than demographics. A "raking" procedure is therefore used to construct weights that make the weighted sample match the population proportions in each demographic category, as well as for marital status, presence of children, region, and 2020 vote in the US Presidential election.

The use of quota sampling and post-stratification weighting ensures that the sample has the same marginal distribution on these variables, and it generally has approximately the same joint distribution. In principle, weighting can remove bias if panel selection and within-panel non-response are conditionally independent of the weighting variables. This is Rubin's "missing at random" condition, which is sufficient for approximate unbiasedness of the survey estimates. (Little and Rubin, 2019)

Expert sample

The expert sample was drawn from the participants as of April 2022 in the panel of 43 economists recruited by the University of Chicago Booth School of Business (the "Booth panel" or "experts"). Since late 2010, the Initiative on Global Markets (IGM) has asked the Booth panel questions on economic policy and analysis. The panel is described as "senior faculty at the world's most elite research universities who represent a wide range of viewpoints." The panelists are chosen by the organizers at the Booth School "to be geographically diverse, and to include Democrats, Republicans and Independents as well as older and younger scholars."

All economic questions in the survey were drawn from ones asked of the Booth panel in earlier times. They were among the simpler questions because the public sample would struggle with Freddie and Fannie questions. The Booth panel received a survey administered by YouGov which contained exactly the same economic and scientific questions as the public panel. The survey for the Booth panel omitted some questions involving education and level of expertise, which were not necessary for the Booth panel. 36 of the 43 economists in the Booth survey responded for a response rate of 84%, slightly below the 89% response rate reported by Booth (Booth 2022).

We compared the responses of the Booth panel on the present survey with results of earlier surveys over the period 2011 – 2021. The responses to the questions were similar in terms of overall agreement or disagreement

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although the questions often were simplified in the present survey. The one notable exception was the question on artificial intelligence, where the central answer for the Booth panel swung sharply from agreement to disagreement about the impacts of AI on long-term employment trends.[4]

c. Treatment of variables

As is typical of a survey of this kind, there are many possible predictors, and most of these are categorical. Models with indicators for all possible categories (*e.g.,* 16 different religions, 26 industry groups, 19 college majors, *etc.*) and interactions, would result in an unmanageable number of variables (about 8000 religion-industry-major categories).

To avoid a proliferation of variables, we have simplified the models by *cardinalizing* most of the predictors and response variables. For ease of interpretation, numerical values were assigned ranging from -1 to +1, with equal-spaced categories. There are other approaches that are sometimes used for discrete variables such as ordered probit, logit, or non-parametric models based upon a latent response model, but these usually generate similar predictions to linear regressions with cardinalized variables.

The approach is the following: We first organized the variables so that they are increasing in the expert answers or determinants of expert answers. For example, the education variable ranged from less than high school graduation to post-graduate education. Since years of education is positively correlated with expert answers, we coded less than high school as -1 and post-graduate education as +1.

We also cardinalized the responses to economic and scientific questions from -1 to +1. For economic questions, -1 would represent complete disagreement with experts while +1 would indicate complete agreement with expert opinion. Mostly agree and disagree were coded as +0.5 and -0.5, with "don't know" coded as zero. There is some ambiguity about correctness (see below), but this is usually a minor concern. Scientific questions were similarly coded.

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[4] When the Booth panel was asked the AI question in 2019, 42% agreed or mostly agreed and 24% disagreed or mostly disagreed. In the 2022 survey, the numbers were 16% agreement and 75% disagreement. In the Booth survey, the question was, "Holding labor market institutions and job training fixed, rising use of robots and artificial intelligence is likely to increase substantially the number of workers in advanced countries who are unemployed for long periods." In the present survey, this was simplified to "The increased use of robots and artificial intelligence will probably increase unemployment substantially over the next twenty years or so."

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The cardinalization imposes a linearity assumption. We did some tests to determine the sensitivity of estimates to relaxing this assumption. The coefficient estimates reported below varied by less than 4% when alternative cardinalizations were used for race and education. We also examined the possibility that cardinalization would affect the major results on our major tests. We found that there is virtually no impact of representing education or race with different functions such as dummy variables for multiple-category variables (such as education). Limited experimentation also suggests that the major results are insensitive to the cardinalization. We conclude for the present survey that, while cardinalization is an approximation, it has the virtue of simplifying the analysis and bringing transparency to the interpretation.

IV. Major results

We start with the major results of the survey, focusing on 18 questions asked of both groups. The exact question wording is provided in Appendix A. Note that all results presented below are weighted as described above for the YouGov panel, while experts are equally weighted.

Figure 1 shows the average answer (cardinalized as explained above) for the experts and the public on all 18 economic questions. We can look at the difference between the two bars in Figure 1 to see the disagreement between the two groups for different questions. For virtually all questions, the public has markedly less agreement with the correct answer than the experts. This can be interpreted as having lower levels of correct knowledge.

If we look at the economic policy questions, we see patterns of agreement and disagreement between the public and the experts. The public and experts agree on the lower risk of diversified portfolios, on whether inequality has risen over the last half-century, and on the priority of profits. The major policy disagreements are on the use of taxes on emissions and fossil-fuel taxes for climate change, the role of speculators, as well as the benefit of free trade. On the climate questions, the experts have strong agreement while the public is essentially neutral. The two groups also have a strong disagreement on the impact of artificial intelligence on employment (but that apparently has changed for the Booth panel).

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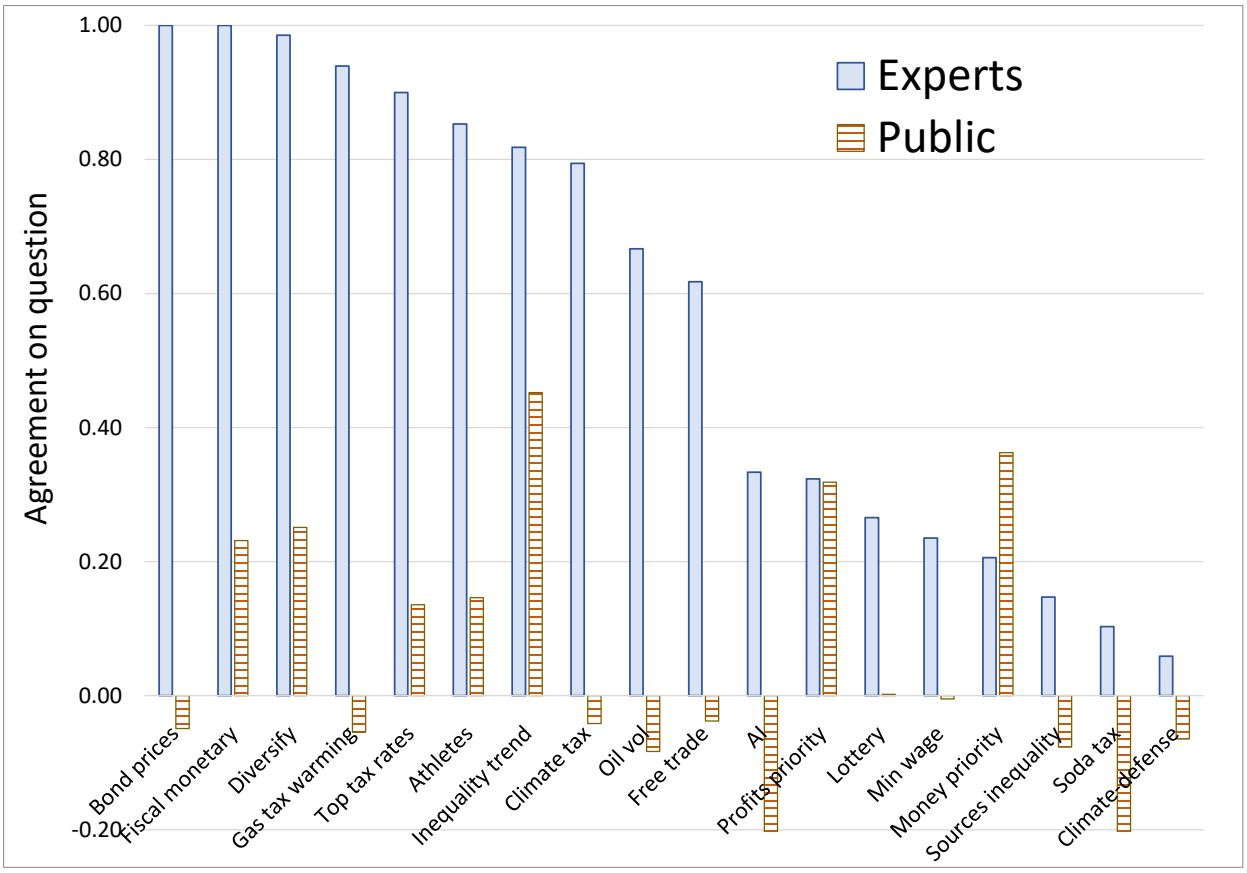

Figure 1. Agreement between the experts and the public on economic questions

The figure shows the average value for each question. Each variable is cardinalized where agreement with experts is positive and disagreement is negative, with the range being +1 for complete agreement of -1 for complete disagreement. Labels for the variables are defined in Table 1. Averages for the YouGov panel were weighted as described in text, while experts are equally weighted. The tabular results are given in Appendix C. AI and Soda tax are truncated for public to improve readability; values are -0.28 and -0.25.

We do not have responses from experts on Bond prices, Fiscal monetary, Top tax rates, and Gas tax warming. We have estimated these on the basis of conversations with Booth leadership.

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V. Overall economic and scientific literacy

a. Index of economic knowledge ("*ECONSCORE*")

Given the wide range of questions and determinants, we constructed an overall index of economic knowledge. These included 8 factual and analytical economic questions from Table 1A. From these, we calculated an "*ECONSCORE*" that equals the average number of "correct" answers on the questions. We define "correct" as answers that correspond to the opinions of expert economists.

These questions range from relatively easy and non-controversial questions such as the value of diversification to relatively difficult ones such as the marginal federal tax rate. These include five factual questions (BONDPRICES, DIVERSIFY, FISCAL MONETARY, HISTORY INEQUALITY, and TOP TAX RATES). Additionally, there are three analytical questions that rely on empirical economic research and were consensual among experts (ATHLETES, FREE TRADE, and OIL INFLATION). We omit questions from *ECONSCORE* which have a value component or are controversial among experts.

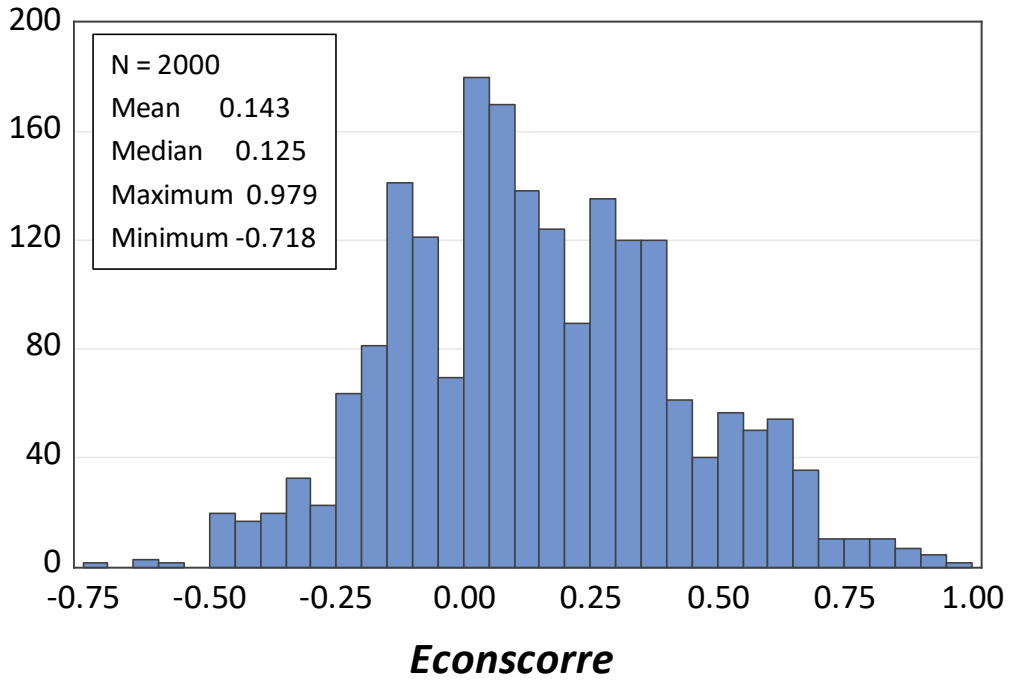

Figure 2. Histogram of the index "*ECONSCORE*" for the YouGov panel

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Figure 2 shows a histogram of the score for the public. The mean score on the nine questions was 0.14. Of these, 29% had scores less than zero, which was worse than random guessing. For the public, 12% had a score greater than +0.5, which was "mostly agree" with the correct answer.

We next look at the 8 components of *ECONSCORE*. Table 3 shows the statistics for the scores on individual questions. Most had high consensus among experts. There was high but incomplete agreement on oil volatility and free trade.

The public did well on the growth of inequality, fiscal/monetary policy, and diversification. The public did no better than random guessing on bond prices, free trade, and oil volatility. There were no examples in the components of *ECONSCORE* where the results for the public were substantially inaccurate; rather they tended to be uninformed. The results for individual components of *ECONSCORE* are discussed further in the section on *TOTALSCORE.*

	Experts		Public		Difference
Question	Mean	St dev	Mean	St dev	Experts - Public
Bond prices	1.00	na	-0.05	0.72	1.05
Fiscal monetary	1.00	na	0.23	0.71	0.77
Diversify	0.98	0.09	0.25	0.59	0.73
Gas tax warming	0.79	0.35	-0.04	0.75	0.83
Athletes	0.85	0.32	0.15	0.61	0.70
Inequality trend	0.81	0.30	0.45	0.62	0.36
Oil vol	0.66	0.32	0.08	0.66	0.57
Free trade	0.62	0.38	-0.04	0.60	0.66

T able 3. Comparison of components of ECONSCORE for experts and the public (average sample N = 33 for Booth panel and N = 2027 for YouGov, both with some missing observations). Note that the expert results were estimated for top tax rates, bond prices, and fiscal-monetary policy.

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b. Statistical analysis of *SCIENCESCORE*

We can perform the same analysis of the answers to the four science questions. All the economic experts answered the four science questions correctly, although the average score of 0.92 indicates that there was some uncertainty, which was primarily about the big bang. (We were unable to find any surveys of scientists on these questions and relied on discussions with scientific colleagues to ensure that the "correct" answers were indeed the scientific consensus.)

The average of *SCIENCESCORE* for the public sample was 0.22, which indicated generally correct knowledge. This is similar to results of surveys in this area, although there is variability across different regions, groups, questions, and periods (see Miller 1998 and Leiserowitz et al 2010). 61% of the answers of the public were positive, indicating on average correct answers. The question with the lowest score in the public sample was also the big bang. The public did slightly better on the scientific questions than the economic questions, but there is no metric of difficulty that would allow a real comparison.

c. Statistical analysis of *TOTALSCORE*

A final test of knowledge augmented the list of the 8 economic questions in *ECONSCORE* with 3 additional economic questions (AI, minimum wage, and sources of inequality), and the 4 scientific questions contained in *SCIENCESCORE* – this index being named *TOTALSCORE.* In this section, we investigate the statistical association of responses with various demographic and other personal characteristics of respondents. Appendix C shows the summary statistics of *TOTALSCORE* as well as those of its 15 components.

As we noted above, the YouGov panel has the advantage of collecting a trove of information about its panelists. Of these, we selected 40 variables as candidates for independent or predictor variables (see Appendix on methods, Appendix C). Given the large number of possible predictors, it was necessary to simplify the list. To limit the combinatorial problems, we first excluded 10 variables that never showed up as near the top of the list of significant variables which left 30 variables.

There are several approaches to variable reduction (Heinze, Wallisch, and Dunkler, 2018). Because it is transparent and simple, we begin by presenting an analysis using stepwise regression, with a combinatorial algorithm to select the best subset. In the next section, we discuss alternative approaches and the sensitivity of the selection of best variables to different

techniques. For these estimates and those below, the stepwise regression started with 30 cardinalized variables and limited the final list to the most significant 10 variables for the composite *TOTALSCORE* variable and 5 predictors for the 15 individual variables.

We begin with an analysis of the aggregate or summary variable, *TOTALSCORE*. Table 4 shows the top ten significant variables using combinatorial regression with the top 10 regressors. The signs of most of the coefficients seem sensible. Age and number of accounts suggest that experience is helpful. College science is clearly important for scientific understanding. At the same time, five ideological, religious, and political variables (ideology, registered voter, religious importance, born again, and church attendance) suggest the importance of personal beliefs and values rather than education or experience as primary determinants of economic and scientific literacy.

Variable	Coefficient	t-Statistic
Age	0.002	9.36
College science	0.059	8.87
Number accts	0.072	7.72
Race	0.032	5.93
Religious importance	0.033	5.07
Voter register	0.026	4.88
Ideology	0.037	4.59
Gender	0.018	4.35
Born again	0.019	3.64
Church attend	(0.021)	(2.70)

Table 4. Top 10 variables in determining *TOTALSCORE*
Variables were selected using a combinatorial version of stepwise regression. This was the best of 30 million combinations.

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d. Components of *TOTALSCORE*

We next looked at the most important predictors for each of the 15 variables in *TOTALSCORE.* These were calculated with stepwise regressions and limited to the top five variables. The list is shown in Table 5. We can also rank the major determinants by frequency, as is shown in Table 6. For the variables in Table 6, we took each of the top five variables shown in Table 5.

Some results seem sensible. Those who understand the difference between fiscal and monetary policy are associated with a large number of financial accounts, higher education, being a registered voter, and trust in the Fed. The top four determinants of views on evolution are religious importance, abortion legal, born again, and ideology. Note that college major in science does not enter at the top, and education is at the bottom, of any list. On the other hand, public views on robots and artificial intelligence are associated with seemingly irrelevant factors such as trust in the IRS, frequency of prayer, party identification, and views on abortion – perhaps it would show the importance of exposure to science fiction if we had such a variable .

The overwhelming impression, however, is the inconsistency in the sources of economic and financial views. Of the 75 coefficients, 31 were related to ideology or politics; 14 were knowledge-related (such as education); 11 related to religion (such as born again); and 9 were related to economic activities (such as accounts or employment). While some of these variables are exogenous (such as gender or age), many are endogenous to life experience. But they are all over the characteristic map.

Some of the variables enter with a negative sign. Those who are born citizens are more skeptical about free trade and the big bang than are immigrants, which is consistent with some cross-national surveys. Those with high earnings, perhaps in denial of their status, think that inequality has not increased. Trust often enters with a negative sign, indicating that those who are more trusting in institutions also tend to have contrarian views on financial matters.

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Bond Prices	Fiscal-Monetary	Invest	Oil	Top Tax Rates
Religious importance	Number accounts	Party ID	Ideology	Age
Trust in IRS	Education	Pray often	Race	College science
Age	Registered voter	Trust CDC	Abortion legal	Race
Account value	Trust in Fed	Account value	Accounts value	Registered voter
Education	Born again	Employment	Trust in Fed	Gender
Inequality	Athletes	Free Trade	Minimum Wage	Sources Inequality
Age	Ideology	Number accounts	Trust CDC	Ideology
Ideology	College science	Trust UN	Registered voter	Trust CDC
Race	Party ID	Ideology	Abortion legal	Trust Fed
Abortion legal	Race	Born citizen	Earnings	Urban
Earnings	Trust in IRS	Pray often	Trust Census	Abortion legal
Antibiotics	Big Bang	Continents	Evolution	Artificial Intelligence
College science	Religious importance	College science	Religious importance	Trust IRS
Age	Trust Census	Church attendance	Abortion legal	Pray often
Race	College science	Age	Born again	Party ID
Registered voter	Born again	Race	Ideology	Abortion legal
Church attendance	Registered voter	Trust in IRS	Education	Account value

Table 5. Five most significant variables for each of the 15 components of *TOTALSCORE*

For each variable, we determined the five most significant variables in a combinatorial regression.

Variable	Frequency		Variable	Frequency	
Abortion legal	6		Born again	3	
Ideology	6		Education	3	
Race	6		Party ID	3	
Age	5		Pray often	3	
College science	5		Religious importance	3	
Registered voter	5		Trust CDC	3	
Account value	4		Trust in Fed	3	
Trust in IRS	4		All others	13	

Table 6. List of significant variables in 15 *TOTALSCORE* components

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Summary on TOTALSCORE

A few points become clear on looking at the results in Tables 5 and 6. The most striking is the heterogeneity of the responses and determining variables. There is no monocausal determinant of views. Of the 75 top variables for the 15 responses, they were made up of 24 different variables. Ideology, views on abortion, race, and age were the most important variables, but they entered only about one-third of the time.

Additionally, ideology, politics, and religion pervade people's answers to economic and scientific questions. Political and ideological views were significant predictors for each of the 15 variables in *TOTALSCORE*, sometimes in multiple variables. Even for purely factual questions, trust or ideology entered into people's views. Religious views have a significant effect on nine of the 15 factors (most important being the science questions).

A striking feature is how often trust appears: it is among the most significant variables for 12 of 15 component variables of *TOTALSCORE*. The measure of trust was "How much confidence, if any, do you have in each of the following institutions to act in the best interests of the public?" This was followed by a list of institutions, such as "Internal Revenue Service (IRS)." On the more intriguing side was that trust in the United Nations was the second most important determinant of attitudes toward free trade. However, other cases are head-scratchers. Trust in the IRS and the Fed each appeared multiple times. The pattern of associations was difficult to interpret, as when Trust in the CDC appeared in views on investment and the minimum wage, while trust in the Census predicted views on the origin of the universe. Perhaps the explanation is confusion about who these institutions are or what they do. A more persuasive interpretation is that distrust permeates through the entire structure of knowledge and belief in the public sphere, but it does so in apparently inconsistent ways.

Religion is a key factor in science questions, which is not surprising given the centuries of doctrinal disputes over many scientific findings. Religion also shows up in bond prices and diversification, and it is tempting to wonder if the deities are invoked to improve our investment performance.

The virtual absence of formal education is a key signal of the way in which affect overwhelms reason. It illustrates Pascal's observation that the heart has reasons that reason does not know, and perhaps social scientists are equally in the dark after four centuries.

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VI. Further analyses

a. Reservation on the analysis

One of the difficulties with interpreting survey data is that the associations often have no clear structural explanations. Lacking a well-developed theory of individual beliefs and knowledge, we relied primarily on finding variables with the highest statistical significance. Because alternative selection methods may lead to different "best" sets of variables, we performed some tests of alternative estimators for the determinants of *TOTALSCORE*. These used OLS and elastic net regressions, with the special cases of ridge and Lasso approaches.

For estimates of *TOTALSCORE*, the results were that the top five variables (age, number of accounts, taking college science courses, being born again, and the importance of religion in daily life) were selected by all four techniques.

After the top five, the next five variables were inconsistent across estimators. Ridge regression and LASSO were moderately consistent on the ranking of variables and their coefficients. However, OLS tended to overestimate the coefficients, while stepwise regression (VARSEL) tended to underestimate them; moreover, both OLS and VARSEL had different significant variables from Ridge and LASSO. There was no systematic difference in the standard errors of the coefficients of the included variables between OLS and VARSEL. The conclusion here is that the results are robust for the inclusion of top variables, but the coefficients and standard errors are modestly to greatly inconsistent across techniques. The results are fully described in Appendix D.

An additional issue is that some of the findings are likely to be spurious or due to the endogeneity of the independent variables. For example, the vote in the 2020 Presidential election is clearly endogenous and is a function of other observed and unobserved structural variables, such as education, income, region, religion, occupation, and parental attitudes. We therefore looked at the impact of excluding clearly endogenous variables. Tests with instrumental variables suggest that some of the coefficients in the estimates are unstable when the set of all variables is replaced with exogenous variables (such as age and gender). Moreover, the standard errors are significantly increased with instrumental variables. One important result of the IV analysis is that, even with an extremely rich set of exogenous variables, we were

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unable to explain many of the ideological variables using deep exogenous variables. See Appendix D for details on the IV analysis.

b. Test-retest reliability

In an earlier survey on labor markets (Foote et al., 2023), we surveyed respondents multiple times to gather data on labor market activity by week. The survey also tested earlier versions of some of the questions used in the current survey. For the present study, we looked at respondents who had at least six responses to determine their consistency. Using the same scaling as in the current survey, the standard deviation of the response was 0.33 (on a scale from -1 to +1). This is approximately 2/3 of the distance between "completely agree" and "mostly agree." The largest inconsistencies were on ANTIBIOTICS, ONLYPROFITS, and SODATAX, while the most consistency was on BIGBANG, TOOMUCHMONEY, and CLIMATETAX. This finding is an encouraging sign that the public panel has modest consistency over time as well as a reminder of the lack of precision of public opinion on economic questions.

c. Agreement Bias

The Booth questions are posed in the form of five-point Likert scales, ranging from "agree completely" to "disagree completely," with "don't know" in the middle. Most questions are posed in a way that agrees with expert economic views. For example, agreeing with the statements on free trade, payments to college athletes, and diversification means that one believes trade is mostly beneficial, athletes would earn more if cash payments were allowed, and diversification reduces risk. There are, however, some items where the Booth question was worded in a way that experts disagreed (such as that automation causes unemployment, lotteries provide resources to states, and corporations should pursue no goals other than profits).

Survey researchers have found that most people tend to agree and avoid disagreement. That is, respondents are more likely to answer "agree" than "disagree." There are many possible mechanisms that could generate this pattern of response (such as politeness, desire to please the interviewer, and a reduction in cognitive effort). This behavior is referred to as "agreement bias" or "acquiescence bias." (See Howard Schuman and Stanley Presser, 1981, among others.)

To address the problem of agreement bias, we created two versions of each question. The *direct* version is the version that is used in Booth surveys. For example, the direct version of the oil speculation question was the following: "Large changes, up or down, in oil prices are driven primarily by

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speculators, not by changes in production costs or consumer demand for oil." We then created a *reversed* version by negating the question. The reversed version changed the important factors: "Large changes, up or down, in oil prices are driven primarily by changes in production costs or consumer demand for oil, not by speculators."

For some questions, it was difficult to construct an exactly reversed question. For example, the direct form of the artificial intelligence question was: "The increased use of robots and artificial intelligence will probably increase unemployment substantially over the next twenty years or so." There were various ways to reverse the wording and we used: "The increased use of robots and artificial intelligence will have little effect on unemployment over the next twenty years or so." However, someone who believes robots and AI will decrease unemployment might object to both statements, which would appear to be inconsistent.

Respondents in the YouGov sample were randomly assigned direct and reversed forms of the questions. Treatment assignments were done independently for each statement, so each panelist received a mix of direct and reversed questions. The order of agreement was alternated for each panelist as well. However, when the order of responses of "Agree completely" through "Disagree completely" was alternated, each respondent saw the same order for each question. The purpose of alternating the order of agreement/disagreement was to deal with any tendency to pick the first or last response, but we also wanted to avoid confusing respondents with constantly changing whether the first response could be either "Agree completely" or "Disagree completely."

In principle, one might expect that reversing a question would just cause respondents to reverse their answers. So, if a respondent agreed that oil-price changes are primarily driven by speculators, then that respondent would disagree that oil-price changes are primarily driven by costs and demand.

Since each respondent answers only one version of each question, individual acquiescence bias is unobservable. However, it is feasible to estimate average acquiescence bias by comparing average difference in responses to the direct and reversed versions. Because the form of the question was randomized, the groups of respondents given direct and reversed versions of each question are guaranteed to be comparable in terms of both observed and unobserved characteristics, except for sampling variability.

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In fact, consistency across reversals is not uniform across questions. Table 7 shows the estimated response bias for the YouGov panel. Note that the coding has been flipped for the reversed version to make the answers comparable. In the table, the items have been arranged in descending order of the agreement bias. The cell entries for the columns labelled "Direct" and "Reversed" are the average answer (on a scale ranging from -1 to +1).

Question	Direct	Reversed	Agreement Bias
Politics and Science	0.32	(0.13)	0.45
Climate priority defense	0.07	(0.20)	0.27
Income	0.05	(0.20)	0.25
Antibiotics	0.40	0.18	0.22
Athletes	0.25	0.05	0.20
Big bang	0.13	(0.05)	0.18
Continents	0.50	0.34	0.16
Free trade	0.03	(0.11)	0.14
Evolution	0.17	0.05	0.12
Money	0.40	0.33	0.07
Lottery	0.03	(0.04)	0.07
Profits	(0.30)	(0.34)	0.04
Oil	0.10	0.07	0.04
Invest	0.22	0.29	(0.07)
Religion and science	0.12	0.20	(0.08)
AI	0.23	0.33	(0.09)
Prayers	0.07	0.18	(0.10)
Wage	(0.14)	0.13	(0.26)

Table 7. Agreement bias by question

We asked direct and reversed questions to half of the YouGov panel. The first column shows the average for the direct question, while the second shows the average for the reversed, with the sign changed to preserve the sense of the question. The last column is the difference between direct and reversed.

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Take as an example the direct "income" question, which is an example of a clean reversal. The direct question was "Differences in individual incomes primarily reflect differences in personal skills." When asked in this form, there was a slight tendency to agree (indicated by an average response of 0.05 on the scale from -1.0 to +1.0). But when the statement is reversed ("Differences in individual incomes do not primarily reflect differences in personal skills and work efforts."), agreement with the reversed statement is 0.20, implying support for the original statement is -0.20. The difference, shown in the last column (equal to +0.25) is the estimated amount of acquiescence bias. The maximum possible difference, which occurs when all respondents completely agree (or disagree) with both the direct and reverse versions would be 2.0, which gives some indication of how large an effect this difference represents.

Many of the effects are large but a few are small or negative, and one (the minimum wage question) is large in the opposite direction of what was expected. There is no obvious pattern to the size or sign of the bias. Are these "large"? One literature review claims that effects around 10% are typical for attitudinal questions, so the results are not atypical.

We conclude with a warning that the existence and size of agreement bias may be a key element in measuring public attitudes and knowledge about economic and scientific issues. Agreement bias can be addressed either by using the "direct/reversed" approach here or by designing surveys where agreement does not enter into the responses. The first can be expensive because it requires doubling the sampling size, while the second has posed major obstacles in survey design and continuity.

Knowledge and agreement bias

Does expertise prevent agreement bias? We first looked at the accuracy of economic knowledge of the YouGov panel to see whether high knowledge reduced agreement bias. Figure 3 shows a scatterplot of number of correct answers on the horizontal axis and agreement bias on the vertical axis. There is no indication that knowledge as proxied by the number of correct answers is associated with lower agreement bias. The most knowledgeable participants had lower agreement bias than the least knowledgeable on 4 of the 8 questions. The high-knowledge YouGov respondents had very large bias (> 0.2) on 3 questions, while the least knowledgeable had similar bias on no questions. However, the low bias of the least educated was in part because of a larger number of "don't know." These results suggest that, like many biases, agreement bias is not alleviated by knowledge and expertise.

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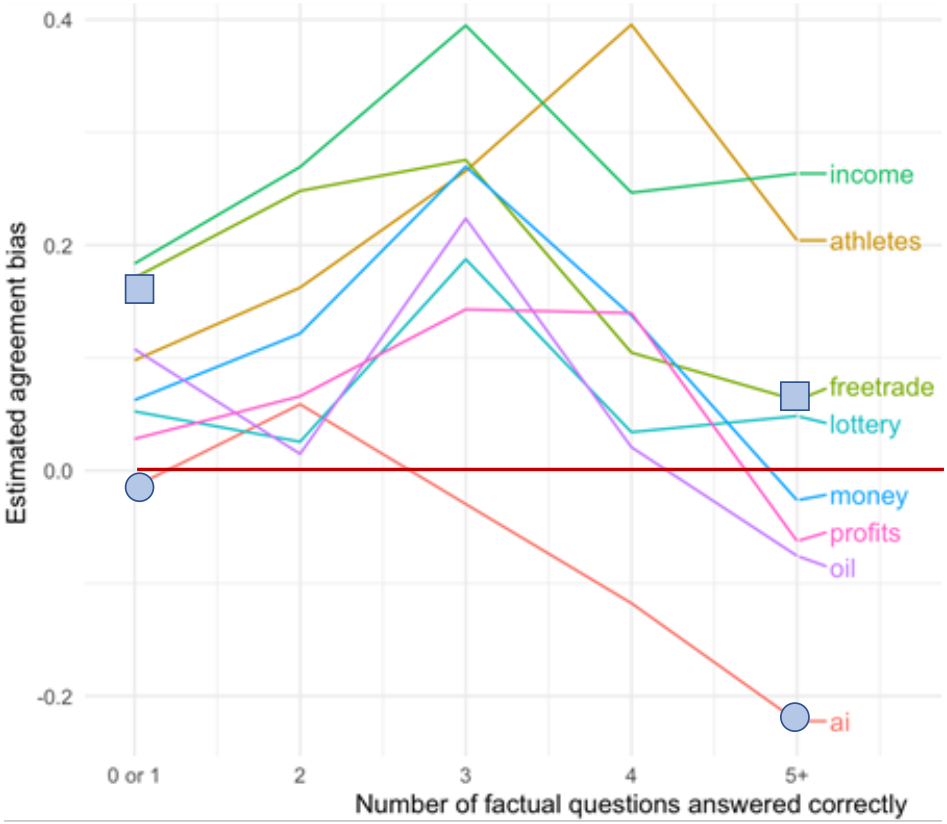

Figure 3. Expertise and agreement bias of YouGov panel

Each line shows the agreement bias compared to the expertise as measured by the number of correct answers for the YouGov panel. The response to AI (shown with circles) displays greater agreement bias among the most expert group, while free trade (in boxes) showed less bias among experts.

Agreement bias of the Booth panel

We mostly resisted the temptation to test whether Booth experts were subject to agreement bias since the Booth sample is small and we wanted to avoid adding unnecessary noise to the analysis. But we succumbed to temptation a bit. We randomly asked reversed versions of two items (causes of oil price fluctuations and sources of income differences) to half of the Booth panel. For the question about oil price fluctuations, the difference was small (with the direct version scoring 0.06 higher than the reversed version) and statistically insignificant.

However, a puzzling result emerged on the income question. Here the *direct* version was "Differences in individual incomes primarily reflect differences in personal skills and work efforts" whereas the *reversed* version

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was “Differences in individual incomes do not primarily reflect differences in personal skills and work efforts.”

We found a tiny negative answer for those answering the direct version of the income question. The average response to the direct version was -0.11, reflecting a roughly even split. However, the average response to the flipped reversed version was 0.44, which means that the experts implicitly strongly supported the claim that income differences are primarily due to skills and efforts. Despite the small sample size (18 in direct, 16 in reversed), the difference is statistically significant ($t = 2.9$, $P < 0.01$). This is a clean test, since the reversed version is an exact negation of the direct version. The difference is not due to ideological imbalance in the two groups. Both groups had equal numbers of self-identified liberals and moderates. Moreover, the size and sign of agreement bias was different from that of the public.

The finding on Booth experts reinforces the result shown in Figure 3 on knowledge and agreement bias of the YouGov panel. Experts are not necessarily immune to biases – a point that is also a reminder for those who survey experts.

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