



The effect of disinformation about COVID-19 on consumer confidence: Insights from a survey experiment[☆]

Pieter Balcaen^{a,*}, Caroline Buts^b, Cind Du Bois^a, Olesya Tkacheva^c

^a The Royal Military Academy Hobbemastraat 184, 1000 Brussels, Belgium

^b The Vrije Universiteit Brussel Pleinlaan 2, 1050 Elsene, Belgium

^c Prof. Dr. Olesya Tkacheva is Assistant Professor at the Brussels School of Governance Pleinlaan 2, 1050 Elsene, Belgium

ARTICLE INFO

Keywords:

Disinformation
COVID-19
Consumer confidence
Fake news

ABSTRACT

Although the COVID-19 pandemic was accompanied by an infodemic about the origin of the virus and effectiveness of vaccines, little is known about the causal effect of this disinformation on the economy. This article fills in this void by examining the effects of disinformation about COVID-19 vaccines on consumer confidence by means of an original survey experiment in Dutch speaking communities of Belgium. Our findings show that the information set that impacts consumer confidence is much broader than previously assumed. We show that disinformation changes the perception of the effectiveness of vaccines which in turn indirectly impacts the future economic outlook, measured by the metric consumer confidence. Moreover, we find that the above effects are larger for respondents exposed to disinformation that is framed as containing 'scientific evidence' compared to 'conspiracy frames'.

1. Introduction

The COVID-19 pandemic has revived scholarly interest in factors affecting consumer sentiments by providing an unprecedented opportunity to examine the relevance of both macro and micro determinants. The pandemic allowed to study the effect of information on consumer sentiments in a new environment, while at the same time identifying health anxiety as an important, but previously overlooked factor affecting consumer economic outlook. This paper contributes to this rapidly growing literature by examining how consumers reacted to disinformation about the effectiveness of anti-COVID-19 vaccines in the midst of the lockdown in Belgium. Unlike the Great Recession or other economic downturns, the COVID-19 pandemic was accompanied by an infodemic that first spread confusion about the origins and contagiousness of the virus and later questioned the effectiveness and safeness of vaccines. Surprisingly however, very little is known about the impact of this infodemic on consumer sentiments. Our study fills in this void by conducting an original online survey-embedded experiment involving a sample of Belgian consumers who were randomly exposed to a scientifically accurate assessment of vaccine effectiveness and two different treatments containing false information about the effectiveness of anti-

COVID vaccines. The first treatment uses a scientific frame that mimics an academic jargon to question the effectiveness of the vaccine, whereas the second is framed in terms of a conspiracy theory, portraying vaccines as the means to covertly extend state control over the population. We find that both of these frames negatively affect respondents' confidence in the effectiveness of the vaccine which subsequently negatively impacts their economic outlook.

Our study is the first of its kind to bridge public health studies that focus on the impact of disinformation on vaccine acceptance, with the economics literature focusing on the determinants of consumer expectations. In doing so, we generate important policy implications by showing that during times of crises (characterized by increased consumer uncertainty), disinformation can create an additional impediment towards economic recovery. Our analysis shows that the information set relevant for economic expectations encompasses factors outside the economic domain. By increasing uncertainty and anxiety related to public and personal health, disinformation un-anchors economic expectations from the traditional macroeconomic indicators that can be targeted by government policies and/or central bank communication, which subsequently weakens the effectiveness of targeted interventions.

Our second contribution consists in comparing how framing changes

[☆] The study was approved by the Ethics Committee of the VUB, ECHW_268.

* Corresponding author at: Royal Military Academy Belgium.

E-mail address: Pieter.balcaen@mil.be (P. Balcaen).

the effectiveness of disinformation on vaccine hesitancy. The infodemic about COVID-19 flooded the information environment with both conspiracy theories about the man-made origin of the virus and false statements full of references to “scientific” evidence. Although our study falls short of providing causal mechanisms that discuss the cognitive processes triggered by these two manipulations the contribution is important. To the best of our knowledge, there’s only one other study that measures the effect of framing (Loomba, de Figueiredo, Piatek, de Graaf, & Larson, 2021), showing that disinformation that mimics scientific objectivity has a greater negative impact on vaccine hesitancy than other frames.

Throughout this study we will refer to information that distorts scientific knowledge about the vaccine as “disinformation.” The political communication literature differentiates between “fake news”, “misinformation” and “disinformation”, with the latter having a deliberate deception component with the intent to harm (Lazer, Baum, & Benkler, 2018). We use the term “disinformation” throughout the paper to capture the fact that the infodemic surrounding the pandemic had a malign intent.

The article is organized as follows: we begin by reviewing the literature on the effect of the pandemic on consumer confidence and the literature on disinformation (including a focus on the recent use of disinformation during the COVID-19 pandemic) in Section 2, followed by developing hypotheses about the effects of disinformation about vaccine effectiveness on consumer confidence in Section 3. We present our methodology and data collection in Section 4. Section 5 provides an overview of our main findings, followed by a discussion of the implications of our study in Section 6. Section 7 concludes and provides direction for follow-up research.

2. What influences consumer confidence?

Consumer confidence is an important measure of the health of the economy because it captures individual prospective and retrospective evaluations of the state of the national economy and one’s personal financial situation (Katona, 1951, 1975). The literature on consumer confidence generally reveals that it is strongly correlated with the evolution of GDP by acting as a driver of consumer spending (Ludvigson, 2004; Perić & Sorić, 2017) and with other economic and financial variables (Nowzohour & Stracca, 2017).¹ A decrease in consumer confidence can exert a substantial negative effect on the economy because it functions as an intervening variable between numerous pieces of information and the final expenditure decision (Katona, 1951, 1975). It therefore conveys information about future economic behavior (Vuchelen, 2004). A decline in consumer confidence might subsequently lead to a decrease in consumption and the associated increase in savings (Hetsroni, Sheaffer, Ben Zion, & Rosenboim, 2014).²

The pre-pandemic literature has focused on how economic news affects consumer confidence (Vliegenthart, Damstra, Boukes, & Jonkman, 2021). Both observational (Blood & Phillips, 1995; Casey & Owen, 2013; Doms & Morin, 2004; Hollanders & Vliegenthart, 2011) and experimental studies (Damstra, 2019; Vliegenthart et al., 2021) find that

negative news about economic downturns undermine consumer confidence and that a negative tone has a greater impact on consumer confidence than positive reporting (Soroka, 2006). The literature explains this negativity bias either by priming theory (Vliegenthart et al., 2021) or by attention bias, which emerges due to the fact that individuals are generally risk-averse and as such read news about economic downturns with greater interest than news about economic growth. This subsequently increases the negative impact of bad news (Damstra, 2019).

The COVID-19 pandemic reinvigorated scholarly interest in the factors affecting consumer sentiments by providing an opportunity to examine the link between public and personal health concerns and economic expectations (see Table A1 in online annex for summary). Methodological approaches used to study this issue have encompassed big data analysis of Google search trends and Twitter feeds, survey-based observational studies, and survey-embedded experiments. The studies based on big data (van der Wielen & Barrios, 2021) compared Google search trends across the European Union countries and found that the growth of COVID-19 cases and COVID-19 related deaths contributed to the anxiety about the economy and jobs, while content analysis of Twitter feeds related to the post-lockdown plans exhibited cross-cultural differences in the preferred types of activities with individual-centric activities more frequently mentioned by users from individualistic cultures and collective activities by those from community-centric cultures (Pantano, Priporas, Devereux, & Pizzi, 2021). Observational studies based on time series analysis of data from U.S. consumers show that the pandemic contributed to the surge in uncertainty about short-term inflation and greater polarization of consumer expectations between those who perceive pandemics as deflationary and those perceiving it as inflationary without at the same time affecting the expected level of inflation (Apergis & Apergis, 2021; Detmers, Ho, & Karagedikli, 2022).

Others point to the differences in correlation pattern between COVID-19 cases and death vis-a-vis the consumer confidence index and producers’ economic expectations with the former being more pessimistic about the economy than the latter, particularly in Europe as compared to the United States or China (Teresiene et al., 2021). Others still note that the correlation between consumer sentiments and consumer spending was weaker than before the pandemic (Abosedra, Laopodis, & Fakhri, 2021).

Two experimental studies conducted respectively by Binder (2020) and Fetzer et al. (2020) in the United States during the first months of the pandemic are particularly relevant to our analysis because they focus on how consumers react to the information about the severity of the pandemic and the risk of contagion. Binder (2020), using a sample of Mechanical Turk workers, tested how the exposure to the WHO declaration of COVID-19 as a global pandemic affected both the economic outlook and COVID-19 related anxiety and found that the treatment triggered higher health anxiety among participants who do not follow the news frequently, albeit she found no effects of this treatment on the expectations for the economy. Fetzer et al. (2020) test how U.S. consumers respond to the choice of frame about the mortality rates by exposure to different frames about mortality rates of the virus: “5 times lower than for SARS” vs. “20 times higher than for the flu” and find that high mortality frames increased anxiety about both the aggregate and personal economic situations. They also show that consumer sentiments are correlated with different mental models about the vector of contagion. Those consumers who understand the exponential nature of virus diffusion adjusted their economic expectations downward by a greater amount than those who assumed a linear trajectory for the spread of the virus.

Our study extends the above literature by shifting the attention from the effects of accurate information to those of disinformation that deliberately distorts the facts with an intent to harm. Our analysis tests whether and how consumers react to disinformation that was presented using a frame that mimics an academic journal vis-a-vis a more politicized frame of conspiracy theory that has been used by populist parties.

¹ Most of the correlations are contemporaneous or forward-looking. Other studies even go further. Scholdra et al. (2022) for example study how the evolution of consumer confidence impacts consumer’s grocery shopping behavior (both in terms of purchase volume as the shopping basket composition).

² The variables consumption and financial saving are the most frequent studied. Other original research however demonstrates that consumer confidence can have a broader impact on economic behavior. Dhar and Weinberg (2016) for example show that a depressed consumer sentiment is countercyclical to movie attendance. Hampson et al. (2018) find that decreased perceived financial well-being leads consumers to prefer domestic products compared to foreign products.

To the best of our knowledge this is the first study to examine the link between disinformation and consumer sentiments. Our analysis is based on a Belgian sample that allows us to evaluate generalizability of studies conducted in the United States. Unlike the previous two experiments that were conducted during the first months of the pandemic, our study took place almost a year after the first cases were reported in China, resulting in the loss of thousands of lives.

3. Disinformation and Consumer Confidence: A Conceptual Model

The importance of information for determining consumer sentiment has received attention from two strands of the literature: the media effect theory that focused on the link between the content of economic news and economic confidence (Blood & Phillips, 1995; Damstra, 2019; Doms & Morin, 2004; Hollanders & Vliegenthart, 2011; Vliegenthart et al., 2021) and the more recent literature on the inflation expectation that examined how consumers respond to different frames used in official communication about changes in interest rates (Coibion, Gorodnichenko, & Weber, 2022), economic news (Buckman, Shapiro, Sudhof, & Wilson, 2020; Deitrich et al., 2022) or perceptions of other consumers (Bui, Hayo, Nghiem, & Dräger, 2021). Both of these camps implicitly assume that there are no challenges to the accuracy of information received by consumers. However, the current information landscape is loaded with fake news, misinformation, and disinformation which requires paying more close attention to the ways inaccurate information may affect consumer confidence. As noted by the World Health Organization's official during the early phase of the pandemic it was going to "be accompanied by a kind of tsunami of information, but also within this information you always have misinformation, rumors" (Zarocostas, 2020) because an incomplete information environment is particularly conducive to the proliferation of rumors that seek to compensate for the shortage of factual information (Larson, 2020).

The misinformation "tsunami" about COVID-19 has received extensive attention by the rapidly sprawling literature in communication, health sciences, and psychology that focused on (1) which cognitive processes may increase individual susceptibility to false information (Bastick, 2021; Greifeneder, Jaffe, Newman, & Schwarz, 2020; Pennycook & Rand, 2019, 2021; Pennycook, Cannon, & Rand, 2018; Vegetti & Mancosu, 2020), (2) how the social media ecosystem can facilitate the spread of misleading content (Bridgman et al., 2020; Caldarelli, De Nicola, Petrocchi, Pratelli, & Saracco, 2021; Papakyriakopoulos et al., 2021; Yang et al., 2021) and (3) how disinformation impacts individual compliance with government COVID-19 guidelines and willingness to get vaccinated (Dib, Maraud, Chauvin, & Launay, 2021; Kreps & Kriner, 2020; Loomba et al., 2021; Roozenbeek et al., 2020; Wilson & Wiysonge, 2021). A comprehensive discussion of this vast literature has been provided elsewhere (see Melchior, et al., 2021; Rocha et al., 2021). We single out studies that are most relevant to ours.

The content analysis of social media posts related to COVID-19 conducted by Zeng and Schafer (2021) uncovered two most prominent frames: 1) the conspiracy theory claiming that the pandemic was a man-made phenomenon to tighten control over the population; 2) the scientific expertise frame that portrays the pandemic as a hoax and/or questions the effectiveness of vaccines. Given that both types of narratives were prevalent on social media, our experiment allows comparing the effect of each of these frames on consumer confidence by exposing a subset of participants to the treatment that incorporates the conspiracy theory frame and the other that evokes scientific expertise. A priori, however, it is not possible to predict which of these two frames will have a greater effect on the perceptions of the vaccine effectiveness as the vast literature on this topic (reviewed by Aw et al., 2021) is inconclusive. The two most relevant experimental studies are by Loomba et al. (2021) conducted during the early phase of the COVID-19 and by Jolley and Douglas (2014) conducted well before the outbreak of the pandemic. Both studies seek to test for the causal effect of disinformation about

vaccine effects on the willingness to vaccinate by exposing respondents to scientific statements in Loomba et al. (2021) and conspiracy theories in Jolley and Douglas (2014). Loomba et al. (2021) find that misinformation references to "scientists" had a greater negative impact on the willingness to vaccinate than other wordings, whereas Jolley and Douglas (2014) show that conspiracy theories had a negative impact on the intent to vaccinate, compared to the statement that refutes anti-vaccine conspiracies. Neither of these two studies, however, discusses the respective causal mechanisms that could lead to the differences in the effect size of these two frames.

Other relevant studies are Pomerance, Light, and Williams (2020) and Cavazos (2019), focusing on the effect of misinformation on uncertainty³ and its subsequent effect on consumer behavior. Pomerance et al. (2020) find that the exposure to misinformation regarding COVID-19 increases uncertainty, which subsequently leads to: (1) resource conservation and (2) compensatory consumption, where the effect of uncertainty on spending intentions varies with income.⁴ Cavazos examines the economic costs stemming from disinformation.⁵ Our experimental design capitalizes on the above findings, as well as on the growing consensus in the consumer behavior literature that the pandemic increased uncertainty about macroeconomic trends (Apergis & Apergis, 2021; Detmers et al., 2022; Dietrich, Kuester, Müller, & Schoenle, 2022). Disinformation about the effectiveness of anti-COVID-19 vaccines is hence particularly relevant in this context. If the vaccine is not working properly, the virus prevents people from going to work and depresses consumer-spending intentions. This in turn has an effect on uncertainty surrounding future income and the degree of unemployment, which have been proven to be key determinants of consumer confidence (Vuchelen, 2004).

This causal mechanism is presented in Fig. 1. The effectiveness of informational manipulation depends on the individual cognitive ability and willingness to question the credibility of disinformation. Individuals who accept disinformation as factually correct change their perception of vaccine effectiveness, become more pessimistic about the future, and subsequently adjust downward their economic outlook; whereas the economic outlook remains unchanged if an individual does not find the disinformation credible. This gives rise to the following hypothesis:

H1: Disinformation questioning vaccine effectiveness will negatively affect the individual perception of the effectiveness of the vaccine (cognitive filtering phase).

As we will discuss further in Section 4.4, the economic outlook in Fig. 1 encompasses both assessments of one's personal (the so-called egotropic evaluation) as well as the aggregate macroeconomic situation (i.e. the sociotropic evaluation). Although there is a convention in the consumer confidence literature to treat the social and personal component as complementary and linear additive, there is a growing empirical evidence that the relation between them is more nuanced. When it comes to the link between consumer confidence and consumption, confidence about personal finances serves as a mitigating

³ Based on answering two questions: (1) "How worried are you about the coronavirus" and (2) "How afraid are you that you or someone close to you will get infected with the coronavirus".

⁴ Pomerance et al. (2020) did not expose participants to disinformation but showed them an infographic with the title 'Fake news: more common than ever'. Participants then indicated how uncertain the infographic made them feel about information stemming from 6 news sources. Our study measures the effect of 'actual' articles containing disinformation. Moreover, we rely on the variable 'Consumer confidence' to measure increased uncertainty stemming from disinformation (whereas Pomerance looks at the impact of fake news on saving and spending behavior). Our approach is hence original.

⁵ Cavazos (2019) estimates the economic damage stemming from 'fake news' globally amounting to \$78 billion. He focuses on the impact of 'fake news' on stock markets, the loss of faith in democratic institutions which in some cases even leads to violence, reputational costs on big brands and the resources spent to tackle the problem.

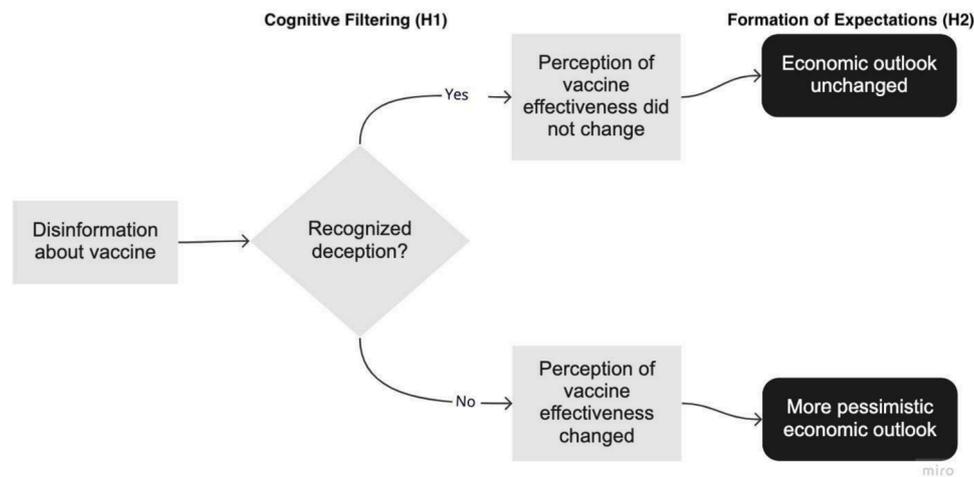


Fig. 1. The effect of disinformation on the perception of vaccine effectiveness and economic outlook. Source: created by the authors.

factor connecting confidence about aggregate economic situation with consumption. The more empowered consumers feel about their personal financial situation, the stronger the link between confidence in the aggregate economy and their consumption (Hampson, Gong, & Xie, 2021). In addition, when it comes to coping with price shocks that increase the relative price of foreign to domestic brands, consumer confidence in the national economy conditions the ways in which they deal with deteriorating personal financial situations (Hampson et al., 2018). Consumers (and their degree of consumption) respond differently to the changes of the macroeconomic vis-a-vis their personal situation (Scholdra, Wichmann, Eisenbeiss, & Reinartz, 2022).

In the light of these studies, we separately examine the effect of disinformation on egotropic vs. sociotropic confidence. Consumer expectations depend on prior experiences and the amount of information. The media dependency theory shows that the effects of economic news are greater when the audience lacks first-hand experience with the issue which increases individual dependency on the media as the source of information (Vliegthart et al., 2019, Jonkman, Boukes, & Vliegthart, 2020) which leads to an uneven effect of economic news on the 'sociotropic' and 'egotropic' evaluation of the economy (Jonkman et al., 2020; Scholdra et al., 2022; Svensson, Albaek, van Dalen, & de Vreese, 2017). Economic news is more likely to influence sociotropic evaluations because individuals can evaluate the evolution of the personal situation, better than the state of the economy in the country (Boomgaarden, van Spanje, Vliegthart, & de Vreese, 2011; Damstra, 2019).

Following the above literature we expect sociotropic confidence to be more sensitive to disinformation about vaccines because consumers are better informed about their own financial situation and own health risks than about herd immunity and the aggregate economy. They should be able to better anticipate future personal financial situations compared to the expectations about the aggregate economy. As such, we expect that sociotropic expectations will be more sensitive to disinformation:

H2: Disinformation about the effectiveness of the vaccine will undermine consumer confidence, and its effect will be greater for sociotropic than for egotropic measures of consumer confidence (formation of expectations phase).

4. Methodology

4.1. Interventions

We conducted a survey experiment in Dutch speaking communities of Belgium in December 2020 well before the approval and distribution of vaccines.⁶ Respondents were randomly assigned to two treatments and a control group. All participants were asked to read a short article about anti-COVID-19 vaccines without any attribution to the source (see Online Appendix B for the texts). The control article (treatment A) comes from *De Tijd*, a respected Belgian journal. It discusses the effectiveness of the vaccine and provides a timeline for its distribution in Belgium.

To find articles with disinformation about COVID-19, we first used the European External Action Services disinformation dashboard (www.euvsdisinfo.eu), which contains an extensive database of fake news and corresponding counter messages. We obtained 98 articles (all in English) pertaining to COVID-19 that targeted the EU audience at large. We then selected those articles with the conspiracy frame that was widely disseminated in online sources. It states that the vaccines contain nanochips and are used by a so-called 'deep state' to create a new world order. The article was translated into Dutch by three different native speakers to ensure that the content is accurately conveyed.

For the scientific frame we selected a Dutch-written article that was circulated shortly before we launched our survey locally in Belgium. The article was distributed in Leuven (a large city in Belgium) by 'antivaxers' (De Prikkrant, 2020) and questions the effectiveness of the vaccines, warning that the vaccine might even aggravate the health crisis. The article and its content was afterwards explicitly labeled as disinformation⁷ by experts in the field. The article contains a mix of facts and erroneous statements, including references to 'scientists'. The wording of each of the treatments is provided in Appendix B.

4.2. Experiment design

We used Qualtrics software and embedded our experiment into an online survey. After asking respondents several background questions, they were asked to read one of the three articles. The software monitored the time respondents dedicated to reading the article to ensure that the treatment was administered properly. After completing the article the question about the effectiveness of the vaccine was presented: "Do you

⁶ The study was approved by the Ethics Committee of the VUB, ECHW_268. .

⁷ We also label this article as disinformation, following the specific intent of the authors to sow confusion and to deceive their target audience.

think that vaccines will protect us?”, followed by four questions related to the expectations about the economic situation in Belgium and respondents’ personal financial situation. For ethical reasons, respondents received a notification at the end of the survey, stating that they were potentially exposed to ‘fake news’. They were also allowed to opt out of the survey at any time or skip questions.

4.3. Sample

Our target population consists of Dutch speaking Belgian residents. We used snowball sampling and disseminated the survey via email, Facebook, and other social media platforms. In total, 927 participants started the survey, 9 of them refused to sign the ‘consent to participation form’ and 102 did not complete the entire survey and were subsequently dropped from the sample. In addition, to ensure that respondents were actually exposed to the manipulation we measured the time they took to read the article,⁸ which allows us to evaluate how carefully the respondents read the article. We remove observations for which this reading time was unrealistically short,⁹ indicating that the respondents had not or only partially read the article. This resulted in a final sample of 705 observations.

There were no significant differences between the three groups according to gender, age, income and level of education.¹⁰ Overall, our respondents are relatively well educated¹¹ (secondary degree at most: 26.67%, undergraduate: 35.18% and graduate degree: 38.16%). The Belgian Dutch speaking community is however generally well educated: about 50% of the population holds an undergraduate or higher degree. Details regarding the composition of our sample can be found in Table A2 of Online appendix C.

4.4. Dependent Variables

Consumer confidence is our ultimate variable of interest to measure the effect of increased uncertainty about the effectiveness of the vaccine on the respondents’ expectations regarding the economy. Our operationalization of this construct mimics the approach used by the National Bank of Belgium¹² (see Online Appendix D for more details) that uses four questions¹³: (1) What are your perspectives regarding the economic situation in Belgium for the coming 12 months, (2) what are your perspectives regarding the degree of unemployment in Belgium for the coming 12 months, (3) what are your perspectives regarding the financial situation of households for the coming 12 months and (4) what are your perspectives regarding households saving potential for the coming 12 months. Questions 1 and 2 refer to the evolution of the national economy (the before-mentioned ‘sociotropic’ evaluation of the economy), whereas question 3 and 4 refer to the evolution of the personal financial situation (i.e. the ‘egotropic’ evaluation).

Our approach is slightly different from other studies. Whereas the composite measure ‘consumer confidence’ is normally obtained by calculating the arithmetic mean of the seasonally adjusted average

⁸ As stated by Bado et al. (2020), more time for ‘deliberation’ improves the extent to which respondents can discern the difference between true and false news.

⁹ Respondents who spent less than 10 seconds reading the article were dropped.

¹⁰ Using Kruskal-Wallis tests, we find no significant differences between our three groups according to age: $\chi^2(2, 705) = 0.768$, $p = 0.7128$; gender: $\chi^2(2, 705) = 0.370$, $p = 0.8312$; level of education: $\chi^2(2, 705) = 2.121$, $p = 0.3463$ and income: $\chi^2(2, 705) = 0.660$, $p = 0.7189$.

¹¹ A large number of observations stemming from ‘lower’ educated respondents was removed when controlling for reading time.

¹² The methodology for measuring consumer confidence in the European Union has been harmonized by the European Commission.

¹³ Until 2001, consumer confidence was measured based upon 5 questions. This composition was changed by the European Commission.

group responses to the four questions, we use the four above-mentioned questions as separate dependent variables. The reason is as follows: weighted averages are normally calculated for each question, resulting in an assessment of the economy on a group level. To obtain a sufficiently large dataset, most of the studies are therefore collecting a time series dataset. Our dataset, on the contrary, was collected during a single month, resulting in a cross-sectional dataset. We hence would only be able to calculate the consumer confidence of the three groups (i.e. the control group and the two groups exposed to disinformation), as we also do in Section 6.1. In order to increase our sample size, we were therefore obliged to use each individual’s assessment of the four separate questions. This conceptual approach has its benefits. Rather than considering consumer confidence as a unidimensional construct, we contribute to recent literature (Hampson et al., 2021; Scholdra et al., 2022) that strives to study consumer confidence in a more granular way. The internal consistency between the four questions in our sample is low (Cronbach’s $\alpha = 0.6315$) which suggests that the perceptions (corresponding with the four separate questions) are influenced by different factors, hence supporting the use of the four separate questions.¹⁴

Trust in the vaccine is our second variable of interest. As explained before, the assessment of the effectiveness of the vaccine might mediate the indirect relationship between being exposed to disinformation and a more depressed consumer confidence. Vaccine effectiveness is measured by means of the following question: “Do you think the vaccine will protect us?” with the answers measured using a seven-point Likert scale (from 1 “very unlikely” to 7 “very likely”).

4.5. Control Variables

Credibility of the article. In order to test whether the respondents recognized the deception (see Fig. 1), we asked to assess the credibility of the article at the end of the questionnaire, using a seven-point Likert scale (1 “Completely unbelievable” to 7 “Completely credible”). Evaluating the extent to which individuals can discern the difference between true and false contents is in line with Pennycook and Rand (2019), Bado et al. (2020) and Zimmermann and Kohring (2020).

Concerns about the virus. Before exposing the respondents to the treatment articles, we measured the extent to which they were concerned about the virus by asking them the question: “how worried are you about the virus” (Pennycook, 2020) using a seven-point Likert scale (1 “not at all worried” to 7 “extremely worried”). In addition, we included a question to test the respondents’ objective knowledge regarding the epidemiological situation in the country: “What is the current number of daily deaths due to COVID-19 in Belgium?” This question was transformed into a dummy variable, with people answering “over 500 deaths” being labeled as having a lack of objective knowledge because this number overstated by 10 times the official statistics.

Trust in media, government and science. As recently demonstrated by Zimmermann and Kohring (2020) and Pomerance (2020), trust in media and politics could explain the belief in disinformation. Similarly, Roozenbeek et al. (2020) find that a higher trust in scientists is associated with a lower susceptibility to disinformation about COVID-19. We measure the trust in media, the government, and science, respectively, using seven-point Likert scales (1 “I do not trust them at all” to 7 “I completely trust them”).

¹⁴ Moreover, the correlation matrix (see appendices, Table A3) shows that the correlation between the four questions used to calculate the metric ‘consumer confidence’ is low.

Table 1
Aggregated Differences Across Groups in Consumer Confidence.

	Economic situation Belgium (1)	Unemployment in Belgium (2)	Financial situation households(3)	Saving potential households(4)	Indicator Consumer Confidence(5)
Control Group (N=229)	-14.19	39.51	-7.86	42.58	15.01
Conspiracy Frame (N=240)	-17.91	41.88	-7.92	40.42	14.12
Scientific Frame (N=236)	-19.29	44.49	-11.24	33.27	11.81

Note: Columns 1–4 contain the average group responses to the four standard questions (by using the formula in Online Appendix D) used to calculate the variable ‘consumer confidence’, which can be found in column 5 (obtained by taking the arithmetic mean of column 1–4). Source: own calculations based on survey results.

We use socio-demographic control variables that have been validated in previous studies focusing on consumer confidence (e.g. the official questionnaire used by the European Commission; Pomerance, 2020) and studies analyzing the effects and credibility of disinformation (Bail et al., 2019; Loomba et al., 2021; Roozenbeek et al., 2020; Zimmerman & Kohring, 2020). These include 1) gender; 2) a categorical age variable; 3) a dummy variable assessing the respondent’s level of education (with a value of ‘one’ representing respondents that enjoyed higher education, i.e. a Bachelor degree or higher); 4) the income group in which the respondent is located; 5) the extent to which the respondent has suffered a loss of income as a result of the COVID-19 crisis (Pomerance, 2020); and 6) the household composition (number of household members and number of these members at work).

5. Results

5.1. Descriptive analysis

We visualized the different answers across groups for the questions ‘credibility of the article’, ‘will the vaccine protect us’ and the four questions on consumer confidence in Figure A2 in Appendix C. We begin by examining how the respondents assessed the article across the three groups, i.e. the variable ‘Credibility of the article’. More than half of the respondents in the control group assessed the article as ‘rather credible’ or ‘credible’. The numbers are substantially lower for the conspiracy frame, only 20 percent of the respondents exposed to the conspiracy frame perceived the article as ‘credible’. Remarkably, 20.9% of the respondents had difficulties in assessing the article as ‘incredible’, despite the ‘obvious’ presence of erroneous statements. The respondents in the group presented with the scientific frame had difficulties with determining the credibility of the article: about one third of the sample believed the article, another one third selected ‘neither uncredible, nor credible,’ and the other one-third selected ‘rather credible’ or ‘credible.’ Using a Kruskal-Wallis test followed by Dunn’s pairwise comparison, we find these differences between the perceived credibility of the article to be significant.¹⁵

We subsequently analyze how the different groups perceived the vaccine effectiveness. The number of respondents assessing the vaccine effectiveness as ‘likely or very likely’ is slightly lower in the group exposed to the conspiracy frame (60.8 %) compared to the control group (62.8%), but substantially lower in the group exposed to the scientific frame (50%). A Kruskal-Wallis test followed by Dunn’s pairwise comparison again shows that the differences in terms of perceived vaccine efficacy between the three groups are significant.¹⁶ Finally, we compare cross-group differences in consumer confidence, using the official methodology used to calculate the metric ‘consumer-confidence’ (discussed in Online Appendix D). The values for the aggregate measure of consumer confidence are reported in Table 1. Column 5 indicates that respondents exposed to the treatment based on the conspiracy frame are

only slightly more pessimistic (-5.95%)¹⁷ than the respondents in the control group. However, the consumer confidence indicator is 21.34% lower for the group exposed to the treatment based on the scientific frame compared to the control group, indicating that the group exposed to the scientific frame is substantially more pessimistic regarding the future evolution of the economy.¹⁸ As column 4 reveals, especially the prospects regarding the households’ financial situation (i.e. the egotrophic evaluation) seem to be substantially more pessimistic (-43%)¹⁹ for those exposed to the scientific frame.

More descriptive statistics (Mean and Standard Deviation of all variables), cross-group comparison of means,²⁰ and a correlation matrix are presented in appendix C. The correlation matrix in Table A3 of the online Annex C indicates that the variable ‘credibility of the article’ is significantly negatively correlated with the variable ‘will the vaccine protect us’. Moreover, there is a significant negative relation between the dummy variable ‘scientific frame’ and the perceived effectiveness of the vaccine. However, the relationship between the variable ‘conspiracy frame’ and the variable ‘will the vaccine protect us’ is, remarkably, not significant. Furthermore, there appears to be a significant negative relation between the variable ‘will the vaccine protect us’ and the four underlying variables of consumer confidence.

5.2. Regression analysis

We start by examining the impact of how disinformation is framed on the perception of vaccine effectiveness (H1). Since our dependent variables are measured on ordered scales we use ordered logistic regressions.²¹ Table 2 reports odd ratios from the logistic regression with ‘do you think the vaccine will protect us’ as the dependent variable.²² Odds ratios (OR) indicate the change in the probability of observing outcome j , relative to outcome $j-1$, with respect to one unit change in the explanatory variable. OR between 0 and 1 indicate that the relative probability declines, and OR greater than one, that the probability

¹⁷ computed as $[100 \times (14.12-15.011)/15.011]$

¹⁸ $(100 \times [(11.807-15.011)/15.011])$

¹⁹ $100 \times [-7.885+11.235]/(-7.855)$

²⁰ Figure A1 in the online Annex C compares the mean values of the individual components of the consumer confidence across the treated and control groups. The respondents who were exposed to the scientific frame on average have more negative economic outlook than those who were exposed to the conspiracy frame and the control group. These differences are not statistically significant because the 95 percent confidence intervals overlap. Thus, without controlling for other variables, the link between the economic outlook and the framing of disinformation cannot be established. Therefore, we carry out the regression analysis in the following section.

²¹ The conditions for this estimation method are fulfilled, following testing for ‘the proportionality of odds assumption’ (Williams, 2016).

²² Online Appendix E contains two alternative estimations. We first estimated the model by means of OLS, to give a preliminary (and more comprehensible) interpretation of the results (Table A4). Moreover, we also estimated the ordered logistic regression model, presenting the estimation results by means of coefficients (Table A6).

¹⁵ $\chi^2(2, 705) = 274.468, p=0.0001.$

¹⁶ $\chi^2(2, 705) = 10.557, p=0.0034.$

Table 2
Estimated Odds Ratios of the Effect of Disinformation on the Perception of Vaccine Effectiveness (H1).

Dependent variable: 'Will the vaccine protect us'		
	OR	SD
Risk-patient	1.373	0.267
Correct estimation casualties	0.809	0.156
Trust in scientists	2.313***	0.131
Male	2.470***	0.371
Age (base: 18–29)		
30–49	1.112	0.216
50–64	1.145	0.254
>65	1.324	0.441
Higher educated	1.486**	0.244
Trust news	1.346***	0.096
Perceived credibility of article	0.839***	0.050
Conspiracy Frame	0.605**	0.139
Scientific Frame	0.515***	0.092
Mc Fadden pseudo R ²	0.162	
Log Likelihood	-926	
p (χ ²)	0.000	
Observations	699	

Note: *** p<0.01, ** p<0.05, * p<0.1. OR values represent the odds ratios from the ordered logistic regression model with the dependent variable “Do you think the vaccine will save us?” and the answer categories ranging from 1 for “very unlikely” to 6 “very likely.” Source: own calculations based on survey results.

increases.

The results show that the variable ‘perceived credibility of the article’ has a significant and negative effect on the trust respondents have in the vaccine (OR=0.84, SE=0.05), i.e. the more credible the article is perceived, the less likely the respondent will agree with the statement that the vaccine will protect us. The model contains two dummy variables for the scientific and the conspiracy frames. Both treatments have a significant and negative effect on the perception of vaccine effectiveness, albeit with the conspiracy frame having a smaller effect than the scientific frame. All other factors held constant, exposure to the conspiracy frame leads to a 39.5 % decrease in odds (i.e., 1-OR=1-0.605, SE= 0.1391) of trusting the vaccine. This effect is even stronger for those exposed to the scientific frame, leading to a 48.46 % decrease in odds (i.e., 1-OR= 1-0.5154, SE= 0.0915) to indicate they trust the vaccine, all other factors held constant. As hypothesized, these results confirm our first hypothesis, demonstrating that exposure to disinformation that questions the vaccine generally reduces the likelihood to consider the vaccine as sufficiently effective to protect us, with the scientific frame having a larger effect than the conspiracy frame. Respondents who consider themselves as being a risk patient, that have a higher trust in scientists,²³ that are male, that have a higher level of education (Bachelor degree or higher) and have a higher trust in the news are generally more confident that the vaccine will protect them.

Now we test whether the uncertainty about the vaccine also impacts respondents’ perceptions regarding the further evolution of the economy as discussed in H2. As stated before, consumer confidence constitutes a metric that provides an indication of future economic prospects on the group level. As we cannot use the composite variable to examine effects on the individual level, we analyze the impact of exposure to

²³ Since we find a strong degree of multicollinearity, we only include the variable ‘trust in scientists’ in this model, given that the development of a vaccine and its efficacy is a prime responsibility of scientists. We include the variable ‘trust in the government’ when we look at respondents’ perceptions regarding the evolution of the economy, given that the government is mainly responsible for taking measures to sustain our economy.

disinformation on each separate question. The results (in odds-ratio) are reported in Table 3.²⁴

The ‘trust in vaccine’ variable has an OR lower than 1 in the models with the ‘evolution of economy’, ‘evolution of financial situation’ and ‘evolution of saving potential’ as dependent variables. Higher values for these variables correspond to the worsening of the future economic outlook. OR lower than 1 indicated that the odds of observing the most extreme negative outcome relative to less negative outcomes declines as the respondents become more confident in vaccine effectiveness. The magnitude of these ORs is similar for both sociotropic and egotropic variables. The variable ‘unemployment’ is reversely coded (a higher value corresponds with a lower degree of unemployment). An OR above 1 hence implies that a one-unit increase in perceived effectiveness of the vaccine leads to higher odds of respondents expecting unemployment to decrease. As hypothesized, a higher perceived vaccine efficacy thus increases the likelihood to assess the evolution of unemployment more positively. These four sets of correlations point to the indirect negative effect of disinformation on consumer confidence.

When it comes to the direct effects of disinformation (the dummy variables ‘conspiracy frame’ and ‘scientific frame’) on consumer confidence, the direction of the relationship is consistent with H2, but the coefficients are not statistically significant. Hence, after controlling for the perception of the vaccine effectiveness, respondents in either of the two treatment groups do not register a lower confidence in the future course of the economy or their own financial situation. Our ordered logistic regressions do not indicate that exposure to disinformation exerts a significant effect on the way our respondents assess the evolution of the state of the economy, neither for the questions assessing the sociotropic evaluation nor for the egotropic evaluations after accounting for the effects of disinformation about the effectiveness of the vaccine.

This outcome could be due to the fact that the link between the public health domain and the economic domain is indirect. When consumers are forming expectations about the economy they do not integrate public health risks into their economic outlook, unless these risks have clear economic implications. Greater uncertainty about the magnitude of the economic effects of health risks subsequently translates into greater uncertainty or even negative expectations about the economic outcomes. The uncertainty about health risks is captured by the perceptions of the vaccine effectiveness. And thus, after it is accounted for, there is no direct effect from the public health domain to the economic realm.

We conduct two robustness checks. First, we create a composite variable that measures the sociotropic evaluation of the economy, averaging the values for ‘evolution of the economy’ and the reversed coding of ‘evolution of unemployment’. This composite variable did not lead to different results. Second, we jointly estimated the four regressions (a Seemingly Unrelated Regression model). This also confirms our previous results.

Our estimations show an interesting difference in significance of our control variables, depending on whether we are looking at the socio-tropic or the egotropic evaluation of the economy. Respondents who perceive themselves as being a risk patient are 20% more likely to have negative outlook about household financial situation and 10% more likely to have a negative outlook about the saving potential. This variable is not significant in the sociotropic model. This might be associated with a fear of losing income due to (future) illness or having to close down one’s own business for respondents who perceive themselves in the risk category. Female respondents and those who have higher education have a significant lower confidence in the future evolution of the

²⁴ Online Appendix E contains two alternative estimations. We first estimated the model by means of OLS, to give a preliminary (and more comprehensible) interpretation of the results (Table A5). Moreover, we also estimated the ordered logistic regression model, presenting the estimation results by means of coefficients (Table A7).

Table 3
The Effect of Exposure to Disinformation on Consumer Confidence (H2).

	1.Evolution economy		2.Evolution unemployment		3.Evolution financial situation		4.Evolution saving potential	
	OR	SD	OR	SD	OR	SD	OR	SD
Concern about virus	0.976	0.056	1.034	0.059	1.219***	0.078	1.108*	0.066
Will the vaccine protect us	0.784***	0.046	1.167***	0.068	0.839***	0.055	0.809***	0.048
Trust government	0.683***	0.038	1.292***	0.071	0.754***	0.048	0.848***	0.050
Male	0.661***	0.101	1.415**	0.216	0.930	0.167	0.853	0.138
Age (base: 18–29)								
30–49	1.359	0.269	0.861	0.172	1.099	0.257	2.052***	0.458
50–65	1.726**	0.381	0.571**	0.127	1.959***	0.501	3.807***	0.920
>65	1.178	0.365	0.491**	0.155	1.591	0.590	7.492***	2.496
Higher educated	1.642***	0.275	0.689**	0.117	1.117	0.217	0.766	0.131
# Household at work	0.972	0.086	0.967	0.089	0.832*	0.089	0.948	0.086
Income	0.894	0.092	1.108	0.115	0.698***	0.085	0.620***	0.066
Income affected	1.255***	0.098	0.775***	0.059	2.165***	0.192	2.007***	0.159
Credibility article	1.002	0.061	0.983	0.0560	1.008	0.068	1.090	0.067
Conspiracy Frame	1.105	0.264	0.832	0.202	1.204	0.326	1.398	0.340
Scientific Frame	1.007	0.180	0.951	0.171	1.091	0.228	1.237	0.230
Mc Fadden pseudo R ²	0.082		0.051		0.140		0.151	
Log likelihood	-936		-899		-597		-726	
p (χ ²)	0.000		0.000		0.000		0.000	
Observations	685		685		685		685	

Note: *** p<0.01, ** p<0.05, * p<0.1. OR values represent the odds ratios from four ordered logistic models with corresponding dependent variables: “How do you think the economic situation in Belgium is and how will it evolve generally” with 1 corresponding to “obviously getting better” and 5 to “obviously getting worse”; “How do you think unemployment in Belgium will develop in the next twelve months? In your opinion, the number of unemployed will” with answers ranging from “clearly increase” (1) to “clearly decreased” (5); “What are your expectations for your household financial situation for the next twelve months? In the next twelve months it will” with answers ranging from “clearly improve” (1) to “obviously deteriorate” (5); Do you expect to save money in the next twelve months?”, with answers ranging from (1) “yes for sure” to “definitely no” (4). Columns 1 and 2 are associated with the sociotropic evaluation of the economy, whereas columns 3 and 4 are associated with the egotropic evaluation of the economy.
Source: own calculations based on survey results.

economy. These variables do however not play a role when assessing one’s egotropic evaluation of the economy. The level of income does not play a role in the sociotropic evaluation but has a positive and significant effect on the egotropic evaluation of the economy, i.e. the higher the income the higher the confidence in one’s evolution of the personal financial situation. The trust in government and the extent to which one’s income has been affected by the crisis have a significant effect on the four variables of consumer confidence. A higher trust in the government leads to an increased confidence in the evolution of the economy, whereas people that suffered income losses during the COVID-19 crisis evaluate the economy in a more pessimistic way.

6. Discussion and limitations

The increasing presence and use of disinformation is a reason for concern, especially in light of the current pandemic. Our study contributes to this discussion in the following ways. First, we demonstrate that disinformation containing a mix of scientific facts and erroneous statements is perceived as more credible than a conspiracy theory frame. Our respondents clearly encounter difficulties in distinguishing between the factually correct information from disinformation when exposed to a scientific-sounding frame. Second, our results confirm our first hypothesis, i.e. being exposed to disinformation questioning the effectiveness of vaccines affects the extent to which respondents believe that the vaccine will protect them, with the scientific frame exerting a greater effect (1-OR=1–0.515) than the conspiracy frame (1-OR=1–0.605). These results are in line with the findings of [Lomba et al. \(2021\)](#) and [Iyengar and Massey \(2019\)](#) who show that the scientific frame is more persuasive. Third, our study provides strong evidence for the link between the anxiety about health and economic expectations suggesting that the factors affecting economic outlook encompass a wider set of factors than economic indicators. It remains to be seen whether this is uniquely due to the COVID-19 pandemic or a permanent feature of the consumer decision-making process.

Fourth, we examine whether the uncertainty created by disinformation has a uniform effect on different measures of consumer

confidence. At the aggregate level, i.e. the consumer confidence index computed by means of the official methodology, we found a substantial decline across the four components of the index. The magnitude of the effect is again correlated with the perceived credibility of the article, the effect being the largest in the group exposed to the scientific frame (-21.34%). Ordered logistic regressions, measuring the impact of disinformation on consumer confidence at the individual level (i.e. looking at the effect on the four individual questions used to calculate the composite metric consumer confidence), points to mixed results. Uncertainty about vaccine effectiveness undermines consumer confidence, whereas disinformation narratives are not significant. This points to the limited spillover effects of a particular narrative across issues. Finally, our results show the positive effect of trust in the government, scientists and the news on the dependent variables ‘trust in the vaccine’ and ‘consumer confidence’. Maintaining and increasing trust in these agencies and actors is therefore of great importance and can act as a bulwark against disinformation.

Our research is however not without limitations. First, our respondents are only exposed once to an article containing disinformation. This is however in line with recent research in the domain of mis/disinformation ([Pennycook, 2020](#); [Pomerance, 2020](#); [Lomba et al., 2021](#); [Roozenbeek et al., 2020](#)). Moreover, [Bastick \(2021\)](#) recently demonstrated how even short exposures to disinformation have the potential to significantly modify the unconscious behavior of individuals. Follow-up research should find out whether an indirect cognitive effect on other variables can be found, when respondents are repeatedly exposed to disinformation. As indicated by the Persuasion Knowledge Model of [Friestad and Wright \(1994\)](#) an individual’s knowledge on persuasion and hence also on disinformation develops over time. Hence, it would be interesting to see how these “disinformation knowledge” progresses contingently and how this effects the impact on perception and behavior. In this context, the impact on a wide range of variables (other than consumer confidence) could also be examined. Second, our sample contains a relatively high number of highly educated respondents. This poses no problem since there is no significant difference between the sample composition of our control group and the two

treatment groups. This comment is even worrying, given that highly educated (or people with greater cognitive reflection, measured by analytic tests) are in general found to be less susceptible to disinformation, misinformation and conspiracy theories (Martel, Pennycook, & Rand, 2020; Pennycook, 2020; Van Prooijen, 2016). Future research, in which less educated respondents are well represented may therefore yield even stronger results. Third, our survey was distributed among the Dutch speaking communities in Belgium. Future research, including the French speaking, the German speaking communities and other countries might reveal interesting insights. Finally, our research assumes an information mechanism which hypothesizes that future economic prospects are associated with news about the success of the vaccine. Within the economic literature, future research can examine the effect of other narratives that are frequently the subject of disinformation and that might even more impact the way we make forecasts about the economy. This is of great importance as the literature discussed in Section 2 demonstrates that there is a clear (empirically tested) relationship between consumer confidence and the real economy. Disinformation, or other types of news that succeed in affecting this variable could hence have real economic consequences.

7. Conclusion

Our analysis provides important insights into the interdependencies between public health and the state of the economy by underscoring the multifaceted nature of disinformation, showing that it could trigger reactions about health risks that spill over to the economic domain. We demonstrated that both scientifically sounding disinformation and conspiracy theory frames affect perceptions of vaccine effectiveness, and that this variable subsequently affects consumer confidence.

The interdependence between public health and economic domains, which are usually perceived as orthogonal but brought to the foreground by our analysis, suggests several fruitful venues for future research. First, it underscores the need for greater scrutiny of the assumptions about the relevant information set on which individual decision-making processes are based. Weaponization of information by authoritarian regimes, politicization of the truth by populist governments, and commodification of attention by social media platforms make the current information environment very different from the one when the foundations of the media effects theory were laid. As such, the studies of consumer expectations should pay greater attention to the process unleashed by these transformations and implications these changes have for the decision-making processes.

The second fruitful venue could be to explain interdependencies across issues. The studies of consumer confidence have focused on the link between the economic news and economic outlook, while leaving exposure to information in other policy areas intact. Our study demonstrates that a more comprehensive model of how individuals convert information from multiple domains into exceptions about the future of the economy could be a productive venue for the media effects theory.

A final line of effort could focus on the causal mechanisms that make some frames more persuasive than others and why. This could be caused by the differences in emotional stimulation between the frames which subsequently impacts the negative and positive economic outlook. It could be the case that the readers perceive articles with positive economic forecasts as more emotionally natural than the articles with negative forecasts. This emotional component could consequently be responsible for asymmetric effects.

Declaration of Competing Interest

No potential conflict of interest was reported by the authors.

Data availability

Data will be made available on request.

Acknowledgment

The authors would like to thank the anonymous reviewers for providing helpful feedback on the earlier draft of the manuscript.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.socsec.2022.101968.

References

- Aboosedra, S., Laopodis, N. T., & Fakhir, A. (2021). Dynamics and asymmetries between consumer sentiment and consumption in pre-and during-COVID-19 time: Evidence from the US. *The Journal of Economic Asymmetries*, 24, 1–11. <https://doi.org/10.1016/j.jeca.2021.e00227>
- Apergis, E., & Apergis, N. (2021). Inflation expectations, volatility and Covid-19: Evidence from the US inflation swap rates. *Applied Economics Letters*, 28(15), 1327–1331.
- Bastick, Z. (2021). Would you notice if fake news changed your behavior? An experiment on the unconscious effects of disinformation. *Computers in Human Behavior*, 116, 1–12. <https://doi.org/10.1016/j.chb.2020.106633>
- Binder, C. (2020). Coronavirus fears and macroeconomic expectations. *Review of Economics and Statistics*, 102(4), 721–730. https://doi.org/10.1162/rest_a_00931
- Blood, D. J., & Phillips, P. (1995). Recession headline news, consumer confidence, the state of the economy and presidential popularity: A time series analysis 1989-1993. *International Journal of Public Opinion Research*, 7(1), 2–22.
- Boomgaarden, H. G., van Spanje, J., Vliegthart, R., & de Vreese, C. H. (2011). Covering the crisis: Media coverage of the economic crisis and economic expectations. *Acta Politica*, 46(4), 353–379.
- Bridgman, A., Merkley, E., Loewen, P. J., Owen, T., Ruths, D., Teichmann, L., & Zhilin, O. (2020). The causes and consequences of COVID-19 misperceptions: Understanding the role of news and social media. *Harvard Kennedy School (HKS) Misinformation Review*, 1(3), 1–18. <https://doi.org/10.37016/mr-2020-028>
- Buckman, S. R., Shapiro, A. H., Sudhof, M., & Wilson, D. J. (2020). News sentiment in the time of COVID-19. *FRBSF Economic Letter*, 8(1), 5–10. <https://www.frbsf.org/w-p-content/uploads/sites/4/el2020-08.pdf>
- Bui, D., Hayo, B., Nghiem, G., & Dräger, L. (2021). *Consumer sentiment during the COVID-19 pandemic: The role of others' beliefs*. working paper no. 9010. Munich: Leibniz Institute for Economic Research at the University of Munich. https://www.econstor.eu/bitstream/10419/235380/1/cesifo1_wp9010.pdf
- Caldarelli, G., De Nicola, R., Petrocchi, M., Pratelli, M., & Saracco, F. (2021). Flow of online misinformation during the peak of the COVID-19 pandemic in Italy. *EPJ Data Science*, 10(34), 1–23. <https://doi.org/10.1140/epjds/s13688-021-00289-4>
- Casey, G. P., & Owen, A. L. (2013). Good news, bad news, and consumer confidence. *Social Science Quarterly*, 94(1), 292–315.
- Cavazos, R. (2019). *The economic cost of bad actors on the internet: Fake news*. Baltimore: The University of Baltimore. <https://www.cheg.ai/fakenews>
- Coibion, O., Gorodnichenko, Y., & Weber, M. (2022). Monetary policy communications and their effects on household inflation expectations. *Journal of Political Economy*, 130(6), 1537–1584. <https://doi.org/10.1086/718982>
- Damstra, A. (2019). Disentangling economic news effects: The impact of tone, uncertainty, and issue on public opinion. *International Journal of Communication*, 13, 5205–5224.
- De Prikkant (2020). *Corona-vaccin: De redding?* <https://www.vaccinatieschade.be/sites/default/files/bijlagen/De%20Prikkant%20small.pdf>
- Detmers, G. A., Ho, S. J., & Karagedikli, O. (2022). Understanding consumer inflation expectations during the COVID-19 Pandemic. *Australian Economic Review*, 55(1), 141–154. <https://doi.org/10.1111/1467-8462.12460>
- Dib, F., Maraud, P., Chauvin, P., & Launay, O. (2021). Online mis/disinformation and vaccine hesitancy in the era of COVID-19: Why we need an eHealth literacy revolution. *Human Vaccines & Immunotherapeutics*, 18(1), 1–3. <https://doi.org/10.1080/21645515.2021.1874218>
- Dietrich, A. M., Kuester, K., Müller, G. J., & Schoenle, R. (2022). News and uncertainty about COVID-19: Survey evidence and short-run economic impact. *Journal of Monetary Economics*, 129(Supplement), S35–S51. <https://doi.org/10.1016/j.jmoneco.2022.02.004>
- Doms, M., & Morin, N. J. (2004). Consumer confidence, the economy, and the news media. *Finance and Economics Discussion Series 2004-51, Board of Governors of the Federal Reserve System (U.S.)*, 2004/51, 1–70. <https://ideas.repec.org/p/fip/fedgfe/2004-51.html>
- Friestad, J., & Wright, J. (1994). The persuasion knowledge model: How people cope with persuasion attempts. *Journal of Consumer Research*, 21(1), 1–31. <https://doi.org/10.1086/209380>
- Greiffeneder, R., Jaffe, M., Newman, E., & Schwarz, N. (2020). *The psychology of fake news: Accepting, sharing, and correcting misinformation* (1st ed.). London: Routledge. <https://doi.org/10.4324/9780429295379>
- Hampson, D. P., Gong, S., & Xie, Y. (2021). How consumer confidence affects price conscious behavior: The roles of financial vulnerability and locus of control. *Journal of Business Research*, 132, 693–704.

- Hetsroni, A., Sheaffer, Z., Ben Zion, U., & Rosenboim, M. (2014). Economic expectations, optimistic bias and television viewing during economic recession: A cultivation study. *Communication Research*, 41(2), 180–207.
- Hollanders, D., & Vliegenthart, R. (2011). The influence of negative newspaper coverage on consumer confidence: The Dutch case. *Journal of Economic Psychology*, 32(3), 367–373. <https://doi.org/10.1016/j.joep.2011.01.003>
- Iyengar, S., & Massey, D. S. (2019). Scientific communication in a post-truth society. *Proceedings of the National Academy of Sciences of the United States of America*, 116(16), 7656–7661. <https://www.pnas.org/content/116/16/7656>.
- Jolley, D., & Douglas, K. M. (2014). The Effects of anti-vaccine conspiracy theories on vaccination intentions. *PLoS ONE*, 9(2), : E89177. doi:10.1371/journal.pone.0089177.
- Jonkman, J., Boukes, M., & Vliegenthart, R. (2020). When do media matter most? A study on the relationship between negative economic news and consumer confidence across the twenty-eight EU states. *The International Journal of Press/Politics*, 25(1), 76–95.
- Katona, G. (1951). *Psychological analysis of economic behavior*. New York: McGraw-Hill.
- Katona, G. (1975). *Psychological economics*. New York: Elsevier.
- Kreps, S., & Kriner, D. (2020). Medical Misinformation in the COVID-19 Pandemic. *Social Science Research Network*, 19(9), 1–24. <https://doi.org/10.2139/ssrn.3624510>
- Larson, H. J. (2020). *Stuck: how vaccine rumors start and why they don't go away*. Oxford: Oxford University Press.
- Lazer, D. M. J., Baum, M. A., Benkler, Y., et al. (2018). The science of fake news. *Science*, 359(6380), 1094–1096.
- Lomba, S., de Figueiredo, A., Piatek, S. J.; de Graaf, K., & Larson, H. J. (2021). Measuring the impact of COVID-19 vaccine misinformation on vaccination intent in the UK and the USA. *Nature Human Behavior*. Advance online publication. 10.1038/s41562-021-01056-1.
- Ludvigson, S. C. (2004). Consumer confidence and consumer spending. *Journal of Economic Perspectives*, 18(2), 29–50.
- Martel, C., Pennycook, G., & Rand, D. G. (2020). Reliance on emotion promotes belief in fake news. *Cognitive Research*, 5(47), 1–20. <https://doi.org/10.1186/s41235-020-00252-3>
- Melchior, C., & Oliveira, M. (2021). Health-related fake news on social media platforms: A systematic literature review. *New Media & Society*, 24(6), 1500–1522.
- Nowzohour, L., & Stracca, L. (2017). More than a feeling: Confidence, uncertainty and macroeconomic fluctuations. *ECB Working Paper Series*, 2100, 1–57. <https://www.ecb.europa.eu/pub/pdf/scpwps/ecb.wp2100.en.pdf>.
- Pantano, E., Priporas, C. V., Devereux, L., & Pizzi, G. (2021). Tweets to escape: Intercultural differences in consumer expectations and risk behavior during the COVID-19 lockdown in three European countries. *Journal of Business Research*, 130, 59–69. <https://doi.org/10.1016/j.jbusres.2021.03.015>
- Papakyriakopoulos, O., Medina Serrano, J. C., & Hegelich, S. (2020). The spread of COVID-19 conspiracy theories on social media and the effect of content moderation. *Harvard Kennedy School (HKS) Misinformation Review*, 1, 1–19. <https://doi.org/10.37016/mr-2020-034>
- Pennycook, G. (2020). Fighting COVID-19 misinformation on social media: Experimental evidence for a scalable accuracy-nudge intervention. *Psychological Science*, 31(7), 770–780.
- Pennycook, G., Cannon, T. D., & Rand, D. G. (2018). Prior exposure increases perceived accuracy of fake news. *Journal of Experimental Psychology: General*, 147(12), 1865–1880.
- Pennycook, G., & Rand, D. G. (2019). Lazy, not biased: Susceptibility to partisan fake news is better explained by lack of reasoning than by motivated reasoning. *Cognition*, 188(1), 39–50.
- Pennycook, G., & Rand, D. G. (2021). The psychology of fake news. *Trends in cognitive sciences*, 25(5), 388–402. <https://doi.org/10.1016/j.tics.2021.02.007>
- Perić, B. S., & Sorić, P. (2017). A note on the “Economic Policy Uncertainty Index. *Social Indicators Research*, 137(2), 505–526.
- Pomerance, J., Light, N., & Williams, L. E. (2020). In these uncertain times: Fake news amplifies the desires to save and spend in response to Covid-19. *Journal for the Association for Consumer Research*, 7(1), 45–53. <https://doi.org/10.1086/711836>. Advanced online publication.
- Rocha, Y. M., de Moura, G. A., Desidério, G. A., de Oliveira, C. H., Lourenço, F. D., & de Figueiredo Nicolete, L. D. (2021). The impact of fake news on social media and its influence on health during the COVID-19 pandemic: A systematic review. *Journal of Public Health*, 1–10. epub, ahead of print.
- Roozenbeek, J., Schneider, C. R., Dryhurst, S., Kerr, J., Freeman, A. L. J., Recchia, G., ... van der Linden, S. (2020). Susceptibility to misinformation about COVID-19 around the world. *Royal Society Open Science*, 10(7), 1–15. <https://doi.org/10.1098/rsos.201199>
- Scholdra, T. P., Wichmann, J. R. K., Eisenbeiss, M., & Reinartz, W. J. (2022). Households under economic change: How micro- and macroeconomic conditions shape grocery-shopping behavior. *Journal of Marketing*, 86(4), 95–117.
- Soroka, S. N. (2006). Good news and bad news: Asymmetric responses to economic information. *The Journal of Politics*, 68(2), 372–385.
- Svensson, H. M., Albaek, E., van Dalen, A., & de Vreese, C. H. (2017). The impact of ambiguous economic news on uncertainty and consumer confidence. *European Journal of Communication*, 32(2), 85–99.
- Teresiene, D., Keliuotyte-Staniuleniene, G., Liao, Y., Kanapickiene, R., Pu, R., Hu, S., & Yue, X. G. (2021). The impact of the COVID-19 pandemic on consumer and business confidence indicators. *Journal of Risk and Financial Management*, 14(4), 159–182. <https://doi.org/10.3390/jrfm14040159>
- Van der Wielen, W., & Barrios, S. (2021). Economic sentiment during the COVID pandemic: Evidence from search behaviour in the EU. *Journal of Economics and Business*, 115, 1–18. <https://doi.org/10.1016/j.jeconbus.2020.105970>
- Van Prooijen, J. (2016). Why education predicts decreased belief in conspiracy theories. *Applied Cognitive Psychology*, 31(1), 50–58.
- Vegetti, F., & Mancosu, M. (2020). The impact of political sophistication and motivated reasoning on misinformation. *Political Communication*, 37(5), 678–695.
- Vliegenthart, R., Damstra, A., Boukes, M., & Jonkman, J. (2021). *Economic new: Antecedents and effects*. Cambridge: Cambridge University Press.
- Vuchelen, J. (2004). Consumer sentiment and macroeconomic forecasts. *The Journal of Economic Psychology*, 25(4), 493–506.
- Williams, R. (2016). Understanding and interpreting generalized ordered logit models. *The Journal of Mathematical Sociology*, 40(1), 7–20.
- Wilson, S. L., & Wiysonge, C. (2021). Social media and vaccine hesitancy. *BMJ Global Health*, 5(10), 1–7. <https://gh.bmj.com/content/5/10/e004206>.
- Yang, K., et al. (2021). The COVID-19 Infodemic: Twitter versus Facebook. *Big Data & Society*, 8(1), 1–16. <https://doi.org/10.1177/20539517211013861>
- Zarocostas, J. (2020). How to fight an infodemic. *The Lancet*, 395(10225), 676. [https://doi.org/10.1016/S0140-6736\(20\)30461-X](https://doi.org/10.1016/S0140-6736(20)30461-X)
- Zeng, J., & Schafer, M. S. (2021). Conceptualizing ‘dark platforms.’ Covid-19-related conspiracy theories on 8kun and Gab. *Digital Journalism*, 9(9), 1321–1343. <https://doi.org/10.1080/21670811.2021.1938165>
- Zimmerman, F., & Kohring, M. (2020). Mistrust, disinforming news, and vote choice: A panel survey on the origins and consequences of believing disinformation in the 2017 German parliamentary election. *Political Communication*, 37(2), 215–237.