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How Optimistic and Pessimistic Narratives about COVID-19 Impact Economic Behavior

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How Optimistic and Pessimistic Narratives about COVID-19 Impact Economic Behavior*

Sören Harrs[1], Lara Marie Müller[2], Bettina Rockenbach[3]

May 17, 2021

Abstract

Politicians, scientists and journalists have aired vastly different assessments of the COVID-19 pandemic, ranging from rather optimistic to very pessimistic ones. In this paper we investigate how narratives conveying different assessments of the pandemic impact economic behavior. In a controlled experiment with incentivized economic games we find that subjects behave more risk averse and less patiently when confronted with a pessimistic compared to an optimistic or balanced narrative. Further we find that narratives change subjects' expectations about the pandemic and the stock market. Hence our experiment provides causal evidence for an impact of narratives on fundamental determinants of household behavior.

Keywords: Narrative Economics, Risk Aversion, Patience, Expectations
JEL Codes: D80, D91, E71, G41

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"The truth is that the hardest times still lie ahead of us. (...) Soon, each one of us will know someone who has died from COVID-19."

— Austrian Chancellor Sebastian Kurz, March 30th 2020 [1]

"We're prepared, and we're doing a great job with it. And it will go away. Just stay calm. It will go away."

— US President Donald J. Trump, March 10th 2020 [2]

1 Introduction

The COVID-19 pandemic is associated with drastic changes in societies worldwide and with great uncertainty regarding its duration and its likely impacts. Assessments of the pandemic, aired by politicians, scientists and journalists, are oftentimes vastly different, ranging from rather optimistic to very pessimistic ones, even in factually similar situations.

Austrian chancellor Sebastian Kurz, for example, used very drastic scenarios that provoke fear in citizens in order to increase compliance with social distancing measures.[3] Similarly, political leaders in China, India and France declared to be at "war against the virus" to emphasize the threat posed by the novel coronavirus.[4] Already at the outset of the pandemic, scientists like Anthony Fauci in the US and Christian Drosten in Germany have warned in public statements about an even more severe second wave of infections.[5] At the same time, other opinion leaders have spread much more optimistic assessments of the pandemic. Most prominently, former US president Donald Trump has purposely downplayed the severeness of COVID-19 in order to prevent a panic (Woodward, 2020).

In this way news about COVID-19 do not only contain information in the form of statistics about the pandemic, but also qualitative assessments of opinion leaders expressed in narratives.[6] While information provision through statistics is widely studied across many

[1] See https://www.kleinezeitung.at/politik/innenpolitik/5793215/Bundeskanzler-Sebastian-Kurz_Bald-wird-jeder-von-uns-jemanden (accessed on December 6th, 2020)

[2] See https://edition.cnn.com/interactive/2020/10/politics/covid-disappearing-trump-comment-tracker/ (accessed on December 6th, 2020)

[3] According to media reports, see for instance: https://www.zeit.de/politik/ausland/2020-04/sebastian-kurz-coronavirus-krisenmanagement-strategie (accessed on December 6, 2020)

[4] See for instance: https://www.washingtonpost.com/world/2020/04/06/are-we-war-with-coronavirus/ (accessed on December 6, 2020)

[5] See for instance the interview of Fauci with CNN: https://edition.cnn.com/2020/04/29/health/us-coronavirus-wednesday/index.html and the statements of Drosten in his podcast: https://www.ndr.de/nachrichten/info/coronaskript178.pdf (both accessed on April 27, 2021)

[6] A narrative, according to Shiller (2017), refers to a "simple story or easily expressed explanation of events that many people want to bring up in conversation or on news or social media because it can be used to stimulate the concerns or emotions of others, and/or because it appears to advance self-interest"(p. 968).

fields of economics,[7] evidence on information provision through stories or narratives is still scarce (Haaland, Roth, and Wohlfart, 2020). As narratives tend to evoke emotional reactions in the audience (Shiller, 2017) and provide explanations about causal relationships ("mental models") (Eliaz and Spiegler, 2020; Schwartzstein and Sunderam, 2021) they could have an important but yet unidentified impact on economic behavior. Shiller (2017) emphasizes that observational studies on narratives and economic behavior face severe methodological issues with reversed causality and highlights the importance of rigorous experimental evidence, which is, to the best of our knowledge, still missing.

In this paper we contribute to closing this gap by presenting experimental evidence on the impact of narratives about COVID-19 on fundamental determinants of household behavior. In a controlled experiment (N=423) subjects read news articles that either provide an optimistic, a pessimistic or a balanced narrative about the COVID-19 pandemic. A baseline condition reads a science-related article that is unrelated to COVID-19. Our data show that a more pessimistic narrative induces negative emotional reactions in subjects, such as feeling more afraid, upset and nervous. Thus when politicians' intention for providing pessimistic narratives is to induce negative emotional reactions in citizens, they seem to serve their purpose. If another motivation for providing pessimistic narratives is to increase compliance with and acceptance of political restrictions, they seem to have only a weak (and not statistically significant) effect. We find that subjects who are exposed to the pessimistic narrative as compared to the optimistic narrative report on average slightly higher support for restrictive policies, but lower levels of intentions to comply.

But what about the effect of narratives on behavior not directly related to taking action in the pandemic? Are there - potentially unintended - collateral effects of narratives on economic behavior, and if so which? These questions are of immanent importance, yet hitherto unexplored. They are the main focus of our study. Our data show that narratives have severe collateral effects on economic decision making. We find that the more pessimistic the narrative about COVID-19, the more risk averse and impatient subjects behave in incentivized economic games. The treatment effects on risk aversion and patience are robust when using different empirical strategies and when accounting for multiple hypothesis testing. The effects are also stable across socio-demographic subgroups, including subjects with high financial education. Pessimistic narratives also cause more pessimistic forward-looking expectations about the pandemic and the stock market which we elicit in an incentivized

[7] Macroeconomic papers in this strand of literature generally provide subjects at random with one statistic about a macroeconomic variable (see e.g. Armantier et al., 2016; Armona, Fuster, and Zafar, 2019; Coibion, Georgarakos, et al., 2019; Roth and Wohlfart, 2020). See Coibion, Gorodnichenko, and Weber (2019) and Haldane and McMahon (2018) for exceptions. These papers provide a news article and written statements of central banks to subjects to study the formation of inflation expectations.

way. Given that during this pandemic people are exposed to narratives at an extremely high frequency, even short-term effects of narratives on risk aversion, patience and expectations imply meaningful impacts on household behavior and the aggregate economy.

Our results serve as a "proof of concept" that narratives spreading through the news and social media can impact economic behavior, as argued by Shiller (2017), and that narratives can be an effective instrument of persuasive communication, as suggested by the models of Eliaz and Spiegler (2020) and Schwartzstein and Sunderam (2021). We thereby contribute empirical evidence to the emerging literature on narratives in economics.[8] One direct policy implication of our study is that politicians who use narratives to steer the behavior of citizens in this pandemic should be aware of the collateral effects on economic behavior.

Generalizing from the COVID-19 context, our results could help explain the emergence of counter-cyclical risk aversion in financial markets.[9] Based on our results, one could conjecture that risk aversion changes over the business cycle in reaction to optimistic and pessimistic narratives that spread via the news, social media or professional networks.

There are several papers in the context of the COVID-19 pandemic that are related to our research findings. Fetzer et al. (2020), Binder (2020), and Coibion, Gorodnichenko, and Weber (2020) investigate how information provision and policy communication impact macroeconomic expectations. A series of papers investigates the effects of persuasive communication on health-related behaviors and outcomes (Banerjee et al., 2020; Bursztyn et al., 2020; Akesson et al., 2020; Ajzenman, Cavalcanti, and Da Mata, 2020; Mariani, 2020). We complement this literature by providing experimental evidence for an impact of narratives about COVID-19 on risk aversion, patience and expectations which are all fundamental determinants of household behavior.

The rest of the paper is organized as follows: Section 2 describes our experimental design and data. We present a manipulation check in Section 3 and discuss hypotheses in Section 4. We report our main results in Section 5. Section 6 discusses the results and Section 7 concludes.

[8] See also Bénabou, Falk, and Tirole (2020) who discuss narratives in the domain of moral behavior. Verrina and Hillenbrand (2020) provide empirical evidence on such moral narratives.

[9] A number of central macroeconomic models assume that individuals act more risk averse in financial downturns than in financial upturns (e.g. Barberis, Huang, and Santos, 2001; Campbell and Cochrane, 1999). For empirical evidence see, for example, C. Huber, J. Huber, and Kirchler (2020) who show that financial professionals exhibit a higher level of risk-aversion in the COVID-19 pandemic than prior to the pandemic.

2 Experimental Design and Data Description

The online experiment was conducted in Germany during the first wave of the COVID-19 pandemic on May 4th 2020 with N=423 subjects, recruited from the subject pool of the Cologne Laboratory for Economic Research (CLER) via ORSEE (Greiner, 2015). The experiment was implemented with the survey software Qualtrics.[10] The median time for completing the experiment was 15 minutes. Subjects were paid dependent on their economic decisions with an average of €6.21. Payments were made via PayPal.

2.1 Setting

When we conducted our experiment, Germany had just lived through six weeks of strict political measures to combat the spread of COVID-19. The set of political measures that were in place since March 23rd 2020 contained (among others): the closure of schools, kindergartens and all non-essential businesses, strict rules of social distancing in public spaces and the prohibition of public gatherings of more than two persons living in different households. It was a wide-spread consensus that these measures had caused the reduction in the number of daily new cases in the weeks prior to the experiment (see Appendix Figure A1). Since mid April, a public discussion about lifting the restrictions and re-opening the economy had started in the media and among scientists and politicians.[11]

2.2 Experimental Procedures - Overview

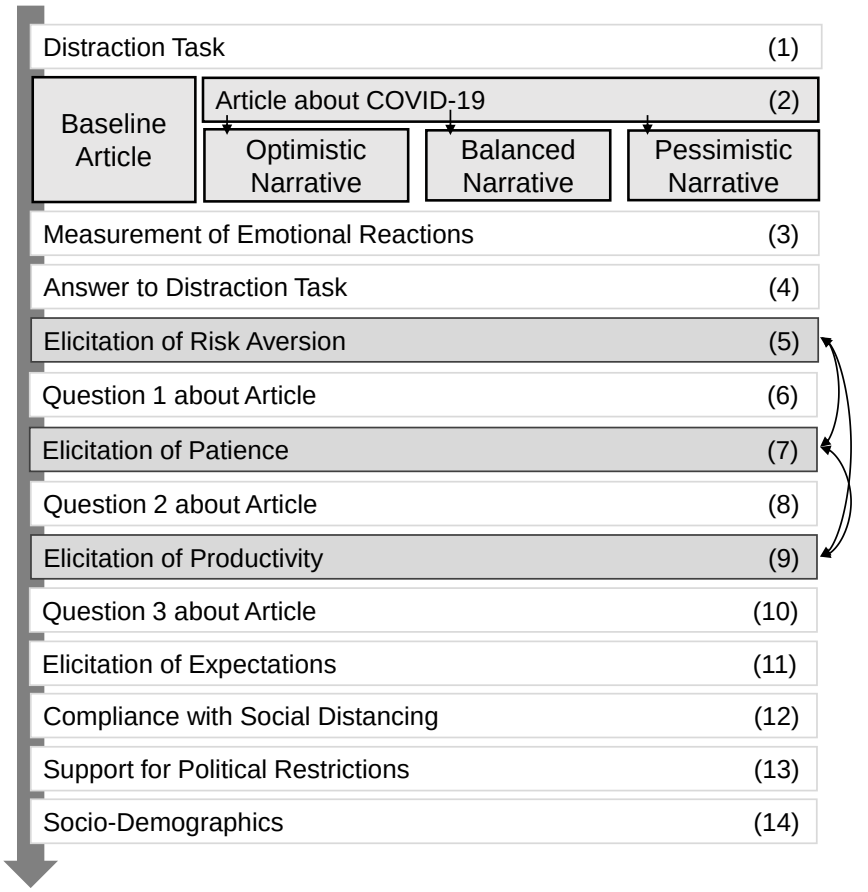
Figure 1 provides a graphical overview of the experimental procedures. Numbers in brackets in this section refer to the stages of the experiment depicted in Figure 1. At the beginning of the experiment, subjects were exposed to an article and were incentivized to memorize it as good as possible within two minutes (2).[12] Later in the experiment, subjects faced three questions about the content of the article (6,8,10): for each correct answer subjects were payed €0.50. By incentivizing the careful reading of the article, we made sure that our subjects were sufficiently exposed to our manipulation. Our experimental manipulation is on the provided article. We study four different articles: containing either an optimistic, a pessimistic or a balanced narrative about the COVID-19 pandemic or a science article not related to COVID-19. Each subject saw and was aware of only one article. See Section 2.3 for details on the manipulation.

[10] A complete English transcript of the experimental instructions is provided in Appendix D.

[11] For a timeline of the pandemic in Germany and the timing of our experiment see Appendix Figure A1.

[12] After two minutes, subjects were automatically directed to the next page. Subjects could not proceed to the next page independently.

Figure 1: Experimental Procedures - Overview



Notes: Figure 1 gives an overview of the experimental procedures. The numbers on the right side refer to the different stages of the experiment. The manipulation and the main outcomes are shaded in grey. The order of the elicitation of risk aversion, patience and productivity was randomized.

We measured the emotional reactions of subjects immediately after the manipulation (3). Next, we elicited our main outcomes risk aversion (5), patience (7) and productivity (9) in three decision blocks. At the end of the experiment, one of the three decision blocks was randomly drawn for each subject and became payoff relevant. We randomized the order of the three main outcomes to be able to control for order effects. After the main outcomes, we elicited subjects' forward-looking expectations for their personal circumstances, the economy and the pandemic (11). The final part of the experiment included questions on compliance with social distancing (12) and on support for political restrictions (13).[13] The experiment

[13]Specifically, we asked for intentions to comply with five social distancing measures in the days after the experiment. Also, we asked subjects whether the political restrictions to contain the spread of COVID-19 should rather be lifted or tightened.

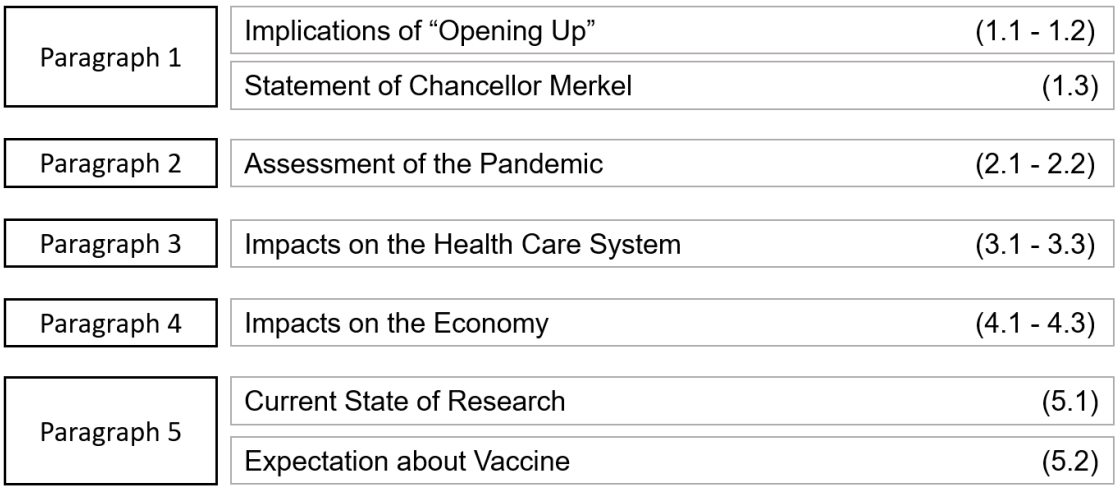
concluded with collecting the socio-demographic characteristics of subjects (14).

At the very beginning of the experiment, we implemented a distraction task to preempt concerns about experimenter demand effects. Subjects were asked to memorize two phone numbers (1) which they had to recall (4) before we elicited the main outcomes. In case some subjects did try to anticipate what our study was about, this phone number task (together with the text memory task in our manipulation) should have created the impression that this study was most likely about working memory ability.[14]

2.3 Manipulation

Participants were randomly assigned to one of four conditions: subjects in the three treatment conditions read an article that provides an optimistic, a balanced or a pessimistic narrative about the COVID-19 pandemic in Germany; subjects in the baseline condition read a science-related article not related to COVID-19. As far as possible, all articles were designed symmetrically regarding their content, length, structure and grammatical style (see Appendix A.3 for the transcripts).

Figure 2: Structure of Narratives



Notes: Figure 2 depicts the common structure of all narratives about COVID-19 used as our experimental manipulation. The numbers on the right side refer to the sentences within the respective paragraph (see Appendix A.3 for the transcripts).

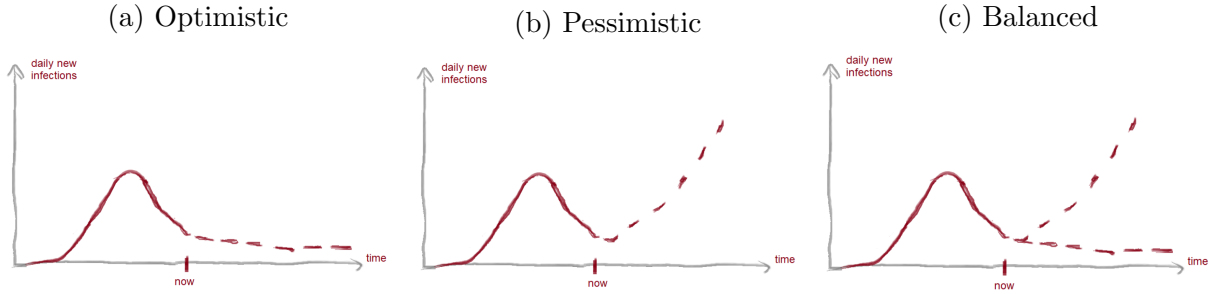
The common structure of all narratives about COVID-19 is depicted in Figure 2. All narratives provide an assessment of the pandemic and describe the causal impacts of the pandemic on the health care system and the economy. The optimistic narrative emphasises

[14]This design feature was implemented even though experimenter demand effects have recently been shown to be only a modest concern in a wide variety of settings (deQuidt, Haushofer, and Roth, 2018).

the recent success in containing daily new infections and points out that the pandemic in Germany is comparatively well under control. It further raises the expectation that the economy will quickly recover after the political restrictions have been relaxed. The pessimistic narrative instead warns about a second wave of infections which will prove much more deadly than the first one. Moreover, it raises the concern that a subsequent second lockdown could prove disastrous to the economy. The balanced narrative combines elements of the optimistic and the pessimistic narrative. The baseline article covers a story about outer space, structured in an analogous fashion.[15]

All articles in the three treatment conditions are complemented with a figure that sketches the future development of daily new infections in line with the respective narrative (see Figure 3). Such epidemic curves have been widely used in news reporting in countries around the world to visualize the outbreak of the pandemic.[16] The curve of daily new infections has arguably become the most important chart driving expectations and sentiments of the general public towards the COVID-19 pandemic. For that reason we decided to make use of it in our experimental manipulation. The baseline article uses a similar figure on the attempts to sail in outer space (see Appendix Figure A.3).

Figure 3: Manipulation - Curves of Daily New Infections



Notes: Figure 3 depicts curves of daily new infections displayed to participants as part of the (a) optimistic, (b) pessimistic and (c) balanced article.

Can this manipulation be classified as providing different narratives about the COVID-19 pandemic? To answer this question, we make use of one characterization of narratives provided in Shiller (2017):

"Narratives are human constructs that are mixtures of fact and emotion and

[15]Here we aimed for a science-related article that would have no effect on our main outcome measures and that would trigger as few associations with COVID-19 as possible. Given the far reaching impacts of the pandemic on nearly every aspect of daily life, we arrived at the conclusion that an article about outer space would serve this purpose well. To the best of our knowledge, there exists no research showing an impact of priming outer space on risk aversion, patience or productivity.

[16]See for example the COVID-19 coverage of the New York Times presented in Appendix A.2.

human interest and other extraneous detail that form an impression on the human mind." (p. 973)

First of all, the articles used in our manipulation provide facts about the pandemic in a selective way. Second, the articles sketch a rather pessimistic or rather optimistic scenario for the development of the pandemic, which are expected to induce emotional reactions in subjects (see Section 3 for evidence). Last, the curves of daily new infections can be seen as an extraneous detail (given the information provided in the article) that could still have an impression on the human mind. On the basis of these features our manipulation can be classified as providing different narratives to subjects according to Shiller (2017).

2.4 Main Outcomes

Risk aversion is elicited using the staircase method for risk preferences introduced by Falk et al. (2018). Subjects face five consecutive choices between a fixed payment and a lottery that pays €4 with 50% probability or €0 with 50% probability. The amount offered as fixed payment changes from decision to decision: if a subject chose the safe payment (lottery), the safe payment offered in the next round is reduced (increased). The game tree is provided in Appendix Figure A4. One of the five decisions is randomly chosen for payment. With the staircase method the certainty equivalent of subjects for the lottery can be elicited in a very fine-grained manner: in our case it can take 32 values ranging from €0.10 to €3.20.

Patience is elicited using the equivalent staircase method for time preferences (Falk et al., 2018). Again, subjects take five consecutive decisions of which one is randomly chosen for payment. In each decision subjects choose between a payment of €2 today and a payment in 60 days. The payment in 60 days changes from decision to decision: if a subject opted the payment in 60 days (payment today), the payment in 60 days offered in the next decision round is reduced (increased). The game tree is provided in Appendix Figure A5. The outcome variable for patience is the future value. The future value indicates the point at which subjects are indifferent between receiving €2 today and receiving a payment of the future value in 60 days. The future value elicited in this game can take 32 values ranging from €2.08 to €4.56.

We measured risk aversion and patience with the staircase method because it allows to elicit fine-grained certainty equivalents and future values in a comparatively time efficient way compared to classical Multiple Price Lists.[17] Further, it prevents inconsistent choices

[17]In a classical Multiple Price List as introduced by Coller and Williams (1999) and Harrison, Lau, and

(multiple switching points) by design and it does not require extensive instructions.[18]

Productivity is measured in a real-effort task: subjects have to count the digit "1" in lines of twelve to fourteen symbols. Subjects have two minutes time to complete as many lines as possible (up to 37). For each correct line subjects are paid €0.10. The design of the task is inspired by a concentration test.[19] We calibrated the task so that entering random numbers is not a profitable strategy.[20] A screenshot of the task is provided in Appendix A.4.3.

2.5 Expectations and Emotions

Expectations After the elicitation of our main outcomes, we elicit incentivized 2-months forward-looking expectations on the German stock market index DAX, the total number of COVID-19 cases and the total number of deaths related to COVID-19. To anchor our subjects' estimates, we provide official data for each of these variables from the previous day. We incentivize the expectations in the following way: for each variable three subjects are randomly selected and are paid depending on the accuracy of their expectations (with up to €20).[21] Each subject can at most receive a payoff for one of the expectations. This incentive scheme has two noteworthy properties: (i) subjects cannot hedge risk between expectations and (ii) the game is non-strategic (the expected payoff is independent from the expectations of the other subjects).

As a complementary qualitative measure of personal expectations we ask subjects to indicate how they expect their personal circumstances to develop over the next weeks on an 11-point Likert scale from (-5 "very negative" to +5 "very positive").

Emotions Immediately after our manipulation, subjects report their current emotional state. We measure affect with 6-items of the i-PANAS-sf scale (Thompson, 2007), which is widely used in psychological research. We elicit three items associated with positive affect (attentive, determined, inspired) and three items associated with negative affect (upset, afraid, nervous). Subjects are asked to state the intensity with which they currently experi-

Williams (2002) subjects would take one decision for each pairwise comparison between the lottery (payment today) and each certainty equivalents (payments in 60 days). In our case this would amount to 32 decisions for each outcome.

[18] In contrast to the Dual Multiple Price Lists of Andersen, Harrison, Lau, and Rutström (2008) and the Convex Time Budget method of Andreoni and Sprenger (2012) the staircase method does not allow for the straight-forward estimation of parameters in the utility function. An estimation of parameters in the utility function is however not necessary to answer the very basic research question at hand.

[19] See the KONT-P concentration test, https://www.psychomeda.de/online-tests/konzentrationstest.html

[20] Entering random numbers would lead to just 3-4 correct answers in expectation - much less than the productivity of all subjects in a pilot study.

[21] We did not disclose the exact payment formula in more detail.

ence the respective emotion on a 5-point Likert scale (1 "not at all" to 5 "very much") for each of the six items. Affect is then constructed as the sum of the positive items minus the negative items.

2.6 Sample Description and Randomization Check

Of the 425 participants that started the experiment only two did not complete it. Hence, there was no considerable attrition. A table of sample characteristics by treatment condition is provided in Appendix Table B1. We present tests for the pairwise balance of covariates between any two treatment conditions in Appendix Table B2. For each covariate we conduct either t-tests or Chi^2 tests. Among the 21 tests conducted between the optimistic, pessimistic and balanced treatment, just one test is significant at the 5% level. This should be expected by chance. The imbalance stems from a higher share of non-students in the optimistic treatment (11.4%) compared to the pessimistic treatment (3.8%). Note that this imbalance can only be due to chance as we randomized by computer and there was close to no attrition. We address this imbalance as follows: in the main part of this paper, we present results for the full sample while controlling for our set of covariates including student status. As a robustness check, we show in Appendix C that all results fully reproduce in a restricted sample of N=396 subjects that excludes all non-students from the sample.

2.7 Empirical Strategy

We test for treatment effects by comparing outcomes in the optimistic and the pessimistic treatment as the treatment effects are expected to be largest between these two conditions. The balanced treatment provides a critical consistency check for our hypothesis that the degree of pessimism of the narratives drives the treatment effects. If the treatment effects are in fact driven by the degree of pessimism of the narratives, then we should observe that the means of the outcomes in the balanced treatment lie between the means in the optimistic and the pessimistic treatments.

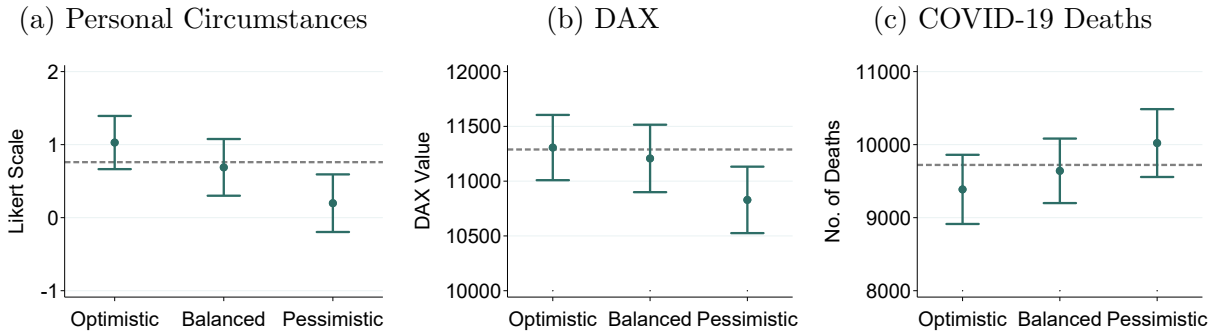
The baseline condition is included in the design to indicate a potential salience effect of COVID-19. Such an effect would exist if subjects change their behavior whenever they are reminded of COVID-19 independently of the narrative provided. Note however that such a salience effect is not cleanly identified in our design: only if the outcomes in all three treatment conditions are higher or lower compared to baseline, then that pattern would provide evidence for the existence of a sizeable salience effect of COVID-19. A salience effect of COVID-19 is therefore only assessed from an exploratory point of view.

3 Manipulation Check

First, we present a manipulation check in which we show that the narratives about COVID-19 provided as our manipulation (i) change subjects' forward-looking expectations and (ii) cause emotional reactions in subjects.

Narratives Change Expectations Figure 4 depicts the forward-looking expectations of subjects for (a) their personal circumstances, (b) the German stock market index DAX and (c) the total number of deaths related to COVID-19 in Germany by treatment condition. Across all three measures, expectations in the pessimistic treatment are more pessimistic compared to the optimistic treatment. For example, subjects in the pessimistic treatment expect the DAX to close on average 474 points lower on July 3rd than subjects in the optimistic treatment (-4.2%). They also expect 634 more people to have died related to COVID-19 until July 3rd (+6.8%).

Figure 4: Effect of Narratives on Expectations



Notes: Figure 4 shows means and corresponding 95% confidence intervals for (a) personal circumstances, (b) DAX expectations and (c) COVID-19 related deaths in the three treatment conditions. The dashed line indicates the mean in the baseline condition. Based on OLS estimates reported in Appendix Table B8.

Mann-Whitney U-tests confirm that the differences in means between the optimistic and pessimistic treatment are significantly different from zero for both personal circumstances (p=0.007) and DAX expectations (p=0.025). The data on expectations for deaths related to COVID-19 and COVID-19 cases turn out to be more noisy than the other two measures as they contain a number of implausible answers and outliers (see Appendix B.6 for details). The expectations for the number of deaths related to COVID-19 in the pessimistic treatment are nevertheless significantly more pessimistic compared to the optimistic treatment according to a Mann-Whitney U-test (p=0.024).[22] Corresponding OLS estimates are presented in

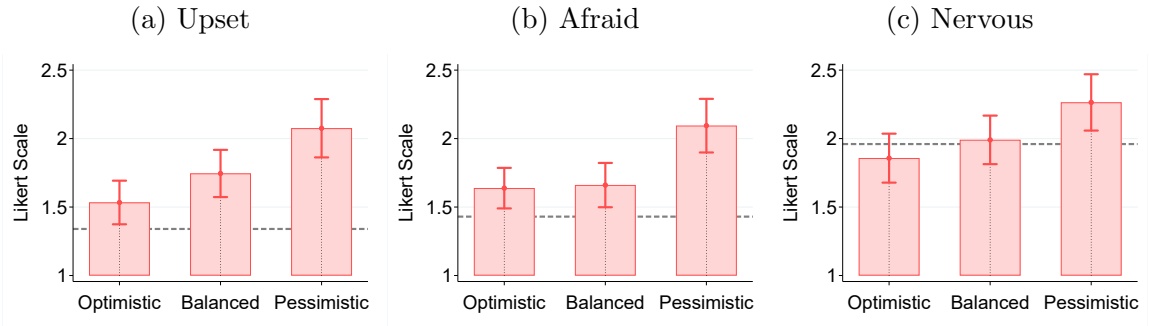
[22]For the expectations about the number of COVID-19 cases, which is the most noisy measure, there is

Appendix Table B8.

Hence, exposure to a more pessimistic narrative about the COVID-19 pandemic induces more pessimistic expectations about the pandemic, the stock market and personal circumstances. These changes in expectations can be seen as the first major channel through which narratives about COVID-19 impact economic behavior. Forward-looking expectations are key variables in central macroeconomic models (Lucas and Sargent, 1981; C. A. Sims, 2003) and have been found to be fundamental determinants of household behavior (Bachmann, Berg, and E. R. Sims, 2015; D'Acunto et al., 2019; Bailey et al., 2019; Coibion, Georgarakos, et al., 2019; Roth and Wohlfart, 2020).

Narratives Cause Emotional Reactions As another reaction to our manipulation, subjects in the pessimistic treatment show lower affect than subjects in the optimistic treatment (t-test, p=0.004). The change in affect is driven by subjects in the pessimistic treatment feeling more upset, afraid and nervous as shown in Figure 5. The emotional reactions towards the pessimistic narrative compared to the optimistic narrative are statistically significant at the one percent level (see Appendix Table B9).

Figure 5: Effect of Narratives on Emotions



Notes: Figure 5 shows means and corresponding 95% confidence intervals for the emotional state of subjects across treatment conditions: for feeling (a) upset, (b) afraid and (c) nervous. The dashed line indicates the mean in the baseline condition. Emotions are measured on a 5-point Likert scale (1 "not at all" to 5 "very much").

no significant difference between the optimistic and pessimistic treatment (Mann-Whitney U-test: p=0.170).

4 Hypotheses

Before presenting our main results, we would like to discuss hypotheses about treatment effects on behavior in our economics games given the results of our manipulation check.

The measures for risk aversion and patience used in our experiment are designed to elicit risk preferences and time preferences (see Falk et al., 2018). Traditionally, economic preferences are thought to be stable across contexts and across time (Stigler and Becker, 1977). Elicitation methods for risk preferences are designed so that changes in expectations shouldn't influence behavior as complete information about the payoffs and the probabilities of all outcomes is provided.[23]

A recent literature investigates empirically how malleable risk and time preferences are in the short-, medium- and long-term (see Chuang and Schechter, 2015; Schildberg-Hörisch, 2018, for reviews). A number of papers have found that risk aversion can change in the short-term due to emotional reactions such as fear, general affect or stress (Cohn et al., 2015; Guiso, Sapienza, and Zingales, 2018; Alempaki, Starmer, and Tufano, 2019; Cahlíková and Cingl, 2017). Similarly, research has found impacts of emotions on time preferences (Ifcher and Zarghamee, 2011) and on productivity (Oswald, Proto, and Sgroi, 2015).

Based on this literature and the results from our manipulation check, one could hypothesize that we observe changes in behavior in our economics games. On the other hand, our manipulation through written articles is much more subtle than most of the experimental manipulations used to induce emotional reactions in the laboratory.[24] Our manipulation instead replicates the type of exposure people have to narratives (and their associated emotional reactions) outside the laboratory during an everyday activity: when reading the news. Most importantly, the extensive literature studying the impact of the media on economic and financial behavior has not yet reported any such behavioral effects of news exposure as reduced risk aversion, patience or productivity (see DellaVigna and La Ferrara, 2015; Tetlock, 2015, for reviews).[25]

[23] For that reason, treatment effects on risk taking behavior in games with complete information are generally interpreted in the literature as a change in risk preferences (see e.g. Cohn et al., 2015; Callen et al., 2014). See Andersen, Harrison, Lau, and Elisabet Rutström (2008) for a discussion on state-dependent preferences.

[24] Cohn et al. (2015), for example, induce fear through the anticipation of painful electroshocks and Guiso, Sapienza, and Zingales (2018) induce fear by having students watch a horror movie.

[25] Rather, economic research has largely focused on the information transmission function of the news and its impacts on expectations and asset pricing (compare Tetlock, 2015).

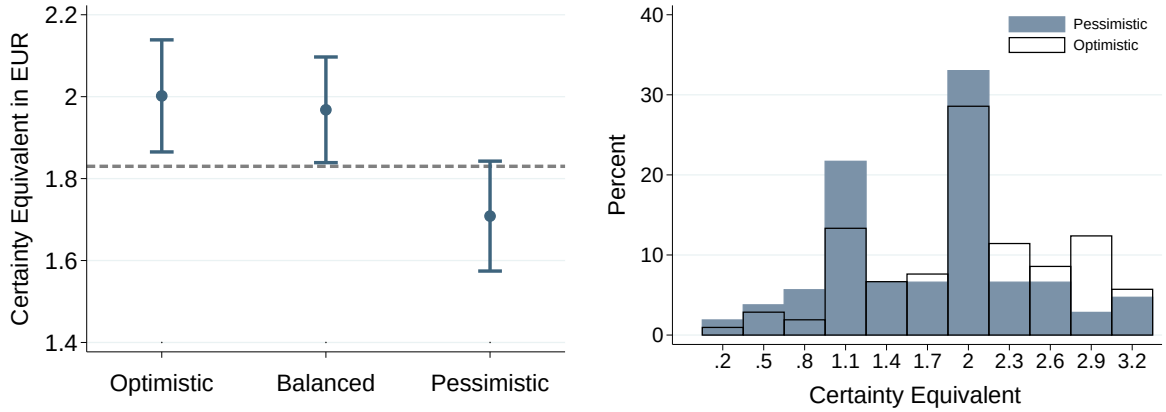
5 Main Results - Behavior in Economic Games

5.1 Risk Aversion and Patience

Figure 6a shows the average certainty equivalent elicited for the lottery (50% €0, 50% €4) across treatment conditions. The average certainty equivalent in the pessimistic treatment is lower than in the optimistic treatment (€1.71 in pessimistic versus €2.00 in optimistic). On average, subjects in the optimistic treatment act risk neutral, so that they maximize expected earnings, while subjects in the pessimistic treatment show a considerable level of risk aversion. Figure 6b depicts histograms of the certainty equivalent in the optimistic treatment relative to the pessimistic treatment.

Figure 6: Treatment Effects on Risk Aversion

(a) Means with 95% CI (b) Distributions Optimistic vs. Pessimistic



Notes: Figure (a) displays the means and 95% confidence intervals for the certainty equivalent by treatment condition. The dashed line in Figure (a) indicates the mean in the baseline condition. Figure (b) displays histograms of the certainty equivalent in the optimistic and pessimistic treatment.

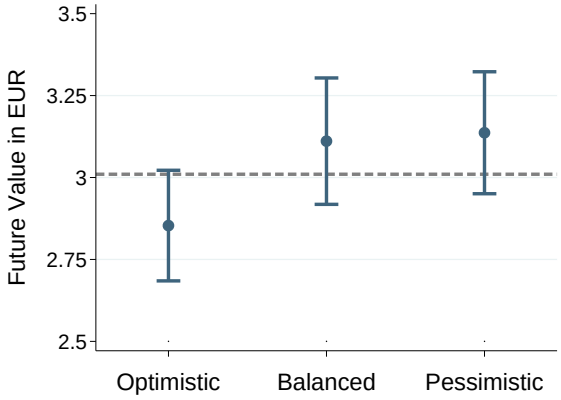
In Table 1 we provide our main regression analyses. In column (1) we report the result of an OLS regression that regresses the certainty equivalent on the treatment dummies with the optimistic treatment as the reference group. In column (2) we additionally control for our set of covariates. Column (1) shows that the treatment effect on risk aversion is highly significant ($p = 0.002$). The coefficient of the pessimistic treatment dummy barely changes and remains highly significant when adding controls ($p = 0.004$). This leads us to our first result:

> **Result 1:** When confronted with a more pessimistic narrative about the effects of the COVID-19 pandemic, subjects behave more risk averse.

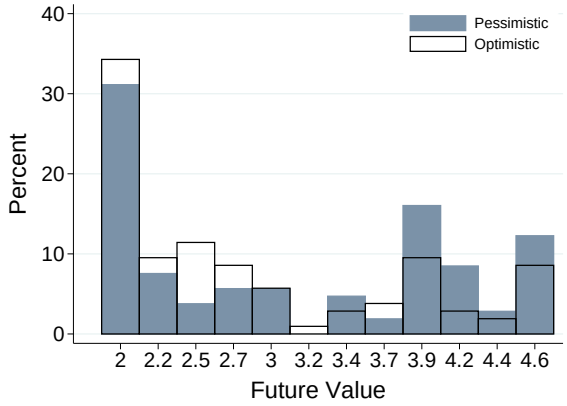
Figure 7a depicts the mean future value of a €2 payment today across treatment conditions. A higher future value implies a higher individual discount rate and hence less patient behavior (see e.g. Andreoni and Sprenger, 2015, footnote 4). Subjects in the pessimistic treatment act less patient than in the optimistic treatment (future value of €3.14 in pessimistic versus €2.85 in optimistic). Across treatment conditions, subjects show sizeable individual discount rates over a rather short time period of two months. Such high individual discount rates are however common in the literature using similar elicitation procedures (Frederick, Loewenstein, and O'Donoghue, 2002; Ericson and Laibson, 2019). Figure 7b depicts histograms of the future value in the optimistic treatment relative to the pessimistic treatment.

Figure 7: Treatment Effects on Patience

(a) Means with 95% CI



(b) Distributions Optimistic vs. Pessimistic



Notes: Figure (a) displays the means and 95% confidence intervals for the future value by treatment condition. The dashed line in Figure (a) indicates the mean in the baseline condition. Figure (b) displays histograms of the future value in the optimistic and pessimistic treatment.

In Table 1 columns (3) and (4) present equivalent regressions to columns (1) and (2) with the future value as the dependent variable. In column (3) the treatment effect on patience is significant at the 5 percent level ($p = 0.030$) and remains significant when adding controls in column (4) ($p = 0.026$). This leads us to our second result:

> **Result 2:** When confronted with a more pessimistic narrative about the effects of the COVID-19 pandemic, subjects act less patiently.

Consistent with the hypothesis that the degree of pessimism of the narratives causes the treatment effects, the means in the balanced treatment lie in between the optimistic and the pessimistic treatment for both risk aversion and patience. The means in the baseline

treatment also lie in between the optimistic and pessimistic treatment which indicates that there is no strong salience effect of COVID-19 on any of the two outcome measures.

Robustness In Table 1 we provide p-values adjusted for multiple hypothesis testing. We use the Romano-Wolf step-down procedure as described in Clarke, Romano, and Wolf (2019). We correct for the fact that we test the same treatment on three main outcomes. When correcting for multiple-hypothesis testing, the treatment effect on risk aversion remains highly significant irrespective of the specification ($p \leq 0.013$). The effect on patience is only marginally significant in the specification without covariates ($p = 0.054$), but remains significant at the 5-percent level in the specification with covariates ($p = 0.041$).

In Appendix Table B3 we show that both treatment effects can already be detected when focusing the analysis on the first of the five decisions in the elicitation procedure. A logit model that regresses the first intertemporal decision on treatment indiciators and covariates reveals that subjects in the pessimistic treatment are 19% more likely to choose the €2 payment today instead of a €3.32 payment in two months ($p = 0.005$). The equivalent logit model for the first risk taking decision shows that subjects in the pessimistic treatment are 13% more likely to choose the safe payment of €1.65 instead of the risky lottery with an expected payoff of €2 ($p = 0.050$). As a further robustness check, we present tobit models that account for censoring of the outcome variables in Appendix Table B3. To complete our analysis, we show in Appendix Table B4 that there are no significant order effects and that there is no heterogeneity in treatment effects depending on the order of elicitation.

5.2 Productivity

Regarding the productivity in our two minute real-effort task we find that the mean of correctly solved tasks does not differ between the optimistic treatment and the pessimistic treatment (optimistic: 16.2 versus pessimistic 16.3; t-test, p=0.896). Moreover, the coefficients and standard errors of the treatment indicators presented in columns (5) and (6) in Table 1 indicate that there are no significant differences between any two treatment conditions.

> **Result 3:** Exposure to a more pessimistic narrative about the COVID-19 pandemic does not decrease productivity.

Is this a meaningful null result? Ex-ante, we were powered to detect a minimal effect size of 1.5 tasks (power=80%, α=0.05, n=200, sd=3.8). In relation to the average number of correctly solved tasks (16.4), the minimal detectable effect size corresponds to a reduction

Table 1: OLS Estimates - Average Treatment Effects

	Certainty Equivalent		Future Value		Productivity	
	(1)	(2)	(3)	(4)	(5)	(6)
Pessimistic	-0.29***	-0.29***	0.28**	0.30**	-0.07	0.23
	(0.10)	(0.10)	(0.13)	(0.13)	(0.53)	(0.52)
Balanced	-0.03	-0.03	0.26**	0.26**	0.52	0.57
	(0.10)	(0.10)	(0.13)	(0.13)	(0.53)	(0.52)
Baseline	-0.18*	-0.17*	0.16	0.21	-0.03	0.10
	(0.10)	(0.10)	(0.13)	(0.13)	(0.53)	(0.52)
Age		0.00		0.00		-0.14***
		(0.01)		(0.01)		(0.04)
Female		-0.06		-0.02		-0.40
		(0.07)		(0.10)		(0.39)
Income		0.00		-0.00*		0.00
		(0.00)		(0.00)		(0.00)
Education		-0.07		0.09		-0.07
		(0.05)		(0.07)		(0.27)
Econ Student		-0.07		-0.21**		0.17
		(0.08)		(0.10)		(0.40)
No Student		-0.06		-0.00		1.88**
		(0.16)		(0.21)		(0.84)
Political Orientation		-0.00		0.02		-0.09
		(0.02)		(0.03)		(0.12)
Risk Group		-0.02		0.06		-1.89***
		(0.12)		(0.16)		(0.63)
Constant	2.00***	2.05***	2.85***	3.02***	16.30***	19.40***
	(0.07)	(0.19)	(0.09)	(0.25)	(0.37)	(0.99)
Observations	423	423	423	423	423	423
R-squared	0.03	0.04	0.01	0.04	0.00	0.08
Initial p-values:						
Pessimistic	$p = 0.002$	$p = 0.004$	$p = 0.030$	$p = 0.026$	$p = 0.896$	$p = 0.664$
Adjusted p-values (Romano-Wolf):						
Pessimistic	$p = 0.009$	$p = 0.013$	$p = 0.054$	$p = 0.045$	$p = 0.891$	$p = 0.662$

Notes: Table reports OLS estimates with standard errors in parentheses. The optimistic treatment is the reference group. Adjusted p-values for multiple hypothesis testing were calculated using the Romano-Wolf step-down procedure as described in Clarke, Romano, and Wolf (2019). We control for the fact that we test the same treatment on three main outcomes. The adjusted p-values were separately derived for the specification without covariates (columns (1), (3) and (5)) and for the specification with covariates (columns (2), (4) and (6)) using 5000 bootstrap replications. *** p<0.01, ** p<0.05, * p<0.1

in productivity of 9%. It is apparent that even much smaller effects on productivity could have severe impacts on individual economic outcomes and the aggregate economy. As we cannot rule out any smaller effects than the minimal detectable effect size this null result should be interpreted with some caution.

5.3 Subgroup Analysis

We now turn to the analysis whether selected covariates interact with the treatment effects of narratives on risk aversion and patience. First of all, we find that the treatment effects do not differ between socio-demographic subgroups by gender, age, education or income (see Appendix Table B5 and Table B6).

In Panel B in Table B6 we test for interactions with the subgroup of economics students (38.3% of the sample), which can provide insights into whether the effects of narratives persist for subjects with high financial education. In column (3) and (4) in Table B6 we see that, contrary to what one might expect, the treatment effects of narratives on patience are even more pronounced among economics students. With respect to risk aversion, there is no heterogeneous treatment effect for economics students (see column (1) and (2) in Table B6). In Panel C in Table B6 we investigate whether our treatment interacts with subject's self-reported level of news consumption about COVID-19. Again, we do not find any significant interactions.

Summing up, we find little evidence that the reaction to our manipulation differs systematically across subgroups. An important insight for the external validity of our findings is that the treatment effects of optimistic and pessimistic narratives on economic decision making persist even in subgroups with high financial education.

5.4 Causal Channel

In this subsection we will draw on theoretical arguments and correlations in our data set to discuss the most plausible behavioral mechanism underlying our treatment effects.[26] As shown in Section 3, the narratives provided influence a broad set of expectations and emotions. Many of the expectations and emotions are strongly correlated (see Appendix Table B10). Most notably, forward-looking expectations about personal circumstances, which can

[26]To provide clear empirical evidence about the causal channel one would have to design a series of experiments that separately manipulate each potential variable on the causal channel while holding all other variables constant. We believe that in the given context it is questionable whether such a design would actually be feasible: Is it possible to manipulate expectations about the pandemic without changing expectations about the DAX? Is it possible to manipulate expectations about personal circumstances without emotional reactions? The strong correlations between these variables in our data set suggest that this could be a rather difficult endeavor.

be seen as the most direct measure of an individuals' general sense of optimism or pessimism, is significantly correlated with all other expectations and emotions.

To provide an empirical analysis on the causal channel, we present regressions in Appendix Table B11 and Table B12. We regress our main outcomes separately on each potential mediator while controlling for our set of socio-demographic variables. These regressions provide us with a simple correlation between behavior and mediators that controls for socio-demographic variables as confounding variables.

Expectations As a first observation, we find that expectations about the DAX and expectations about COVID-19 deaths are weakly correlated with patience in our experimental game (see column (6) and (7) in Table B11). If these were causal relationships, then the treatment effects on expectations would actually bias against the treatment effect on patience. Therefore, the treatment effect on patience cannot be explained by a change in these forward-looking expectations.

Columns (6) to (8) in Table B12 show that expectations about the DAX and expectations about the pandemic are not significantly correlated with risk aversion. Only personal expectations, that is an individuals sense of optimism or pessimism, is weakly correlated with risk aversion. More pessimistic subjects tend to be more risk averse and more optimistic subjects tend to be less risk averse.

Emotions When looking at the emotional reactions, we observe that feeling upset and feeling afraid are both correlated with more impatience in our economic game (see column (2) and (3) in Table B11). Subjects that feel more upset or afraid tend to act more impatient. For risk aversion, we do not find that any of the emotional reactions is significantly correlated with behavior (see columns (1) to (4) in Table B12). The direction of the association between feeling afraid and risk aversion, while not significant (p=0.133), still is broadly in line with Cohn et al. (2015), that is, more afraid subjects tend to show a higher level of risk aversion.

Summing up The empirical analysis presented shows that the changes in forward-looking expectations cannot well explain the observed changes in behavior. Instead, our data can be seen as broadly in line with the literature showing that emotions, such as fear, can induce changes in risk aversion and patience (Cohn et al., 2015; Guiso, Sapienza, and Zingales, 2018; Alempaki, Starmer, and Tufano, 2019; Cahlíková and Cingl, 2017; Ifcher and Zarghamee, 2011). However, we can also not rule out that a different behavioral mechanism other than emotions underlies our treatment effects such as optimistic and pessimistic mindsets or heuristics (Gilovich, Griffin, and Kahneman, 2002; Gigerenzer and Gaissmaier, 2011).

6 Discussion

6.1 Relevance and External Validity

We should certainly discuss how relevant the effects of narratives are outside of our controlled experimental context. We believe that numerous arguments support the view that the impacts of narratives on economic behavior are economically relevant and help explain economic dynamics during the COVID-19 pandemic and beyond.

First of all, it is worth stressing that what we measure in our experiment is the marginal effect of reading one additional article with a more pessimistic or more optimistic narrative. One can reasonably expect that changes in the dominant public narrative, which individuals are then confronted with repeatedly and over longer periods of time, induce in total larger and more persistent effects than the ones that we measure in this experiment.[27]

Second, we do not find that performing a mentally challenging real-effort task (our productivity measure) prior to the elicitation of risk aversion and patience reduces treatment effects (see Appendix Table B4 Panel C). Therefore, the effects are at least persistent in the short-term.

Third, given that people today are exposed to narratives at high frequency via the internet and social media, even short-term effects on risk aversion, patience and expectations imply meaningful impacts on economic behavior. In the context of this pandemic, one can easily imagine a multitude of situations in which people have been confronted with optimistic or pessimistic narratives about COVID-19 before taking important economic decisions, for example, when reading the latest news while at work or when searching the internet before taking private financial decisions.

Last, our experiment did take place in the very same setting in which people in industrialized countries today often consume the news and take a large share of their financial decisions: at home in front of their computers. We hence believe that the effects of narratives on economic behavior translate comparatively well into behavior outside of our experimental context and are economically relevant.

6.2 Should Optimistic or Pessimistic Narratives Be Provided?

This paper has shown in detail how optimistic and pessimistic narratives about the COVID-19 pandemic can impact economic behavior. A natural question to ask, based on our results,

[27] Enke and Zimmermann (2019) show that people tend to neglect correlations in information structures when receiving the same information from multiple sources. Based on this research, one can expect that the impacts of narratives on economic behavior aggregate even in case of repeated exposure to the same narrative.

is whether politicians should provide optimistic or pessimistic narratives about the COVID-19 pandemic.

Here is important to point out that our results do not allow to draw simple conclusions about whether pessimistic or optimistic narratives should be provided in the context of the COVID-19 pandemic. Most importantly, one should not infer from our results that optimistic narratives about COVID-19 are generally "good" for the economy and pessimistic narratives are "bad". Such an assessment would in the first place require the definition of an optimal level of risk aversion, patience and optimism in society, which seems hard to justify based on existing economic research.[28] A more fundamental argument against the use of biased narratives as an instrument of persuasive communication is their potential to distort household decision making with the consequence that households take sub-optimal investment, consumption, and health related decisions.

What one can infer from our results is that pessimistic narratives about COVID-19 are associated with negative emotional reactions in subjects that can be seen as directly utility relevant. To justify the use of pessimistic narratives based on utilitarian welfare arguments, the psychological costs borne by citizens would have to be offset by an increase in socially desirable behavior.[29]

Arguably, increasing compliance with social distancing and increasing support for restrictive policies have been two of the main motivations for politicians to spread pessimistic narratives about COVID-19. While not the main focus of this paper, we also elicit these two outcomes with survey questions. Subjects who are exposed to the pessimistic narrative as compared to the optimistic narrative report on average slightly higher support for restrictive policies but lower levels of compliance.[30] Both differences in means between the optimistic and pessimistic treatment are however not statistically significant (policy support: t-test, $p = 0.493$; compliance: t-test, $p = 0.155$).[31] While we cannot rule out that pessimistic narratives do increase support for restrictive policies to some politically meaningful degree, our results at least suggest that pessimistic narratives are not necessarily successful in increasing compliance with social distancing.

[28] While Falk et al. (2018) show that countries with higher patience have on average higher income and countries with lower risk aversion have higher entrepreneurial activity, it is also apparent that high risk taking and overly optimistic expectations of individuals are not desirable in many contexts, for example, during stock market booms or housing market bubbles, and plausibly in a pandemic.

[29] As shown in our paper, one narrative can influence multiple beliefs and multiple behaviors of the audience at the same time. In such cases, senders of narratives will likely face complex trade-offs between different objectives when using narratives in persuasive communication.

[30] The direction of the effect on compliance is therefore in line with a "fatalism effect" on compliance found in Akesson et al. (2020). The authors find that more pessimistic beliefs about the severeness of the COVID-19 pandemic cause lower intentions to comply with social distancing.

[31] The corresponding OLS regressions and figures are presented in Appendix Table B13 and Figure B4.

7 Conclusion

In this paper we provide causal experimental evidence that optimistic and pessimistic narratives about the COVID-19 pandemic impact fundamental determinants of household behavior. Specifically, we identify risk aversion, patience and expectations as three major channels through which narratives can impact economic behavior. These three channels likely interact and could amplify each other, as more pessimistic expectations, more risk aversion and less patience could all, for example, reduce investments in the stock market.

In this pandemic, narratives are widely used by politicians as an instrument of persuasive communication. One direct policy implication of our study is that politicians who use narratives to steer the behavior of citizens should be aware of the collateral effects on economic behavior. Many optimistic and pessimistic narratives about COVID-19 have also been shared by other opinion leaders, like scientists and journalists, and have spread through social networks. Based on our results, these narratives seem to have influenced the economic behavior of millions of households. Observing how narratives spread in networks and how they influence behavior outside experimental contexts seem important next steps for future research.

Another important area for future research is to investigate the limits and preconditions for the persuasiveness of narratives. For example, are narratives persuasive even if they are not justified based on the underlying fundamentals? What role does the relationship between the sender of narratives and their audience play? These seem to be just some of many important questions for future research to gain a comprehensive understanding of how narratives impact economic behavior.

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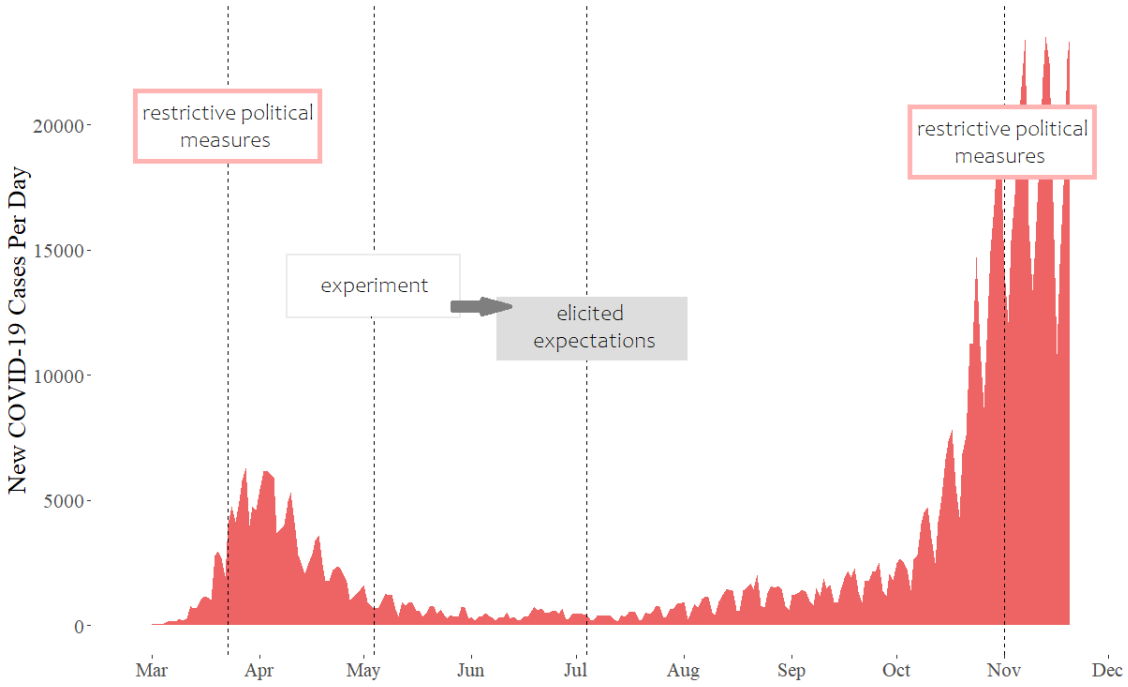
Appendix

A Supplementary Materials

A.1 Timeline of the COVID-19 Pandemic in Germany

Figure A1: Overview of Daily New Infections and Regulatory Framework within Germany



Notes: The graph illustrates the numbers of daily new infections reported to the Robert Koch Institute. Further, we indicated the points in time when more restrictive policies to prevent the spread of COVID-19 were implemented. The restrictions in March included closures of most "non essencial" businesses, travel restrictions, prohibitions of gatherings with more than two people from different households, closures of schools and kindergartens, among other measures. The restrictions in November include closures of restaurants and bars and prohibitions to sell alcohol at certain times and mandatory usage of face masks in many public spheres, among other measures. Our experiment was conducted on May 4th 2020. Participants had to state their expectations about the course of the pandemic until July 3rd 2020.

A.2 Media Coverage

Figure A2: Coronavirus coverage of the New York Times

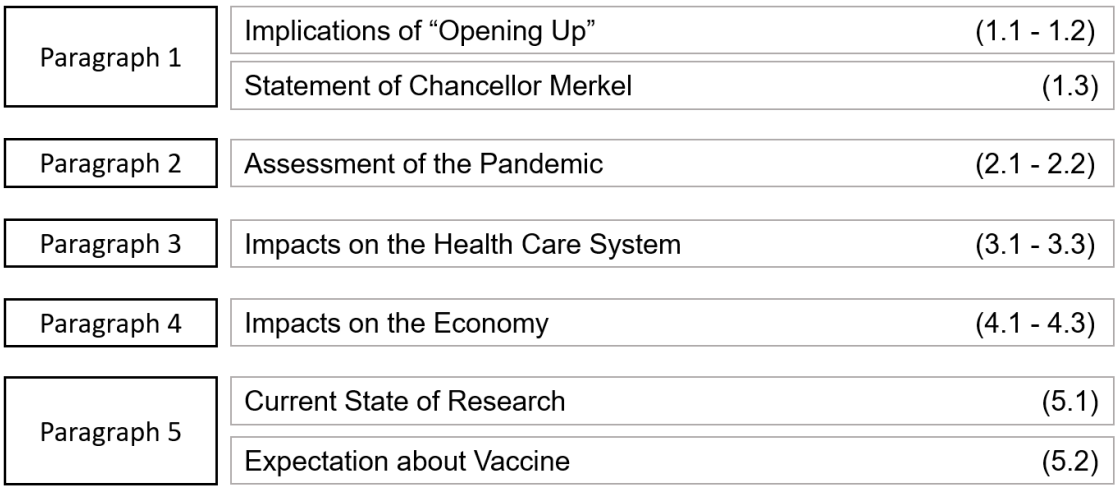
Note: Screenshot taken on October 23rd 2020.

A.3 Manipulation

A.3.1 Structure of Narratives

Figure A3 illustrates the common structure of all narratives about COVID-19. All narratives consist of five paragraphs covering the same aspects of the COVID-19 pandemic. The corresponding sentences can be found in the transcripts of the narratives provided in sections A.3.2 to A.3.4.

Figure A3: Structure of Narratives



Notes: This figure depicts the common structure of all narratives about COVID-19 used as our experimental manipulation. The numbers on the right side refer to the sentences within the respective paragraph.

The information provided in the narratives was spread in this or in a very similar way in news articles and in public communication in the weeks prior to our experiment. The statements of chancellor Angela Merkel were made during a press conference on 20th April 2020.[32]

The baseline text also followed a similar structure. In the baseline text, a quote of Galileo was used instead of a statement of Merkel and a story about scientific progress was provided instead of a text about the COVID-19 pandemic. The transcript of the baseline text is available in section A.3.5.

[32]The transcript of the press conference is available under `https://www.bundeskanzlerin.de/bkin-de/aktuelles/pressekonferenz-von-bundeskanzlerin-merkel-1745362` (accessed on April 27th, 2021)

A.3.2 Transcript Optimistic Narrative

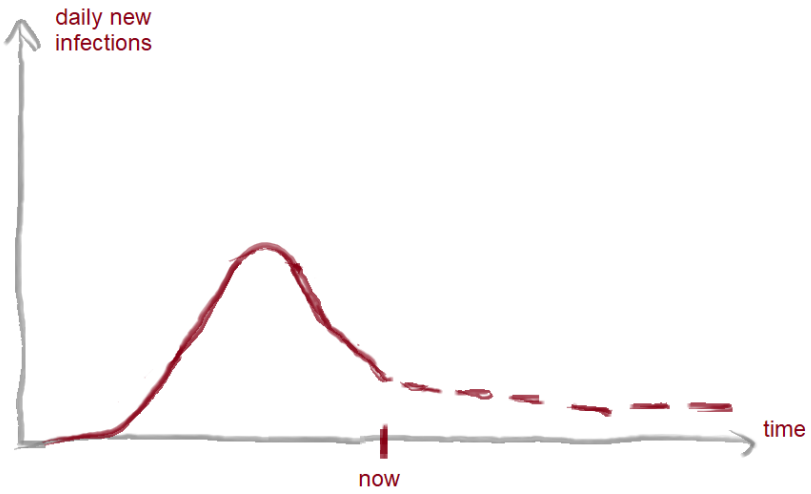
In Germany the measures to contain the spread of the coronavirus are currently being relaxed. (1.1) Now more and more people move around in public and many shops are reopening. (1.2) Due to its discipline, the population has made great achievements in the last weeks, chancellor Angela Merkel praised in a speech. (1.3)

Many of those currently infected with the coronavirus are expected to recover within the next days, and by now many have already recovered. (2.1) Day by day, the number of new infections decreases compared to previous weeks, and this trend is expected to continue. (2.2)

So far the German health care system has not come close to reaching its capacity limit. (3.1) In comparison to Italy or Spain, the situation in Germany has almost always been under control. (3.2) Many physicians in Germany were even less occupied than usual as a lot of non-urgent interventions have been postponed. (3.3)

Due to the relaxation of restrictions, the economy picks up again. (4.1) Customers go shopping more frequently, which stimulates sales for many business. Some people are even starting to make plans for summer holidays. (4.2) It seems that all the effort of the last weeks eventually pays off. (4.3)

Meanwhile scientists around the world are constantly working on better understanding the novel coronavirus. (5.1) A vaccine might soon be found. (5.2)



Note: Narratives were provided in German and did not contain the numbers in gray which are included as a reference to the common structure of all narratives (see Figure 2).

A.3.3 Transcript Pessimistic Narrative

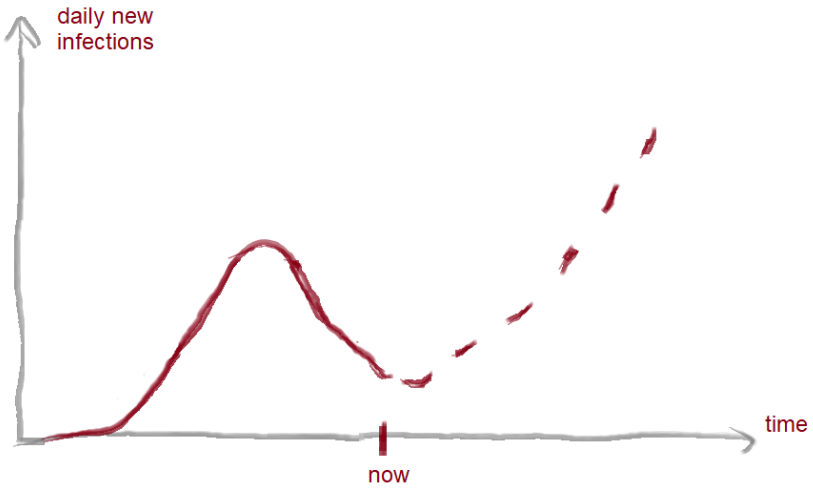
In Germany the measures to contain the spread of the coronavirus might be relaxed too soon. (1.1) If more and more people move around in public, a second wave of infections becomes likely. (1.2) The population should not for a second lull itself into a false sense of security, chancellor Angela Merkel warned in a speech. (1.3)

It is expected that in a second wave of infections significantly more elderly will be infected with the coronavirus. (1.2) A second wave would thus turn out to be a lot deadlier. (2.2)

In a second wave the German health care system might collapse. (3.1) Germany could then face conditions like in Italy or Spain, where the situation spiraled out of control. (3.2) Physicians had to decide which patients to treat and whom to let die – the so-called triage. (3.3)

If the virus starts to spread faster and faster again, the economy faces the threat of a second, likely more severe, shutdown. (4.1) A second shutdown would mean final bankruptcy for a lot of businesses. (4.2) In that case all the effort of the last weeks would be lost. (4.3)

Meanwhile, many fundamental questions about the novel coronavirus remain unanswered. So far the infection rate and the most common transmission paths have not been identified. (5.1) Most likely it will take until next year until a vaccine is available. (5.2)



Note: Narratives were provided in German and did not contain the numbers in gray which are included as a reference to the common structure of all narratives (see Figure 2).

A.3.4 Transcript Balanced Narrative

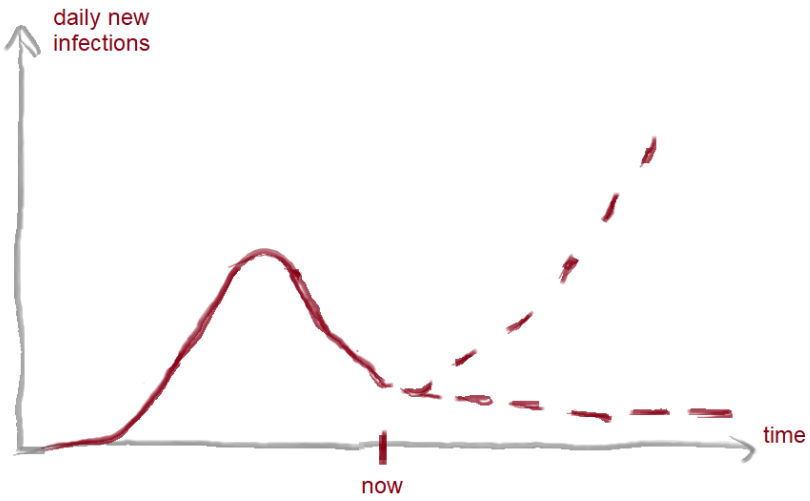
In Germany the restrictive policies to combat the spread of the coronavirus are slowly being relaxed. (1.1) That is good news for people and the economy, but increases the risk of a second wave of infections. (1.2) The population has made great achievements, but should not lull itself into a false sense of security, chancellor Angela Merkel said in a speech. (1.3)

Currently, daily new infections are decreasing, and in some regions and age groups there have yet been almost no deaths. (2.1) A second wave of infections could, however, turn out to be a lot deadlier. (2.2)

So far the German health care system has not reached its capacity limit. (3.1) In comparison to Italy and Spain, the situation in Germany has been relatively well under control. (3.2) In some cases physicians in Italy and Spain had to decide whom to treat and whom to let die. (3.3)

Due to the relaxation of restrictions, customers go shopping more frequently. This is good for many businesses. (4.1) However, a second shutdown could be more severe than the first one. A second shutdown could mean final bankruptcy for a number of businesses. (4.2) Therefore, it remains to be seen if the efforts of the last weeks will eventually pay off. (4.3)

Meanwhile scientists are constantly working on open questions regarding the novel coronavirus. (5.1) It is however hard to predict when a vaccine will be available. (5.2)



Note: Narratives were provided in German and did not contain the numbers in gray which are included as a reference to the common structure of all narratives (see Figure 2).

A.3.5 Transcript Baseline Text

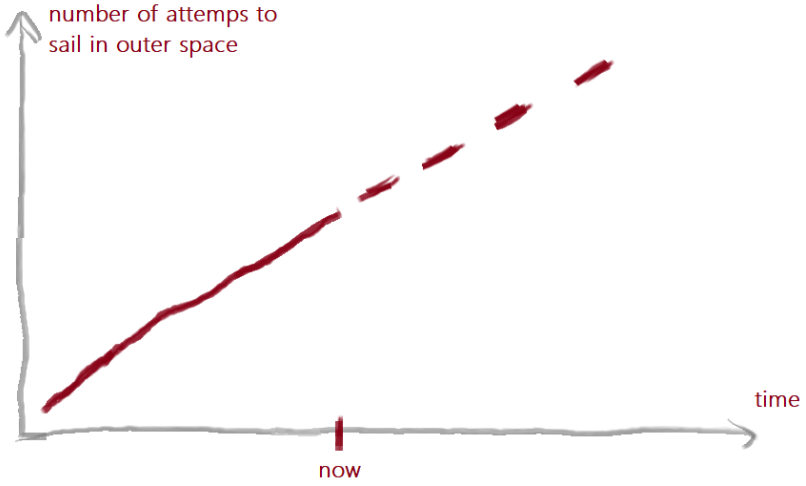
As early as in the 18th century German scientists dreamt of sailing in outer space. Already the astronomer Johannes Kepler wrote in a letter to Galileo Galilei: “Provide ships or sails that are suitable for the breeze of heaven”. This ancient dream came true last year. A space mission showed that objects can be moved only by the force of a sail.

To a layperson, such a project may seem absurd. There is no air in outer space and hence no wind to blow into a sail. But apparently it is possible to sail with solar radiation. This is made possible as there is extremely little frictional resistance in outer space.

Previously, many similar sailing projects have failed. On a recent mission, however, it worked – with the use of a very light space probe and a comparatively large sail.

This is the second time it has been shown that such a mechanical propulsion can work. If the mission continues without any problems, the efforts of the ancient thinkers might finally pay off.

Meanwhile a lot of questions about outer space remain unanswered. A mechanical propulsion that is independent of rocket engines could help lead scientists to many new insights. It is however hard to predict, if and when this will be the case.



Note: The text was provided in German.

A.4 Elicitation of Main Outcomes

A.4.1 Risk Aversion

Risk preferences are elicited using the staircase method as in Falk et al. (2018) with adjusted payoffs. Subjects take five consecutive decisions, each time facing the following question:

> "*Do you want to receive a safe payment of €X or play a lottery with 50 percent chance for €4 and 50 percent chance for €0?*
>
> - *€X as safe payment.*
> - *A lottery with 50% chance for €4 and 50% chance for €0.*"

X is replaced with the corresponding value at each decision node in the game tree (see Figure A4). The starting value for X is 1.65. In the game tree shown in Figure A4 the action A refers to choosing the lottery while the action B refers to choosing the safe payment of X. The value at the next decision node is then inserted as X in the subsequent question. The outcome of the game is the certainty equivalent (CE) used for analysis which can take 32 values ranging from €0.10 to €3.20.

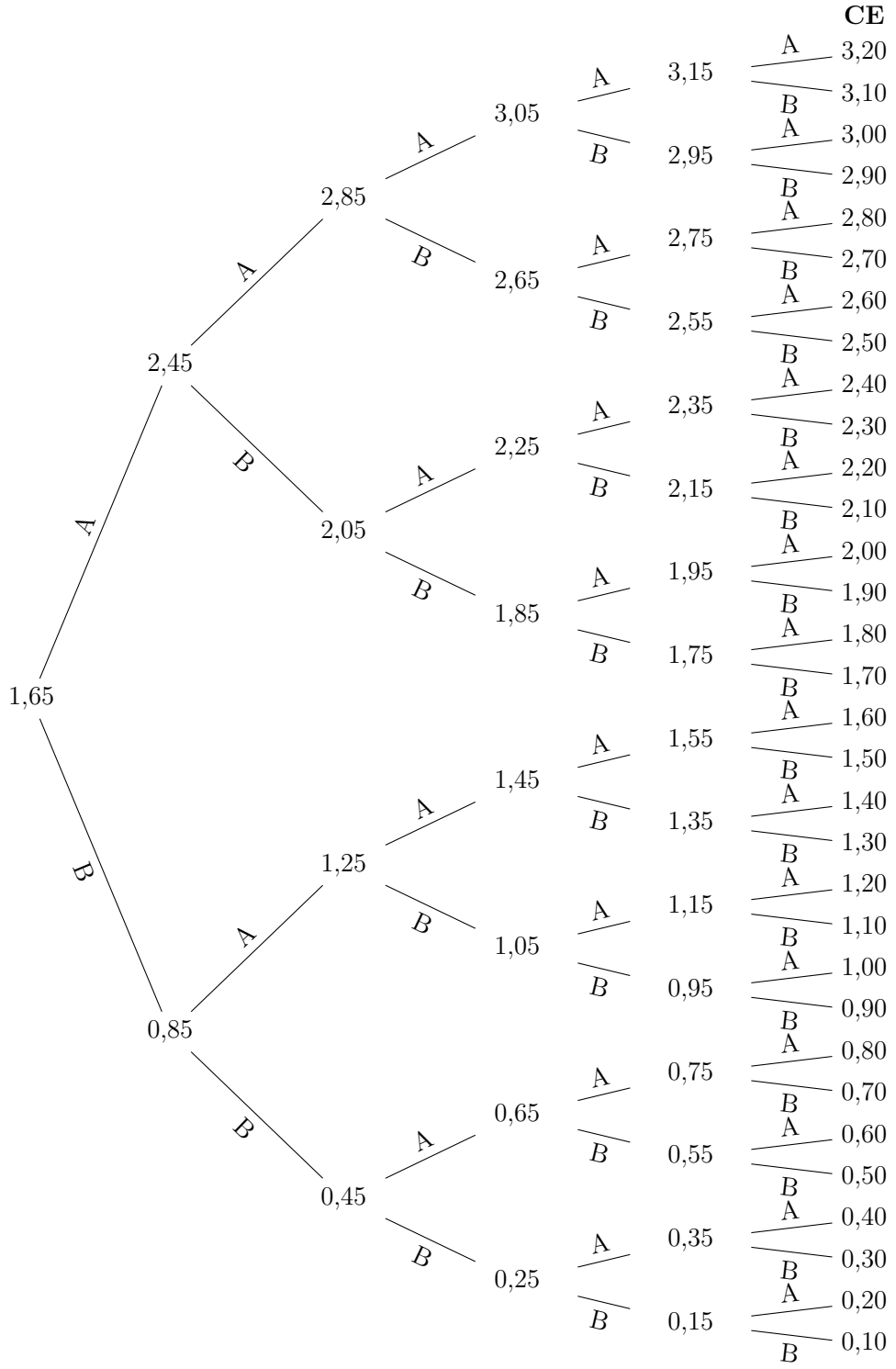
A.4.2 Patience

Time preferences are elicited using the staircase method as in Falk et al. (2018) with adjusted payoffs. Subjects take five consecutive decisions, each time facing the following question:

> "*Do you want to receive €2 euros today or €X in two months?*
>
> - *€2 today.*
> - *€X in two months.*"

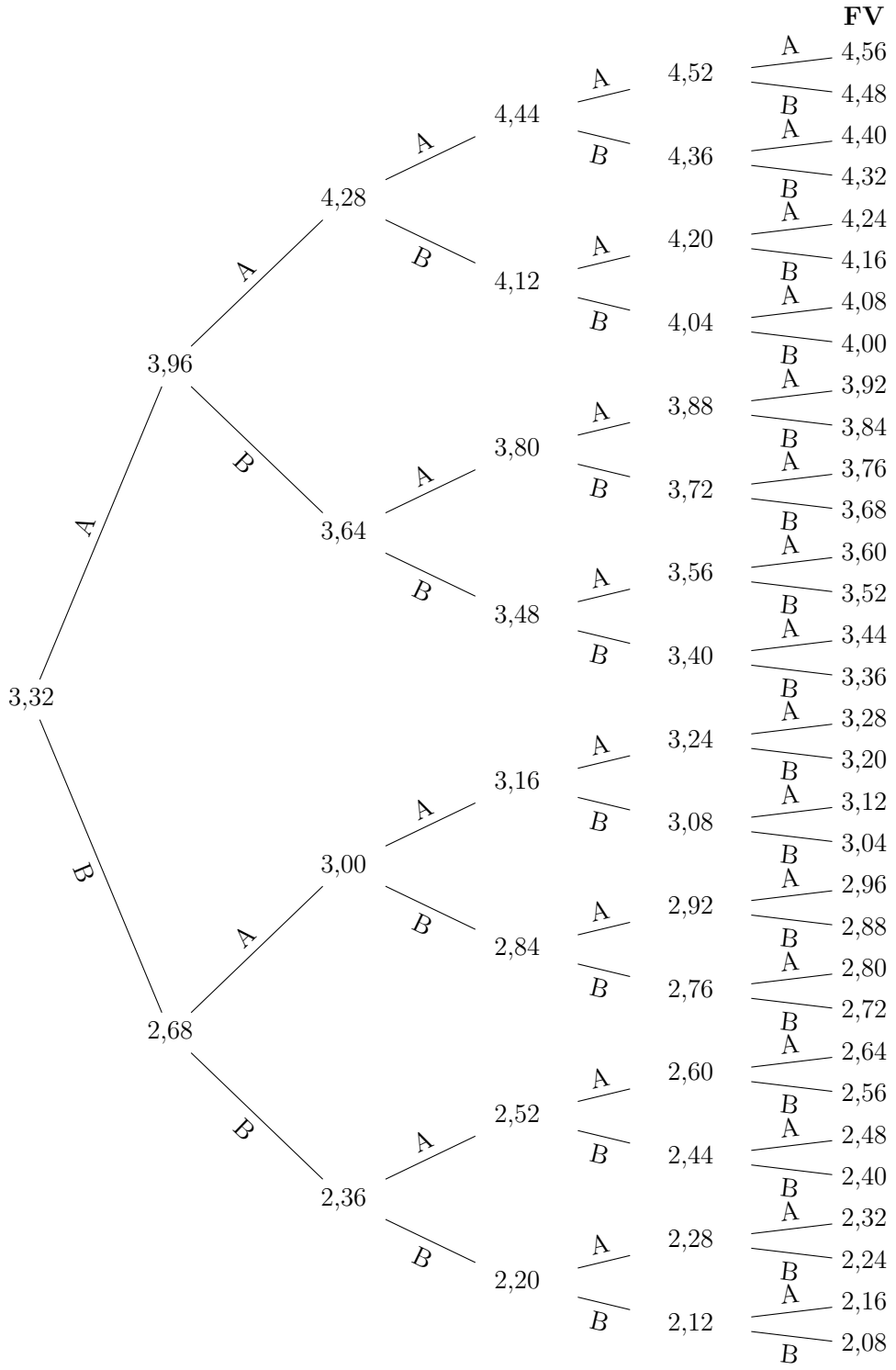
X is replaced with the corresponding value at each decision node in the game tree (see Figure A5). The starting value for X is 3.32. In the game tree shown in Figure A5 the action A refers to choosing €2 today while the action B refers to choosing the payment of X in two months. The value at the next decision node is then inserted as X in the subsequent question. The outcome of the game is the future value (FV) used for analysis which can take 32 values ranging from €2.08 to €4.56.

Figure A4: Game Tree of the Staircase Method For Risk Aversion



Notes: Participants take five decisions between a lottery with 50% chance for €4 and 50% chance for €0 (A) or €X euros as a safe payment (B). X is replaced with the value at each decision node with 1.65 as the initial value. The CE indicates the outcome of the game, that is the certainty equivalent used for analysis.

Figure A5: Game Tree of the Staircase Method for Patience



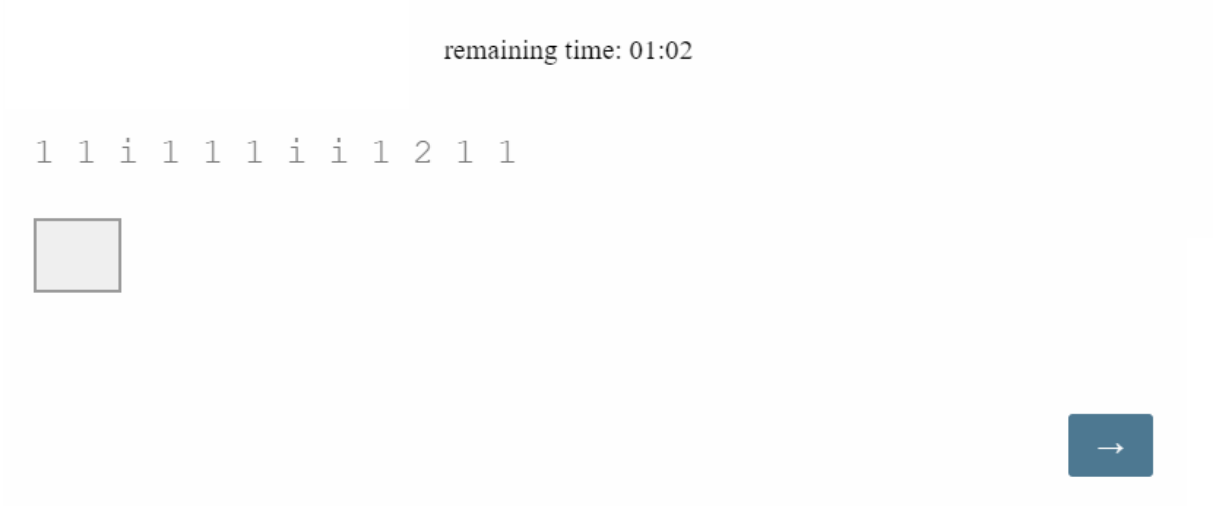
Notes: Participants take five decisions between a payment of €2 today (A) or €X in two months (B). X is replaced with the value at each decision node with 3.32 as the initial value. The FV indicates the outcome of the game, that is the future value used for analysis.

A.4.3 Productivity

Productivity is measured in a real-effort task: subjects have to count the digit "1" in lines of twelve to fourteen symbols. Subjects have two minutes time to complete as many lines as possible (up to 37). For each correct line subjects are paid €0.10. The lines were presented to participants in sequential order. Subjects could not go back to the previous line to revise their answers. After two minutes, all participants were forwarded and had to stop solving the task. The remaining time was displayed throughout the real effort task (see Figure A6).

The design of the task is inspired by a concentration test.[33] We calibrated the task so that entering random numbers is not a profitable strategy. Entering random numbers would lead to just 3-4 correct answers in expectation - much less than the productivity of all subjects in a pilot study.

Figure A6: Screenshot of the Productivity Task



[33] See the KONT-P concentration test, https://www.psychomeda.de/online-tests/konzentrationstest.html

B Supplementary Tables and Figures

B.1 Sample Characteristics and Randomization Check

Table B1: Balance Table

	Optimistic (1)	Pessimistic (2)	Balanced (3)	Baseline (4)	Full Sample (5)
Age	25.81	26.98	25.93	26.92	26.41
	(4.69)	(7.69)	(5.46)	(7.51)	(6.47)
Female	65.7%	62.3%	62.3%	61.3%	62.9%
Income	901.19	893.87	930.42	985.85	927.90
	(448.92)	(423.21)	(483.69)	(484.68)	(460.66)
Education					
High School	47.6%	41.5%	41.5%	47.2%	44.4%
Bachelor	41.9%	43.4%	38.7%	34.0%	39.5%
Master	10.5%	15.1%	19.8%	18.9%	16.1%
Student Status					
Non Econ	57.1%	52.8%	61.3%	50%	55.3%
Econ	31.4%	43.4%	33.0%	45.3%	38.3%
No Student	11.4%	3.8%	5.7%	4.7%	6.4%
Political Orientation	0.78	0.74	0.52	0.33	0.59
	(1.43)	(1.45)	(1.65)	(1.39)	(1.49)
Risk Group	9.5%	10.4%	8.5%	9.4%	9.4%
Observations	105	106	106	106	423

Notes: Income: available income per month in Euros; Political Orientation: scale from right (-3) to left (3) with the German parties assigned to values as follows. AFD: -3, FDP: -2, CDU/CSU: -1, SPD: 1, Bündnis90/Grüne: 2, Die Linke: 3; unaffiliated participants were assigned the value 0; Risk Group: belonging to a risk group for a severe case of COVID-19;

Table B2: Tests for the balance of covariates (p-values)

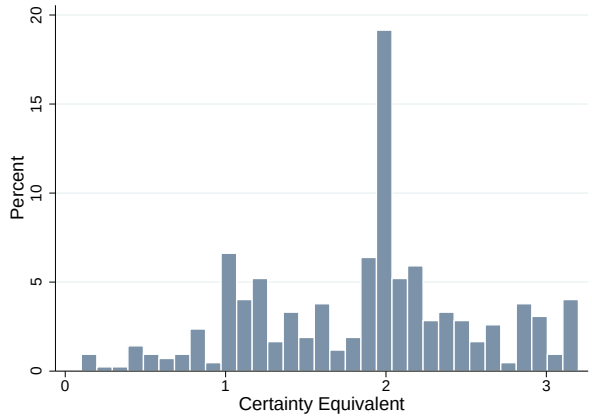
	Opt=Pess (1)	Opt=Bal (2)	Pess=Bal (3)	Pess=Base (4)	Opt=Base (5)	Bal=Base (6)
Age	0.183	0.859	0.254	0.957	0.198	0.273
Female	0.602	0.602	1.00	0.888	0.507	0.888
Income	0.903	0.650	0.559	0.143	0.190	0.406
Education	0.510	0.165	0.618	0.359	0.182	0.693
Student Status	0.043**	0.324	0.278	0.889	0.048**	0.188
Political Orientation	0.820	0.219	0.311	0.038**	0.021**	0.369
Risk Group	0.836	0.793	0.638	0.818	0.982	0.810
Observations	211	211	212	211	212	212

Notes: The table reports p-values for the following tests: for age, income, and political orientation the p-values of a t-test; for female, education, student status and risk group the p-values of a Chi2-test. *** p<0.01, ** p<0.05, * p<0.1

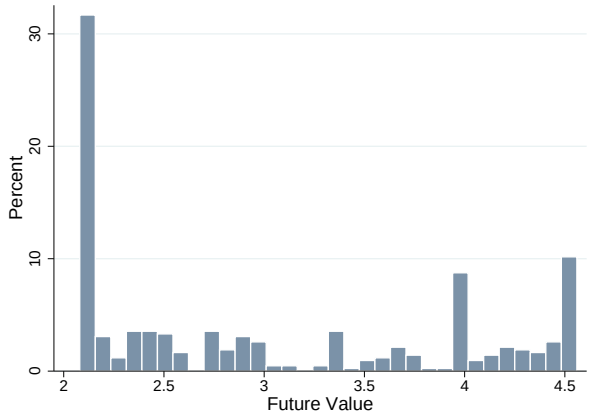
B.2 Distribution of Main Outcomes

Figure B1: Distribution of Main Outcomes

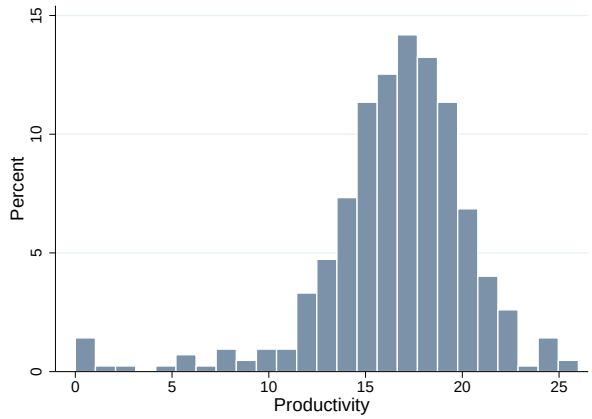
(a) Certainty Equivalent



(b) Future Value



(c) Productivity



Notes: Histograms for (a) the certainty equivalent, (b) the future value and (c) productivity.

B.3 Robustness Checks for Main Results

Table B3: Robustness Checks for Main Results - Logit and Tobit Models

	Risk Aversion				Patience			
	Chose Lottery		Certainty Equivalent		Chose €2 Today		Future Value	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Pessimistic	-0.12*	-0.13**	-0.30***	-0.29***	0.17**	0.19***	0.30**	0.32**
	(0.06)	(0.06)	(0.10)	(0.10)	(0.07)	(0.07)	(0.14)	(0.14)
Balanced	0.01	0.01	-0.04	-0.03	0.13**	0.14**	0.28*	0.28*
	(0.07)	(0.07)	(0.10)	(0.10)	(0.07)	(0.07)	(0.14)	(0.14)
Baseline	-0.06	-0.08	-0.18*	-0.17*	0.11	0.14**	0.16	0.20
	(0.07)	(0.07)	(0.10)	(0.10)	(0.07)	(0.07)	(0.14)	(0.14)
Age		0.00		0.00		-0.00		0.00
		(0.00)		(0.01)		(0.00)		(0.01)
Female		-0.05		-0.05		0.00		-0.06
		(0.05)		(0.08)		(0.05)		(0.11)
Income		0.00		0.00		-0.00		-0.00*
		(0.00)		(0.00)		(0.00)		(0.00)
Education		-0.04		-0.07		0.04		0.10
		(0.03)		(0.05)		(0.04)		(0.08)
Econ Student		0.05		-0.09		-0.15***		-0.24**
		(0.05)		(0.08)		(0.05)		(0.11)
No Student		-0.09		-0.08		0.01		-0.03
		(0.10)		(0.16)		(0.11)		(0.23)
Political Orientation		0.00		-0.00		0.01		0.03
		(0.02)		(0.02)		(0.02)		(0.03)
Risk Group		-0.10		-0.02		-0.03		0.07
		(0.08)		(0.12)		(0.08)		(0.17)
Observations	423	423	423	423	423	423	423	423

Notes: Columns (1), (2), (5) and (6) report average marginal effects from logit models on the first decision in the respective elicitation procedure (see Appendix A.4). Columns (3), (4), (7) and (8) report coefficients from tobit models that account for censoring from above of the outcome variables. Standard errors in parentheses.*** p<0.01, ** p<0.05, * p<0.1

B.4 Order Effects

Table B4: Order Effects

	Certainty Equivalent		Future Value		Productivity	
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Order Effects						
Order = 2	-0.01	-0.02	0.07	0.06	-0.13	-0.15
	(0.08)	(0.08)	(0.11)	(0.11)	(0.46)	(0.46)
Order = 3	-0.12	-0.13	0.15	0.13	0.13	0.17
	(0.08)	(0.08)	(0.11)	(0.11)	(0.45)	(0.46)
Controls	No	Yes	No	Yes	No	Yes
Observations	423	423	423	423	423	423
Panel B: Heterogeneous Treatment Effects by Order						
Pessimistic	-0.33**	-0.28*	0.07	0.22	-0.38	0.23
	(0.17)	(0.15)	(0.22)	(0.20)	(0.95)	(0.81)
Order = 2	0.04	-0.02	-0.09	0.06	-0.19	-0.09
	(0.17)	(0.10)	(0.22)	(0.13)	(0.96)	(0.52)
Order = 3	-0.31*	-0.14	-0.14	0.13	-0.46	-0.18
	(0.17)	(0.10)	(0.23)	(0.13)	(0.90)	(0.52)
Pessimistic X Order = 2	-0.06	-0.00	0.27	0.09	-0.36	-0.74
	(0.23)	(0.19)	(0.31)	(0.26)	(1.35)	(1.06)
Pessimistic X Order = 3	0.19	-0.01	0.39	0.14	1.11	0.59
	(0.24)	(0.20)	(0.32)	(0.27)	(1.28)	(1.02)
Controls	No	Yes	No	Yes	No	Yes
Observations	423	423	423	423	423	423
Panel C: Heterogeneous Treatment Effects by Order (After Productivity)						
Pessimistic	-0.35***	-0.34**	0.20	0.29*		
	(0.13)	(0.14)	(0.18)	(0.16)		
Order After RET	-0.19	-0.18	-0.06	0.14		
	(0.14)	(0.14)	(0.19)	(0.11)		
Pessimistic X Order After RET	0.12	0.10	0.18	0.01		
	(0.19)	(0.20)	(0.26)	(0.21)		
Controls	No	Yes	No	Yes		
Observations	423	423	423	423		

Notes: Table reports OLS estimates with standard errors in parentheses. In all panels controls include our set of covariates (age, female, income, education, econ student, no student, political orientation, risk group). In Panel B and C controls additionally include treatment dummies for balanced and baseline and their interaction(s) with the order dummies. Constants not reported. *** p<0.01, ** p<0.05, * p<0.1

B.5 Subgroup Analysis

Table B5: Treatment Effects by Gender, Age and Education

	Certainty Equivalent		Future Value	
	(1)	(2)	(3)	(4)
Panel A: Gender				
Pessimistic	-0.21	-0.19	0.46**	0.49**
	(0.14)	(0.14)	(0.19)	(0.19)
Female	-0.02	-0.02	0.13	0.05
	(0.08)	(0.09)	(0.11)	(0.11)
Pessimistic X Female	-0.14	-0.15	-0.28	-0.31
	(0.16)	(0.16)	(0.22)	(0.22)
Controls	No	Yes	No	Yes
Observations	423	423	423	423
Panel B: Age				
Pessimistic	-0.27**	-0.26**	0.29*	0.30*
	(0.12)	(0.12)	(0.16)	(0.16)
Age(>25)	0.09	0.15	0.03	0.01
	(0.08)	(0.10)	(0.11)	(0.14)
Pessimistic X Age(>25)	-0.05	-0.05	-0.00	-0.02
	(0.16)	(0.16)	(0.22)	(0.22)
Controls	No	Yes	No	Yes
Observations	423	423	423	423
Panel C: Education				
Pessimistic	-0.40***	-0.39***	0.28	0.32*
	(0.13)	(0.13)	(0.18)	(0.18)
Education (≥Bachelor)	-0.06	0.33**	0.04	-0.10
	(0.08)	(0.16)	(0.11)	(0.22)
Pessimistic X	0.20	0.19	0.00	-0.05
Education (≥Bachelor)	(0.16)	(0.16)	(0.21)	(0.22)
Controls	No	Yes	No	Yes
Observations	423	423	423	423

Notes: Table reports OLS estimates with standard errors in parentheses. Controls include treatment dummies for balanced and baseline and our set of covariates (age, female, income, education, econ student, no student, political orientation, risk group) excluding the covariate that is interacted with the treatment indicator in the respective regression. Constant not reported. *** p<0.01, ** p<0.05, * p<0.1

Table B6: Treatment Effects by Income, Econ Students and News Consumption

	Certainty Equivalent		Future Value	
	(1)	(2)	(3)	(4)
Panel A: Income				
Pessimistic	-0.23*	-0.22*	0.16	0.18
	(0.13)	(0.13)	(0.17)	(0.17)
Income(≥875)	0.08	0.16	-0.08	0.17
	(0.08)	(0.11)	(0.11)	(0.15)
Pessimistic X Income(≥875)	-0.13	-0.14	0.25	0.22
	(0.16)	(0.16)	(0.21)	(0.21)
Controls	No	Yes	No	Yes
Observations	423	423	423	423
Panel B: Econ Students				
Pessimistic	-0.26**	-0.25**	0.12	0.09
	(0.12)	(0.12)	(0.16)	(0.16)
Econ Student	-0.03	-0.05	-0.35***	-0.34***
	(0.08)	(0.09)	(0.11)	(0.12)
Pessimistic X Econ Student	-0.08	-0.09	0.48**	0.50**
	(0.16)	(0.16)	(0.21)	(0.21)
Controls	No	Yes	No	Yes
Observations	423	423	423	423
Panel C: News Consumption				
Pessimistic	-0.30**	-0.29**	0.15	0.14
	(0.13)	(0.14)	(0.18)	(0.18)
News Consumption (>=Often)	-0.09	-0.10	-0.01	0.01
	(0.08)	(0.08)	(0.11)	(0.11)
Pessimistic X	0.01	0.01	0.23	0.26
News Consumption (>=Often)	(0.16)	(0.16)	(0.22)	(0.22)
Controls	No	Yes	No	Yes
Observations	423	423	423	423

Notes: Table reports OLS estimates with standard errors in parentheses. Controls include treatment dummies for balanced and baseline and our set of covariates (age, female, income, education, econ student, no student, political orientation, risk group) excluding the covariate that is interacted with the treatment indicator in the respective regression. Constant not reported. *** p<0.01, ** p<0.05, * p<0.1

B.6 Expectations

Note on data cleaning Expectations about the DAX, COVID-19 deaths and cases were elicited with an open text field, so that subjects could enter any value. Therefore, the data set contains a number of implausible values and outliers. One noteworthy data cleaning step was performed on these three measures: we recoded values that were unreasonably low and were most likely meant to be in thousands. For example, an entry of 12.5 for the DAX Value was recoded as 12500 and an entry of 10.2 for COVID-19 deaths was recoded as 10200.

In Table B7 we show with Mann-Whitney U-tests that treatment effects on expectations are significant irrespective of performing this data cleaning step. Mann-Whitney U-tests are our preferred test for treatment effects on expectations as they are robust to outliers.

Table B7: Treatment Effects on Expectations - Robustness to Data Cleaning

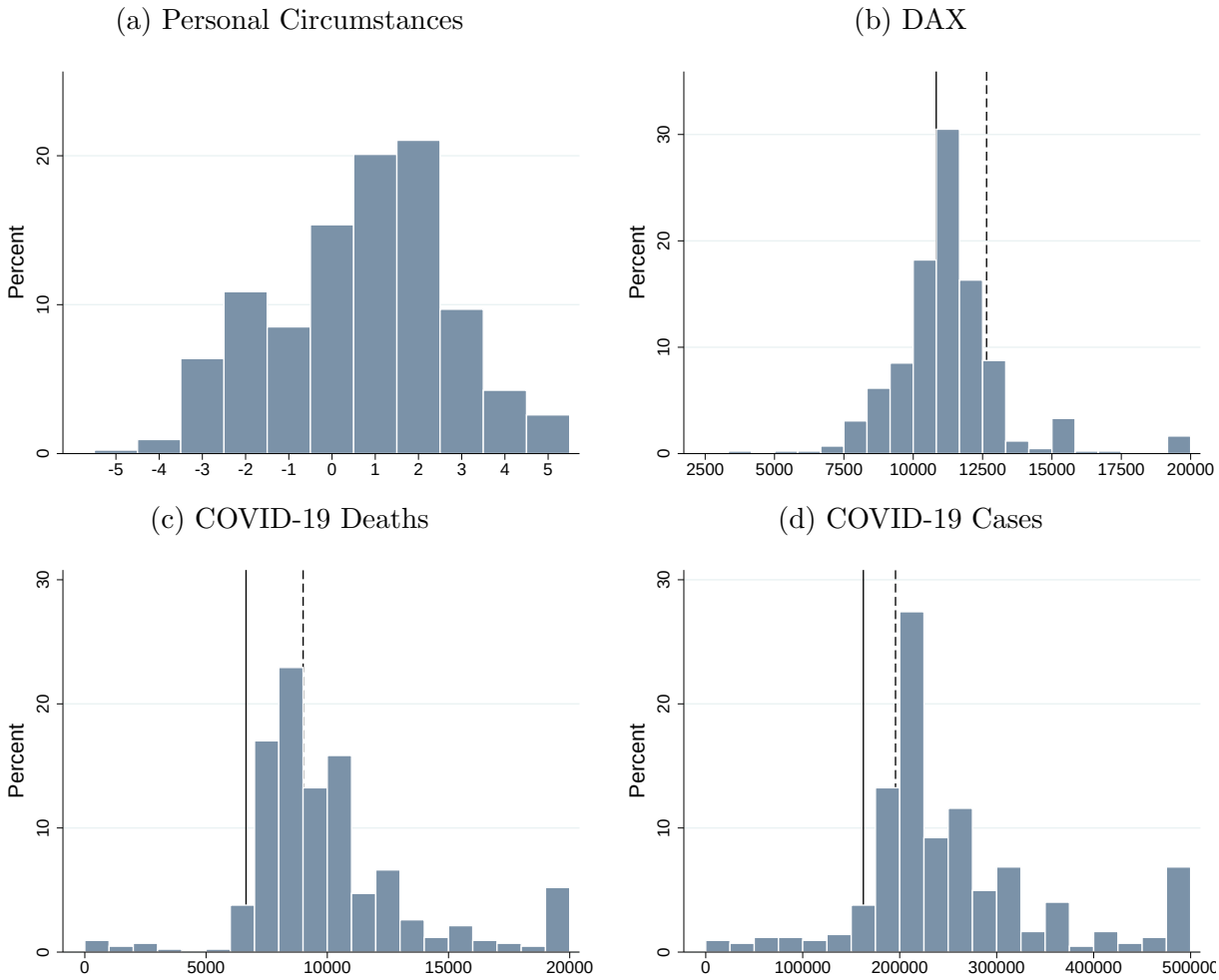
	DAX	COVID-19 Deaths	COVID-19 Cases
	(1)	(2)	(3)
P-values Mann-Whitney U-Test: (Optimistic = Pessimistic)			
Prior to Cleaning	0.025	0.021	0.209
After Cleaning	0.025	0.024	0.170
N Implausible Prior to Cleaning	10	23	51
N Cleaned	10	11	22
N Implausible After Cleaning	0	12	29
N total	423	423	422 [a]

Notes: Table reports p-values from Mann-Whitney U-tests, the number of observations recoded as part of the data cleaning and the number of observations that are still implausible after data cleaning. [a]One observation for COVID-19 cases is dropped as the subject entered "improved" instead of a number.

After data cleaning, the expectations about COVID-19 deaths and cases still contain a number of implausibly low values (lower than the initial value of COVID-19 deaths/ cases in Germany on May 3rd). This issue is most severe for COVID-19 cases, which is therefore our most noisy measure among the four forward-looking expectations. Figure B2 depicts the distribution of expectations after data cleaning.

It was not necessary to perform any data cleaning on the qualitative measure of personal expectations which showed significant treatment effects of our manipulation using both Mann-Whitney U-tests ($p = 0.007$) and OLS regressions ($p < 0.005$) (see Table B8).

Figure B2: Distribution of Expectations



Notes: Histograms for (a) personal circumstances, (b) expectations about the DAX Value, (c) expectations about COVID-19 deaths and (d) expectations about COVID-19 cases. The solid line indicates the initial value on May 3rd. The dashed line indicates the realized value on July 3rd. Note that all values below the initial value in (c) and (d) are implausible values as the total number of COVID-19 deaths or cases cannot decrease. The histogram for the Dax Value has been winsorized at 20,000 points. The histogram for COVID-19 deaths has been winsorized at 20,000 deaths and for COVID-19 cases at 500,000 cases.

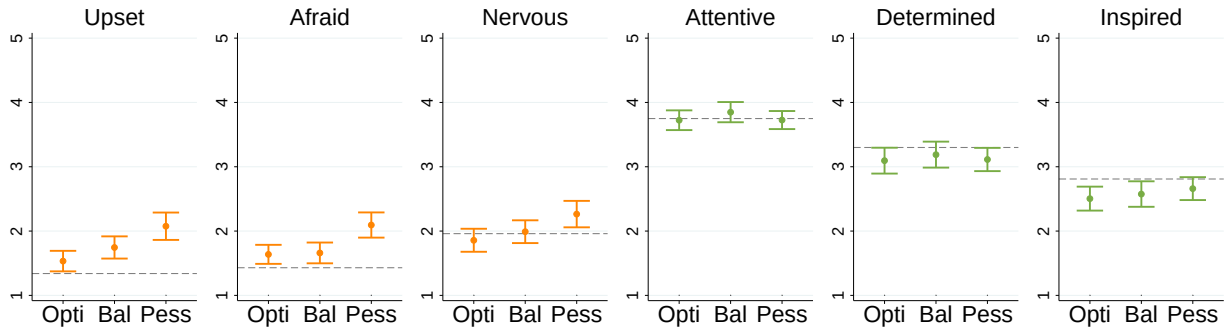
Table B8: OLS Estimates - Treatment Effects on Expectations

	Personal Circumstances		DAX		COVID-19 Deaths		COVID-19 Cases	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Pessimistic	-0.83***	-0.78***	-474.84**	-490.58**	634.29*	597.41*	10,977.00	9,652.76
	(0.28)	(0.28)	(223.83)	(228.65)	(329.10)	(331.55)	(12,359.53)	(12,587.66)
Baseline	-0.26	-0.31	16.95	-22.17	335.85	371.31	-169.79	1,633.87
	(0.28)	(0.28)	(223.83)	(229.31)	(329.10)	(332.51)	(12,388.78)	(12,645.92)
Balanced	-0.34	-0.37	-70.02	-85.95	254.12	215.36	-1,603.95	-1,410.75
	(0.28)	(0.28)	(223.83)	(226.64)	(329.10)	(328.63)	(12,359.53)	(12,476.20)
Age		-0.02		21.40		-33.15		72.29
		(0.02)		(15.80)		(22.90)		(869.81)
Female		-0.21		55.65		-718.50***		-14,649.34
		(0.21)		(173.03)		(250.90)		(9,535.19)
Income		0.12**		-7.10		-30.83		-4,120.83
		(0.06)		(47.51)		(68.89)		(2,615.57)
Education		0.12		4.02		189.45		2,213.86
		(0.15)		(120.84)		(175.22)		(6,672.18)
Econ Student		0.04		-56.61		-64.81		1,495.20
		(0.21)		(175.17)		(254.00)		(9,666.30)
No Student		0.66		45.14		-558.89		-6,782.42
		(0.45)		(368.55)		(534.41)		(20,288.33)
Political Orientation		-0.10		-68.23		141.54*		4,175.02
		(0.07)		(54.73)		(79.37)		(3,014.05)
Risk Group		-0.65*		-82.00		229.24		-1,675.60
		(0.34)		(276.92)		(401.54)		(15,244.12)
Constant	1.03***	1.39***	11,272.56***	10,776.34***	9,387.10***	10,641.01***	253,448.94***	269,502.98***
	(0.20)	(0.53)	(158.64)	(434.83)	(233.26)	(630.51)	(8,760.19)	(23,973.90)
Observations	423	423	423	423	423	423	422	422
R-squared	0.02	0.07	0.02	0.03	0.01	0.05	0.00	0.02

Notes: Table reports OLS estimates with standard errors in parentheses. In columns (3) to (8) we control for outliers and implausible values by winsorizing the outcome variables. In columns (3) and (4) the DAX Values have been winsorized at 7,500 and 15,000 points. In columns (5) and (6) the COVID-19 related deaths have been winsorized at the initial value on May 3rd (6,649) and at 20,000 deaths. In columns (7) and (8) COVID-19 deaths have been winsorized at the initial value on May 3rd (162,496) and at 500,000 cases. *** p<0.01, ** p<0.05, * p<0.1

B.7 Affect

Figure B3: Treatment Effects on Affect



Notes: Figure depicts means and 95% confidence intervals for the six items of affect by treatment condition on a 5-point Likert scale. The dashed line indicates the mean in the baseline condition. Upset, afraid and nervous are associated with negative affect, while attentive, determined and inspired are associated with positive affect.

Table B9: Treatment Effects on Affect

	Affect	Upset	Afraid	Nervous	Attentive	Determined	Inspired
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Pessimistic	-1.23***	0.54***	0.46***	0.41***	0.00	0.02	0.16
	(0.41)	(0.12)	(0.12)	(0.14)	(0.11)	(0.14)	(0.14)
Balanced	-0.08	0.21*	0.02	0.13	0.13	0.09	0.07
	(0.41)	(0.12)	(0.12)	(0.14)	(0.11)	(0.14)	(0.14)
Baseline	0.83**	-0.18	-0.20*	0.11	0.03	0.21	0.31**
	(0.41)	(0.12)	(0.12)	(0.14)	(0.11)	(0.14)	(0.14)
Constant	4.30***	1.53***	1.64***	1.86***	3.72***	3.10***	2.50***
	(0.29)	(0.09)	(0.09)	(0.10)	(0.08)	(0.10)	(0.10)
Observations	423	423	423	423	423	423	423
R-squared	0.06	0.08	0.07	0.02	0.00	0.01	0.01

Notes: Table reports OLS estimates with standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

B.8 Causal Channel

Table B10: Pairwise Correlation Coefficients between Expectations and Emotions

	Personal Expectations	DAX	COVID-19 Deaths	COVID-19 Cases	Affect	Upset	Afraid	Nervous
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Personal Expectations	1.000							
DAX	0.252***	1.000						
COVID-19 Deaths	-0.152***	-0.157***	1.000					
COVID-19 Cases	-0.103**	-0.083*	0.611***	1.000				
Affect	0.288***	0.129**	-0.003	0.023	1.000			
Upset	-0.235***	-0.120**	0.045	0.036	-0.587***	1.000		
Afraid	-0.163***	-0.077	-0.014	0.021	-0.621***	0.390***	1.000	
Nervous	-0.193***	-0.046	-0.038	-0.041	-0.609***	0.391***	0.599***	1.000

Notes: Table reports pairwise correlation coefficients. *** p<0.01, ** p<0.05, * p<0.1

Table B11: Causal Channel on Patience

	Future Value							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Affect	-0.021							
	(0.015)							
Upset		0.094*						
		(0.050)						
Afraid			0.108**					
			(0.052)					
Nervous				0.059				
				(0.046)				
Personal Expectations					-0.007			
					(0.023)			
DAX						0.048*		
						(0.028)		
COVID-19 Deaths							-0.036*	
							(0.020)	
COVID-19 Cases								-0.045
								(0.051)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	3.242***	2.980***	2.991***	3.056***	3.166***	2.642***	3.547***	3.281***
	(0.251)	(0.261)	(0.256)	(0.257)	(0.245)	(0.389)	(0.322)	(0.281)
Observations	423	423	423	423	423	423	423	423
R-squared	0.029	0.033	0.035	0.028	0.025	0.031	0.032	0.026

Notes: Table reports OLS estimates with standard errors in parentheses. Expectations about the DAX are winsorized at 7,500 and 15,000 points and transformed in thousands. COVID-19 related deaths are winsorized at the initial value (6,649) and at 20,000 deaths and transformed in thousands. COVID-19 deaths are winsorized at the initial value (162,496) and at 500,000 cases and are transformed in hundred thousands. Controls include our set of covariates (age, female, income, education, econ student, no student, political orientation, risk group). *** p<0.01, ** p<0.05, * p<0.1

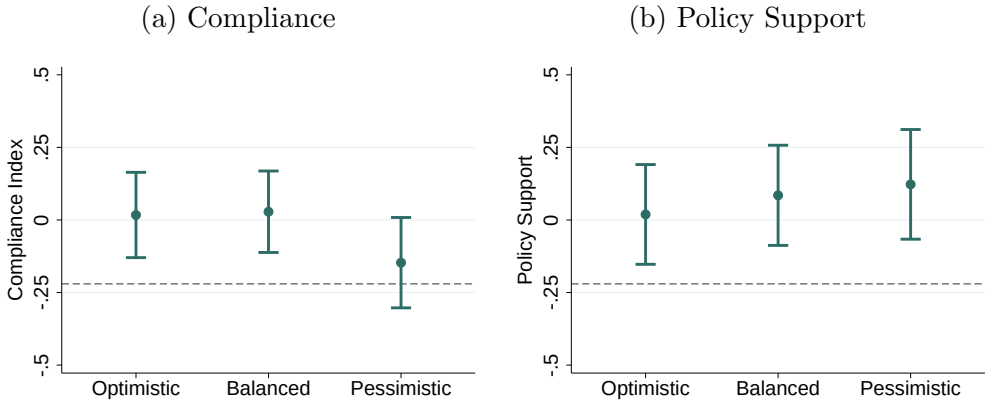
Table B12: Causal Channel on Risk Aversion

	Certainty Equivalent							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Affect	0.015							
	(0.011)							
Upset		0.004						
		(0.037)						
Afraid			-0.058					
			(0.039)					
Nervous				0.011				
				(0.035)				
Personal Expectations					0.033*			
					(0.017)			
DAX						0.028		
						(0.021)		
COVID-19 Deaths							-0.023	
							(0.015)	
COVID-19 Cases								-0.045
								(0.039)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	1.949***	2.000***	2.098***	1.988***	1.973***	1.704***	2.258***	2.129***
	(0.188)	(0.196)	(0.192)	(0.193)	(0.183)	(0.292)	(0.242)	(0.210)
Observations	423	423	423	423	423	423	423	423
R-squared	0.014	0.010	0.015	0.010	0.018	0.014	0.016	0.013

Notes: Table reports OLS estimates with standard errors in parentheses. Expectations about the DAX are winsorized at 7,500 and 15,000 points and transformed in thousands. COVID-19 related deaths are winsorized at the initial value (6,649) and at 20,000 deaths and transformed in thousands. COVID-19 deaths are winsorized at the initial value (162,496) and at 500,000 cases and are transformed in hundred thousands. Controls include our set of covariates (age, female, income, education, econ student, no student, political orientation, risk group). *** p<0.01, ** p<0.05, * p<0.1

B.9 Compliance and Policy Support

Figure B4: Treatment Effects on Compliance and Policy Support



Notes: Means and corresponding 95% confidence intervals for (a) compliance with social distancing measures and (b) support for policy interventions in the three treatment conditions. The dashed line indicates the mean in the baseline condition.

Table B13: Treatment Effects on Compliance and Policy Support

	Compliance		Policy Support	
	(1)	(2)	(3)	(4)
Pessimistic	-0.16	-0.11	0.10	0.12
	(0.11)	(0.11)	(0.13)	(0.13)
Balanced	0.01	0.06	0.07	0.12
	(0.11)	(0.11)	(0.13)	(0.12)
Baseline	-0.24**	-0.21*	-0.24*	-0.17
	(0.11)	(0.11)	(0.13)	(0.13)
Age		-0.01		-0.00
		(0.01)		(0.01)
Female		0.41***		0.29***
		(0.08)		(0.09)
Income		0.00		-0.00
		(0.00)		(0.00)
Education		-0.15**		-0.15**
		(0.06)		(0.07)
Econ Student		0.11		0.02
		(0.08)		(0.10)
No Student		0.26		-0.09
		(0.17)		(0.20)
Political Orientation		-0.00		0.09***
		(0.03)		(0.03)
Risk Group		0.05		0.21
		(0.13)		(0.15)
Constant	0.02	-0.09	0.02	-0.06
	(0.08)	(0.21)	(0.09)	(0.24)
Observations	423	423	423	423
R-squared	0.02	0.10	0.02	0.10

Notes: Table reports OLS estimates with standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

C Robustness - Results for Restricted Sample (N=396)

Table C1: OLS Estimates - Average Treatment Effects, Restricted Sample (N=396)

	Certainty Equivalent		Future Value		Productivity	
	(1)	(2)	(3)	(4)	(5)	(6)
Pessimistic	-0.33***	-0.31***	0.30**	0.31**	0.13	0.27
	(0.10)	(0.10)	(0.14)	(0.14)	(0.56)	(0.55)
Balanced	-0.10	-0.09	0.26*	0.27*	0.53	0.53
	(0.10)	(0.10)	(0.14)	(0.14)	(0.56)	(0.55)
Baseline	-0.21**	-0.20*	0.14	0.19	0.10	0.07
	(0.10)	(0.10)	(0.14)	(0.14)	(0.56)	(0.55)
Age		-0.00		0.00		-0.14***
		(0.01)		(0.01)		(0.04)
Female		-0.07		-0.02		-0.43
		(0.08)		(0.10)		(0.42)
Income		0.00		-0.00*		0.00*
		(0.00)		(0.00)		(0.00)
Education		-0.08		0.07		-0.11
		(0.06)		(0.08)		(0.30)
Econ Student		-0.08		-0.20**		0.13
		(0.08)		(0.10)		(0.41)
Political Orientation		-0.00		0.02		-0.12
		(0.02)		(0.03)		(0.13)
Risk Group		-0.07		0.08		-2.02***
		(0.13)		(0.17)		(0.68)
Constant	2.04***	2.15***	2.85***	2.97***	16.17***	19.54***
	(0.07)	(0.21)	(0.10)	(0.29)	(0.40)	(1.16)
Observations	396	396	396	396	396	396
R-squared	0.03	0.04	0.01	0.04	0.00	0.07
Initial p-values:						
(Pessimistic)	0.001	0.002	0.029	0.023	0.813	0.629
Adjusted p-values (Romano-Wolf):						
(Pessimistic)	0.003	0.006	0.054	0.046	0.808	0.627

Notes: Table reports OLS estimates with standard errors in parentheses. Adjusted p-values for multiple hypothesis testing were calculated using the Romano-Wolf step-down procedure as described in Clarke, Romano, and Wolf (2019). We control for the fact that we test the same treatment on three different outcomes. The adjusted p-values were separately derived for the specification without covariates (columns (1), (3) and (5)) and for the specification with covariates (columns (2), (4) and (6)) using 5000 bootstrap replications. *** p<0.01, ** p<0.05, * p<0.1

Table C2: OLS Estimates - Treatment Effects on Expectations, Restricted Sample (N=396)

	Personal Circumstances		DAX		COVID-19 Deaths		COVID-19 Cases	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Pessimistic	-0.77***	-0.81***	-513.51**	-543.76**	503.87	499.65	6,889.76	7,261.69
	(0.29)	(0.29)	(233.52)	(236.27)	(345.50)	(345.88)	(12,960.19)	(13,043.82)
Baseline	-0.15	-0.28	-44.47	-98.96	289.48	357.85	-921.26	2,700.41
	(0.29)	(0.29)	(234.08)	(238.46)	(346.31)	(349.09)	(13,021.85)	(13,189.25)
Balanced	-0.40	-0.49*	-142.28	-181.23	211.64	224.51	-1,866.14	-975.93
	(0.29)	(0.29)	(234.64)	(237.34)	(347.14)	(347.45)	(13,021.85)	(13,102.53)
Age		-0.02		25.20		-43.66		-1,071.98
		(0.02)		(19.02)		(27.85)		(1,050.41)
Female		-0.16		103.05		-781.28***		-18,977.60*
		(0.22)		(179.63)		(262.96)		(9,928.85)
Income		0.11*		3.72		-19.59		-3,350.49
		(0.06)		(50.04)		(73.26)		(2,763.01)
Education		0.13		28.33		191.69		6,927.86
		(0.16)		(130.37)		(190.85)		(7,219.42)
Econ Student		0.05		-40.25		-86.34		-934.91
		(0.22)		(176.82)		(258.85)		(9,785.80)
Political Orientation		-0.11*		-58.23		136.85		4,721.13
		(0.07)		(56.89)		(83.28)		(3,141.67)
Risk Group		-0.86**		-90.14		330.79		-3,538.63
		(0.36)		(293.14)		(429.12)		(16,182.77)
Constant	0.96***	1.24**	11,298.13***	10,644.28***	9,503.24***	10,944.64***	255,834.37***	297,075.19***
	(0.21)	(0.61)	(168.89)	(503.68)	(249.88)	(737.33)	(9,373.34)	(27,845.73)
Observations	396	396	396	396	396	396	395	395
R-squared	0.02	0.06	0.02	0.03	0.01	0.04	0.00	0.02

Notes: Table reports OLS estimates with standard errors in parentheses. In columns (3) to (8) we control for outliers and implausible vlaues by winsorizing the outcome variables. In columns (3) and (4) the DAX Values have been winsorized at 15,000 points. In columns (5) and (6) the COVID-19 related deaths have been winsorized at the initial value (6,649) and at 20,000 deaths. In columns (7) and (8) COVID-19 deaths have been winsorized at the initial value (162,496) and at 500,000 cases. *** p<0.01, ** p<0.05, * p<0.1

D Experimental Instructions

Participants received experimental instructions in German. Below we provide a translation into English. A dashed line indicates the next page of the survey. Explanatory comments (which were not displayed to participants) are indicated by blue, italic text.

Welcome to this online experiment! You will receive €2.50 as a show-up fee. Depending on the decisions you take during this study, you can earn an additional payment.

As described in the invitation, you payment will be transferred to your PayPal account. Therefore, you will be asked to provide the email address of your PayPal account at the end of this survey. Please make sure you know the email address of you PayPal account before you begin.

Your participation will take approximately 15 minutes.

O I consent to the above conditions.

Participants could only continue when they gave their consent.

On the next page two telephone numbers will be displayed. Please try to memorise these numbers. You will have 20 seconds to do so.

You will be asked to recognise the two numbers at a later point in time.

05454/444-54 08421/792-65

Participants were automatically forwarded after 20 seconds. A timer indicated the remaining time they had on this page.

On the next page a text will be displayed. Please try to memorise as much of the content as possible. You will have two minutes to do so.

At a later point in time you will be asked to answer three questions about the content of the

text. You will earn €0.50 per correct answer.

One of the four treatments was randomly selected and displayed. Participants could not leave this page ("click over" the text), but were automatically forwarded after 120 seconds. A timer indicated the remaining time they had left to read the text. The treatment texts are available in full length in Appendix A.3.

We would like to know how you feel right now.

The following words describe different feelings and sensations. Read every word, then indicate the intensity with which you experience the respective emotion at the moment on a scale from "not at all" to "very much".

	not at all	a little	somewhat	much	very much
upset	○	○	○	○	○
attentive	○	○	○	○	○
afraid	○	○	○	○	○
determined	○	○	○	○	○
nervous	○	○	○	○	○
inspired	○	○	○	○	○

At the beginning of the study you were shown two telephone numbers. Which ones?

O 02235/679-89
O 08421/792-65
O 0721/972-56
O 05454/444-54

Now you will make decisions in three blocks. At the end of the study, one of the three blocks will be randomly selected. Only the decisions made in the selected block will be relevant for your payment.

This means at the same time that every decision that you will take can potentially influence the payment you receive. You should therefore take all decisions as if they would be implemented.

In-between the decision blocks we will ask questions about the text that you have read in the beginning.

Decision block 1 starts now.

The order of the elicitation of risk taking, patience and productivity was randomized. Thus, block 1 could contain any of the three main outcomes. As an example, we are presenting the elicitation of risk aversion here.

In this block you will take five decisions. You will always have the choice between a guaranteed payment and a lottery. The lottery pays €4 with 50 percent chance and €0 with 50 percent chance.

One of your five decisions is randomly selected to be considered for payment.

Do you want to receive a guaranteed payment of €X or play a lottery with 50 percent chance for €4 and 50 percent chance for €0?

O €X as guaranteed payment O lottery with 50% chance for €4 and 50% chance for €0

This question was displayed five times with different values for X. The first value for X was €1.65 and subsequent values depended on the previous decisions. Figure A4 in Appendix A.4 illustrates all possible values for X.

Next is a question on the text that you read in the beginning.

The following statement was made or was contained in the text in this or in a similar fashion:

– sentence –

O True O False

Instead of – sentence – a sentence from the treatment text was displayed to participants. This sentence was the same independently of which outcome was elicited in block 1. The sentences displayed were:

Pessimistic: The population should not for a second lull itself into a false sense of security, chancellor Angela Merkel warned in a speech.

Balanced: The population has made great achievements, but should not lull itself into a false sense of security, chancellor Angela Merkel said in a speech.

Optimistic: Due to its discipline the population has made great achievements in the last weeks, chancellor Angela Merkel praised in a speech.

Baseline: Already the astronomer Johannes Kepler wrote in a letter to Galileo Galilei: Provide ships or sails that are suitable for the breeze of heaven.

Decision block 2 starts now.

Here one of the two remaining main outcomes was randomly elicited. As an example we are presenting the elicitation of patience here.

In this block you will take five decisions. You always have the choice between a payment you receive directly after your participation in this study and a payment you receive in 2 months (in exactly 60 days). In both cases the money will be transferred to your PayPal account.

One of your five decisions is randomly selected to be considered for payment.

Do you want to receive €2 today or €X in two months?

O €2 today O €X in two months

This question was displayed five times with different values for X. The first value for X was €3.32 and subsequent values depended on the previous decisions. Figure A5 in Appendix A.4 illustrates all possible values for X.

Next is a question on the text that you read in the beginning.

The following statement was made or was contained in the text in this or in a similar fashion:

– sentence –

O True O False

Instead of – sentence – a sentence from the treatment text was displayed to participants. This sentence was the same independently of which outcome was elicited in block 2. The sentences displayed were:

Pessimistic: In a second wave of infections, Germany could face conditions like in Italy or Spain.

Balanced: In Germany, the situation has not yet developed like in Italy or Spain. In the worst case, this might change with a second wave of infections.

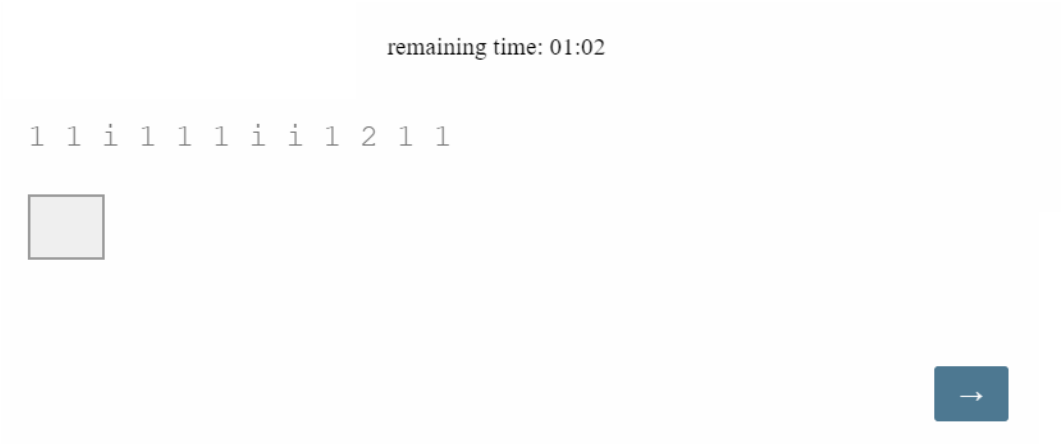
Optimistic: If the numbers continue to develop in such a positive way, the situation in Germany will not unfold like in Italy or Spain.

Baseline: If a current sailing mission in outer space continues to be successful, the efforts of the ancient thinkers might pay off.

Decision block 3 starts now.

Here, the remaining main outcome was elicited. As an example, we are presenting the productivity task here.

In this block your task is to count how often the digit '1' appears in a line of symbols. For each correct answer you receive €0.10. You have two minutes to solve as many lines as possible.



What do you think:

- How many lines did you complete?
- How many lines did you answer correctly?

Next is a question on the text that you read in the beginning.

The following statement was made or was contained in the text in this or in a similar fashion:

– sentence –

O True O False

Instead of – sentence – a sentence from the treatment text was displayed to participants. This sentence was the same independently of which outcome was elicited in block 3. The sentences displayed were:

Pessimistic: Most likely it will take until next year until a vaccine is available.

Balanced: It is hard to predict when a vaccine will be available.

Optimistic: A vaccine for the coronavirus might be found soon.

Baseline: A mechanical propulsion that is independent of rocket engines could help lead scientists to many new insights. It is however hard to predict, if and when this will be the case.

The three decision blocks are completed now. You now have an opportunity to earn an additional payment by making a number of predictions.

You are now asked to make predictions about the development of key figures regarding the current pandemic until the 3rd of July 2020 (this is in exactly 60 days). Three participants will be selected randomly for each question and will be paid depending on the accuracy of their predictions. The closer the prediction is to the realized value, the higher the payment will be. You can win up to €20 with your predictions.

Note: Your payment is independent of what other participants predict. You should therefore state the value which you regard as most likely for each figure. For the selection of the winners, only one of your predictions will be considered. Therefore it is not possible to spread your risk across predictions and you cannot win multiple times.

We will use official data of the Robert Koch Institute (RKI) and the German stock exchange to evaluate the predictions.

- What do you think: How many confirmed coronavirus cases will there be in Germany on 3rd July 2020 (in 60 days)? On 3rd of May 2020 the RKI reported 162,496 confirmed coronavirus cases in Germany.
- What do you think: How many confirmed deaths due to the coronavirus will there be in Germany on 3rd July 2020 (in 60 days)? On 3rd of May 2020 the RKI reported 6,649 confirmed deaths due to coronavirus in Germany.
- What do you think: With how many points will the Dax close on 3rd of July 2020 (in 60 days)? On 3rd of May the Dax closed with a value of 10,828 points.

Expectations were elicited with open text boxes.

Think about your personal circumstances in the next weeks. To what extent do you expect things to develop positively or negatively?

Participants had to answer the above question on an 11-point Likert scale: from very negatively (1) to very positively (11).

Think of the upcoming days. How likely is it that ...

- ... you only make trips that are absolutely unavoidable (e.g. to the pharmacy or supermarket)?
- ... you always wear a face mask in the public?
- ... you attend private parties or meet up with more than one person (who do/does not live in the same household)?
- ... you use public transport?
- ... you meet or visit persons who are part of a risk-group for the coronavirus?

Participants had to answer the above question on an 5-point Likert scale: very unlikely (1), rather unlikely (2), indecisive (3), rather likely (4), very likely (5).

How often did you inform yourself about the impacts of the coronavirus in the last days?

Participants had to answer the above question on an 5-point Likert scale: never (1), seldom (2), sometimes (3), often (4), very often (5).

In your opinion, should the current political measures to contain the spread of the coronavirus be loosened or tightened?

Participants had to answer the above question on an 5-point Likert scale: significantly loosened (1), rather loosened (2), neither nor (3), rather tightened (4), significantly tightened (5).

Thank you! Finally, a few questions about you:

- How old are you? [ ]
- Which gender do you identify with? [male / female / diverse]
- What is your subject of studies? (If more than one: Major) [all subjects that can be studied at the University of Cologne]
- What is your highest educational achievement? [No formal degree / Secondary Modern School / Junior High School / A-levels / Master Craftsmen / Bachelor / Diploma or Magister / Master / State Examination / PhD]
- How much money do you have at your disposal monthly? (net) [less than 500 euros / 500 euros - 750 euros / 750 euros - 1000 euros / 1000 euros - 1250 euros / 1250 euros - 1500 euros / 1500 euros - 1750 euros / 1750 euros - 2000 euros / more than 2000 euros]
- Which political party do you identify most with? [CDU-CSU / SPD / AfD / FDP / Die Linke / Bündnis90-Die Grünen / other / none]
- If you were sick with the coronavirus: Do you belong to a group of people with an increased risk of a severe disease? [yes / no / I don't know]

Thank you for your participation in this study. We need the email address of your PayPal account to be able to transfer the money you earned. As soon as the payment is completed, your email address will be deleted. All data will be stored in an anonymous way.

– box to enter email address–

On the next page you will be informed about the exact amount you earned today.

Thanks again for your participation.

As announced, you will earn a guaranteed show-up fee of €2.50. Furthermore, your payment is composed of the following parts:

Out of the three questions about the text you read in the very beginning you answered X questions correctly. This results in an additional payment of €X.

In addition, block X was randomly chosen for your payment. There decision number x was randomly picked to be relevant for you. You decided to X.

Therefore, you will receive a total payment of €X on your PayPal account today and a total payment of €X in exactly 60 days.

The results for the predictions will be published on the 4th of July 2020 on the homepage of the chair for Experimental and Behavioral Economics (https://behavecon.uni-koeln.de). The winners will be paid via PayPal.

If you have questions about the study or your payment please contact harrs@wiso.uni-koeln.de.

Instead of the Xs participants were shown the respective values that applied to them.