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Policy Advice of Economic Experts: Facts or Preferences?

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Abstract

Is policy advice of economic experts based on facts or preferences? We conduct a global randomized experiment among 1,224 influential economic experts across 109 countries with two treatments that represent drastic changes of facts. The first treatment is the variation in the initial spread of Covid-19 across the globe during March 2020. The second treatment informs experts about their countries' past macroeconomic performance. Both treatments substantially change experts' fiscal policy recommendations. Machine learning techniques for sentiment analyses applied to open-ended questions suggest that changes in policy recommendations are caused by information updating and not by changes in preferences.

Keywords: Policy advice; fiscal policy; fiscal rules; economic experts; randomized controlled trial; preferences; machine learning; natural language processing; epidemics

JEL no.: A11; E62; H60; H63

AEA Registry: This experiment has been registered at the AEA RCT Registry. RCT ID: AEARCTR-0006570.

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1 Introduction

“When the facts change, I change my mind. What do you do, sir?”

— John Maynard Keynes

In many areas of politics, politicians rely on the advice of scientific experts. Advice of experts is particularly demanded when policymakers’ information about specific topics is limited or when there is high uncertainty about the future. On average, the predictions of economic experts about economic outcomes are quite precise and independent from scientific merit (DellaVigna and Pope, 2018a). Despite the consistency in predictions, however, there is substantial heterogeneity in experts’ opinions on many economic policy topics (e.g. Sapienza and Zingales, 2013). These observations give rise to a natural set of questions: is policy advice of economic experts tailored to specific situations or driven by experts’ own preferences? Would economic experts change their recommendations when the facts change? And would such changes be grounded in information updating or changes in preferences? Answers to these questions are important to assess the reliability of policy advice provided by economic experts.

We design a large-scale randomized experiment among 1,224 economic experts across 109 countries to examine whether experts change policy recommendations when new information about the state of the world becomes available. Our study combines a natural experiment with a randomized controlled trial (RCT) to assess changes in experts’ policy recommendations in response to two types of treatments. The first treatment is the geographic and temporal variation in the initial spread of Covid-19 during March 2020, which we exploit as a natural experiment. The Covid-19 pandemic can be thought of as the most drastic global change of facts of the past decades. The second treatment is a randomly assigned information treatment that informs experts about the past macroeconomic performance of their country, resolving potential information asymmetries about the economic situation in the experts’ host country. Combining the natural experiment with the information treatment allows us to disentangle the epidemic effect from the effect of macroeconomic crises.

Our study asks experts about a controversial topic that involves strong preferences and beliefs: should governments increase spending or should rules be adopted that restrict a country’s fiscal policy stance? The debate about the role of government spending for the prosperity of economies is as old as the economics profession (see, e.g., Smith, 1776; Ricardò, 1817). We ask experts whether rules should be imposed that restrict policymakers’ leeway for fiscal policy (“fiscal rules”). Evidence suggests that fiscal rules may improve fiscal sustainability (Asatryan et al., 2018) but their effects on other macroeconomic variables are inconclusive and depend on specific circumstances (Heinemann et al., 2018). Hence, objective criteria as to whether increasing or decreasing spending would generally be a dominant strategy to foster economic prosperity are scarce (see also the controversy

about the size of fiscal multipliers, e.g. [Auerbach and Gorodnichenko, 2012](#); [Ramey and Zubairy, 2018](#); [Ramey, 2019](#)).

Previous studies have shown the advantages of using epidemic outbreaks as natural experiments for causal inference (see, e.g., [Almond, 2006](#) and [Lin and Liu, 2014](#)). Three features make the initial spread of Covid-19 an exceptional testing ground to assess changes in expert advice in response to changing environments. First, the epidemic struck without warning in early 2020. Although China was affected well before other countries, [Aksoy et al. \(2020\)](#) document that there was practically no public attention given to Covid-19 prior to the first officially reported national case. Second, there was large temporal and geographic variation in the initial stage of the pandemic, and there was large heterogeneity and little accuracy among the many attempts to model the initial spread of Covid-19 ([Cyranoski, 2020](#); [Roda et al., 2020](#); [Ioannidis et al., 2020](#); [Manski and Molinari, 2021](#)). We focus on the initial occurrence of the virus because its eventual circulation in a country’s population may be endogenous to policy responses.¹ Third, experts have been central figures during the Covid-19 pandemic in many countries. Their advice has been demanded in many scientific areas, including medicine, epidemiology, and virology. Extraordinary stimulus packages have been implemented in many countries to tackle the economic crises that followed the outbreak of Covid-19 and the political actions to fight its spread. Economic experts have been pivotal figures in designing these packages. The experts included in our study are working in central banks, universities, embassies, international organizations, and research institutes. We focus on prestigious policy advisors who have impact on the national economic debates and the design of policies in response to the Covid-19 crisis.

We link the date on which experts filled out our survey with the number of confirmed Covid-19 cases in the country they work in (“host country”) on this day. We also confront a randomly selected subset of experts with the real GDP growth rate of their host country in the five years prior to our survey (“information treatment”). We find that both the past macroeconomic performance and the exposure to Covid-19 have large effects on experts’ policy advice. A larger number of confirmed cases of Covid-19 decreases the probability that experts recommend introducing contractionary fiscal policies. Similarly, the probability to introduce contractionary fiscal policies increases with the past growth rate of experts’ host country. We also find that the epidemic effect is lower when the past macroeconomic performance was favorable. A particular advantage of our global setting is that we can account for cross-country heterogeneity in unobserved factors (e.g. institutions, geography, political history, cultural norms, dominant schools of thought). Controlling for such fixed country effects has little influence on the results. The treatment

¹Even though the eventual spread of the virus depends on policies to tackle the circulation of Covid-19, scholars have emphasized that policy response has often been misguided ([Khosrawipour et al., 2020](#)), mitigating concerns about endogeneity.

effects are also very similar for the subsample of US-based experts.

While our results provide evidence that experts adjust their policy recommendations in response to changing environments, it is unclear whether this change is caused by information updating or by a fundamental change in preferences and beliefs. The literature on *experience effects* shows that shocks can leave an imprint on individuals' attitudes and risk aversion (Cogley and Sargent, 2008; Malmendier and Nagel, 2011; Malmendier and Nagel, 2016). These studies build on Friedman and Schwartz (1963), who describe how macroeconomic shocks create a "*lingering mood of depression*". Empirical evidence shows that one-time effects can have long-lasting impacts on individual attitudes and preferences (e.g. Giuliano and Spilimbergo, 2014; Malmendier and Shen, 2018). Hence, a possible explanation of our results may be that the change in policy recommendations reflects a change in preferences rather than a re-evaluation of the current situation based on newly available information.

To examine whether the treatments in our study change experts' preferences, our survey also includes open-ended questions, where experts are asked to write down their main considerations about fiscal rules in free-text entry boxes. We run machine learning algorithms for text mining on the free-text answers to measure the polarity (positive or negative) and the strength of emotions experts have towards fiscal rules. Our sentiment analyses suggest that there are no differences in attitudes towards fiscal rules between treated and non-treated experts and between experts with high or low exposure to Covid-19. This finding indicates that the change in policy recommendations is caused by information updating and not by a change in preferences. Experts may hence provide economic advice that they perceive to fit best to the current situation, even though this advice may be conflicting with their views of the world.

Contribution to the literature: Our study contributes to the burgeoning literature on the role of economic experts in the design of economic policies. This literature has shown that the average forecast of experts predicts the outcomes of economic experiments quite well (DellaVigna and Pope, 2018a; DellaVigna and Pope, 2018b), even though evidence on a general consensus in the profession about economic policy topics is mixed (e.g. Frey et al., 1984; Alston et al., 1992; Fuchs et al., 1998; Gordon and Dahl, 2013). There are also substantial differences between preferences of economic experts and those of the average population (McMurray, 2013; Sapienza and Zingales, 2013). Experts have been shown to be self-motivated (Zingales, 2020) and to make office-seeking parties serve their interests (Chakraborty et al., 2020). Hence, a major question is to what extent experts change their minds "*when the facts change*" (Li, 2007). There is little empirical evidence on the adaption of experts' recommendations to changing circumstances, and on whether such adaptations reflect more tailored policy recommendations or rather changing preferences. We provide evidence that experts adjust their policy advice in response to external shocks

and changing macroeconomic environments. Our results indicate that the average expert aims to give her best advice regardless of her economic preferences and beliefs.

Our study also relates to the literature examining how politicians and policy professionals form their beliefs and whether providing expert information changes these beliefs (Banuri et al., 2019; Vivalt and Coville, 2020). This literature has shown that providing research expertise to political leaders has a high chance to initiate policy changes (Hjort et al., 2020). Our study takes one step back and asks whether the expertise provided to advise policymakers depends on specific circumstances or rather on experts' own preferences and beliefs.

We also relate to the literature on experience effects. Previous studies show that incisive experiences have long-lasting and large effects on individuals' attitudes, expectations and preferences (Malmendier and Nagel, 2011; Giuliano and Spilimbergo, 2014; Malmendier and Nagel, 2016; Malmendier and Shen, 2018; Malmendier et al., 2021). We contribute to this literature in two ways. First, we examine experience effects in response to epidemics, while previous studies focus on macroeconomic shocks. Little is known about how experiencing epidemics coin individuals. Evidence from the Covid-19 crisis suggests that greater exposure to SARS-CoV-2 influences individual's preferences regarding the US safety-net system (Rees-Jones et al., 2020). We advance on this literature by examining changes in preferences in response to the Covid-19 pandemic on a global scale. Second, our analysis examines experience effects for experts rather than non-experts. We may expect experts to be more deliberate when forming decisions after a shock. Compared to non-experts, experts may display a lower tendency to over-react in response to crises. The results show that experts change policy recommendations when confronted with epidemics, but we do not find evidence for experience effects that materialize in a change in the preferences of experts.

We also contribute to the literature examining how natural disasters influence individuals' preferences and perceptions (Hanaoka et al., 2018). Previous studies arrived at ambiguous conclusions, but the literature faces two methodological challenges (Chuang and Schechter, 2015): first, when external shocks occur, survey data is usually available after the event but not before. Second, it is often difficult to find a suitable control group when focusing on local events, because many events affect populations differently. Our expert survey tackles these challenges. The survey was conducted during the period when Covid-19 was initially spreading across the world. A substantial fraction of countries had not been affected at the beginning of our sample, but Covid-19 had caused devastating consequences in all surveyed countries by the end of our sample period.

Organization: The remainder of this paper is organized as follows: section (2) describes the Covid-19 pandemic and shows why its initial spread provides a well-suited natural experiment. Section (3) presents the design of our international experiment. Our

empirical strategy is described in section (4), with results presented in section (5). Section (6) examines whether changes in policy recommendations are caused by changes in preferences or information updating. Section (7) concludes.

2 The 2020 Covid-19 pandemic

2.1 The crisis

The Covid-19 pandemic (“coronavirus pandemic”) is a pandemic of coronavirus disease 2019 (Covid-19), caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). The outbreak, which was first identified in Wuhan (China) in December 2019, spread across almost all countries in the world between January and May 2020. The World Health Organization declared the outbreak a pandemic on March 11, 2020. By the end of 2020, more than 85 million individuals had been infected with SARS-CoV-2 worldwide.

2.2 Need for expert advice

When confronted with unexpected events, policymakers need to rely on expert advice. [Nelson \(2013\)](#) summarizes the need for experts in the wake of natural disasters by noting that “*scientists [...] with an analytical bent are sought-after in natural-hazard risk assessment*”. Experts have also been central figures during the Covid-19 pandemic. In most industrialized countries, the Covid-19 crisis stands unprecedented in living memory. Due to the unforeseen and sudden outbreak, policymakers faced an unparalleled situation and had no experience to build on to determine countermeasures.

In the United States, Anthony Stephen Fauci, a physician and immunologist and director of the National Institute of Allergy and Infectious Diseases (NIAID) became a lead member of the Trump Administration’s White House Coronavirus Task Force in January 2020. Similar key figures were installed in other countries, e.g. in Germany (Christian Drosten, head of the Institute of Virology at Charité in Berlin), the United Kingdom (Chris Whitty, chief medical officer for England), and Sweden (Anders Tegnell, Swedish state epidemiologist at the Public Health Agency of Sweden).

Experts’ advice, however, was not only needed in medical matters. To tackle the severe economic crisis that accompanied the measures to fight the epidemic, many countries launched economic aid packages that were unparalleled in their nations’ public finance history. In May 2020, fiscal policy measures in Germany amounted to a total of 1.17 trillion euro, which equals one third of the nation’s GDP the year before the crisis. These actions were the result of close cooperation between policymakers and economic experts. On May 4, 2020, the German daily business newspaper *Handelsblatt* ran a piece titled “*Government suddenly relies much more on top economists*” and added that “*the cooperation has never been closer*” ([Handelsblatt, 2020](#)). In a survey among 155 university economics professors

in Germany that was conducted by the ifo Institute’s Economist panel, 81 percent of the participants agreed with the stimulus package or responded that the government should take even more expansionary measures. Similar extraordinary recovery packages have also been passed in the United States and other economies (e.g. [Bayer et al., 2020](#); [Hepburn et al., 2020](#)).

2.3 The initial spread of Covid-19 as a natural experiment

Previous studies have demonstrated the statistical advantages of using epidemic outbreaks as natural experiments for causal inference (see, e.g., [Almond, 2006](#) and [Lin and Liu, 2014](#)). Our identification strategy follows this approach, exploiting the geographic and temporal variation in the initial spread of Covid-19 as a natural experiment. Two features make the Covid-19 pandemic an exceptional testing ground to evaluate changes in experts’ policy recommendations in response to changing environments. First, the pandemic struck without warning in early 2020. Even though Covid-19 had severe effects in China well before it hit other countries, the virus was given very little attention by individuals before it hit their own country. Using daily Google searches via Google Health Trends API, [Aksoy et al. \(2020\)](#) show that there was practically no public attention given to Covid-19 prior to the first officially reported national case, and that there was an immediate surge in public attention afterwards.

Second, there was substantial temporal and geographic variation in the initial spread of Covid-19, and forecasting this spread was impossible. Since the start of the outbreak, several modeling groups around the world have reported predictions for the spread of Covid-19. In the early days of the outbreak, estimated basic reproduction numbers varied between 2 and 6, the total number of infected people ranged from 50,000 to millions, and peak time was estimated to be between mid-February and late March ([Cyranoski, 2020](#)). Despite the large heterogeneity in predictions, studies conducted at the beginning of the outbreak underestimated the extent of the pandemic. The reason is that the spread of Covid-19 has been remarkably difficult to predict, both for the world as a whole and also even for China alone ([Roda et al., 2020](#)). The inaccuracy in predicting outbreaks of Covid-19 in the initial stage prompted [Ioannidis et al. \(2020\)](#) to conclude that “*forecasting for Covid-19 has failed*”. Hence, in its initial stage, the spread of Covid-19 was random in the sense that it was impossible to anticipate which countries would be hit on a given day.

The specific circumstances of the initial spread of Covid-19 limits the scope for omitted variable bias and anticipation effects. SARS-CoV-2 is the successor to SARS-CoV-1 (the strain which caused the 2002–2004 SARS outbreak), but during its global outbreak in early 2020, there was very little information available about its elementary features, including its origin, contagiousness, and deadliness. Concerns about anticipation effects are also

mitigated by high infection rates of Covid-19, leading to a rapid spread of the disease once a country has been affected. In many instances, action changed on a daily basis, and there was large uncertainty among policymakers on how to best respond to the virus and on whether the virus poses a severe threat or not. A prime example of missing anticipation effects was the now infamous twitter post of US president Donald Trump on March 9, 2020, in which he claimed that SARS-CoV-2 was not as perilous as the common flu.²

We focus on the developments during the early stage of the global Covid-19 pandemic because the timing at which countries were initially hit was random, and the following public attention, although negligible before the first cases were confirmed, was immense. However, after countries are initially affected, the further spread of the virus is likely to be endogenous to policy responses, which is why our analysis only exploits the time window when Covid-19 initially spread around the world.

3 Design of the expert survey

3.1 Background information about the survey

Our survey was conducted in 2020 between March 5 and April 3 (Central European Time - CET). It includes 1,224 economic experts working in 109 advanced, emerging and developing countries. We exploit the unique infrastructure of the World Economic Survey (WES) collected by the ifo Institute for Economic Research in Munich to reach out to renowned economic experts from central banks, universities, embassies, international organizations, and research institutes. The WES is a global survey that elicits expectations and policy advice of economic experts since 1981. We focus on prestigious policy advisors whose opinions have an impact on the national economic debates in their country. Many of the surveyed experts are also likely to be key figures in designing policies in response to the coronavirus crisis. Almost all experts in our sample have completed tertiary education; 42 percent of the participants hold a PhD.

Our survey encompasses 15 questions that ask experts about their views on fiscal rules (see Figures B2–B3 in the appendix). There are two types of questions in the survey. The first type of questions is designed to measure experts' general attitudes towards fiscal rules, including experts' general view about the effect of fiscal rules on economic growth, public debt, and public investment (see Gründler and Potrafke, 2020). These questions are not assigned any information treatment and as expected, answers to these questions are unaffected by the spread of Covid-19.³ The second type of questions explicitly asks

²The exact wording of the post was “*So last year 37,000 Americans died from the common Flu. It averages between 27,000 and 70,000 per year. Nothing is shut down, life & the economy go on. At this moment there are 546 confirmed cases of CoronaVirus, with 22 deaths. Think about that!*”.

³The correlation between answers to these questions and the spread of Covid-19 is between 0.017 and 0.062 and far from being of statistical significance.

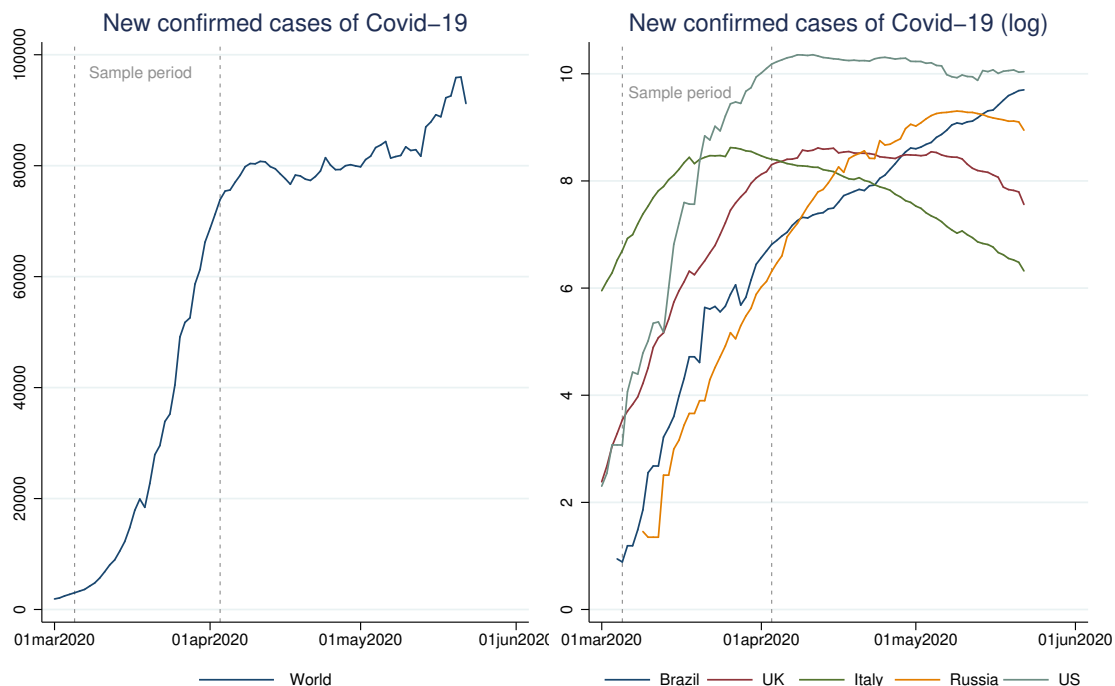


Figure 1 SPREAD OF COVID-19 ACROSS THE GLOBE AND SAMPLE PERIOD, MARCH–MAY 2020.

Notes: The figure shows the number of new confirmed cases of Covid-19 developed in the world between March and May 2020. Data is collected from the World Health Organization ([World Health Organization, 2020](#)). The left-hand figure illustrates the development of new confirmed cases of Covid-19 in the world (seven-day moving average), the right-hand figure shows the development of new confirmed cases of Covid-19 for selected countries. The country-level perspective uses log scales to handle the large absolute differences in total numbers across countries. The gray-dashed lines denote the sample period during which our survey was conducted.

experts to make policy recommendations and informs a randomly chosen subsample of experts about the past macroeconomic performance of their country.

Our expert survey was conducted during the time when Covid-19 was spreading around the world. Figure (1) shows the development of new confirmed cases of Covid-19 in the world (total, left-hand side) and for selected countries (log scale, right-hand side) between March and May 2020. On March 5, 2020, the starting date of our survey, there were 21 countries in our sample without a single reported case of Covid-19. At the end of our observation period, Covid-19 had spread to all countries in our sample. There is substantial temporal and geographic heterogeneity in the spread of Covid-19. For instance, while Italy was hit hard early in the sample period, the United States was hit later, but the increase in cases was even stronger.

Our survey was distributed to the participants via the WES’s software tool. Participants received an e-mail that included a brief cover letter (signed by a research assistant who usually sends out the WES questionnaire) and a link to the survey. Participation took place online—there was no offline version available. We sent out three reminders to

remind experts to participate in our survey. Figure (B1) shows that we have substantial temporal heterogeneity in survey participation.

3.2 Information treatment and randomization

Our randomized experiment includes two treatments. The first treatment is the geographic and temporal spread of Covid-19 (see section 2.3). The second treatment is an information treatment that we randomly assigned to survey participants. The experts in our survey were randomly split into two groups of roughly equal size that were sent two versions of the survey. Randomization was achieved by a software-based randomization generator. One group, which we refer to as the control group, was asked *“Suppose there would be no fiscal rule in the country you work in (if there is none, then consider the current situation). Would you recommend introducing one?”*. The other group of panelists, which we refer to as the treatment group, instead received the question *“Over the last five years, real per capita GDP growth was on average [growth rate] per year in [requested country]. Suppose there would be no fiscal rule in the country you work in (if there is none, then consider the current situation). Would you recommend introducing one?”*. The average real per capita GDP growth rate over the past five years [growth rate] is individualized for each expert and refers to the experts’ host country [requested country]. In 78 percent of cases, the expert’s host country is also their country of origin. Data on GDP was collected from [World Bank \(2020\)](#).

The public finance literature has found mixed evidence regarding the effects of fiscal rules on macroeconomic outcomes (for a meta analysis, see [Heinemann et al., 2018](#)). In the absence of objective criteria that suggest whether increasing or decreasing public spending is superior to foster economic prosperity, experts’ views on fiscal rules reflect their fiscal preferences. Those with positive views on fiscal rules are likely to prefer contractionary fiscal policies and vice versa.

We create a dummy variable that equals 1 if an expert has received information treatment, and zero otherwise. We denote this variable by T_{it} , with i and t indexing countries and days. We also multiply the dummy by the level of growth associated with the treatment that is received by expert e , denoted by T_{eit}^E (see also [Coibion et al., 2020](#)).

The recommendation to introduce fiscal rules is coded as a dummy variable, which equals 1 if an expert responds that (s)he would recommend introducing a fiscal rule. We denote this variable by F_{eit} . Fiscal policy recommendations across experts included in our survey are balanced. Of the 1,161 respondents that answered the question, 567 (48.84 percent) recommended fiscal rules, whereas 594 (51.16 percent) did not recommend introducing fiscal rules.

4 Empirical strategy

4.1 Hypotheses

Little is known about the factors that determine policy recommendations of experts. In particular, whether experts provide recommendations in line with their preferences or in line with what they perceive to be the best strategy in a specific situation remains an open question (Saint-Paul, 2018; Asatryan et al., 2020).

Policy recommendations of experts, like most economic decisions, are usually derived under incomplete information. If experts are Bayesian, they will update their policy recommendation when new information about the state of the world becomes available (for surveys on belief updating and information provision, see, for example, Benjamin, 2019 and Haaland et al., 2020).

We model expert e 's policy recommendation for country i provided at time t , denoted by F_{eit} , as depending on the state of the world w_i that describes the (economic) situation in country i and her preferences p_e . Experts need to infer the state of the world based on available information, i.e. experts' expectations of w_i , $E[w_i]$, determine policy recommendations

$$F_{eit} = F(E[w_i], p_e). \quad (1)$$

We assume that greater values of w reflect a more favorable (economic) situation and that policy recommendations depend linearly on $E[w_i]$ and p_e , i.e.

$$F_{eit} = \beta E[w_i] + \rho p_e, \quad \beta, \rho \geq 0 \quad (2)$$

where β and ρ reflect the relative importance of $E[w_i]$ and p_e for expert e 's policy recommendations. Experts who put greater weight on the inferred state of the world than on preferences ($\beta > \rho$) may gain utility from solving problems or from perceiving themselves as being altruistic and of integrity. Experts for whom preference motives dominate ($\beta < \rho$) may gain utility when policymakers adopt policies that are in line with their views of the world.

Equation (6) suggests that a change in policy recommendations ΔF_{eit} can be caused by a change in experts' assessment of the state of the world or a change in preferences, i.e.

$$\Delta F_{eit} = \beta \Delta E[w_i] + \rho \Delta p_e. \quad (3)$$

Suppose that F_{eit} are recommendations about a policy that fulfills four characteristics: (i) experts have strong preferences towards the policy, (ii) there is heterogeneity in experts' preferences, (iii) there is no acceptance among experts about a general optimality on how

to design the policy, but (iv) there is a wide consensus that when the state of the world is unfavorable, implementing the policy yields unfavorable outcomes (and vice versa). Suppose further that experts gain access to new information about the true state of the world. The change in recommendations then depends on whether the true state of the world is less favorable than experts' initial expectations $E'[w_i]$

$$\Delta E[w_i] = E'[w_i] - w_i < 0 \quad (4)$$

or vice versa. For $\Delta E[w_i] < 0$, it follows that $\beta < 0$ and vice versa. In practice, many policies resemble the characteristics of F_{eit} , but we argue that the scope for expansionary fiscal policies serves as a prime example. Economists have strong and heterogeneous preferences about whether fiscal policy should be expansive or restrictive (Asatryan et al., 2020) and estimates about the size of fiscal multipliers differ substantially across studies (see, e.g., Auerbach and Gorodnichenko, 2012; Ramey and Zubairy, 2018; Ramey, 2019). There is, however, a consensus among most economists that countercyclical fiscal policy is generally favorable to stabilize economic activity (e.g. Sapienza and Zingales, 2013).

We ask experts about fiscal rules to operationalize their fiscal policy recommendation. The implementation of fiscal rules is a concrete policy measure that has direct consequences for the scope of fiscal policy. We expect that experts who are informed that the state of the world is less favorable than expected hesitate to recommend introducing limits for fiscal policy at the time of the treatment, even though some experts may believe that fiscal rules benefit countercyclical policies in the long-run.

Our experimental design includes two treatments that provide experts with updated information about the true state of the world w_i . The first treatment is the Covid-19 epidemic, a traumatic event that has plunged countries into deep humanitarian crises. The Covid-19 pandemic was a global shock that can be assumed to have initiated the most drastic update $\Delta E[w_i]$ of the past decades. In this situation, experts that are motivated by finding the most tailored policy for the present situation may be in favor of expansionary fiscal policies to increase health expenditure and to invest in medical personnel and equipment. Hence, our first hypothesis is:

Hypothesis 1 (H1): *A greater exposure to Covid-19 infections decreases the likelihood of experts recommending adopting fiscal rules.*

The second treatment is the information about the past macroeconomic performance of a country. The central argument underlying our design of confronting experts with the past macroeconomic performance is that experts should be more in favor of fiscal rules during booms than during busts, because fiscal rules restrict expansionary policies during recessions. Our second hypothesis is:

Hypothesis 2 (H2): *Recent national booms increase the likelihood of experts recommending adopting fiscal rules.*

The two treatments capture different aspects of changing facts. The Covid-19 pandemic reflects an exogenous shock that initiated a severe public health crisis. Combining this shock with an information treatment about the past macroeconomic performance allows us to disentangle the effect of the Covid-19 pandemic from economic recessions. Both types of treatments may be connected. National macroeconomic circumstances are likely to reinforce the effects of Covid-19 on experts' policy advice. Countries with better macroeconomic performance in the past withstand disasters more easily (Noy, 2009), and economic growth is less affected by disasters in richer than in poorer economies (Loayza et al., 2012). Our third hypothesis is:

Hypothesis 3 (H3): *Unfavorable macroeconomic conditions reinforce the Covid-19 effect on experts' advice on whether fiscal rules should be adopted.*

A key question is whether changes in policy recommendations are caused by information updating or whether they reflect a change in preferences and beliefs. Previous studies show that natural disasters have large effects on the risk preference of individuals (see, e.g., Cameron and Shah, 2015; Hanaoka et al., 2018) and change their beliefs about the frequency and magnitude of future shocks (Brown et al., 2018). Empirical evidence on “experience effects” also shows that macroeconomic crises have a long-lasting impact on individuals' preferences and attitudes. An alternative explanation for a change in policy recommendations may hence be that experts have changed their preferences when experiencing the Covid-19 epidemic or when being informed about the true macroeconomic performance of their country. That is, the treatments may have led to $\Delta p_e \neq 0$, and hence the observable effect on policy recommendations may be grounded in a change in preferences p_e .

Hypothesis 4 (H4): *Changes in experts' policy recommendations are caused by a change in preferences.*

In the event that Hypothesis (4) cannot be rejected, policy recommendations of experts may either be caused by their own preferences or by their subjectively perceived dominant policy measure. However, in the event that Hypothesis (4) can be rejected and Hypotheses (1) and (2) cannot be rejected, this would provide strong indication that experts' policy advice is not predominantly guided by their own preferences.

4.2 Estimation strategy

Our empirical strategy brings the simple problem of policy advice outlined in Equations (1)–(4) to the data. Our empirical model is designed to explore the effects of our two treatments on fiscal policy recommendations of experts, examining whether a fundamental

change of facts influences policy advice. In a second step, we study whether changes in policy recommendations are caused by information updating or a change in preferences (section 6).

We start by investigating the effects of the geographic and temporal spread of confirmed Covid-19 cases on expert recommendations by estimating

$$F_{eit} = \gamma \text{Covid-19}_{eit} + \eta_i + \varepsilon_{eit}, \quad (5)$$

where F_{eit} is the dummy variable that denotes whether an expert recommends introducing fiscal rules and Covid-19_{eit} is the number of confirmed cases of Covid-19 in the host country i of expert e on day t when experts filled out our survey. The number of confirmed Covid-19 cases may be affected by measurement error in the presence of incorrect functioning tests and strategic underreporting of governments (e.g. [Atkeson, 2020](#)). However, the officially reported number of confirmed cases of Covid-19 has received great attention and has been prominently discussed in the media on a daily basis. We argue that these numbers are more decisive for the formation of preferences than the (unknown) true figures.⁴ This argument is in line with the literature showing that individuals' subjective perceptions are more important for preferences than objective criteria (see, e.g., [Cruces et al., 2013](#)). As the spread of Covid-19 in its initial stage was random in the sense that it was impossible to anticipate which countries would be hit on a given day and how quickly the spread would proceed thereafter, the parameter γ reflects the causal effect of exposure to Covid-19 on experts' fiscal policy recommendations. By a similar argument, we would also not expect that heterogeneity across experts regarding their perceptions about certain aspects of fiscal rules (e.g. escape clauses, supplementary budgets etc.) would systematically influence $\hat{\gamma}$.

To consider cross-country heterogeneity and differential trends in the spread of Covid-19, we later augment our baseline model by country fixed effects η_i . Fixed effects on the country level account for the ex ante risk of epidemics, which differs across countries. Accounting for systematic variation in general exposure to epidemics across countries addresses the possibility that individuals who already live in high-risk environments may not be particularly concerned about additional risks. Hence, the effect on preferences may be smaller than for those individuals living in low-risk environments. However, if the spread of Covid-19 has been random across space and time, these effects should have little influence on the estimated parameter $\hat{\gamma}$.

To disentangle effects of exposure to Covid-19 from perceptions about past macroeconomic conditions, we confront a random subset of experts with the economic performance

⁴Alternatively, we could focus on deaths rather than confirmed cases. Because of the long incubation period, however, there is a lengthy time lag between exposure to Covid-19 and death. In Germany, for instance, the first reported death from Covid-19 was confirmed six weeks after the first infection. We believe that using deaths would result in a mistiming of the shock caused by Covid-19.

of their host country during the past five years. We examine the effect of the information treatment in two ways. Our first strategy follows the setup of a traditional RCT, relating policy recommendations to the dummy variable on the treatment status T_{eit} of experts. The information treatment makes experts think about a nation’s macroeconomic conditions when making their recommendation. We also examine the extent of the information treatment by re-estimating Equation (6) using the specific growth rate that experts were informed about, T_{it}^E . Our second strategy examines the interaction of the treatment status with exposure to Covid-19 via

$$F_{eit} = \gamma \text{Covid-19}_{eit} + \omega T_{it} + \lambda \{ \text{Covid-19}_{eit} \times T_{it} \} + \eta_i + \varepsilon_{eit}, \quad (6)$$

where the term $\text{Covid-19}_{eit} \times T_{it}$ account for the interaction of the two treatments.

Our baseline estimates are obtained based on standard errors that are robust to arbitrary heteroskedasticity. We do not cluster standard errors in our baseline specification because the number of observations for many of the country clusters is (too) low, potentially biasing our estimates towards non-robust standard errors. We evaluate changes of our baseline specification, particularly standard errors nested in country clusters, in our robustness tests.

5 Results

5.1 Key identifying assumption and balance tests

The key identifying assumption of our model is that in the absence of the treatment, the control and the treatment populations would be statistically identical, i.e.

$$E[\varepsilon_{eit} | T_{eit} = 1] = E[\varepsilon_{eit} | T_{eit} = 0] = 0. \quad (7)$$

This assumption cannot be tested directly because we cannot observe ε_{eit} . When randomization was successful, the assumption in Equation (7) should be fulfilled by construction (Bruhn and McKenzie, 2009). We can, however, conduct tests to examine whether the assumption is *likely* to hold by comparing the sample means of observable characteristics between the treatment group and the control group. In statistical terms, such tests can assess the success of the randomization, but they do not show whether any observed imbalances between the groups might have affected the results of the trial (Altman, 1985). In Table (A1) in the appendix, we show two-sample t-tests for differences between the groups in terms of key socio-economic characteristics, occupation, and field of expertise. Figures (B5)–(B8) provide graphical illustrations to assess the random assignment of the information treatment. Our tests provide no evidence for differences between the treatment group and the control group with respect to sex, age, or edu-

Table 1 COVID-19 CASES, MACROECONOMIC PERFORMANCE AND EXPERTS’ FISCAL POLICY ADVICE—BASELINE RESULTS

Dependent variable: “Recommendation that fiscal rules should be adopted”, F_{eit}				
	(I) Covid-19	(II) Treatment	(III) Covid-19 and Treatment	
	(Model 1)	(Model 2)	(Model 3)	(Model 4)
Covid-19	-0.00397** (-2.83)		-0.00316** (-2.86)	-0.00526*** (-3.70)
Information-Treatment		0.421*** (15.41)	0.418*** (14.72)	0.394*** (13.33)
Information-Treatment \times Covid-19				0.00066*** (3.74)
Observations (# of Experts)	1,119	1,119	1,119	1,119
R-Squared	0.009	0.161	0.165	0.171
F Stat	8.008	237.4	120.8	84.58
F Stat (p-val)	0.004	0.000	0.000	0.000

Notes: The table reports the results of our baseline model on the effect of epidemics on fiscal policy recommendations of experts. t statistics of (two-sided) t -tests are reported in parentheses. “Covid-19” denotes the number of confirmed cases of Covid-19 at the time the experts filled out the questionnaire. “Treatment” is the information treatment that confronts experts with the economic development of their home country during the past five years. Coefficients on Covid-19 cases and interaction terms with Covid-19 cases are multiplied by 1,000 to keep the parameter in a displayable space.

*** Significant at the 1 percent level,

** Significant at the 5 percent level

cation, occupation, or the field of expertise. We also do not observe any differences in these characteristics between the groups that experienced a high (above-average) or low (below-average) exposure to Covid-19 (see Figures B7–B8 in the appendix).⁵

5.2 Baseline results

Table (1) reports our baseline results in three steps. Column (I) shows the results for the Covid-19 treatment, Column (II) presents estimates for the information treatment, and Column (III) combines the two. In Column (I), we link the total number of confirmed Covid-19 cases to fiscal preferences of experts. The parameter estimate is -0.00397, suggesting that 1,000 additional case of Covid-19 decreases the probability of being in favor of restrictive fiscal policies by about 0.4 percentage points. The effect is statistically significant at the 5 percent level ($t = 2.83$). This result suggests that we cannot reject H1.

In Column (II), we examine how confronting experts with the growth rate of their

⁵To guarantee anonymity of experts, we do not ask respondents for socio-economic characteristics other than sex, age, and income. Also, the age of respondents is coded in classes between 1–5 to guarantee that individual participants cannot be identified in the data.

host country during the past five years influences their policy recommendations. The results show that informing experts about the macroeconomic performance of their country increases the probability that they will recommend introducing fiscal rules. The effect is statistically significant at the 1 percent level. Numerically, the effect is large: Informing experts about past macroeconomic conditions increases the probability that they will recommend introducing fiscal rules by 42.1 percentage points. This result shows that a better macroeconomic performance increases the probability of experts' to recommend contractionary policies. Hence, we cannot reject H2.

Column (III) includes both the information treatment and the spread of Covid-19. Inferences do not change when we include both variables in our model (Model 3). Also, the estimated parameters are similar in size compared to the parsimonious specifications in Models (1)–(2). In Model (4), we interact confirmed cases of Covid-19 with our information treatment. While the negative effect of Covid-19 and the positive effect of the information treatment persist, the results show that the information treatment is particularly strong for individuals with higher exposure to Covid-19.

Figure (B9) in the appendix visualizes our main treatment effects, showing the share of experts who recommend the adoption of fiscal rules depending on whether experts have received the information treatment (left-hand side) and whether experts live in countries with confirmed Covid-19 cases smaller or greater than the sample mean (right-hand side). Both types of treatments have a strong impact on experts' propensity to recommend the adoption of fiscal rules, indicating that past macroeconomic conditions and the spread of Covid-19 influence experts' fiscal preferences (Figure B9).

5.3 Differential trends and heterogeneity across countries

The impact evaluation for our treatment variable reported in Table (1) is equivalent to comparing mean outcomes of the treatment and the control group. Also, the results for the spread of Covid-19 are obtained based on parsimonious regression frameworks in which the number of confirmed Covid-19 cases and the information treatment serve as the only explanatory variables. A key feature of our global RCT is that it allows drawing inferences with high external validity. A potential drawback is that there may be cross-country heterogeneity in unobserved factors (culture, institutions, dominant schools of thought, political history, past macroeconomic performance, geography) and that countries may differ in the ex ante risk of epidemics and past epidemic experiences. There may also be differential trends in the pace of Covid-19's spread between countries. When randomization was successful, there would be no correlation between the treatment variables and the error term, and hence such factors should not influence the results.

We proceed in two steps to examine whether cross-country heterogeneity influences the results. First, we exploit the within-country variation by including fixed effects for

countries in an augmented version of Equation (5) in Table (A2) in the appendix. This strategy may purge some of the variation in the initial spread of Covid-19 (the information when the first case arrived in a country), but it has the advantage to account for the cross-country heterogeneity in our global sample.⁶

As a second strategy to address potential cross-country differences, we allow standard errors to be nested in countries (Table A3 in the appendix). Our baseline model draws inferences based on standard errors that are robust to arbitrary heteroskedasticity because for some countries, the number of participating experts is low. Hence, modeling standard errors to be nested in countries would most likely result in biased estimates when using the full sample of experts. Table (A3) hence uses observations from countries with a sufficiently large number of included experts.⁷

Accounting for cross-country heterogeneity does not change the inferences regarding the negative effect of exposure to Covid and the positive effect of the information treatment. These effects also do not change when we combine country-level fixed effects and clustered standard errors (Table A4 in the appendix). Standard errors regarding the effect of the interaction between exposure to Covid-19 and the information treatment, however, increase.

5.4 Treatment intensity

A key question is whether the effect of the information treatment depends on the growth rate delivered to experts. We use two variants to measure the intensity of the treatment. The first measure multiplies the treatment dummy by the growth rate over the past five years that has been reported to experts. The second variant considers more extreme treatments, multiplying the treatment dummy by an indicator variable that is 1 if the past growth rate of the country was in the top 25 percent of the distribution of growth rates, and 0 otherwise.

The results, shown in Table (2), confirm the negative effect of the spread of Covid-19 on the probability of experts' to recommend contractionary fiscal policies. The coefficient on the treatment intensity variable is positive and statistically significant at the 1 percent level (see Columns 1–3). This result suggests that the probability to recommend introducing fiscal rules increases when the past macroeconomic performance reported to experts was good. Numerically, the estimates imply that one additional percentage point of past economic growth reported to experts increases their support for fiscal rules by

⁶Given that 88 of the 109 countries in our sample had at least one case of Covid-19 at the beginning of our sample, including fixed effects for countries only takes away a small fraction of variation. The main variation is based on differences in trends in the spread of Covid-19 across countries.

⁷The results are obtained using information from countries that have a sufficiently large number of experts. Balancing between a sufficiently large number of observations per cluster and a sufficiently large total sample of observations is challenging. The results reported in Table (A3) are based on countries for which we have at least 15 observations but inferences do not change when we use other cut-off points.

Table 2 COVID-19 CASES, MACROECONOMIC PERFORMANCE AND FISCAL POLICY ADVICE—TREATMENT INTENSITY

Dependent variable: “Recommendation that fiscal rules should be adopted”, F_{eit}						
	Treatment Intensity			Extreme Treatment		
	Treatment (1)	Covid-19 & (2)	Treatment (3)	Treatment (4)	Covid-19 & (5)	Treatment (6)
Covid-19		-0.0046*** (-4.48)	-0.0062*** (-4.31)		-0.0051*** (-4.50)	-0.0072*** (-4.94)
Treatment Intensity	0.0959*** (10.35)	0.101*** (9.62)	0.0947*** (8.44)			
Treatment Int. \times Covid-19			0.0009*** (3.33)			
High-Treatment				0.414*** (9.25)	0.482*** (8.85)	0.394*** (7.18)
High-Treatment \times Covid-19						0.0009*** (5.84)
Observations	1,161	1,119	1,119	1,119	1,119	1,119
R Squared	0.104	0.116	0.120	0.033	0.046	0.054
F Stat	107.0	51.83	212.5	85.64	46.93	451.7
F Stat (p-val)	0.000	0.000	0.000	0.000		

Notes: The table reports the results on the effect of epidemics on fiscal policy recommendations of experts. t statistics of (two-sided) t -tests are reported in parentheses. “Covid-19” denotes the number of confirmed cases of Covid-19 at the time the experts filled out the questionnaire. “Treatment” is the information treatment that confronts experts with the economic development of their home country during the past five years. Coefficients on Covid-19 cases and interaction terms with Covid-19 cases are multiplied by 1,000 to keep the parameter in a displayable space. “Treatment Intensity” is the treatment dummy multiplied with the growth rate of experts’ host country during the past five years to measure the intensity of the information treatment. “High-Treatment” is the treatment dummy multiplied by a dummy variable that is 1 if the growth rate of experts’ host country over the past five years lies within the upper quartile of the distribution (top 25 percent).

*** Significant at the 1 percent level

about 9 percentage points. The interaction term between Covid-19 cases and the treatment intensity variable shows that a better macroeconomic environment mitigates the negative effect of exposure to Covid-19 (H3). The effects are similar although greater in magnitude if we consider our high-treatment variant in Columns (4)–(6). Again, accounting for cross-country heterogeneity does not change the inferences (see Table A5 in the appendix).

5.5 Additional results

We conduct a series of additional tests to examine the robustness of our key findings. The treatment effects may depend on experts’ experiences with fiscal rules. Cross-country differences in the design of fiscal institutions and historical fiscal policies should be eliminated by our models including fixed effects on the country-level (Table A2 in the appendix). In Table (A6), we examine more directly whether there are systematic differences between experts living in countries that ever had fiscal rules in place since the mid-1980s, and those that did not use fiscal rules in the past.⁸ Accounting for experiences with fiscal rules does not change the inferences. We also re-estimate our benchmark estimates for individual countries. For the United States, our survey includes a total of 112 experts. The treatment effects for the United States are similar to those based on the whole sample of countries (see Table A7 in the appendix). For the United States, an increase in 1,000 additional cases of Covid-19 decreases the support for contractionary fiscal policies by around 0.37 percentage points, which is slightly lower than in the full sample of experts (0.4 percentage points). The information treatment regarding the past macroeconomic performance is also comparable to the baseline outcomes (0.366 compared to 0.421 in the full sample).

5.6 Experimenter demand effects

Our outcome variable is self-reported, which gives rise to the possibility of experimenter demand effects (i.e. that experts give answers in line to what they think we want them to say, see De Quidt et al., 2018). Such effects would bias our estimates when the participants of our survey (i) know that they are part of an RCT, (ii) are willing to help us, (iii) know our hypotheses and (iv) know which response would produce results in line with our hypotheses. There are three arguments for why experimenter demand effects are unlikely in our setting. First, experts did not know the intend of our study, and they also did not know about the RCT. Second, the ifo institute and the CESifo network have conducted the World Economic Survey (WES) since 1981, and many experts participated the survey since years or decades. Prior waves of the WES were sent at similar times of the year.

⁸Data on fiscal rules originally comes from Schaechter et al. (2012) and has been updated by the Fiscal Affairs Department of the IMF. The data covers the period 1985–2015.

Second, the invitation letter was sent by an assistant of the ifo’s survey department who sent out invitations to previous surveys to rule-out that answers were driven by any emotions of participants towards us. Third, even if experts knew the setting, it would be extremely difficult to provide answers that produce interesting results, because this would mean knowing the exact development of the spread of Covid-19 in each of the included countries.

6 Information updating versus changes in preferences

A pending question is whether the observed changes in experts’ policy recommendations are caused a re-assessment of the current situation regardless of their preferences or whether the updated state of the world directly influences experts’ preferences. When the treatment was randomly assigned, the estimated parameters $\hat{\gamma}$ and $\hat{\omega}$ identify the effect of a change in facts and hence suggest that experts adjust their policy advice in response to changing circumstances. An alternative explanation for the observable change in F_{eit} , however, may be that experts’ preferences and beliefs are influenced by the treatments of our experiment. According to our simple illustration of experts’ advisory problem in Equation (3), an influence of the shocks experts experienced in our experiment on their preferences would result in an additional effect on policy recommendations depending on the size of the parameter $\hat{\rho}$. Studies examining “experience effects” find that experiencing shocks leaves long-lasting imprints on individuals (e.g. [Malmendier and Nagel, 2011](#); [Giuliano and Spilimbergo, 2014](#); [Malmendier and Nagel, 2016](#); [Malmendier and Shen, 2018](#); [Malmendier et al., 2021](#)), but there is no evidence yet on how such shocks influence preferences of experts. A main argument against changing expert preferences would be that experts’ economic decisions and judgments are formed in a more deliberate and evidence-based manner than those of laypersons.

To examine whether the change in expert advice is based on information updating or driven by a change in preferences, our expert survey includes an open-ended question (Q13), which asks respondents “*What are your main considerations about fiscal rules?*”. Experts are asked to answer this question by writing down their considerations in free-text entry boxes. We employ text mining algorithms to systematically evaluate the sentiment of expert responses to this question using qualitative and quantitative analyses. For our qualitative analysis, we preprocess the expert responses and build word clouds that reflect the relative frequency of words used by respondents.⁹

Eye-balling the word clouds presented in Figure (2) does not reveal any differences between treated and non-treated experts. Figure (B10) in the appendix shows that there is a strong correlation of words mentioned in answers of treated and non-treated experts (96.44 percent).

⁹We transform the text to only include lowercase words, filter stop words, and tokenize the raw input.

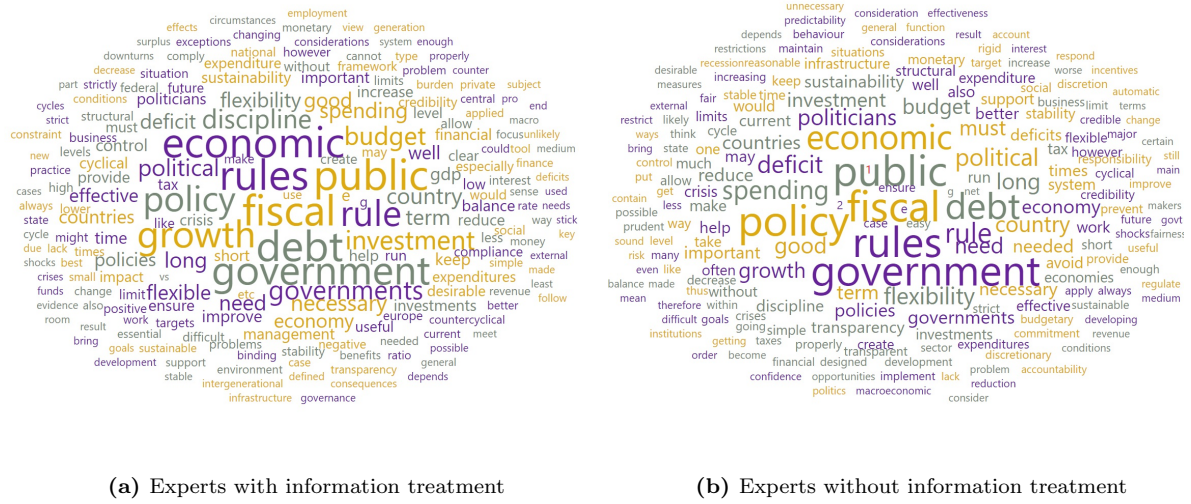


Figure 2 WORD CLOUDS OF EXPERT RESPONSES, MAIN CONSIDERATIONS ABOUT FISCAL RULES.

Notes: The figure shows a word cloud of expert responses to the question “What are your main considerations about fiscal rules?”, distinguishing between experts that received the information treatment (sub-figure a) and those that did not receive the information treatment (sub-figure b). The world cloud is based on about 2,500 distinct words.

For our quantitative analysis, we perform sentiment analyses based on the VADER (Valence Aware Dictionary for sEntiment Reasoning) model, a natural language processing algorithm that is trained to extract the polarity (positive or negative) as well as the intensity (strength) of emotions of a text. The algorithm, initially developed by [Hutto and Gilbert \(2014\)](#), is particularly designed to gather emotions from brief microblogs and social media messages, which most closely resembles the format of the answers given by the experts in our survey. The algorithm has been shown to provide classifications that are almost identical to the emotions humans would assign to a text (see [Hutto and Gilbert, 2014](#) for a detailed description and a comparison to human classifications). Additional information on the VADER algorithm and its use to extract experts’ sentiment towards fiscal rules in open-ended questions is provided in appendix (C).

The VADER algorithm classifies texts on a scale running from -1 (most negative) to $+1$ (most positive). Expert #344 is a prime example for negative attitudes towards fiscal rules, declaring that “the problem with fiscal rules is that accounting strategies can be used to meet the goals. In addition, fiscal rules can be very restrictive at times of economic recession and make recovery difficult. Fiscal rules can have a negative impact on investment”. This assessment receives a compound sentiment score of -0.8481 . In contrast, expert #18 is has positive attitudes towards fiscal rules, writing that “with Italian mentality fiscal rules are absolute necessary, otherwise public income would decrease strongly. At the same time the possibility to increase the tax deductible expenses would also be a great help for public incomes.” This assessment receives a score of 0.8807 .

Figure (3) shows the average sentiment score for the group of experts that received the

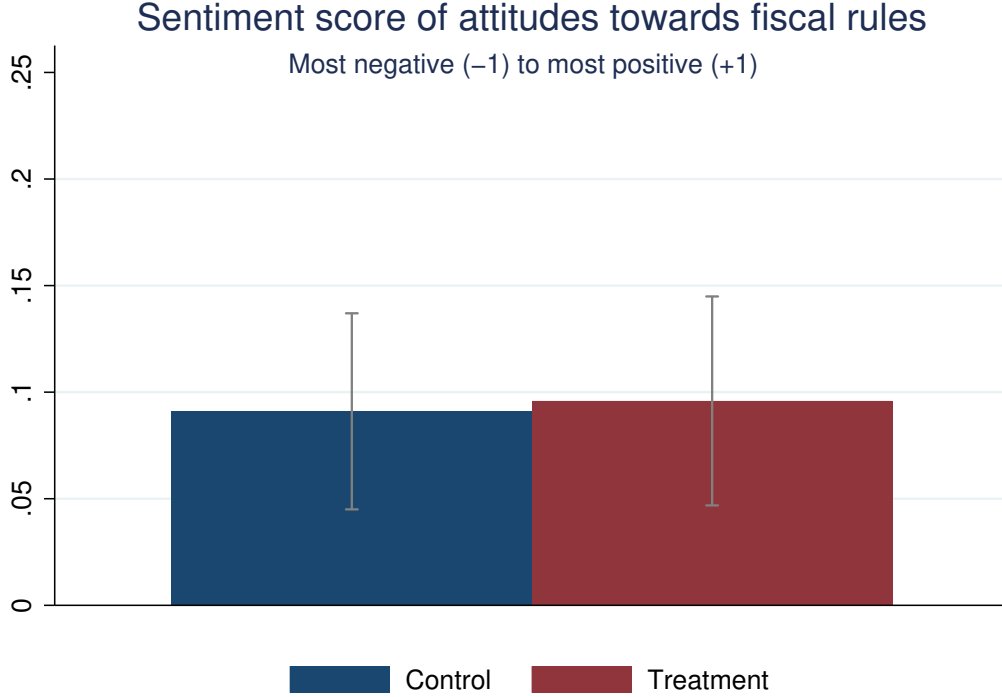


Figure 3 AVERAGE SENTIMENT SCORE OF ATTITUDES TOWARDS FISCAL RULES ACROSS TREATED AND NON-TREATED EXPERTS.

Notes: The figure shows mean values of sentiment scores computed by text mining of answers to the question: “*What are your main considerations about fiscal rules?*”. We specify a VADER (Valence Aware Dictionary for Sentiment Reasoning) model for text sentiment analysis that is sensitive to both polarity (positive/negative) and intensity (strength) of emotion to compute compound scores of the sentiment of answers. Mean levels of sentiment scores ranging between -1 (most negative) and $+1$ (most positive) are plotted for treated and non-treated experts. Vertical lines represent 95 percent confidence intervals.

information treatment and those that did not receive the treatment. The figure shows that there are no significant differences in attitudes towards fiscal rules between the treated and the non-treated experts. There are also no indications for differences in preferences across experts with above-median or below-median exposure to Covid-19. This result also occurs when we re-estimate our empirical models of Equations (5) and (6) using the sentiment score as the dependent variable (not reported). Our results indicate that the change in experts’ policy recommendation is not caused by a change in preferences, rejecting hypothesis (4). Rather, the results suggest that experts change their minds when new information becomes available, even though their new recommendations may go against their own preferences and beliefs.

7 Conclusion

By advising policymakers, economic experts influence policymaking. An important question is whether experts’ policy recommendations are based on facts or preferences. We examined this question by asking influential economic experts around the globe for pol-

icy recommendations about a topic that involves strong preferences and confronted them with two fundamental changes of facts. We found that experts' policy recommendations adapt substantially in reaction to these changes of facts. The results also showed that the changing recommendations are not driven by changes in preferences. Taken together, our results suggest that experts, on average, provide policy recommendations that are based on an assessment of the available facts rather than their own views of the world.

A key message of our paper is that expertise of scientific experts can help design tailored policies that are based on scientific evidence. Mistrust of experts, however, has become part of the modern zeitgeist and is amplified during epidemics ([Eichengreen et al., 2021](#)). When subjective opinions trump expert advice, there is great leeway for partisan politics.

Our study is a first step towards understanding the motivation of scientific experts when providing policy recommendations, and we hope that our analysis will be followed by other studies examining the objectivity of experts' advice. At this stage, our results provide an interesting answer to Keynes' initially quoted question: when the facts change, we also change our minds—but not our hearts.

Appendix (for online publication)

Appendix A: Supplementary tables

Table A1 BALANCE TESTS—SAMPLE MEANS OF CONTROL AND TREATMENT GROUP AND T-TESTS FOR DIFFERENCES IN MEAN CHARACTERISTICS

(I) Variable	(II) Control (mean)	(III) Treatment (mean)	(IV) Difference (<i>t</i>)
<i>Treatment I: Spread of Covid-19 (> sample mean)</i>			
Sex (1 = male)	0.955	0.980	-0.025 (1.67)
Age (coded in groups, 1–5)	2.727	2.478	0.248 (1.41)
Education (coded in groups, 1–5)	3.841	3.796	0.045 (0.75)
Degree in economics (1 = yes)	0.899	0.878	0.021 (0.44)
Affiliation: University (1 = yes)	0.714	0.755	-0.041 (0.59)
Affiliation: Central Bank (1 = yes)	0.104	0.122	-0.019 (0.39)
<i>Treatment II: Information treatment</i>			
Sex (1 = male)	0.967	0.945	0.022 (1.79)
Age (coded in groups, 1–5)	2.748	2.636	0.113 (0.90)
Education (coded in groups, 1–5)	3.821	3.846	-0.024 (0.57)
Degree in economics (1 = yes)	0.891	0.899	-0.008 (0.25)
Affiliation: University (1 = yes)	0.711	0.729	-0.019 (0.38)
Affiliation: Central Bank (1 = yes)	0.119	0.094	0.025 (0.74)

Notes: The table reports the mean levels of key socio-economic characteristics of experts included in our sample for the control group (Column II) and the treatment group (Column III). The differences between the means are reported in Column IV, with test statistics of a two-sample t-test reported in parentheses. To guarantee anonymity of experts, we do not ask respondents for socio-economic characteristics other than sex, age, and income. Also, the age of respondents is coded in classes between 1–5 to guarantee that individual participants cannot be identified in the data.

Table A2 COVID-19 CASES, MACROECONOMIC PERFORMANCE AND EXPERTS' FISCAL POLICY ADVICE—ACCOUNTING FOR COUNTRY-LEVEL HETEROGENEITY IN UNOBSERVED FACTORS

Dependent variable: “Recommendation that fiscal rules should be adopted”, F_{eit}				
	(I) Covid-19	(II) Treatment	(III) Covid-19 and Treatment	
	(Model 1)	(Model 2)	(Model 3)	(Model 4)
Covid-19	-0.0038** (-3.00)		-0.0026** (-2.19)	-0.0028** (-2.34)
Information-Treatment		0.286*** (9.21)	0.289*** (9.13)	0.280*** (8.60)
Information-Treatment \times Covid-19				0.0029 (1.00)
Observations (# of Experts)	1,103	1,103	1,103	1,103
R-Squared	0.317	0.391	0.380	0.381
F Stat	8.993	84.78	45.80	30.88
F Stat (p-val)	0.002	0.000	0.000	0.000
Country FE	YES	YES	YES	YES

Notes: The table reports the results on the effect of epidemics on fiscal policy recommendations of experts. t statistics of (two-sided) t -tests are reported in parentheses. “Covid-19” denotes the number of confirmed cases of Covid-19 at the time the experts filled out the questionnaire. “Treatment” is the information treatment that confronts experts with the economic development of their home country during the past five years. Coefficients on Covid-19 cases and interaction terms with Covid-19 cases are multiplied by 1,000 to keep the parameter in a displayable space. All regressions include country-level fixed effect. Inclusion of country-level dummies leads to the exclusion of experts from countries in which only one expert participated the survey.

*** Significant at the 1 percent level,

** Significant at the 5 percent level

Table A3 COVID-19 CASES, MACROECONOMIC PERFORMANCE AND EXPERTS' FISCAL POLICY ADVICE—STANDARD ERRORS CLUSTERED ON THE COUNTRY-LEVEL, SAMPLE OF COUNTRIES ≥ 15 EXPERTS INCLUDED IN SURVEY

Dependent variable: "Recommendation that fiscal rules should be adopted", F_{eit}				
	(I) Covid-19	(II) Treatment	(III) Covid-19 and Treatment	
	(Model 1)	(Model 2)	(Model 3)	(Model 4)
Covid-19	-0.00656** (-2.85)		-0.00459** (-2.71)	-0.00455** (-2.53)
Information-Treatment		0.466*** (6.81)	0.454*** (6.60)	0.455*** (6.47)
Information-Treatment \times Covid-19				-0.000384 (-0.12)
Observations (# of Experts)	759	759	759	759
R-Squared	0.0229	0.188	0.199	0.199
F Stat	8.146	46.31	26.07	17.44
F Stat (p-val)	0.011	0.000	0.000	0.000

Notes: The table reports the results on the effect of epidemics on fiscal policy recommendations of experts. t statistics of (two-sided) t -tests are reported in parentheses. "Covid-19" denotes the number of confirmed cases of Covid-19 at the time the experts filled out the questionnaire. "Treatment" is the information treatment that confronts experts with the economic development of their home country during the past five years. Coefficients on Covid-19 cases and interaction terms with Covid-19 cases are multiplied by 1,000 to keep the parameter in a displayable space. Results are obtained using countries with at least 15 participating experts to avoid biases caused by a low number of observations per cluster.

*** Significant at the 1 percent level,

** Significant at the 5 percent level

Table A4 COVID-19 CASES, MACROECONOMIC PERFORMANCE AND EXPERTS' FISCAL POLICY ADVICE—ACCOUNTING FOR COUNTRY-LEVEL HETEROGENEITY IN UNOBSERVED FACTORS AND STANDARD ERRORS CLUSTERED ON THE COUNTRY-LEVEL

Dependent variable: "Recommendation that fiscal rules should be adopted", F_{eit}				
	(I) Covid-19	(II) Treatment	(III) Covid-19 and Treatment	
	(Model 1)	(Model 2)	(Model 3)	(Model 4)
Covid-19	-0.00378*** (-5.35)		-0.00242** (-3.54)	-0.00245** (-3.40)
Information-Treatment		0.349*** (5.56)	0.344*** (5.41)	0.342*** (5.20)
Information-Treatment \times Covid-19				0.000560 (0.18)
Observations (# of Experts)	759	759	759	759
R-Squared	0.254	0.341	0.344	0.344
F Stat	28.63	30.90	30.65	20.76
F Stat (p-val)	0.000	0.000	0.000	0.000
Country FE	YES	YES	YES	YES

Notes: The table reports the results on the effect of epidemics on fiscal policy recommendations of experts. t statistics of (two-sided) t -tests are reported in parentheses. "Covid-19" denotes the number of confirmed cases of Covid-19 at the time the experts filled out the questionnaire. "Treatment" is the information treatment that confronts experts with the economic development of their home country during the past five years. Coefficients on Covid-19 cases and interaction terms with Covid-19 cases are multiplied by 1,000 to keep the parameter in a displayable space. All regressions include country-level fixed effect. Results are obtained using countries with at least 15 participating experts to avoid biases caused by a low number of observations per cluster.

*** Significant at the 1 percent level,

** Significant at the 5 percent level

Table A5 COVID-19 CASES, MACROECONOMIC PERFORMANCE AND EXPERTS’ FISCAL POLICY ADVICE—TREATMENT INTENSITY, ACCOUNTING FOR COUNTRY-LEVEL HETEROGENEITY IN UNOBSERVED FACTORS

Dependent variable: “Recommendation that fiscal rules should be adopted”, F_{eit}						
	Treatment Intensity			Extreme Treatment		
	Treatment (1)	Covid-19 & (2)	Treatment (3)	Treatment (4)	Covid-19 & (5)	Treatment (6)
Covid-19		-0.00303** (-2.51)	-0.00302** (-2.50)		-0.00377** (-3.00)	-0.00377** (-2.99)
Treatment Intensity	0.0885*** (8.49)	0.0917*** (8.54)	0.0922*** (8.18)			
Treatment Int. \times Covid-19			-0.0000803 (-0.16)			
High-Treatment				0.290*** (3.37)	0.307*** (3.48)	0.274** (2.96)
High-Treatment \times Covid-19						0.00277 (0.82)
Observations	1,103	1,103	1,103	1,103	1,103	1,103
R Squared	0.379	0.370	0.370	0.335	0.323	0.323
F Stat	72.16	40.82	27.18	11.35	10.54	7.166
F Stat (p-val)	0.000	0.000	0.000	0.000	0.000	0.000
Country FE	YES	YES	YES	YES	YES	YES

Notes: The table reports the results on the effect of epidemics on fiscal policy recommendations of experts. t statistics of (two-sided) t -tests are reported in parentheses. “Covid-19” denotes the number of confirmed cases of Covid-19 at the time the experts filled out the questionnaire. “Treatment” is the information treatment that confronts experts with the economic development of their home country during the past five years. Coefficients on Covid-19 cases and interaction terms with Covid-19 cases are multiplied by 1,000 to keep the parameter in a displayable space. “Treatment Intensity” is the treatment dummy multiplied with the growth rate of experts’ host country during the past five years to measure the intensity of the information treatment. “High-Treatment” is the treatment dummy multiplied by a dummy variable that is 1 if the growth rate of experts’ host country over the past five years lies within the upper quartile of the distribution (top 25 percent). All regressions include country-level fixed effects.

*** Significant at the 1 percent level,

** Significant at the 5 percent level

Table A6 COVID-19 CASES, MACROECONOMIC PERFORMANCE AND EXPERTS' FISCAL POLICY ADVICE—ACCOUNTING FOR EXPERIENCES WITH FISCAL RULES

Dependent variable: “Recommendation that fiscal rules should be adopted”, F_{eit}				
	(I) Covid-19	(II) Treatment	(III) Covid-19 and Treatment	
	(Model 1)	(Model 2)	(Model 3)	(Model 4)
Covid-19	-0.00348** (-3.06)		-0.00283** (-3.04)	-0.00444*** (-3.52)
Information-Treatment		0.379*** (13.63)	0.382*** (13.30)	0.365*** (12.27)
Information-Treatment \times Covid-19				0.00505** (3.21)
Observations (# of Experts)	1,119	1,119	1,119	1,119
R-Squared	0.009	0.161	0.165	0.171
F Stat	8.008	237.4	120.8	84.58
F Stat (p-val)	0.004	0.000	0.000	0.000
Control for Past Fiscal Rules	YES	YES	YES	YES

Notes: The table reports the results on the effect of epidemics on fiscal policy recommendations of experts. t statistics of (two-sided) t -tests are reported in parentheses. “Covid-19” denotes the number of confirmed cases of Covid-19 at the time the experts filled out the questionnaire. “Treatment” is the information treatment that confronts experts with the economic development of their home country during the past five years. Coefficients on Covid-19 cases and interaction terms with Covid-19 cases are multiplied by 1,000 to keep the parameter in a displayable space. The table controls for experts’ experience with fiscal rules by including a dummy variable that indicates whether the host country of experts has ever had a fiscal rule in place since 1985. Data on past fiscal rules originally comes from [Schaechter et al. \(2012\)](#) and has been updated by the Fiscal Affairs Department of the IMF. The data covers the time period 1985–2015.

*** Significant at the 1 percent level,

** Significant at the 5 percent level

Table A7 COVID-19 CASES, MACROECONOMIC PERFORMANCE AND EXPERTS' FISCAL POLICY ADVICE—RESULTS FOR THE UNITED STATES

Dependent variable: "Recommendation that fiscal rules should be adopted", F_{eit}				
	(I) Covid-19	(II) Treatment	(III) Covid-19 and Treatment	
	(Model 1)	(Model 2)	(Model 3)	(Model 4)
Covid-19	-0.00373*** (-3.63)		-0.00213** (-2.46)	-0.00228** (-2.62)
Information-Treatment		0.366** (3.28)	0.342** (2.98)	0.290** (2.34)
Information-Treatment \times Covid-19				0.0427* (1.91)
Observations (# of Experts)	112	112	112	112
R-Squared	0.039	0.156	0.168	0.186
F Stat	13.14	10.79	10.90	11.48
F Stat (p-val)	0.000	0.001	0.000	0.000

Notes: The table reports the results on the effect of epidemics on fiscal policy recommendations of experts. t statistics of (two-sided) t -tests are reported in parentheses. "Covid-19" denotes the number of confirmed cases of Covid-19 at the time the experts filled out the questionnaire. "Treatment" is the information treatment that confronts experts with the economic development of their home country during the past five years. Coefficients on Covid-19 cases and interaction terms with Covid-19 cases are multiplied by 1,000 to keep the parameter in a displayable space. The table only considers experts whose host country is the United States.

- *** Significant at the 1 percent level,
- ** Significant at the 5 percent level,
- * Significant at the 10 percent level

Appendix B: Supplementary figures

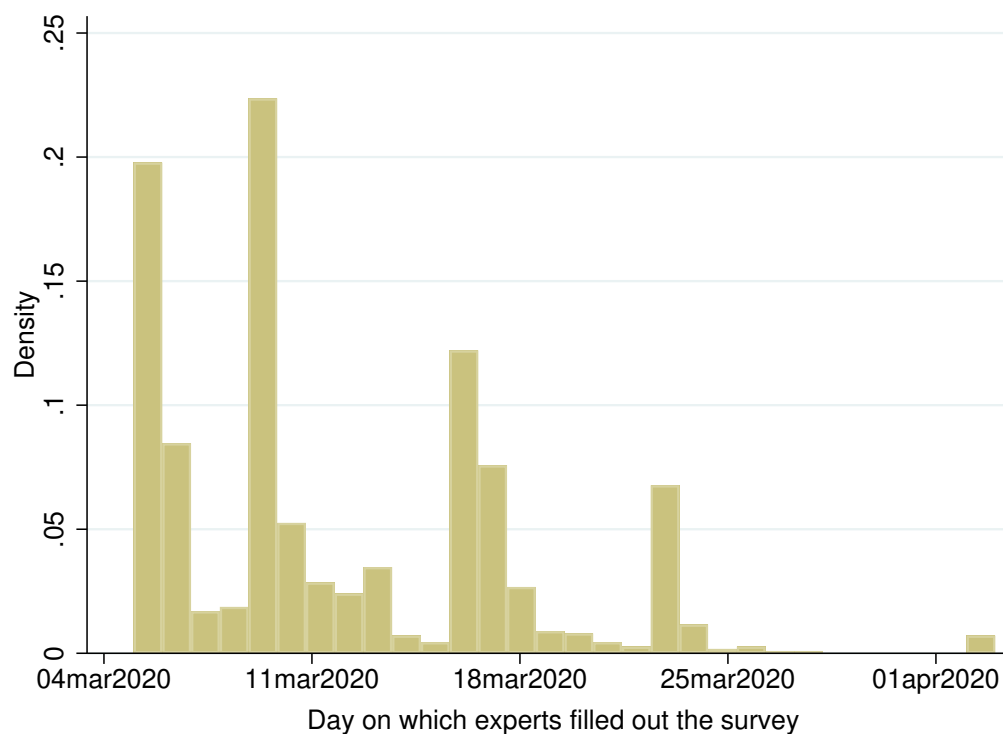


Figure B1 DAYS ON WHICH EXPERTS FILLED OUT THE SURVEY, MARCH–APRIL 2020.

Notes: The figure shows the day at which experts responded to our survey. After sending the survey to experts on March 5, 2020, we sent out three reminders to guarantee that our survey spanned the entire period. The reminders were sent on March 9, 2020, on March 16, 2020, and on March 23, 2020.

World Economic Survey: Special Issue

Thank you for participating in the new format of the WES survey.
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complied with at all times.
[Questionnaire as PDF for printing](#)

Fiscal rules

Media and Media use

Complete Survey

Fiscal rules in general

1. Please state if you agree with the following statement:

	Strongly agree	Slightly agree	Slightly disagree	Strongly disagree	I don't know
A) Fiscal rules are effective in reducing government debt.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
B) Fiscal rules increase economic growth.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
C) Fiscal rules crowd out public investments.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Fiscal rules in the country where you work

2. Do you have a fiscal rule in place in the country you work in?

☐ Yes
☐ No (please go to question 4)
☐ I don't know (please go to question 4)

3. if yes, please state if you agree with the following statement:

	Strongly agree	Slightly agree	Slightly disagree	Strongly disagree	I don't know
A) Fiscal rules are effective in reducing government debt in the country where you work.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
B) Fiscal rules increase economic growth in the country where you work.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
C) Fiscal rules crowd out public investments in the country where you work.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

4. Suppose there would be a fiscal rule in the country where you work (if there is one, then consider the current situation).

A) How likely do you think it is that the government comply with the fiscal rules?

☐ Highly likely ☐ Likely ☐ Unlikely ☐ Very unlikely ☐ I don't know

B) What will happen if the country where you work does not comply with the fiscal rules?

☐ Drastic consequences ☐ Some consequences ☐ Minor consequences ☐ Nothing ☐ I don't know

C) Do you think complying with the fiscal rule is desirable?

☐ Strongly agree ☐ Slightly agree ☐ Slightly disagree ☐ Strongly disagree ☐ I don't know

5. Over the last five years, real per capita GDP growth was on average 5.65 per year in Democratic Republic of the Congo. Suppose there would be no fiscal rule in the country you work in (if there is none, then consider the current situation). Would you recommend introducing one?

☐ Yes
☐ No
☐ I don't know

Figure B2 ONLINE SURVEY QUESTIONNAIRE (1/3).

Notes: The figure shows the first part of our online survey questionnaire, measuring experts' views on fiscal rules. Question 5 includes the variant with information treatment. As an example, the question delivers the information that the growth rate in the sample country was 5.65 percent per year over the past five years. Other participants of the sample country did not receive this information.

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Fiscal rules in your country of origin

6. Is the country you work in also your **country of origin**?

☐ Yes (please go to question 11)
☐ No

7. Do you have a fiscal rule in place in your **country of origin**?

☐ Yes
☐ No (please go to question 9)
☐ I don't know (please go to question 9)

8. Please state if you agree with the following statement:

	Strongly agree	Slightly agree	Slightly disagree	Strongly disagree	I don't know
A) Fiscal rules are effective in reducing government debt in your country of origin.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
B) Fiscal rules increase economic growth in your country of origin.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
C) Fiscal rules crowd out public investments in your country of origin.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

9. Suppose there would be a fiscal rule in **your country of origin** (if there is one, then consider the current situation).

A) How likely do you think it is that your **government will comply** with fiscal rules?

☐ Highly likely ☐ Likely ☐ Unlikely ☐ Very unlikely ☐ I don't know

B) What will happen if your country **does not comply** with the fiscal rules

☐ Drastic consequences ☐ Some consequences ☐ Minor consequences ☐ Nothing ☐ I don't know

C) Do you think complying with the fiscal rule is **desirable**?

☐ Strongly agree ☐ Slightly agree ☐ Slightly disagree ☐ Strongly disagree ☐ I don't know

10. Suppose there would be no fiscal rule in your country of origin (if there is none, then consider the current situation). Would you **recommend** introducing one?

☐ Yes
☐ No
☐ I don't know

Figure B3 ONLINE SURVEY QUESTIONNAIRE (2/3).

Notes: The figure shows the second part of our online survey questionnaire, which looks at fiscal rules in the home country of experts.

Views about fiscal rules

11. Did you change your view about fiscal rules during the **past five years**?

☐ Yes
☐ No

12. Did you change your view about fiscal rules during the **past ten years**?

☐ Yes
☐ No

13. What are your **main considerations** about fiscal rules?

14. What should be the **goal** of fiscal rules?

15. What are the **main shortcomings** of fiscal rules?

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Figure B4 ONLINE SURVEY QUESTIONNAIRE (3/3).

Notes: The figure shows the third part of our online survey questionnaire, which includes open questions to assess the participants' attitudes and views towards fiscal rules.

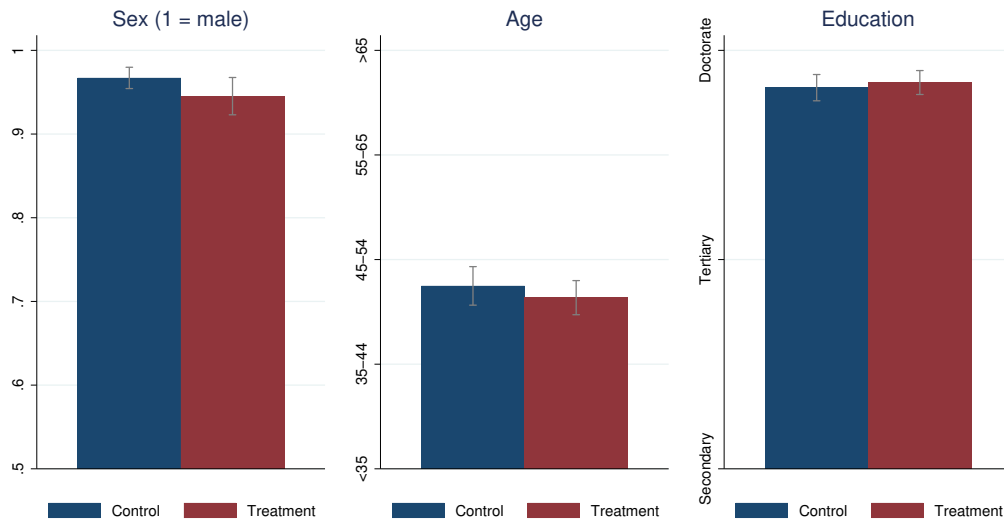


Figure B5 INFORMATION TREATMENT—BALANCE TESTS (1/2), MEAN OF SOCIO-ECONOMIC CHARACTERISTICS ACROSS TREATED AND NON-TREATED EXPERTS.
Notes: The figure shows mean values of key socio-economic characteristics of treated and non-treated experts. To guarantee the anonymity of experts, data for age is available only in ranges. Vertical lines represent 95 percent confidence intervals.

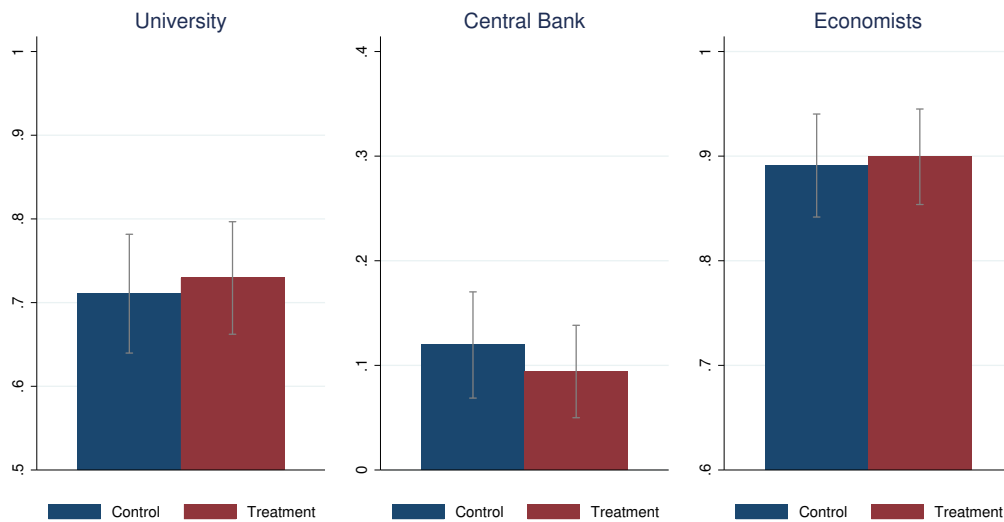


Figure B6 INFORMATION TREATMENT—BALANCE TESTS (2/2), MEAN OF OCCUPATIONS AND FIELDS OF EXPERTISE ACROSS TREATED AND NON-TREATED EXPERTS.
Notes: The figure shows mean values of occupations and fields of expertise of treated and non-treated experts. Vertical lines represent 95 percent confidence intervals.

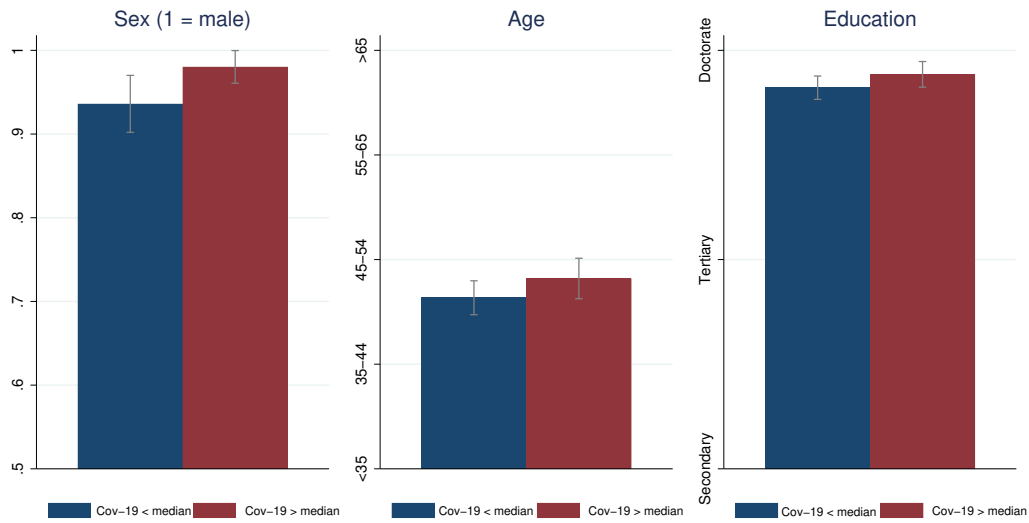


Figure B7 COVID-19 TREATMENT—BALANCE TESTS (1/2), MEAN OF SOCIO-ECONOMIC CHARACTERISTICS ACROSS TREATED AND NON-TREATED EXPERTS.

Notes: The figure shows mean values of key socio-economic characteristics of treated and non-treated experts. To guarantee the anonymity of experts, data for age is available only in ranges. Vertical lines represent 95 percent confidence intervals.

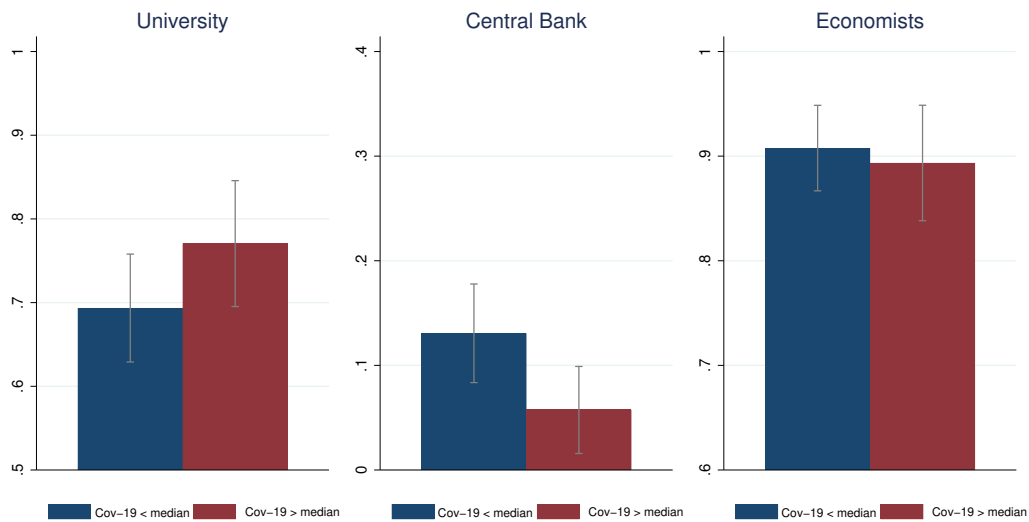


Figure B8 COVID-19 TREATMENT—BALANCE TESTS (2/2), MEAN OF OCCUPATIONS AND FIELDS OF EXPERTISE ACROSS TREATED AND NON-TREATED EXPERTS.

Notes: The figure shows mean values of occupations and fields of expertise of treated and non-treated experts. Vertical lines represent 95 percent confidence intervals.

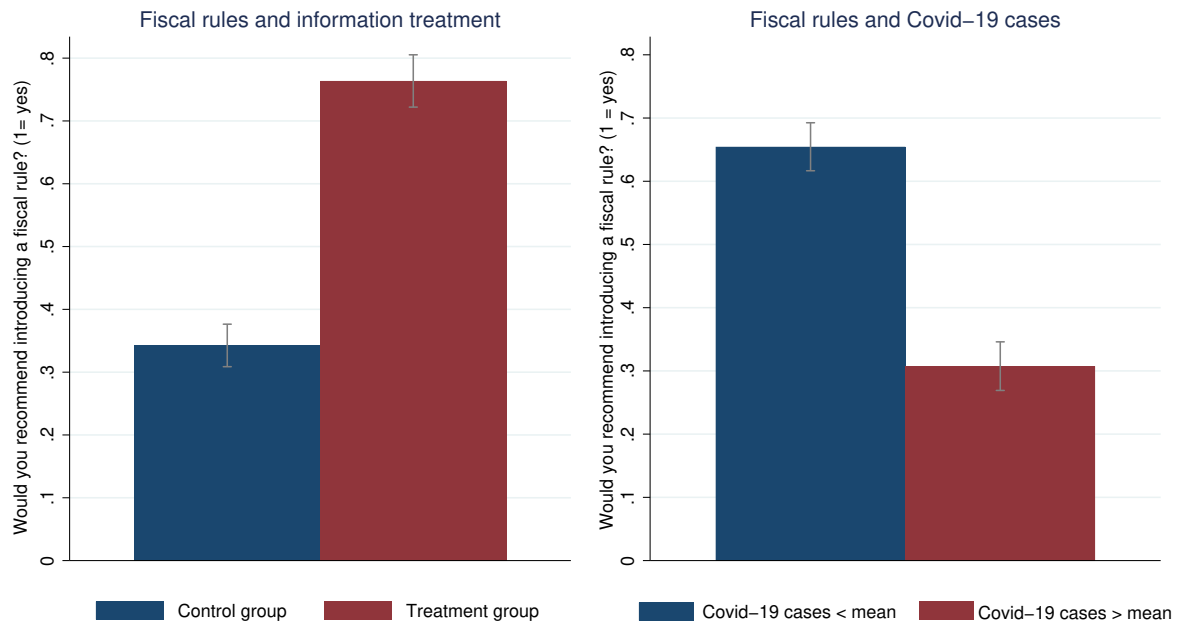


Figure B9 TREATMENT EFFECTS, PAST MACROECONOMIC PERFORMANCE AND COVID-19.

Notes: The figure shows the percentage of individuals recommending adopting fiscal rules for experts with and without the information treatment about past macroeconomic performance (left-hand side) and for those experts living in countries with confirmed corona cases below and above the sample median (right-hand side). The vertical lines reflect the 95 percent confidence intervals.

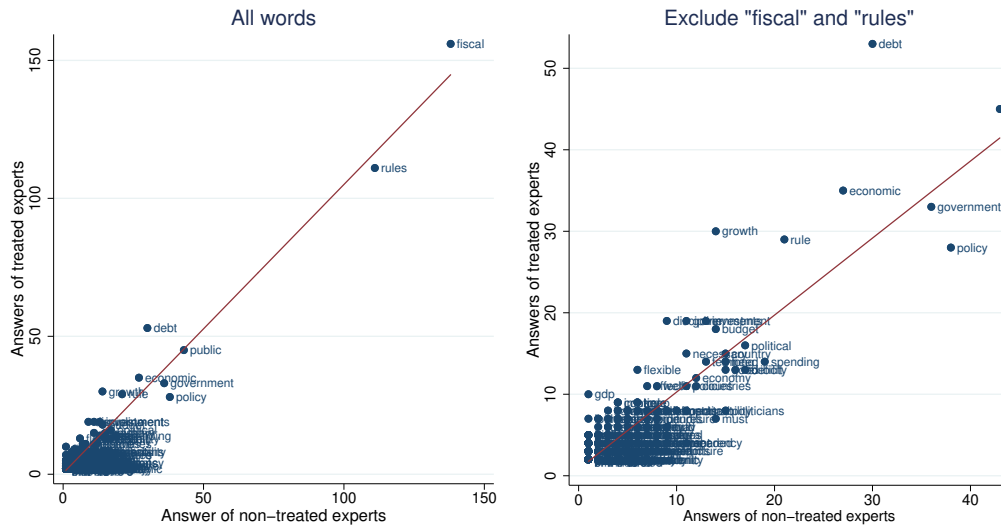


Figure B10 CORRELATION IN THE FREQUENCY OF WORDS MENTIONED IN ANSWERS TO OPEN-ENDED QUESTIONS, EXPERTS WITH AND WITHOUT INFORMATION TREATMENT.

Notes: The figure shows the correlation of the frequency of words used in answers of treated and non-treated experts. The figure on the left-hand side shows the correlation for all words, the figure on the right-hand side excludes the two keywords “fiscal” and “rules”. The overall correlation of words used by treated and non-treated experts is 96.44 percent.

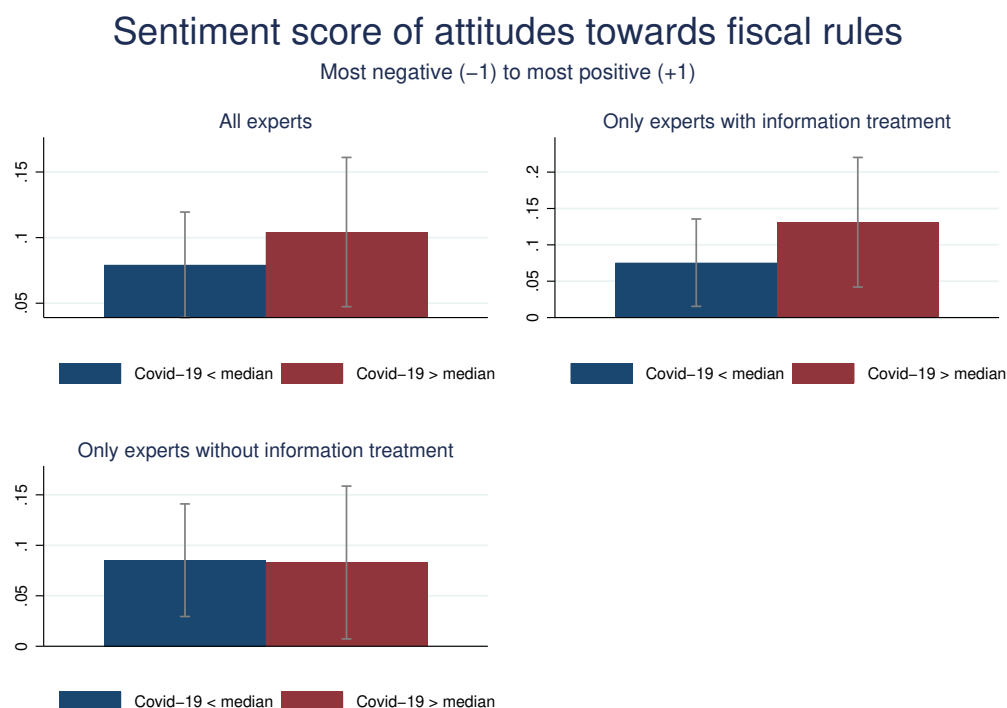


Figure B11 AVERAGE SENTIMENT SCORE OF ATTITUDES TOWARDS FISCAL RULES ACROSS EXPERTS WITH BELOW AND ABOVE THE MEDIAN EXPOSURE TO COVID-19.

Notes: The figure shows mean values of sentiment scores computed by text mining of answers to the question: “What are your main considerations about fiscal rules?”. We specify a VADER (Valence Aware Dictionary for Sentiment Reasoning) model for text sentiment analysis that is sensitive to both polarity (positive/negative) and intensity (strength) of emotion to compute compound scores of the sentiment of answers. Mean levels of sentiment scores ranging between −1 (most negative) and +1 (most positive) are plotted for experts with below-median and above-median exposure to Covid-19, measured by officially reported cases. Vertical lines represent 95 percent confidence intervals. Results are shown for all experts and are also separately listed for expert that received the information treatment of past macroeconomic performance and those that did not receive the treatment.

Appendix C: Notes on the VADER algorithm and its use to classify experts’ sentiment towards fiscal rules in open-ended questions

Sentiment analyses (often also referred to as “opinion mining”) are part of the field of natural language processing and are designed to examine individual’s opinions, evaluations, attitudes, and emotions via the computational treatment of subjectivity in written text. The first academic studies measuring public opinions have been conducted after and during World War II, but the systematic computer-based analysis of sentiments and emotions in texts has become possible only since the mid-2000’s that when substantial progress in computing power and software applications was made (for a survey on the methods and the history of sentiment analyses, see [Liu, 2012](#)).

The most fundamental step in conducting a sentiment analysis is obtaining a benchmark for the polarity (positive, negative, or neutral) and the intensity (strength) of emotions that can be assigned to a given word or phrase. Benchmarks are often provided in lexicons that are compiled and validated by researchers. A particularly popular lexicon is the “Linguistic Inquiry and Word Count” (LIWC), which has been extensively validated in a process of almost two decades of work by psychologists, sociologists, and linguists. LIWC uses a proprietary dictionary of about 4,500 words organized into 76 categories. The VADER (Valence Aware Dictionary for sEntiment Reasoning) algorithm developed by [Hutto and Gilbert \(2014\)](#) enlarges LIWC and provides the “gold-standard” sentiment lexicon for text mining analyses. The computational sentiment analysis engine is based on 9,000 lexical features. It has four favorable features over prior applications: i) it generalizes to multiple domains and is particularly designed for microblogs and social media platforms such as twitter. Messages on these platforms are closely comparable to answers given in to open-ended questions, which usually cover 1-2 sentences. (ii) VADER requires no training data. Instead, it is constructed from a generalized, valence-based, human-curated lexicon. (iii) It is faster than other viable alternatives and (iv) does not encounter a substantial trade-off between accuracy and speed.

To establish sentiment scores regarding the polarity and strength of lexical features, the VADER algorithm uses a “Wisdom-of-the-Crowd” (WotC) approach, where ten independent human raters classify more than 9,000 lexical features on a scale running from, -4 (extremely negative) to +4 (extremely positive) with allowance for 0 (neutral). The more than 90,000 ratings were collected by Amazon Mechanical Turk (AMT). The ratings are then used to compile a mean valence. For instance, the word “okay” has a positive valence of 0.9, “good” receives a value of 1.9, and “great” receives a value of 3.1. On the other end of the spectrum, “horrible” is classified by -2.5. Words whose ratings exceed a standard deviations of 2.5 across raters or that receive an average neutral score are excluded. This produces a full list of about 7,500 sentiment-laden lexical features.

In the next step, [Hutto and Gilbert \(2014\)](#) use a data-driven inductive coding technique similar to the Grounded Theory approach to identify properties and characteristics of the text which affect its perceived sentiment intensity. The resulting heuristics go beyond a typical Bag-of-Words model, incorporating word-order sensitivity relationships between terms. The deep qualitative analysis results in five generalizable heuristics that are used to extract the sentiment of the text

1. Punctuation: differences in punctuation reflect differences in sentiments. For instance, usage of an exclamation point (“!”) signals higher intensity of emotions.
2. Capitalization: when authors use capitalized words, they emphasize a sentiment-relevant word. Capitalization is particularly relevant for classifying microblogs, but less so for our analysis of abstracts.
3. Degree modifiers (also referred to as “intensifiers”, “booster words”, or “degree adverbs”): degree modifiers either increase or decrease the sentiment of words. For instance *“we find a large positive effect of investment on growth”* has a higher intensity than the phrase *“we find a positive effect of investment on growth”*.
4. Contrastive conjunctions: contrastive conjunctions are words that signal a shift in sentiment, with the text following the conjunction being dominant. For instance, *“our results show that investment and growth are correlated, but our synthetic control analyses demonstrate that there is no causal relationship between the variables”* has mixed sentiment, with the latter half dictating the overall rating.
5. Negation flips in the polarity of texts: negated sentences often flip the polarity of texts, which can produce biases in the classification. For instance, a sentence such as *“we do not find a large and positive effect of investment on growth”* would have a positive sentiment score because of the term “positive effects” and the degree modifier “large”. Negation flips are identified and taken into the sentiment score by examining the tri-gram preceding a sentiment-laden lexical feature.

The heuristics are included in VADER’s rule-based approach. [Hutto and Gilbert \(2014\)](#) validate the classification by comparing the sentiment extracted from 4,000 tweets on twitter, 2,000 movie reviews, 309 customer reviews for technical products, and 500 New York Times opinion editorials. Their results show that VADER produces sentiment classifications that are indistinguishable from that of human raters, and that VADER outperforms other methods for sentiment analyses.

For our analysis, we compute the overall compound score of sentiment by summing the valence scores of each word used in the responses of experts. The final metric is derived by normalizing the sum on a scale running from -1 (most negative) to $+1$ (most positive) via

$$\mathfrak{S}_i^n = \frac{\mathfrak{S}_i}{\sqrt{\mathfrak{S}_i^2 + \alpha}}, \quad (8)$$

where \mathfrak{S}_i is the sum of adjusted valence scores of constituent words, \mathfrak{S}_i^n is the final normalized compound score, and α is the normalization constant. The metric derived by equation (8) reflects a single uni-dimensional rating of the responses written by experts. We use this metric in our analyses, but we also re-estimate our models for the neutral, positive, and negative components separately, with little changes for the inferences.

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