

POLITICAL PARTIES, POPULISM, AND PEOPLE'S ATTITUDE TOWARDS SCIENCE

A quantitative study looking at the effects of anti-science sentiment of political parties on citizens' attitude towards science and scientific knowledge

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Abstract

In today's increasingly globalized world, the proliferation of information has made distinguishing between true and false claims a difficult and complex task. The prevalence of political parties advocating their own versions of truth further exacerbates this challenge. This research explores the effect of anti-science sentiment from political parties on individuals' acceptance of scientific claims and trust in science. Additionally, it investigates whether this effect is more pronounced when associated with populist parties. A survey vignette experiment, utilizing a within- and between-subject design, was conducted in the Netherlands to examine the influence of anti-science sentiment of political parties on individuals.

The results indicate that the anti-science sentiment of political parties does indeed impact citizens' trust in science and their willingness to accept scientific claims. Notably, tweets from the VVD were found to influence people's likelihood to reject scientific claims, while other political parties did not exert a similar influence. Interestingly, both positive and negative sentiments from political parties had a significantly negative effect on people's trust in science, with the negative sentiment having a slightly stronger impact. Moreover, party cueing was not found to have a significant effect on the influence of anti-science sentiment on individuals. Also, people who identified themselves with populist parties also were not significantly affected.

This research sheds light on the critical role that political parties play in shaping public attitudes towards science and emphasizes the importance of discerning reliable information in an era of increasing misinformation. Further investigation into the dynamics of political party influence on science perception can aid in developing strategies to bolster trust in scientific evidence and promote informed decision-making in society.

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1. Introduction

Concern over misinformation and distrust in science has been growing since the mid-2010s (Lee, 2021; Oreskes and Conway, 2022; Carvalho, 2022). The Brexit and US presidential elections in 2016 have shown the effects that misinformation has on political debates and people's voting behaviour. Furthermore, the COVID-19 pandemic also showed increased belief in misinformation and distrust in science (Jennings, et al., 2021). Within a globalizing world, information is spreading ever faster, making it difficult for people to make up their opinion on societal and political issues (Bauman, 2000; Moffitt, 2016).

This is why people rely on party ideologies. People are likely to copy the stance of the political party that they identify with if they are unsure about their own stance (Steenbergen, Edwards and De Vries, 2007; Slothuus, 2016). This is especially the case for parties that have been around for a long time because people are able to guess what their political stance would be. Even though it is helpful for people to look for party ideologies to base their own opinion on, it could also have dangerous effects. When people take over these stances without hesitation, it could harm society and democracy. Especially when it concerns political parties that spread misinformation, such as populist parties and other extremist parties (Lee, 2021; Enders and Uscinski, 2021).

Scholars argue that populist parties are a threat to the democratic values of society because they are against the elite and the establishment (Reinemann, et al., 2019; Mudde and Kaltwasser, 2012, p. 205; Gerschewski, 2019; Norris and Inglehart, 2019). This sometimes includes scientists and scientific knowledge. By rejecting and questioning scientific knowledge, populist parties can mislead society (de Vreese, et al., 2019; Waisbord, 2018; Mede, Schäfer and Füchslin, 2021; Ylä-Anttila, 2018). This can turn people distrustful towards scientific institutions. In the past, this has led people to do unsafe things such as inject bleach (Scheufele, Krause and Freiling, 2021; Yamey and Gonsalves, 2020; Speed & Mannion, 2017) or to people not wanting to get vaccinated. In the Netherlands, Thierry Baudet, political leader of Forum for Democracy, a Dutch populist party, openly questioned scientific research and science by saying COVID-19 did not exist and the vaccines did not work (Rooduijn, et al., 2019; Rooij, 2020; Van Gemert and Bolhuis, 2021). If party supporters adopt these stances and start questioning scientific research, this can lead to the delegitimization of science.

Populist parties have received increasing attention in the 21st century both by researchers and in elections (Canovan, 2004; Mudde and Kaltwasser, 2012). De Vreese and colleagues said that "one of the keys to populist success is its ability to cultivate the perception that crisis and decline are imminent and that certain groups are to blame" (2019, p. 244). Even if real-life does not show impending decline, populists can use misinformation to portray a "misleading characterization of reality" (de Vreese, et al., 2019, p. 244). This misleading description can go so far that arguments can be used that are untrue and can be refuted (ibid.). Populists have their own version of the truth and real life (Ylä-Anttila, 2018). With their own version of the truth, populist parties can have different impacts on society and attract different voters. These voters can, in turn, be misled by populists to see dangers even though these dangers and crises do not currently exist.

Electoral success and thus winning the most votes is important for political parties. Populist parties try to do this by, among other things, delegitimizing and undermining experts and other actors that produce knowledge (Žuk and Žuk, 2020; Szabados, 2019). Populist parties are distrustful towards experts because they were not democratically chosen. Populist parties claim that they produce truthful knowledge, which can sometimes be easily refuted because it is not based on facts or other sources (Szabados, 2019). By misleading voters and spreading misinformation, populist parties can be seen as a threat to democracy and to science (Mudde, 2004; Norris and Inglehart, 2019). Non-populist political parties can alter people's attitude towards science (Merkely, 2020). It is important to study whether this also is the case for populist political parties, because of the anti-elite sentiment of populist parties and their success in convincing people of nearing crises and decline as this can have consequences for people's trust in governments, science and democracy.

This research aims to get an understanding of the influence that political parties have on people's opinion on scientific knowledge. In particular, this research looks at the anti-science sentiment of (populist)

political parties and how this affects citizens' attitude towards science and scientific knowledge. Therefore, this study has the following research question:

To what extent does the anti-science sentiment of political parties change citizens' trust in science and acceptance of scientific claims and is this effect bigger for populist parties?

Scientific and societal impact

This research makes an empirical, theoretical and methodological addition to the field of political science, more specifically the research areas that study trust in science, populism, and party cueing. First, this research furthers the scientific field that studies populism, especially the anti-intellectual sentiment of citizens. According to Merkley (2020): “[l]ittle work has explored the nature of [people’s anti-intellectual] predisposition and how it may shape attitudes toward areas of expert consensus” (p. 25). His research proved that US citizens’ trust in intellectuals and experts are shaped by the way (populist) politicians portray facts from experts. In other words, this suggests that political parties do play a role in people’s attitude towards science. Notwithstanding the importance of these findings, this research was done in 2020, using a survey from 2016 and has a different context, namely the US. This research thus has an empirical addition. The Netherlands is an interesting case study because it has a multi-party system, unlike the US. It is therefore interesting to see whether the theory of Merkley holds in a different context. Considering that there are more political parties in the Netherlands with different party ideologies, people might be more likely to switch their vote than in a two-party system like the US (Van der Meer, et al., 2015; De Vries, et al., 2021). This could alter the way people look at political parties and how political parties frame their narrative. It could be the case that political parties also change their narrative to attract more voters (Newton and Van Deth, 2016). By using the multi-party system in the Netherlands, this research adds another dimension to the research of Merkely by also checking whether different types of political parties play a role in people’s attitude towards science.

Second, this research has a theoretical addition. Merkely (2020) called for a need of a stronger theorization of anti-intellectualism. This research contributes to this call by analysing Dutch people’s attitudes toward scientific knowledge to see whether Merkley’s conceptualization holds in a different country. This study looks Dutch citizens’ attitude towards science regarding two topics that differ in saliency and complexity. Also, this research will be done in 2023, thereby supplying newer data. The survey was sent out two months after the Dutch provincial elections (Alle Cijfers, n.d.), thereby decreasing the risk of people not remembering what they voted for during these elections. This is important because replicating Merkley’s research in a new context can help further frame the scope of the topic.

Furthermore, this study uses party cueing (the likeliness of people to accept information because it comes from or aligns with the party they identify most with) to study how likely people are to accept information from political parties (Bullock, 2020). Party cueing is used in this study to look at acceptance of knowledge, not to look for agreement with policy views (Bullock, 2020) or trust in government (Beldad, et al., 2012). Earlier studies looked at the effect of party cueing on different topics (Euro-scepticism, trust in government, immigration) (Lubbers and Jaspers, 2011; Beldad, et al., 2012; Hartevelde, Kokkonen and Dahlberg, 2017; Sheets, Bos and Boomgaarden, 2016), but not yet on the effects of party cueing on Dutch citizens’ trust in science. Research by Merkely and Stecula (2020) showed that people trust in science might be a moderating variable in the effect that party cues have. This is the first research to study the effect of party cueing and party sentiment on Dutch citizens’ anti-intellectual sentiment, thereby also adding to this field of literature. This research looks at the following political parties: a left-wing, centrist, right-wing and populist party.

Thirdly, this research has a methodological addition. This research uses a novel experimental design where newly collected data is used. This research uses self-made vignettes in an experimental design with randomization. The vignettes are tweets, which is a format that is not used often in survey vignette experiment. Usually older media outlets, such as newspapers, are used to study the influence of populist parties (de Vreese, et al., 2019). By giving a clear operationalization of the experimental design, this research is easily replicable. Other scholars can copy and customize this vignette experiment and execute the research in different countries with multi-party systems.

In combining the studies by Merkley, Bullock and Beldad and colleagues, this research furthers the field of populism and trust in science by adding both a new case, the Netherlands, using a new

experiment in a new context, a multi-party system, and by further testing the concepts of trust in science, acceptance of scientific knowledge and party cueing.

This research has societal impact in that it shows how people's anti-intellectual attitudes can be shaped by (populist) political parties. Misinformation is rising with the increased use of the internet and globalization, making it easier than ever for people to spread (mis)information (Bauman, 2000; Moffitt, 2016). In looking if and how anti-science sentiment of populist parties can change people's attitude towards science, this research makes clear if and to what degree this is happening in the Netherlands. This has implications for the spread and acceptance of scientific research. Recently, a study by the Social and Cultural Planning Office (SCP) was published on scepticism among Dutch citizens during the pandemic. The SCP is an interdepartmental, scientific institute that conducts solicited and unsolicited social scientific research (SCP, 2023). The study shows that a group of Dutch citizens was sceptical towards governmental policies regarding COVID-19 (ibid.). Some citizens that were sceptical to governmental policies felt not heard and not taken seriously by the national government. Furthermore, the study also shows that once people start to distrust the government, they can also become more sceptical towards other topics. By understanding if and how political parties can play a role in this distrust, this research aims to uncover potential causes for distrust in science.

Finally, understanding whether the anti-science sentiment of populist parties change people's attitude towards science is important because of its potential effects on the democratic values of society. Democratic countries value freedom of speech highly, but with populist parties instigating people to 'take back what is theirs' other political parties are now considering limiting freedom of speech. Müller calls this militant democracy meaning "a democracy willing to use un-democratic means to defend itself against the enemies of democracy" (2009, p. 215; Loewenstein, 1937). Currently, in the Netherlands there is a debate going on whether certain political parties should be banned that seriously disrupt the rule of law (NPO Radio 1, 2022; Van Soest, 2022; Visser, 2022; NOS, 2023).

2. Theory and Hypotheses

To be able to answer the research question, some concepts and their relations towards science and scientific claims require more explanation. First, the anti-intellectual sentiment of citizens can affect their attitude towards science, and acceptance of scientific knowledge. Party cueing can also affect citizens' attitude towards science. The effect of party cueing is stronger when people identify with the party that gives the cue (Steenbergen, Edwards and De Vries, 2007). Thirdly, considering that populist parties can have an anti-science sentiment, their potential relation to people's attitude towards science is also elaborated upon. Based on these relations, hypotheses are made.

Citizens' attitude towards science

Citizens can have an anti-intellectual sentiment. This means that they mistrust experts and disagree with expert-based information on topics that are both controversial, think of climate change and vaccines, (Merkley, 2020; Ylä-Anttila, 2018) and less politicized, such as nutrition and physical therapy (Mede and Schäfer, 2020). These people feel that "scientists and experts are immoral, produce useless knowledge, and conspire with other elites" (Mede, Schäfer and Fuchsli, 2021, p. 276). Citizens do not see the value in the research done by scientists and feel that they waste money. Research shows that individuals that have low confidence in scientific institutions are sceptical towards expert opinions, distrust professors and do not think that scientists act in the interest of the public (see Mede and Schäfer, 2020, pp. 484-485). It can thus be argued that people with low trust in science have a more negative attitude towards science.

Citizens' acceptance of scientific knowledge

People who have an anti-intellectual sentiment are not only likely to distrust science, but they are also more likely to reject scientific knowledge (Merkley, 2020; Merkley and Loewen, 2021). These people with anti-intellectual dispositions distrust scientific sources, they think that scientists are corrupt and that these scientists do not apply the theory of knowledge production correctly (Mede and Schäfer, 2020). These people are less likely to agree with scientific consensus cues (Merkley, 2020). These cues, or statements, signal expert or scientific consensus on a topic. Only citizens who do trust scientists and

intellectuals accept these signals when they form their opinion (Merkley, 2020; Zaller, 1992). This means that people who do not trust scientists will not accept these signals. Research shows that people with anti-intellectual sentiment are more likely to believe in COVID-19 conspiracy theories (Eberl, et al., 2021). People with anti-intellectual sentiment are thus likely to believe in false information, are more critical towards scientific research and are more likely to resist expert consensus cues (Juen, et al., 2021).

Party cueing

Research shows that party cueing effects play a role in people's voting behaviour and political positioning (Steenbergen, Edwards and De Vries, 2007). Party cueing happens when citizens take cues from political elites and "adjust their views to be more or less in line with those elites" (ibid., p. 17). This can happen for policy areas or issues that are technically difficult for citizens to fully grasp. Citizens then look at public actors, usually political parties, for cues.

Political parties usually have "historically rooted orientations that guide their response to new issues" (Hooghe, 2007, p. 6). Their orientation can serve as a source of information for voters. Research in Italy and the US has shown that party cueing strongly influences the opinion of citizens on policies such as electoral reform, gay marriages and the climate (Brader, De Sio, Paparo and Tucker, 2020; Merkley and Stecula, 2021). In other countries, party cueing effects are more or less comparable, but are more variable and weaker. The average effect of party cues on attitudes ranges from 3% to 43%, making generalization difficult (Bullock, 2011; Slothuus, 2016).

There are two types of party cues: bottom-up and top-down. The bottom-up part of party cueing is based on the opinion of voters. Here, parties will change their views on certain topics according to the opinion of their voter base or a majority of the population (Hooghe, 2007). At least a small part of voters has transparent and stable attitudes that affect their voting behaviour. Sometimes this group is bigger and then political parties will listen to the public opinion and change their stance to be more congruent. Parties do this to increase their voter base. The bottom-up view looks at voters as a source of party positioning.

The top-down view of party cues sees parties as the source of information for voters (Hooghe, 2007; Merkley and Stecula, 2021, p. 1440). Top-down party cueing occurs because people use cues from political parties as a cognitive shortcut to make decisions in a low-information context (Bullock, 2020; Cohen, 2003; Kam, 2005; Merkley and Stecula, 2021). This happens with complex issues and with issues that are not salient.

Party cueing depends on how strongly citizens identify with the party (Azrout and De Vreese, 2018). The more citizens identify with a party, the more they are likely to perceive the party as a credible and trustworthy source, making them more susceptible to the party cue. One experimental study showed that people are more likely to accept and assume the position of the party they support instead of basing their opinion on the objective content of the policy and their own ideological beliefs (Cohen, 2003; Slothuus and Bisgaard, 2021). People thus valued the position of the party they support over their own ideas on the policy.

This susceptibility to party cues could be dangerous when political parties share incorrect information and citizens hold this information to be true. Party cueing can then also influence people's attitude towards science. Research shows that support for compulsory vaccinations during the COVID-19 pandemic was lower for people who identified themselves with political parties with anti-science sentiment. These parties oppose science-based policies and the scientific elite (Mede and Schäfer, 2020; Juen, et al., 2021).

Populism

Populist parties are part of the political spectrum and can take both an extremist left-wing position or an extremist right-wing position (Rooduijn, et al., 2019). Before looking at how populist parties have an anti-science sentiment, it is important to define the concept. Populism has been researched since the 1980s and still is a difficult concept to define as there is little agreement on its definition (Akkerman, et al., 2014; see e.g., Maly, 2018; Mouffe, 2005; Müller, 2016; Laclau, 2005). Most scholars use the definition by Mudde (2004), who says that populism is a thin "ideology that considers society to be ultimately separated into two homogeneous and antagonistic groups, 'the pure people' versus 'the

corrupt elite’, and which argues that politics should be an expression of the *volonté générale* (general will) of the people” (Mudde, 2004, p. 562, italics in original). Populists thus argue that they represent the pure people and that they are against the elite, who are corrupt. The elite do not stand for the general will of the people, the populists do. The populists and only the populists represent the people (Müller, 2016).

This research uses this thin ideology of populism. Therefore, it is important to add another concept to better explain the term (see also Stanley, 2008). In this case, the research looks at right-wing populism with anti-science sentiment. While the Netherlands also has a left-wing populist party, namely the Socialist Party (SP) (Rooduijn, et al., 2019), this party is not included because the SP does not have an anti-science sentiment, while the right-wing populist party PVV (Party for Freedom) does.

Anti-elitism, anti-intellectualism, and anti-science sentiment of populists

Populists are against and distrust the elite as they do not come up for the general will of the people and are corrupt (Müller, 2016; Maly, 2018; Laclau, 2015; Mudde, 2004; Rooduijn, 2013). Extending this view, populists can also be against experts and actors that produce knowledge (Mede, Schäfer and Füchslin, 2021; Huber, Fesenfeld and Bernauer, 2020; Szabados, 2019; Hofstadter, 1966). Scientists, and science in general, are seen as part of the elite that control society and oppress “the ordinary citizen” (Krämer and Klingler, 2020, p. 261). Merkley (2020, p. 26) defines this as anti-intellectualism, meaning “a generalized suspicion and mistrust of intellectuals and experts of whatever kind”. Populists do not accept the truth of these intellectuals and experts because they were not democratically chosen to do research.

While all populist politicians are anti-elitist, not all are anti-intellectualist (Krämer and Klingler, 2020). Research by Szabados (2019) shows that in four studied countries with populist leaders (the United States, Russia, Turkey and Hungary), anti-science policy is not always present. Szabados argues that populist leaders are suspicious of scientists, not science. Populist leaders want to strengthen their power by eliminating critics, which scientists are a part of.

To convey their messages, populists make scientific claims that are based on emotional and easily falsifiable statements. Scientists critique these statements for being incorrect. This critique is unfavourable for populist parties because it can delegitimize their power and can decrease their voter base. By saying that scientists are wrong and should not be trusted, populist parties can try to convince their voters that they are right (Szabados, 2019; Krämer, 2021). Žuk and Žuk (2020, p. 800) call this part of populist discourse “the undermining of expert knowledge”.

The undermining of expert knowledge can also be seen as anti-science sentiment (Mede and Schäfer, 2020; Mede, et al., 2022). Anti-science sentiments are catered towards science and expertise, not politics. This sentiment shows a distrust in science and negative attitude towards the academic elite, where the “ordinary people” reject knowledge produced by “academic elites” because it is useless and ideologically biased (Mede and Schäfer, 2020, p. 484; Mede, et al., 2021, 2022). When people accept this anti-science sentiment, they can also become more distrustful towards science and more likely to reject scientific claims. This leads to the following hypotheses:

H1a: The anti-science sentiment of political parties leads to a lower trust of people in science.

H1b: The anti-science sentiment of political parties leads people to reject scientific claims.

Combining party cueing theory with the anti-science sentiment of political parties, it could be argued that people who identify themselves with a political party are more likely to accept the anti-science sentiment of this party. In return, the same is true for populist parties. This leads to the following hypotheses:

H2: The effect of anti-science sentiment is bigger when people identify with the party that gives the cue compared to people who do not identify with the political party.

H3: The effect of anti-science sentiment is bigger for people who identify themselves with the populist party that gives the cue compared to people who do not identify with the populist party.

Overview of hypotheses

To be able to answer the research question, the following hypotheses are tested:

- H1: The anti-science sentiment of political parties leads to a) a lower trust of people in science and b) rejection of scientific claims by people.
- H2: The effect of anti-science sentiment is bigger when people identify with the party that gives the cue compared to people who do not identify with the political party.
- H3: The effect of anti-science sentiment is bigger for people who identify themselves with the populist party that gives the cue compared to people who do not identify with the populist party.

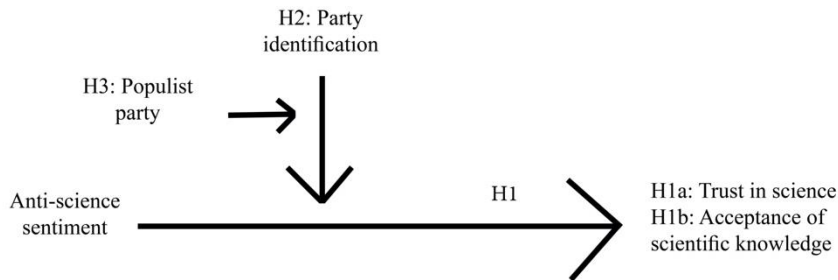


Figure 1: overview of hypotheses.

3. Case, Data, Design and Methods

The Dutch case has multiple characteristics that make it an interesting case to study. Firstly, the Netherlands has a multi-party system which, compared to earlier studies into acceptance of scientific claims and trust in science, has not been extensively studied. Italy has previously been studied to look at party cueing on high-salience issues (Brader, et al., 2020). This study looks at low salience issues (Google Trends, n.d.ab), thereby making this is a relevant study.

In using a multi-party system, left-wing, centrist, right-wing and populist right-wing political parties can be compared to each other. This leads to a broader understanding of how people react to anti-science sentiment. Furthermore, the multi-party system allows me to choose more political parties, thereby allowing to research a populist political party. Some Dutch political parties distrust science, which can be seen during COVID-19, where conspiracy theories took of that some political parties shared (Rooduijn, 2021; SCP, 2023). 20% of Dutch citizens doubted governmental COVID-19 related information (SCP, 2023). Furthermore, the Netherlands is an interesting case because it has multiple populist parties, indicating that the populist sentiment is prevalent among citizens and takes different forms. This gives more room to choose a suitable populist political party to study the effects of anti-science sentiment.

Data collection method and sampling

The study was pre-registered on AsPredicted¹. This is done to increase the transparency and reliability of the study (Bryman, 2016). Also, ethical approval was gotten via the Ethical Committee of my university's department because personal data was asked of respondents and respondents were manipulated. All data is stored on Yoda, a research data management service that enabled me to securely deposit and share my data with my supervisor. This software is developed by Utrecht University (Utrecht University, n.d.).

Data was collected using both convenience sampling and Prolific. The survey was made in Qualtrics, and people filled in the survey via a link that I shared in my network (via different social media platforms) and via Prolific. Prolific is an online-panel company. It is a website that offers respondents money for filling in surveys. The respondents that filled in my survey via Prolific were paid a small amount of money. I paid Prolific for 220 respondents, so in total, 220 respondents filled in the survey via Prolific. The inclusion criteria for respondents to take part in the survey via Prolific was to

¹ Pre-registration can be found here: <https://aspredicted.org/vb27c.pdf>

be 18 years or older and to live in the Netherlands. I asked Prolific to give me a standard sample, which meant they distributed the study to all available participants. The survey was online and open to fill in for all Dutch-speaking people over 17 years old. The survey was open for two weeks, after that the minimum required number of respondents was achieved. The sample size was determined using G*Power, which led to a minimum required number of 304 respondents (see also table B5 in the appendix). The structure of the survey can be found in the appendix A.

In total, 393 people started filling in the survey. 339 people completed the survey. Only respondents were excluded who did not finish the survey or who did not agree with the debriefing information at the end of the survey². This led to a completion percentage of 86%. The sample consists of 57,5% men and 41,9% women, with an average age of 31 years. The average age in the Netherlands is 42.4 years in 2022. In 2022, in the Netherlands, there were more women than men (50.3%) (CBS, 2022a). The sample is thus somewhat representative for the total population.

Furthermore, the sample has less people with a primary school diploma, as well as a lower degree diploma compared to the Dutch population (see table A3 in appendix, CBS, 2022a). The sample especially has more people with a higher educational level than the total Dutch population. This might be to do with convenience sampling in my own network. The respondents for each province are somewhat representative (CBS, 2022b). The sample has more respondents living in the province of Drenthe, Groningen, Overijssel and Utrecht. There are less respondents from Noord-Brabant and Noord-Holland (see table B4).

Design of experiment

To answer the research question, a survey vignette experiment was set up. A vignette is “a short, carefully constructed description of a person, object, or situation, representing a systematic combination of characteristics” (Atzmüller and Steiner 2010, p. 128) The vignettes of this experiment consist of a description of a situation. A vignette experiment was useful because it allows the researcher to look for an effect between and within respondents (Atzmüller and Steiner 2010). The effects that were looked for are the hypotheses: trust in science, acceptance of scientific claims, and party cueing.

The vignette experiment is a 4x2 factorial design (see table 1). This is a design that allows a researcher to study multiple independent variables based on different vignettes (Nordstokke and Colp, 2014). Another benefit of vignette experiments is that it has more realistic questions compared to regular survey questions because the vignettes are embedded in a more realistic scenario (Steiner, Atzmüller and Su, 2016). In this case that is real tweets from two research institutes and made-up tweets from political parties that respond to the research institute’s tweet. This also increases the construct validity of the experiment, namely measuring what was intended to be measured (ibid.).

The vignettes either accept the information or reject the information. The independent variables that are used are political party and anti-science sentiment. This design is partially based on an earlier study by Merkley (2020), who used vignettes to study anti-intellectualism and expert consensus in the USA.

	Option a: right-wing populist party	Option b: left- wing political party	Option c: centrist party	Option d: right- wing political party
Option 1: Accepting information				
Option 2: Rejecting information				

Table 1: matrix for vignette experiment.

² In the pre-registration respondents that did not pass the attention checks were said to be removed. However, this led to a low number of respondents. As a robustness check, these analyses were still executed. Those results can be found in the appendix E. Certain outcomes are further discussed in the discussion section.

The vignette gives respondents some information on one of two topics which are spread by either a right-wing populist party (option a), a left-wing party (option b), a centre party (option c), or a right-wing party (option d). For the populist party, Partij voor de Vrijheid ('Party for Freedom' or PVV) is chosen, because this party has been around for a long time compared to BBB ('Farmer Citizen Movement'), which is described by some as an agrarian right-wing populist party (Rooduijn, et al., 2019; Rooduijn, 2023; Van Eijdsen, 2023). Furthermore, FvD and JA21 are not chosen as right-wing populist parties because the FvD makes political statements that can be too polarizing, thereby unnecessarily influencing the experiment. JA21 does not have an anti-science sentiment when looking at its party program of 2021 (JA21, 2021).

The left-wing party is the Labour party (PvdA), and the right-wing party is the Liberal Party (VVD). The centre party is the CDA (Christian party). These options are added to test whether people's attitudes are affected by (non-)populist parties and whether the political dimension matters.

By adding an overview of the research design and the data collection method the research becomes more internally valid. By showing what is researched and in what way this is done, readers can make sure that the results coming from this research are because of the research and not because of something else (Bryman, 2016). For more transparency, reliability and reproducibility purposes, all survey questions have been translated into English and can be found in the appendix.

The survey was pre-tested in my own network to check if the survey design worked. This led to some textual changes. No major changes to the survey were made after the pre-test was done. In total, 5 people filled in the pre-test.

Topic and format of vignettes

The vignettes contained information on one of two topics: women's quota or fireworks. The women's quota relates to a law that was passed in Parliament in 2022 which had to lead to a more balanced division between men and women in high positions at private companies (Rijksoverheid, 2021). The report on woman's quota is from the Central Planning Agency from 2019. The report from the Central Planning Agency gives an overview of the share of women at the top of business compared to other European countries between 2014-2017. The report looks at the causes of why less women are at the top, compared to men (Central Planning Agency, 2019). The vignette on fireworks is about banning fireworks in the public space and the damages that fireworks cause. The report that was mentioned in the vignette on fireworks includes numbers on fireworks related injuries during New Year's Eve in 2016-2017 and is a report by the Research Council (Onderzoeksraad, 2017).

Two research institutes were chosen that have researched one of the two topics. These institutes have tweeted about their research and the different political parties respond to this. The institutes are *Centraal Planbureau* (Central Planning Agency; Centraal Planbureau, 2019) and *Onderzoeksraad* (Research Council; Onderzoeksraad, 2017). Both are renowned research institutes in the Netherlands. The Central Planning Agency is an independent research institute that mostly does policy-relevant economic analyses and forecasts (Centraal Planbureau, n.d.). The Research Council is an independent organization that researches topics related to the safety of Dutch citizens (Onderzoeksraad, n.d.). Their tweets were either fully copied or slightly adapted to make the tweet clearer. By using real tweets from research institutes and by creating tweets from political parties that are based on their stance towards the topic, the realism, and thus external validity, is increased as much as possible (Bryman, 2016). Two examples of the vignettes, translated into English, can be found in the appendix (see figure A1 in appendix).

These topics were chosen because they have been in the news over the past couple of years (Google Trends, n.d.ab) and have been discussed in parliament, which means that all four political parties have an opinion on the topic (see table 2). This makes creating fictional tweets easier and more realistic, thereby increasing the external validity (Bryman, 2016). Furthermore, the two topics differ in level of complexity. Women's quota is a more complex topic than fireworks. The more complex topic is chosen to test whether people are more likely to look for party cues when facing complex issues. The less complex topic is chosen, because Merkley recommended to study a less complex topic for follow up research (2020, p. 31). Furthermore, these topics were chosen based on the voting behaviour of the four political parties in Parliament to get a spread of supporters and opponents (see du Pré, Twigt and Heijkant, 2021).

	Women's quota	Fireworks
PvdA	Pro	Pro
CDA	Pro	Against
VVD	Against	Against
PVV	Against	Against

Table 2: overview of party stances on the two topics (du Pré, Twigt and Heijkant, 2021).

The format of the vignettes is a retweet. Political parties respond to a tweet by the research institute about the research of the topic. This allows the text of the vignette to be spread as a message by a political party. The retweets from the political parties were made using a website called tweetgen.com. A tweet can contain a maximum of 280 characters, thereby making the vignette noticeably short which reduces the risk of attrition, people ending the experiment before they have answered all the questions (Toshkov, 2016; James, Jilke, and Van Ryzin, 2017) Avoiding attrition reduces the risk of having low internal validity (Bryman, 2016). Each respondent gets two vignettes to study the experimental variation both within subjects and between subjects. Therefore, this research uses a within-subject design because respondents get multiple vignettes and get questions after each vignette (ibid.; Mutz, 2011). Also, a between-subject design was done to test hypothesis 1a. Furthermore, considering that repeated measures are used, the internal validity can increase. The experiment setting decreases external influences, making the research more internally valid (Bryman, 2016).

Finally, masking was used to increase the internal validity of the research. By using masking, respondents do not know to which groups they are being assigned. This reduces the risk of research bias, specifically desirability bias where respondents understand what the researchers wants the respondents to answer and act accordingly (Fowler, 2015).

Measures

The complete questionnaire and descriptive information on those measures can be found in table B1 in the appendix. These include independent, dependent and control variables.

Main dependent variables

After respondents read a vignette, five questions were asked. These questions were randomly shown. This was done for both vignettes to minimize the learning effect as much as possible (Bryman, 2016). The five questions are about: acceptance of scientific claims, trust in science, politicians and political parties and influence of the political party. Acceptance of scientific claims is measured by asking people whether they think the research done by the research institute that made the tweet was trustworthy (5-point Likert scale). Trust in science is measured by asking people how much they trust scientists (5-point Likert scale). People could completely distrust scientists (1) or could completely trust scientists (5). Trust in politicians and trust in political parties were asked in the same way (Merkley, 2020; Motta, 2018; Oliver and Rahn, 2016; European Commission, 2021; Kam, 2005). Influence was measured by asking whether people agreed with the tweet from the political party (5-point Likert scale).

Main independent variables

Party identification is measured by asking people how likely it was that they would vote for the following political parties: PvdA, CDA, PVV and VVD (5-point Likert scale, Cronbach's Alpha: 0.31). This variable does not have a high Cronbach Alpha, meaning it has low internal consistency. This might be to do with the fact that all four political parties are on various parts of the political spectrum. The composite variable was shown to be significant on its own, but not when interacted with sentiment³. The individual questions are used to do the analyses. This variable was based on two earlier studies that used similar wording to measure this variable (ESS, 2016; Azrout and De Vreese, 2018).

Secondly, anti-intellectual sentiment was measured by combining multiple questions on people's attitude towards scientists and science (5-point Likert scale, Cronbach's Alpha: 0.60) (Kam, 2005; Eurobarometer, 2018; European Commission, 2021).

³ See table C1 in the appendix for the table of results.

Control variables

To control for alternative explanations for trust in science, acceptance of scientific claims and influence, a range of variables are included in the models: opinion on scientists, populist attitude, political interest, political positioning, and political awareness. The reliability of the scales of these variables can be found in appendix B.

To check the representativeness of the sample, descriptive questions are based on the categorization of CBS, the Dutch statistical bureau. These control variables include gender, age, level of education and province that people live in. The province people live in is also asked to be able to give people the correct political parties to choose from when asking them about which party they voted for in the provincial elections. Individual characteristics, such as demographics, are controlled for in a within-subject design. This is advantageous because comparisons are made within the same individual and therefore (possibly confounding) individual characteristics are kept constant (Bryman, 2016; Mutz, 2011).

Modelling technique

On the sample data, I performed multi-level linear regressions. This analysis method was necessary because, to study the hypothesized relationships on the within levels, the data had to be reshaped into a long format. This led to a clustered dataset that has responses to the different vignettes nested within respondents.

The vignette data has a two-level structure, where the first level represents the vignette level and the second level represent the respondent level. I am interested in the vignette level because I am interested to see whether the topic of the vignette matters for respondents' judgement. Also, I am interested in the change within respondents (Atzmüller and Steiner 2010). The linear mixed models look at fixed effects, because of the within-subject nature of the study. A benefit of fixed effects models is that they only estimate within effects and can therefore not suffer from heterogeneity bias (Bell and Jones, 2015, p. 138). Also, a between-subjects design was used to test people's trust in science.

The lmerTest-package of Crawley (2012) was used to perform the analyses in RStudio, version 2023.03.2. In comparison to ANCOVA, analysis of covariance, performing multi-level analyses is more flexible, because both random intercepts and random slopes can be easily modeled. Furthermore, multi-level analysis can also deal with missing data (Atzmüller and Steiner 2010).

Mitigating potential risks

A thing to keep in mind are potential pre-treatment effects of political parties on respondents. Political parties can namely shape citizens' opinions on topics (Slothuus, 2016). Sometimes parties react to views that citizens already have, or citizens have an opinion on the party because they are very visible actors. In this case pre-treatment can occur, where the "the real world interferes with the stimulus presented in the experiment" (ibid., p. 303). This pre-treatment effect happens when participants know about the stance of the political party on the policy that the experiment is about. They can either have read or heard about the political stance of that party on the policy (exposure-based pre-treatment) or can infer the stance of the party from its reputation (reputation-based pre-treatment). Slothuus' research shows that where people do not expect a certain cue given the policy reputation of the party, they adjust their policy preferences accordingly.

Political awareness as a control variable can partly control for pre-treatment effects, because politically aware individuals already know the party's stance on the policy well. Also, party identification can help to partly control for pre-treatment effects. If people namely identify themselves with a party and are politically aware, it might be possible that their exposure-based and reputation-based pre-treatment effects are higher than with people who are less politically aware and have less party identification.

Thus, when the difference between the pre-treatment questions and the after-treatment questions differs a lot, this difference could be because the treatment worked. Or the treatment worked because people identify themselves with the party and are politically aware. By asking people before the treatment about the political awareness and party identification, this can be controlled for when analysing the results.

Finally, there is no control group who did not see vignettes. Therefore, it is difficult to test for learning effects for the hypotheses. This was minimized by showing only two vignettes, thereby decreasing the number of vignettes that people see that could potentially lead them to guess what the study was about. Furthermore, two filler questions were asked in between the two vignettes to try to decrease the learning effect.

For hypothesis 1a a control group could be made. This was done by creating a new dataset where the question on trust in science that was asked before respondents saw a vignette was combined with respondents' trust in science after seeing the first and the second tweet to make a new variable. The answer before the vignettes were seen then acted as the control group in the analysis.

4. Results

Before turning to the analyses to accept or reject the hypotheses, descriptive information on the main dependent and independent variables are presented.

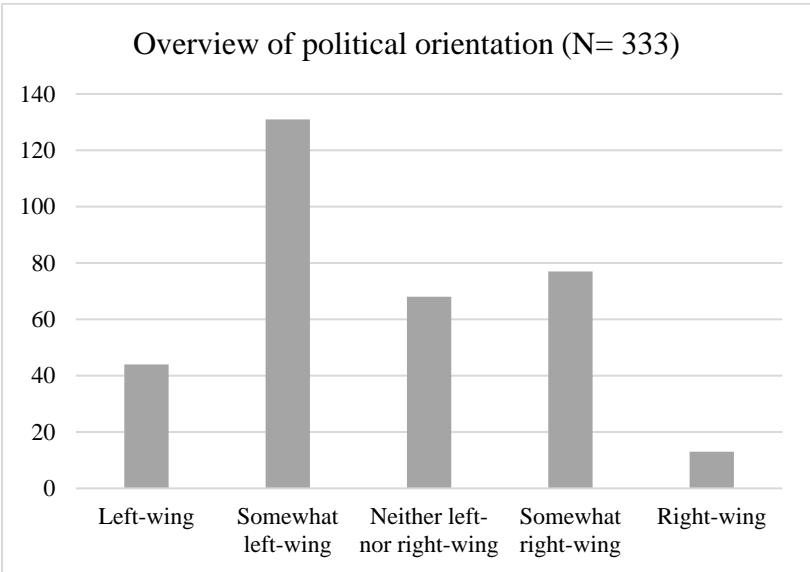
Respondents are distributed pretty well among vignettes (see figure B3 in appendix). Respondents also seem to be randomly and normally distributed among vignettes. All vignettes have enough observations according to the G*Power analysis (see table B5 in appendix).

Variable	N	Mean	St. Dev.	Min	Max
Trust in scientists (control)	339	4.54	0.70	1	5
Trust in science	338	4.24	0.75	1	5
Trust in politics	338	2.55	0.95	1	5
Acceptance of scientific claims	327	2.70	1.30	1	5
Scientific literacy	308	3.95	0.38	1	5
Political awareness	339	0.69	0.33	0	1
Political positioning	327	2.65	1.09	1	5

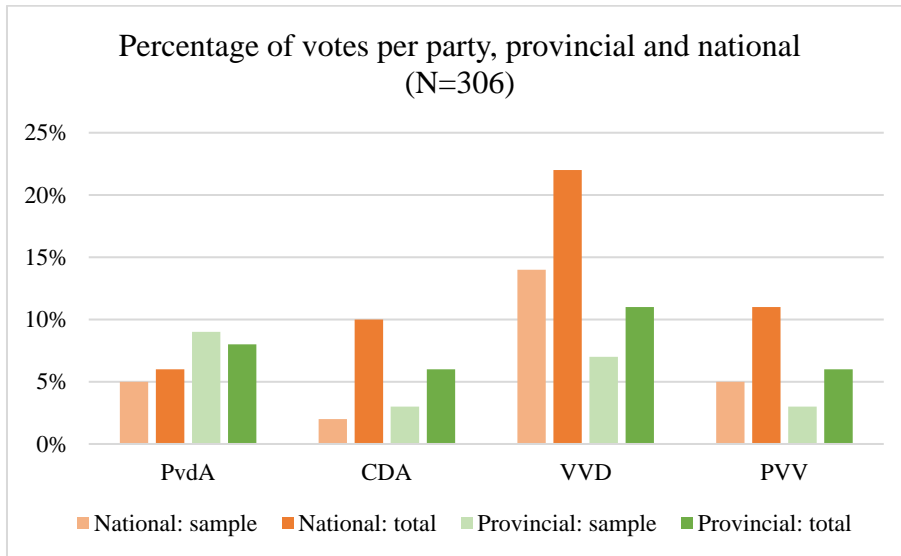
(1=left, 5=right)

Table 3. Descriptive statistics

Table 3 shows that respondent's trust in scientists is higher than people's trust in science. Respondent's scientific literacy is pretty high (3.95 out of 5), and they are more likely to reject scientific claims (2.70 out of 5). Respondents are also somewhat aware (0.69 out of 1) and are more positioned on the left than on the right (see graph 1).

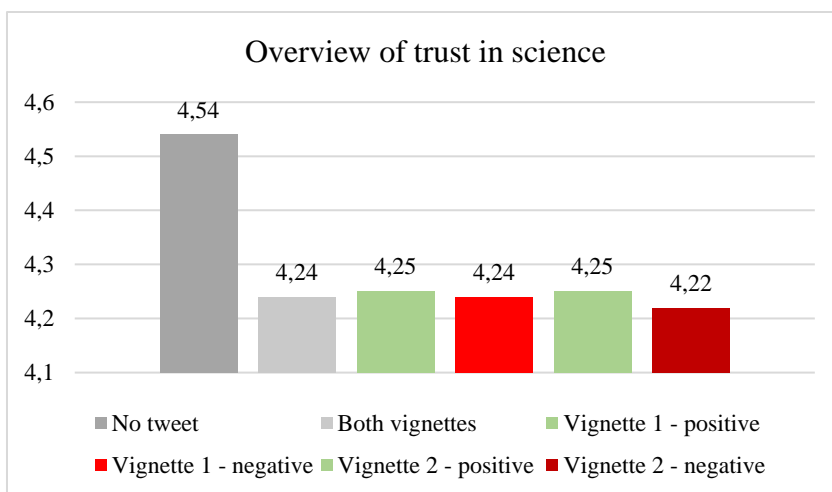


Graph 1. Overview of political orientation.



Graph 2. Percentage of votes per party.
Source: Alle Cijfers (n.d.).

Only the part of the sample that voted for the PvdA are representative of the total compared to all Dutch citizens who voted during the national and provincial elections (Alle Cijfers, n.d.). The other three parties are not representative. For the CDA, VVD and PVV the sample includes less people who voted for both elections compared to the entire Dutch population that voted (ibid.).



Graph 3. Overview of trust in science.

What can be seen is that people's average trust in scientists is higher before seeing vignettes. This difference is significant ($p < 0.001$). The difference in average trust does not differ that much between positive and negative tweets ($p = 0.30$) and between the first and second vignette (see also table A4 in the appendix for more information). More people somewhat trust scientists after seeing the first negative tweet, compared to the first positive tweet (resp. 96 and 86 people). Slightly more people saw a positive tweet.

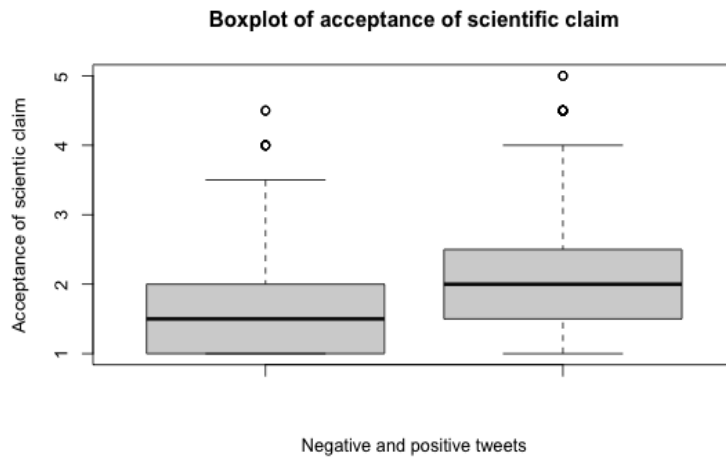


Figure 2: boxplot of acceptance of scientific claims.

Figure 2 shows a boxplot of people’s likeliness to accept scientific claims (where 1 means rejection of scientific claims and 5 means acceptance of scientific claims). The left boxplot shows the negative tweets, the right boxplot shows the positive tweets. When people saw a negative tweet, they were more likely to reject the scientific claim (mean of 1.78 compared to mean of 2.22). This difference in means is significant ($p < 0.001$).

Further testing shows that the difference between means for the negative tweets is not significant ($p = 0.53$), but the difference between means for the positive tweets is significant ($p < 0.001$). It thus seems like people’s acceptance of scientific claims differed between topics when a positive tweet was shown but not when a negative tweet was shown.

Hypothesis testing

This part shows the results of the hypotheses, all significant results are discussed⁴.

Hypothesis 1a: The anti-science sentiment of political parties leads to a lower trust of people in science.

	b/SE
Intercept	4.45 *** (0.04)
Sentiment (positive)	-0.20 *** (0.03)
Sentiment (negative)	-0.23 *** (0.03)
N	339
Observations	1015
Marginal R ² / Conditional R ²	0.019 / 0.744
AIC	1668.500

Significance codes ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05
Standard error in parentheses.

⁴ In the pre-registration, 6 hypotheses were drafted. To answer the research question, only four hypotheses have to be tested. The analyses of the other two hypotheses (H: people with more anti-intellectual sentiment are more likely to be influenced by anti-science sentiment, and H: People with low political trust are less likely to be influenced by party cues and) can be found in appendix D.

The table includes one predictor variable (sentiment) and its coefficient for both a positive sentiment and a negative sentiment. The coefficients represent the estimated effect of each predictor on the dependent variable (trust in science) when other variables in the model are held constant. The standard errors (SE) provide a measure of uncertainty for each coefficient estimate. The table also shows that the fixed effects do explain some things (0.0019 and 0.744). The model explains 1,9% and 74,4% of the variance.

Anti-science sentiment has a negative significant effect on people's trust in science ($p < 0.001$). This means that when people see a tweet with an anti-science sentiment (the political party disagreeing with the research), people's trust in science decrease by 0.23. The effect of a positive sentiment (where a political party approves the research) is also significant ($p < 0.001$). A positive sentiment also has a negative significant effect, meaning that when people see a positive tweet, their trust in science goes down by 0.20. This is situated on a 5-point scale where 1 is the lowest (complete distrust in science) and 5 is the highest (complete trust in science). The effect of the anti-science sentiment tweet is thus bigger. Hypothesis 1a can thus be accepted.

Hypothesis 1b: The anti-science sentiment of political parties leads to the rejection of scientific claims by people.

Table 5. Linear Mixed Model for Hypothesis 1b				
	Model I	Model II	Model III	Model IV
	b/SE	b/SE	b/SE	b/SE
Intercept	4.29 *** (0.05)	4.23 *** (0.06)	4.35 *** (0.08)	4.24 *** (0.10)
Sentiment (negative)	-0.16 * (0.06)	-0.16 * (0.06)	-0.16 * (0.06)	0.07 (0.13)
Topic (fireworks)		0.12 * (0.05)	0.12 * (0.05)	0.12 * (0.05)
Tweet from PvdA			-0.06 (0.09)	0.06 (0.13)
Tweet from CDA			-0.18 (0.09)	0.00 (0.13)
Tweet from VVD			-0.26 ** (0.09)	-0.10 (0.13)
Sentiment*PvdA				-0.24 (0.18)
Sentiment*CDA				-0.36 (0.18)
Sentiment*VVD				-0.33 (0.18)
N	334	334	334	334
Observations	656	656	656	656
Marginal R ² / Conditional R ²	0.008 / 0.430	0.012 / 0.436	0.024 / 0.434	0.031 / 0.447
AIC	1680.187	1681.175	1687.153	1693.804

*Significance codes '***' 0.001 '**' 0.01 '*' 0.05
Standard error in parentheses.*

Model I shows that anti-science sentiment has a significant negative effect on people's acceptance of scientific claims ($p < 0.05$). The negative effect means that people's likeliness to accept scientific claims (the intercept) decreases when people see an anti-science sentiment tweet. Their likeliness to accept the scientific claim decreases by 0.16. This is situated on a 5-point scale where 1 is the lowest (full rejection of scientific claims) and 5 is the highest (full acceptance of scientific claims). This thus means that people will still accept the scientific claim after they see a negative tweet. Their agreement with the scientific claim goes down from 4.29 to 4.16 in the first model. The height of the negative significant effect is the same when the topic (model II) and the different parties that made the tweet (model III) are added. The effect stays the same, namely a decrease by 0.16 with a significance of $p < 0.05$. We do see that the first model explains the most (considering the AIC is the lowest). On the other hand, the third model explains the most of the variance (0.024 or 2.4%).

In model III, the tweets from the PvdA, CDA and VVD were analyzed compared to the tweets from the PVV. The PVV thus served as the reference group. Only the tweet from the VVD has a negative significant effect ($p < 0.01$). There is no significant effect for PvdA and CDA. This means that when people see a tweet from the VVD, instead of the PVV, they are more likely to reject the scientific claim. Their level of rejection then goes down by 0.26 to 4.09. This is still above 3, meaning that people will still accept the scientific claim.

Model IV shows that sentiment does not have a significant negative effect ($p = 0.57$) on people's acceptance of scientific claims. Next to this, the topic of the tweet does have a positive significant effect ($p < 0.05$) on people's acceptance of scientific claim, thus making people more likely to accept the scientific claim when they see the tweet on fireworks compared to the other tweet (on women's quota). No interaction between anti-science sentiment and political party is significant.

Hypothesis 1b can thus be partially accepted because the anti-science sentiment of political parties leads people to lower their acceptance of scientific claims. It does not lead to a rejection of scientific claims.

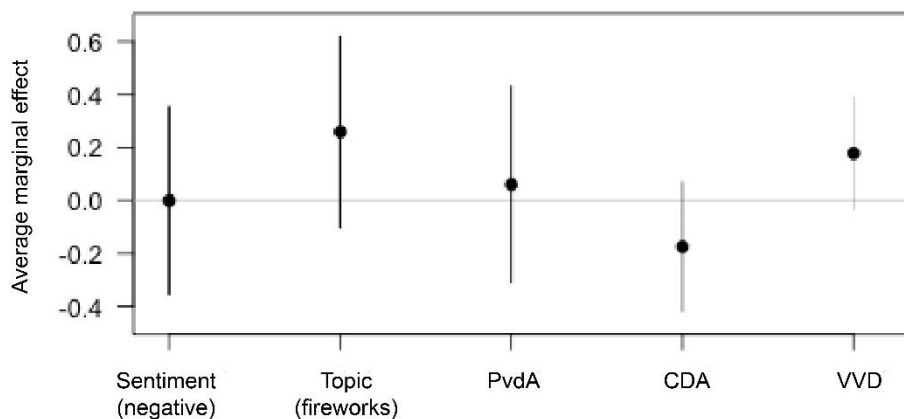


Figure 1. Plot of Average Marginal Effect for hypothesis 1b.

This figure shows the average marginal effects for sentiment, topic, tweet from the PvdA, tweet from the CDA and tweet from the VVD. Sentiment has a marginal effect of -0.18 and topic has a marginal effect of 0.18 . This means that for a 1-unit increase of sentiment, the probability of people accepting scientific claims decreases by 0.18 . For topic, a 1-unit increase leads to a probability of people accepting scientific claims increase of 0.18 . The marginal effect of the VVD is 0.06 . However, no variables have a significant effect.

H2: The effect of anti-science sentiment is bigger when people identify with the party that gives the cue compared to people who do not identify with the political party.

	Model I	Model II	Model III
	b/SE	b/SE	b/SE
Intercept	3.05 *** (0.07)	2.89 *** (0.09)	2.84 *** (0.10)
Sentiment (negative)	-0.71 *** (0.10)	-0.71 *** (0.10)	-0.60 *** (0.14)
Identification with PvdA		0.12 (0.12)	0.28 (0.17)
Identification with CDA		-0.01 (0.12)	0.15 (0.17)
Identification with VVD		0.28 * (0.12)	0.18 (0.17)
Identification with PVV		0.26 (0.19)	0.12 (0.27)
Identification with PvdA* sentiment			-0.29 (0.22)
Identification with CDA* sentiment			-0.30 (0.22)
Identification with VVD* sentiment			0.19 (0.23)
Identification with PVV* sentiment			0.25 (0.35)
N	337	322	322
Observations	655	628	628
Marginal R ² / Conditional R ²	0.075 / 0.249	0.086 / 0.244	0.092 / 0.255
AIC	2153.823	2077.265	2084.082

*Significance codes '***' 0.001 '**' 0.01 '*' 0.05
Standard error in parentheses.*

The anti-science sentiment of political parties does have a negative significant effect on people ($p < 0.001$). This means that when people see a tweet with a negative sentiment, their tendency to agree with the tweet from the political party decreases. This is thus contrary to the hypothesis.

Looking at the party that people identify themselves with, model II, identification with the VVD ($p < 0.05$) has a positive significant effect on people being influenced by the anti-science sentiment. This means that when people identify themselves with the VVD they are more likely to accept the information in the tweet that they saw. This is regardless of the party that made the tweet. Further testing shows that there is no significant effect for people who identify with VVD and see a tweet from the VVD.

No interactions are significant (see model III). Hypothesis 2 should thus be rejected.

H3: The effect of anti-science sentiment is bigger for people who identify themselves with the populist party that gives the cue compared to people who do not identify with the populist party.

Table 7. Linear Mixed Model for Hypothesis 3

	Model I	Model II
	b/SE	b/SE
Intercept	2.77 *** (0.16)	2.81 *** (0.16)
Sentiment (negative)	-0.26 (0.43)	-0.33 (0.21)
Identification with PVV	0.42 (0.43)	0.02 (0.55)
Identification with PVV*sentiment		0.98 (0.85)
N	138	138
Observations	155	155
Marginal R ² / Conditional R ²	0.017 / 0.104	0.026 / 0.088
AIC	529.009	528.182

*Significance codes '***' 0.001 '**' 0.01 '*' 0.05
Standard error in parentheses.*

For this analysis, only people who identify themselves with the PVV were used, which led to a lower sample (N=138). People who identify with the PVV does not have a significant effect on the effect of anti-science sentiment ($p=0.25$). The interaction is also not significant ($p=0.97$). Therefore, this hypothesis can be rejected.

5. Conclusion

In an increasingly globalizing world, information gets more abundant, but it is difficult to assess what information is true and what information is fake. With political parties trying to gain voters by telling their own version of the truth, this distinction does not get easier. It is important to study the effect that political parties can have on people's perception of truth but more specifically on people's acceptance of scientific claims and their trust in science. Also, is this effect bigger for populist parties? This survey vignette experiment with a within- and between-subject design, allowed for testing the influence of anti-science sentiment on people. This research answers the following question: To what extent does the anti-science sentiment of political parties change citizens' trust in science and acceptance of scientific claims and is this effect bigger for populist parties?

The results show that anti-science sentiment of political parties does change citizens' trust in science and their acceptance of scientific claims. It is interesting to see that both a positive sentiment and a negative sentiment have a significant negative effect on people's trust in science. The effect that the negative tweet has, is slightly bigger than the effect of a positive tweet. People's acceptance of scientific claims is influenced by tweets from the VVD, other political parties do not influence people's likeliness to reject scientific claims. Party cueing does not have a significant effect on the effect that the anti-science sentiment has on people. Finally, the effect of anti-science sentiment is not bigger for people who identify themselves with populist parties.

More concretely, hypotheses 2 and 3 are rejected. Hypotheses 1a and 1b are partially accepted. This means that the anti-science sentiment of political parties does change people's acceptance of

scientific claims and trust in science. When looking at if specific political parties change this, no significant results were found.

Discussion

This section discusses the theoretical implications of the conclusions, its practical implications and makes recommendations for future research.

Theoretical implications

This study shows that populist political parties do not affect people's attitude towards science. Therefore, it cannot confirm the research by Stecula and Pickup (2021) who looked at how populist parties can shape people's belief in conspiracy theories. They showed that populism is even more strongly correlated to trusting non-scientific information than partisanship. This means that regardless of which party people vote for, populist rhetoric influences whether people believe in other information. This was not found in this research. This study can confirm that people's mistrust in science is regardless of the type of topic (Merkley, 2020; Ylä-Anttila, 2018; Mede and Schäfer, 2020). The topics in this study were not significant in explaining people's lowering of trust in science. This is both the case for the less complex topic as well as for the more complex topic.

This research showed that regardless of the sentiment of the tweet, people distrust science more and reject scientific claims more when they read a tweet from a political party concerning research. The hypothesis only looked at anti-science sentiment of political parties and did not look at the positive (or pro-science) sentiment of political parties. This is a surprising and unexpected finding. Relating this to the theory discussed in this research, it could be the case that all people in the sample have an anti-intellectual sentiment. However, the findings do not corroborate this. People's trust in science before seeing tweets was high (4.54 out of 5, see table 3) (Merkley, 2020; Ylä-Anttila, 2018). The sample also had high scientific literacy, meaning that it is less likely that the total sample has an anti-intellectual sentiment (3.95 out of 5, see table 3) (Mede, et al., 2022). Mede and colleagues also found that left-leaning people are less likely to have anti-intellectual sentiment, however, no evidence of this was found in this research.

The tweet from the VVD did have a significant effect, however, party identification with the VVD was not significant. Also, the tweet from the PVV with an anti-science sentiment did have a significant negative effect ($p < 0.01$) when only the people that correctly answered the attentiveness questions were used for analysis (see table E6 in appendix). This means that most people did not pay attention to the party while this does have an effect on how people perceive information. It must be noted that only the negative sentiment had a significant effect, people who identified themselves with the PVV were not significantly influenced ($p = 0.33$). Considering that the sample of table E6 is only 37, future tests should point out if these results are still significant when the sample size is bigger.

There thus appears to be a gap in literature regarding anti-intellectual sentiment of people and acceptance of scientific claims and trust in science. This research showed that people's trust in science significantly decreases after seeing a tweet from a political party that responds to a study done by a research institute.

It could be the case that people's trust in science and acceptance of scientific claims is politicized. One study showed that politicization can stunt the effect that scientific consensus has on people's attitude towards climate change (Bolsen and Druckman, 2018). It could be the case that in my research the fact that a political party responded to a study led to a decrease in acceptance of scientific claims, simply because a political party responded to it, thereby making it politicized.

Practical implications

People who are very active on social media and are politically engaged might see the effect of political tweets on science even more. Considering that political parties responded to the research, it could also be the case that research done by a research institute becomes politicized which has a negative effect on people's attitude towards science. The Netherlands has many different research institutes and some of these institutes do give advice to the government. This might also make the research politicized, even though the research is independently done and scientifically sound. This could have implications for people's acceptance of research, which could lead to the delegitimization of science. While this research

expected to find a stronger effect from populist political parties, it found that it does not matter which political party made the tweet. It thus seems like politicians can have the best intent with sharing and responding to research that has been done, but according to this research that intent always has a negative effect.

Future research

Future research should look at the reason why people both decrease their trust in science when they read a tweet, or vignette, with an anti-science sentiment, and when they read a tweet with a pro-science sentiment. Considering that this research found this effect, it could have implications outside of this experiment in real-life. Do people distrust the research more because a political party responded to it? It appears that this has not been researched a lot in academia (Bolsen and Druckman, 2018). Research has been done into the effect of party cueing and trust in science, but it seems like not a lot of research has been done in just the fact that a political party responds to a study. A study could thus research the effect that different types of organisations have on people's attitude towards science.

Furthermore, a recent study in the Netherlands shows high trust in science and scientific institutions, but it also shows that there is a decrease in trust when the study has been done on behalf of the government (Rathenau, 2022ab). This research looked at how political parties differently responded to the COVID-19 pandemic. Future research could look at the difference between a governmental paid study and a non-governmental paid study to see if this does make a difference in people's trust in science and scientific institutions.

Future research should look at whether people change their own opinion after seeing a tweet or vignette from a political party that they identify with (party cueing). Where this research looked at four parties, future research could look at the entire political spectrum of a country with a multi-party system. This would result in a simpler design, namely a 2x2 factorial design, where people either identify with the party or not and where the political party either accepts or rejects the information.

It is interesting to further study the communication of political parties to then be able to make more realistic vignettes where emotions can also play a role (Bonansinga, 2020; Hameleers, et al., 2017). This leads to better external validity of this type of research. Further studies can be done to see what the information in a vignette does with people's view on that topic. For example, by making statements, similar to the study of Merkley (2020). This study looked at people's disposition towards climate change, GMOs, nuclear power, and water fluoridation, which are complex issues. This research can be replicated and altered to account for vignettes with a varying degree of saliency and complexity.

It is important to perform more survey vignette experiments to study different topics to better understand when people reject scientific claims. This research used two different types of topics in terms of complexity. However, it might also be the case that people have a stronger opinion on the women's quota than on the fireworks report. Therefore, complexity and salience of the topic has to be further studied. Qualitative research, using interviews, could also help explain if and why people have different opinions on certain topics. This is important because of the echo chamber theory. This theory explains that it is possible that people accept or reject information based on their environment instead of just based on the tweet itself (Szabados, 2019; An, Quercia and Crowcroft, 2014). Future research could change the setting of the experiment to be in a lab setting and could include more survey questions before the vignettes are shown, to better understand the environment of people and thus the effect that the environment may have.

Finally, the power of the analyses might be less strong for hypothesis 2 and 3, considering that only the sample of people who voted for PvdA is representative, those for CDA, VVD and PVV are not. This could have led to lower statistical power for these three parties and makes it harder to generalize the found results for the entire Dutch population.

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7. Appendices

Appendix A. Structure of the survey

The survey consists of eight parts (see also table A1). First, the research is explained, and people give informed consent. Secondly, some questions are asked about people's personal characteristics, their populist attitude, political awareness and colour, trust in politics, and anti-intellectual sentiment. Thirdly, the first vignette text is introduced. After reading the vignette, questions that have a randomized order are asked to check whether the text in the vignette changed the attitude of the respondent. One of these questions is people's trust in politicians. This is the same question as in the first step, which allows to check whether respondents' attitude changes based on the information in the vignette and whether party cueing occurred, making this a within-subject experiment (Mutz, 2011). Fourthly, people get questions about media and news consumption. This is done to make respondents think of something else than the tweet they just read. Fifthly, respondents get their second vignette and have to answer questions about their opinion on the vignette. These are the same questions as the first vignette, but the order of these questions is randomized. Sixthly, after both vignettes are read and questions about the vignettes are answered, attentiveness questions are asked. This is done to check whether the respondent has read the vignettes carefully. This ensures that the given answers are valid and based on people's attitudes after reading the vignette (Kane and Barabs, 2018). Seventhly, people are asked about their scientific literacy.

The vignettes are randomly distributed to increase the statistical validity of the research and to account for causal inference (Toshkov, 2016; James, et al., 2017; Sniderman and Druckman, 2011).

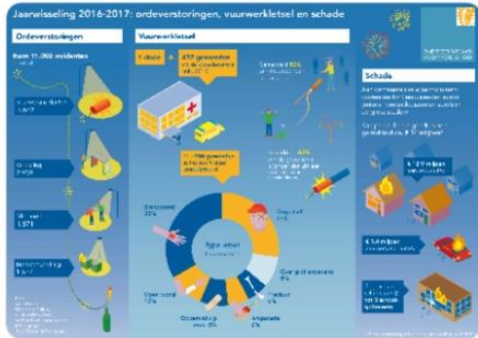
Step 1	Introduction and explanation of research
Step 2	Questions about personal characteristics and DV
Step 3	Vignette 1 and questions regarding people's attitude
Step 4	Questions on media and news consumption
Step 5	Vignette 2 and questions regarding people's attitude
Step 6	Attentiveness question
Step 7	Final questions
Step 8	Debriefing

Table A1. Structure of vignette experiment.

Finally, respondents are debriefed, and the goal of the study is mentioned to reduce the risk of deception (James, Jilke, and Van Ryzin, 2017). Deception happens when researchers actively use "false information and practices intended to mislead participants" (ibid., p. 108). As the echo chamber theory (Szabados, 2019; An, Quercia and Crowcroft, 2014) notes it is possible that people do accept or do not accept information as true because of their environment. Therefore, the vignettes they read might enhance their attitude towards (mis)information which is not the goal of this research. This research aims to understand the phenomenon of people's attitude towards expert knowledge and does not want to contribute to the phenomenon of echo chambers. Debriefing is therefore very important in this study (James, et al., 2017). Furthermore, the aim of this research is not to spread misinformation, it wants to look at another phenomenon. However, the information given at the start of the experiment will not mention that respondent will be reading either misinformation or correct information, as this can affect people's responses to the questions. This also makes debriefing very important, because people need to be made aware when they have read misinformation to avoid the risk of respondents spreading this misinformation after the research (ibid.).

Figure A1. Example of two vignettes, translated to English

Onderzoeksraad @Onderzoeksraad · Dec 1, 2017
 Each year, on average 1 person dies, hundreds of people get wounded as a consequence of fireworks, and around 11.000 incidents are registered:
https://onderzoeksraad.nl/uploads/fm/infographic_Veiligheidsrisicos_Jaarwisseling_1600px.jpg



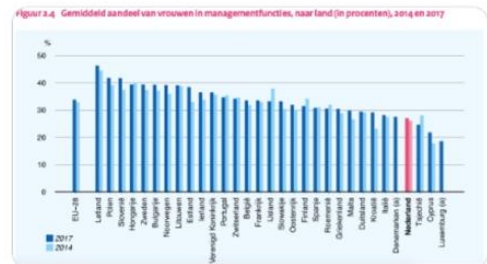
13 44 16

PVV - Partij voor de Vrijheid @pvv · Dec 1, 2017
 Clear and insightful research by @Onderzoeksraad! Get rid of the #nuisance. All these vandals and illegals contribute to half of the wounded! It is good that @Onderzoeksraad has found these results. Stop illegal fireworks and vandals! #awaywithnuisance #stopvandals #PVV

13 44 16

Centraal Planbureau @CPBnl · Jun 1, 2018
 There are plenty of highly educated #women active on the #labourmarket, but the share that moves no to #management is low in European terms. The Netherlands dangles (almost) at the bottom of the list.

Research by @CPBnl and @SCP:
<https://cpb.nl/vrouwen-aan-de-top>



5 19 6

CDA @cdavandaag · Jun 1, 2018
 Useless research by @CPBnl. The Netherlands did not even have a women's quota in '14-'17, so what is the use of this? They should have research something else. Women deserve fair chances. Research how we can achieve that. #womenatthetop #womensquota #CDA

5 19 6

Appendix B. Extra information on variables used in analysis

Table B1. Overview of variables used in the analyses.

Variable	Type	Items	Level in analyses
Age	Single item (continuous)	What is your year of birth?	[Year of birth]
Gender	Single item (categorical)	What is your gender?	0 = male, 1 = female, 2 = other
Education	Single item (dummy-coded)	What is your highest obtained degree?	1 = primary school, 2 = secondary education, 3 = higher level secondary education, 4 = applied university or Bachelor university degree, 5 = applied university or university Master degree
Province of residence	Single item (categorical)	In which province do you live?	[List of all Dutch provinces]
Political interest	Single item (categorical)	How interested are you in politics?	1 = not interested at all, 5 = very strongly interested, NA = Don't know
Political positioning	Single item (categorical)	Where would you place yourself on this scale where 1 means left and 5 means right?	1 = very left-leaning, 5 = very right-leaning, NA = Don't know
Political colour and party identification	Single item (categorical)	On which party did you vote during the last Provincial elections (15 th of March 2023)?	[List of political parties], NA = Don't remember, NA = Prefer not to say, NA = I was not allowed to vote, NA = I did not vote
	Single item (categorical)	To what extent do you feel connected to this party?	1 = Not at all, 5 = Completely, NA = Don't know
	Single item (categorical)	How likely is it that you will vote for one of the following parties? 1. CDA 2. PvdA 3. PVV 4. VVD	1 = Very unlikely, 5 = Very likely, NA = Don't know, NA = Prefer not to say
	Single item (categorical)	On which party did you vote during the last National elections of 2021?	[List of political parties per province] NA = Don't remember, NA = Prefer not to say, NA = I was not allowed to vote, NA = I did not vote
	Single item (categorical)	To what extent do you feel connected to this party?	1 = Not at all, 5 = Completely, NA = Don't know, NA = Not applicable

Political awareness	Single item (categorical)	How many political parties are in the current coalition (Rutte IV?)	1=1, 2=2, 3=3, 4=4, 5=5, 6=6, NA=Don't know.
	Single item (categorical)	To which political party do the following politicians belong? 1. Esther Ouwehand 2. Attje Kuiken 3. Sigrid Kaag	[Open question] Correct answers: Partij van de Dieren, PvdA and D66.
Populist attitude	Single item (categorical)	To what extent do you agree with the following statements? (1) What unites the ordinary people is that they trust their common sense in everyday life. (2) Ordinary people are of good and honest character.	1= Totally disagree, 5= Totally agree
Trust in institutions	Single item (categorical)	Below is a list of some groups. Please indicate to what extent you trust these groups. (1) Scientists (2) Economists (3) Political parties (4) Professors (5) Doctors (6) Politicians (7) Advocates (8) Parliament	1= Totally distrust, 5= Completely trust, NA= Don't know
Anti-intellectual sentiment (Composite score) Consisting of:	Single item (categorical)	What is your opinion on the influence of science on society?	1= Very negative, 5= Very positive, NA= Don't know
- Opinion on influence of science		Below is a list of some groups. Please indicate to what extent you trust these groups. (1) Scientists	1= Totally distrust, 5= Completely trust, NA= Don't know
- Trust in scientists	Single item (categorical)	To what extent do you agree with the following statements? (1) Science will solve our social problems like crime and mental illness. (2) One trouble with science is that it makes our way of life change too fast. (3) Scientists always seem to be prying into things that they really ought to stay out of. (4) One of the bad effects of science is that it breaks down people's ideas of right and wrong.	1= Totally disagree, 5= Totally agree, NA= Don't know
- Opinion on science			

Opinion on scientists	Single item (categorical)	To what extent do you agree with the following statements? (1) We can no longer trust scientists to tell the truth about controversial scientific issues because they depend more and more on money from industry (2) Scientists only look at very specific issues and do not consider problems from a wider perspective (3) Nowadays, the problems we are facing are so complex that scientists are no longer able to understand them (4) Scientists should not intervene in political debate when decisions ignore scientific evidence (5) Scientists should intervene in political debate to ensure that decisions take into account scientific evidence (6) Scientists should be held accountable for the misuse of their discoveries by other people	1= Totally disagree, 5= Totally agree, NA= Don't know
Acceptance of scientific claim (vignette question)	Single item (categorical)	Would you say the research done by the [name of scientific research institute] was trustworthy?	1= Not at all trustworthy, 5= Completely trustworthy, NA= Don't know
Influence (vignette question)	Single item (categorical)	To what extent do you agree with the tweet from the political party?	1= Totally disagree, 5= Totally agree, NA= Don't know
Trust (vignette question)	Single item (categorical)	To what extent do you trust the following groups? (1) Scientists (2) Political parties (3) Politicians	1= Totally distrust, 5= Completely trust
Filler questions	Single item (categorical)	On average, how many hours a week do you watch television?	1= Less than 1 hour per week, 2= 1-5 hours per week 3= 5-10 hours per week, 4= 10-20 hours per week, 5= more than 20 hours per week
	Single item (categorical)	On average, how many hours a day are you on social media?	1= Less than 1 hour per day, 2= 1-3 hours per day, 3= 3-5 hours per day, 4= 5-7 hours per day, 5= more than 7 hours per day.
Attentiveness questions	Single item (categorical)	Do you remember which political party responded to the tweet of the Onderzoeksraad?	[Correct answer depends on which vignette was shown] 1= PvdA, 2= Forum

	Single item (categorical)	Do you remember from which year the report on fireworks was? [Correct answer is 2016-2017]	voor Democratie, 3=CDA, 4= PVV, 5=D66, 6=VVD, 7=GroenLinks, NA= Don't remember 1= 2015-2016, 2=2016-2017, 3=2018-2019, 4=2020-2021, NA= Don't remember
Scientific literacy	Composite score	To what extent do you think the following statements are true? (1) The earliest humans lived at the same time as the dinosaurs (false) (2) The continents on which we live have been moving for millions of years and will continue to move in the future (true) (3) The oxygen we breathe comes from plants (true) (4) The methods used by the natural sciences and the social sciences are equally scientific (true) (5) Human beings, as we know them today, developed from earlier species of animals (true) (6) Climate change is for the most part caused by natural cycles rather than human activities (true) (7) The cure for cancer exists but is hidden from the public by commercial interests (false) (8) Viruses have been produced in government laboratories to control our freedom (false)	1 = certainly wrong, 5 = certainly true, NA = don't know 1 = certainly wrong, 5 = certainly true, NA = don't know 1 = certainly wrong, 5 = certainly true, NA = don't know 1 = certainly wrong, 5 = certainly true, NA = don't know 1 = certainly wrong, 5 = certainly true, NA = don't know 1 = certainly wrong, 5 = certainly true, NA = don't know 1 = certainly wrong, 5 = certainly true, NA = don't know 1 = certainly wrong, 5 = certainly true, NA = don't know

Control variables and their Cronbach's Alpha

To measure opinion on scientists, people were asked to what extent they agreed with six statements (5-point Likert scale, Cronbach's Alpha: 0.17) (Eurobarometer, 2018). Populist attitude was measured by asking respondents how much they agreed with two statements, using a validated scale (5-point Likert scale, Cronbach's Alpha: 0.53) (Mede, et al., 2020). To measure political positioning, people were asked where they would position themselves on a 5-point scale where 1 meant left and 5 meant right. Political awareness was measured by asking respondents how much they agreed with two statements, using and adapting existing questions to fit the Dutch context (5-point Likert scale, Cronbach's Alpha: 0.74) (Slothuus, 2016). Political interest was measured by asking respondents how interested they were in politics (5-point Likert scale) (Azrout and De Vreese, 2018).

Table B2. Level of education (N=317)

Level of education	Percentage	Percentage (NL)
Primary school	0.9%	9%
VMBO, HAVO, VWO-onderbouw, MBO 1	4%	20%
HAVO, VWO, MBO 2-4	26%	36%
HBO Bachelor or WO Bachelor	43%	21%
HBO Master, WO Master or Doctor	26%	13%

Source: CBS (2022b).

Table B3. Province (N=314)

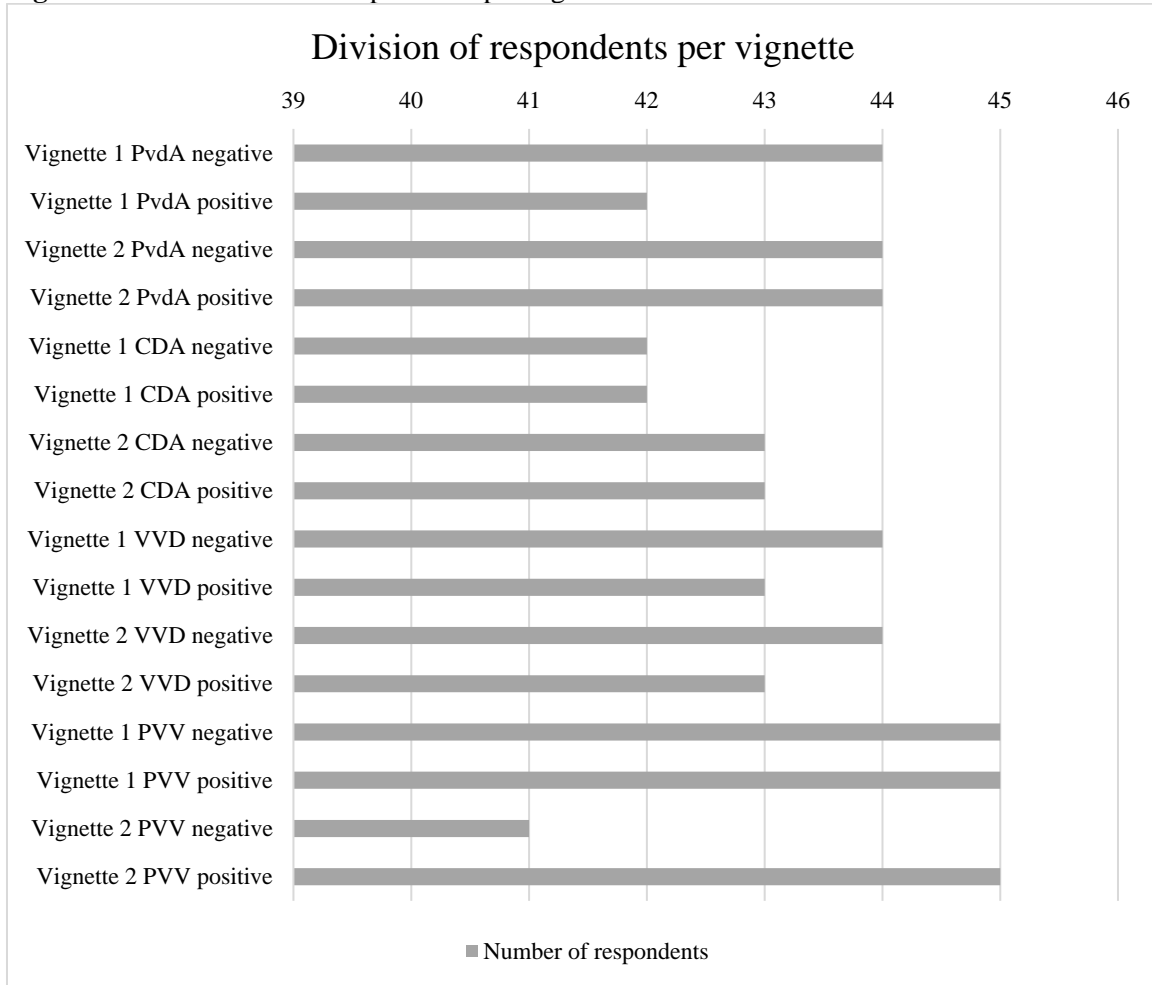
Province	Percentage	Percentage (NL)
Drenthe	4%	3%
Flevoland	2%	2%
Friesland	3%	4%
Gelderland	10%	12%
Groningen	6%	3%
Limburg	5%	6%
Noord-Brabant	9%	15%
Noord-Holland	14%	17%
Overijssel	7%	7%
Utrecht	18%	8%
Zeeland	2%	2%
Zuid-Holland	21%	21%

Source: CBS (2022b).

Table B4. Overview of trust in scientists

DV= Trust in scientists	Control	Both vignettes	Vignette 1		Vignette 2	
	No tweet	All	Positive tweet	Negative tweet	Positive tweet	Negative tweet
Mean	4.54	4.24	4.25	4.24	4.25	4.22
Totally distrust	4	6	2	1	2	1
Somewhat distrust	12	18	4	4	3	7
Neither distrust nor trust	22	37	10	9	10	8
Somewhat trust	274	362	86	96	90	90
Totally trust	366	253	66	60	65	62
N	339	337	168	171	170	168

Figure B1. Division of respondents per vignette



*G*power analysis*

t tests - Linear multiple regression: Fixed model, single regression coefficient

Analysis: A priori: Compute required sample size

Input: Tail(s) = One
 Effect size f^2 = 0,3
 α err prob = 0,05
 Power (1- β err prob) = 0,95
 Number of predictors = 7

Output: Noncentrality parameter δ = 3,3763886
 Critical t = 1,6972609
 Df = 30
 Total sample size = 38
 Actual power = 0,9509284

The power analysis shows that a sample size of 38 is needed. This means, given the 16 conditions (four political parties that each can respond in two different ways to a tweet from research institute A or B, so $4*2*2 = 16$), that I need a sample of 608 participants ($16*38=608$). However, given that participants get to see two vignettes, the sample size can be halved and is now 304.

Appendix C. Output for hypothesis testing

Table C1. Linear Mixed Model for Hypothesis 3, including party identification.

Table C1. Linear Mixed Model for Hypothesis 3				
	Model I	Model II	Model III	Model IV
	b/SE	b/SE	b/SE	b/SE
Intercept	3.07 *** (0.09)	3.27 *** (0.05)	3.06 *** (0.10)	3.23 *** (0.05)
Sentiment (negative)	-0.18 *** (0.03)	-0.18 *** (0.03)	-0.15 (0.10)	-0.11 * (0.05)
Party identification	0.14 *** (0.04)		0.15 *** (0.05)	
Identification with PvdA		0.23 ** (0.07)		0.31 *** (0.08)
Identification with CDA		0.02 (0.07)		0.05 (0.08)
Identification with VVD		0.18 * (0.07)		0.19 * (0.08)
Identification with PVV		-0.13 (0.11)		-0.19 (0.12)
Party id* sentiment			-0.01 (0.04)	
Identification with PvdA* sentiment				-0.17 * (0.07)
Identification with CDA* sentiment				-0.05 (0.07)
Identification with VVD* sentiment				-0.03 (0.08)
Identification with PVV* sentiment				0.11 (0.12)
N	317	317	317	317
Observations	608	608	608	608
Marginal R ² / Conditional R ²	0.052 / 0.748	0.064 / 0.750	0.053 / 0.748	0.068 / 0.753
AIC	846.495	856.202	852.851	869.814

Appendix D. Output for hypotheses from pre-registration.

Table D1. Output for hypothesis: people with more anti-intellectual sentiment are more likely to be influenced by anti-science sentiment than people with little or no anti-intellectual sentiment.

Table D1. Linear Mixed Model for Hypothesis			
	Model I	Model II	Model III
	b/SE	b/SE	b/SE
Intercept	2.98 *** (0.07)	2.79 *** (0.09)	2.82 *** (0.09)
Sentiment (negative)	-0.70 *** (0.10)	-0.69 *** (0.09)	-0.75 *** (0.10)
Anti-intellectual sentiment	0.55 *** (0.16)	0.55 *** (0.16)	0.33 (0.20)
Topic (fireworks)		0.37 *** (0.09)	0.37 *** (0.09)
Anti-intellectual sentiment*sentiment			0.49 (0.28)
N	337	337	337
Observations	655	655	655
Marginal R ² / Conditional R ²	0.095 / 0.250	0.114 / 0.290	0.118 / 0.294
AIC	2145.710	2132.846	2132.473

*Significance codes '***' 0.001 '**' 0.01 '*' 0.05
Standard error in parentheses.*

Table D2. Output for hypothesis: people with low political trust are less likely to be influenced by party cues than people with high political trust.

Table D2. Linear Mixed Model for Hypothesis				
	Model I	Model II	Model IV	Model V
	b/SE	b/SE	b/SE	b/SE
Intercept	1.85 *** (0.19)	2.28 *** (0.11)	1.99 *** (0.25)	2.34 *** (0.12)
Low political trust	0.19 (0.11)	0.19 (0.12)	-0.07 (0.34)	0.05 (0.17)
Party identification	0.26 *** (0.08)		0.19 (0.11)	
Topic (fireworks)	0.39 *** (0.09)	0.39 *** (0.09)	0.39 *** (0.09)	0.39 *** (0.09)
Identification with PvdA		0.10 (0.13)		0.07 (0.16)
Identification with CDA		-0.06 (0.13)		-0.27 (0.16)
Identification with VVD		0.30 * (0.13)		0.38 (0.16)
Identification with PVV		0.25 (0.20)		0.12 (0.27)
Low political trust*Party identification			0.13 (0.15)	
Low political trust*idPvdA				0.15 (0.26)
Low political trust*idCDA				0.55 (0.26)
Low political trust*idVVD				-0.33 (0.28)
Low political trust*idPVV				0.11 (0.42)
N	322	322	322	322
Observations	628	628	628	628
Marginal R ² / Conditional R ²	0.046 / 0.244	0.040 / 0.247	0.047 / 0.246	0.051 / 0.253
AIC	2096.801	2110.780	2100.046	2115.053

Significance codes '***' 0.001 '**' 0.01 '*' 0.05
Standard error in parentheses.

Appendix E. Output for all six hypotheses after respondents were removed that did not pass the attentiveness checks.

Table E1. Output for hypothesis 1a.

Hypothesis 1a: The anti-science sentiment of political parties leads to a lower trust of people in science.

Table E1. Linear Mixed Model for Hypothesis 1a.	
	Model I
	Estimate
Intercept	4.47 *** (0.08)
Sentiment (positive)	-0.17 ** (0.06)
Sentiment (negative)	-0.25 *** (0.05)
N	88
Observations	263
Marginal R ² / Conditional R ²	0.020 / 0.775
AIC	423.745

*Significance codes '***' 0.001 '**' 0.01 '*' 0.05*

Standard error in parentheses.

Table E2. Output for hypothesis 1b.

Hypothesis 1b: The anti-science sentiment of political parties leads to the rejection of scientific claims by people.

Table E2. Linear Mixed Model for Hypothesis 1b.				
	Model I	Model II	Model III	Model IV
	b/SE	b/SE	b/SE	b/SE
Intercept	4.30 *** 4.31 (0.11)	4.22 *** (0.12)	4.13 *** (0.16)	4.37 *** (0.21)
Sentiment (negative)	-0.17 (0.12)	-0.19 (0.12)	-0.17 (0.12)	-0.57 * (0.26)
Topic (fireworks)		0.18 (0.11)	0.18 (0.11)	0.17 (0.11)
Tweet from PvdA			-0.00 (0.18)	-0.11 (0.27)
Tweet from CDA			0.26 (0.18)	-0.22 (0.27)
Tweet from VVD			0.06 (0.19)	-0.26 (0.30)
Sentiment*PvdA				0.11 (0.37)
Sentiment*CDA				0.87 * (0.36)
Sentiment*VVD				0.53 (0.38)
N	88	88	88	88
Observations	175	175	175	175
Marginal R ² / Conditional R ²	0.009 / 0.387	0.018 / 0.398	0.032 / 0.401	0.069 / 0.428
AIC	462.571	464.546	473.156	472.793

*Significance codes '***' 0.001 '**' 0.01 '*' 0.05
Standard error in parentheses.*

Table E3. Output for hypothesis 2.

H2: The effect of anti-science sentiment is bigger when people identify with the party that gives the cue.

Table E3. Linear Mixed Model for Hypothesis 2				
	Model I	Model III	Model II	Model IV
	b/SE	b/SE	b/SE	b/SE
Intercept	2.51 *** (0.34)	2.29 *** (0.47)	2.94 *** (0.18)	2.72 *** (0.22)
Sentiment (negative)	-0.78 *** (0.19)	-0.37 (0.63)	-0.80 *** (0.19)	-0.38 (0.29)
Party identification	0.25 (0.14)	0.36 (0.21)		
Identification with PvdA			-0.08 (0.23)	0.21 (0.36)
Identification with CDA			0.32 (0.22)	0.84 * (0.34)
Identification with VVD			0.07 (0.22)	0.05 (0.32)
Identification with PVV			0.27 (0.39)	0.45 (0.57)
Party identification* sentiment		-0.19 (0.28)		
Identification with PvdA* sentiment				-0.54 (0.46)
Identification with CDA* sentiment				-0.94 * (0.43)
Identification with VVD* sentiment				0.15 (0.43)
Identification with PVV* sentiment				-0.51 (0.77)
N	85	85	85	85
Observations	167	167	167	167
Marginal R ² / Conditional R ²	0.110 / 0.125	0.111 / 0.132	0.106 / 0.139	0.143 / 0.179
AIC	554.388	556.601	562.208	560.811

*Significance codes '****' 0.001 '***' 0.01 '**' 0.05*

Standard error in parentheses.

Table E4. Output for hypothesis 3.

H3: People with more anti-intellectual sentiment are more likely to be influenced by anti-science sentiment.

Table E4. Linear Mixed Model for Hypothesis 3		
	Model I	Model II
	b/SE	b/SE
Intercept	3.08*** (0.15)	2.80 *** (0.17)
Anti-intellectual sentiment	0.36 (0.54)	0.14 (0.64)
Sentiment (negative)	-0.80 *** (0.19)	-0.84 *** (0.19)
Topic (fireworks)		0.59 ** (0.18)
Anti-intellectual sentiment * sentiment		0.63 (1.04)
N	87	87
Observations	170	170
Marginal R ² / Conditional R ²	0.098 / 0.151	0.147 / 0.237
AIC	567.817	560.348

*Significance codes '***' 0.001 '**' 0.01 '*' 0.05
Standard error in parentheses.*

Table E5. Output for hypothesis 4.
H4: People with low political trust are less likely to be influenced by party cues.

Table E5. Linear Mixed Model for Hypothesis 4.				
	Model I	Model II	Model III	Model IV
	b/SE	b/SE	b/SE	b/SE
Intercept	1.62 *** (0.37)	2.17 *** (0.21)	1.46 ** (0.51)	2.08 *** (0.23)
Low trust in politics	0.22 (0.21)	0.16 (0.22)	0.52 (0.69)	0.28 (0.32)
Party identification	0.30 (0.16)		0.37 (0.23)	
Topic	0.52 (0.18)	0.52 ** (0.18)	0.52 ** (0.18)	0.52 ** (0.18)
Identification with PvdA		-0.09 (0.25)		0.22 (0.31)
Identification with CDA		0.25 (0.24)		-0.03 (0.31)
Identification with VVD		0.11 (0.24)		0.26 (0.30)
Identification with PVV		0.33 (0.43)		0.56 (0.52)
Low political trust * party identification			-0.14 (0.31)	
Low political trust * identification with PvdA				-0.88 (0.52)
Low political trust * identification with CDA				0.75 (0.52)
Low political trust * identification with VVD				-0.21 (0.50)
Low political trust * identification with PVV				-0.98 (0.89)
N	85	85	85	85
Observations	167	167	167	167
Marginal R ² / Conditional R ²	0.068 / 0.191	0.057 / 0.209	0.069 / 0.196	0.101 / 0.227
AIC	564.209	572.896	566.490	570.890

*Significance codes '***' 0.001 '**' 0.01 '*' 0.05
Standard error in parentheses.*

Table E6. Output for hypothesis 5.

H5: The effect of anti-science sentiment is bigger when people identify with the populist party that gives the cue.

Table E6. Linear Mixed Model for Hypothesis 5	
	Model I
	b/SE
Intercept	2.75 *** (0.28)
Sentiment (negative)	-1.05 ** (0.36)
Identification with PVV	1.25 (1.26)
N	36
Observations	46
Marginal R ² / Conditional R ²	0.185 / 0.426
AIC	155.224

Significance codes '***' 0.001 '**' 0.01 '*' 0.05

Standard error in parentheses.

RStudio gave an error, stating that the fixed-effects model was rank deficient, therefore one coefficient was dropped. This made it impossible to perform the interaction analysis.

Appendix F. Codebook

Variable	Description
age	Respondent's age in years
agree	To what extent do you agree with the tweet from the political party? 5 points 1 – Completely disagree 5 – Completely agree
agree_cda_0	To what extent do you agree with the tweet from the political party? 5 points [after shown a positive tweet from CDA]
agree_cda_1	To what extent do you agree with the tweet from the political party? [after shown a negative tweet from CDA]
agree_pvda_0	To what extent do you agree with the tweet from the political party? [after shown positive tweet from PvdA]
agree_pvda_1	To what extent do you agree with the tweet from the political party? [after shown negative tweet from PvdA]
agree_pvv_0	To what extent do you agree with the tweet from the political party? [after shown positive tweet from PVV]
agree_pvv_1	To what extent do you agree with the tweet from the political party? [after shown negative tweet from PVV]
agree_vvd_0	To what extent do you agree with the tweet from the political party? [after shown positive tweet from VVD]
agree_vvd_1	To what extent do you agree with the tweet from the political party? [after shown negative tweet from VVD]
ai	Anti-intellectual sentiment of people
att1	Attention question 1: Which political party reacted to the tweet of the Onderzoeksraad?
att2	Attention question 2: From which year was the report by the Onderzoeksraad?
belief	To what extent do you think the report by [research institute] was trustworthy? 5 points 1= Very untrustworthy, 5=Very trustworthy
belief_cda_0	To what extent do you think the report by [research institute] was trustworthy? [after shown positive tweet from CDA]
belief_cda_1	To what extent do you think the report by [research institute] was trustworthy? [after shown negative tweet from CDA]
belief_pvda_0	To what extent do you think the report by [research institute] was trustworthy? [after shown positive tweet from PvdA]
belief_pvda_1	To what extent do you think the report by [research institute] was trustworthy? [after shown negative tweet from PvdA]
belief_pvv_0	To what extent do you think the report by [research institute] was trustworthy? [after shown positive tweet from PVV]
belief_pvv_1	To what extent do you think the report by [research institute] was trustworthy? [after shown negative tweet from PVV]
belief_vvd_0	To what extent do you think the report by [research institute] was trustworthy? [after shown positive tweet from VVD]

belief_vvd_1	To what extent do you think the report by [research institute] was trustworthy? [after shown negative tweet from VVD]
conlocpart	How connected do you feel to the party that you voted for? 5 points [question asked after people answered question: Which political party did you vote for during the provincial elections?]
connatpart	How connected do you feel to the party that you voted for? 5 points [question asked after people answered question: Which political party did you vote for during the national elections?]
educ	Level of education
educ_b	Level of education – recoded
fill1	Filler question 1
fill2	Filler question 2
gender	Gender of respondent
gndr	Gender 0. Male 1. Female
ID	ID of respondent
id_2	ID of respondent – after reshaping
inflscience	Respondent’s opinion on the influence of science on society
inflscience_N	Respondent’s opinion on the influence of science on society – recoded
leveduc	Education level – recoded to turn levels numeric
lr_scale	Left-right scale: people’s political orientation
nat_vote	Which political party did you vote for during the national elections?
nat_vote_LCRP	Which political party did you vote for during the national elections? – recoded into left-wing, right-wing, centrist, and populist party
nat_voteR	Which political party did you vote for during the national elections? – recoded to exclude NA
opinscience_1	People’s opinion on science, question 1 - reverse recoded, 5 points 1 – Completely disagree 5 – Completely agree
opinscience_2	People’s opinion on science, question 2 - reverse recoded
opinscience_3	People’s opinion on science, question 3 – reverse recoded
opinscience_4	People’s opinion on science, question 4 – reverse recoded
opinscience_F	People’s opinion on science, combined
opinscienceN_1	People’s opinion on science, question 1 - recoded
opinscienceN_2	People’s opinion on science, question 2 – recoded
opinscienceN_3	People’s opinion on science, question 3 – recoded
opinscienceN_4	People’s opinion on science, question 4 - recoded
opinscient_1	People’s opinion on scientists, question 1, 5 points 1 – Completely disagree 5 – Completely agree
opinscient_2	People’s opinion on scientists, question 2
opinscient_3	People’s opinion on scientists, question 3
opinscient_4	People’s opinion on scientists, question 4
opinscient_5	People’s opinion on scientists, question 5 – reverse recoded
opinscient_6	People’s opinion on scientists, question 6 - reverse recoded
opinscient_F	People’s opinion on scientists, combined
opinscientN_1	People’s opinion on scientists, question 1 - recoded
opinscientN_2	People’s opinion on scientists, question 2 - recoded
opinscientN_3	People’s opinion on scientists, question 3 - recoded
opinscientN_4	People’s opinion on scientists, question 4 - recoded
opinscientN_5	People’s opinion on scientists, question 5 - recoded
opinscientN_6	People’s opinion on scientists, question 6 - recoded
party	Political party that made the tweet
party_CDA	Tweet from CDA
party_id1	Party identification with CDA, PvdA, PVV and VVD combined

party_idCDA	Party identification with CDA
party_idPvdA	Party identification with PvdA
party_idPVV	Party identification with PVV
party_idVVD	Party identification with VVD
party_PvdA	Tweet from PvdA
party_PVV	Tweet from PVV
party_VVD	Tweet from VVD
polaw	Political awareness of respondent
polintr	Political interest of respondent
pollit1	Political literacy of respondent, question 1
pollit2	Political literacy of respondent, question 2
pollit3	Political literacy of respondent, question 3
pollit4	Political literacy of respondent, question 4
poltrst	Political trust of respondent
poltrstL	Low political trust of respondent
pop_1	Populist attitude of respondent, question 1
pop_2	Populist attitude of respondent, question 2
prov	Which political party people voted for during the provincial elections
prov_vote_LCRP	Which political party people voted for during the provincial elections – recoded into left-wing, right-wing, centrist, and populist party
prov_voteR	Which political party people voted for during the provincial elections – recoded to exclude NA
province	Province of residence
Q2	Which political party people voted for during the provincial elections – combined for all 12 provinces
Q2_Drenthe	Which political party people voted for during the provincial elections, made specific for Province of Drenthe
Q2_Flevoland	Which political party people voted for during the provincial elections, made specific for Province of Flevoland
Q2_Friesland	Which political party people voted for during the provincial elections, made specific for Province of Friesland
Q2_Gelderland	Which political party people voted for during the provincial elections, made specific for Province of Gelderland
Q2_Groningen	Which political party people voted for during the provincial elections, made specific for Province of Groningen
Q2_Limburg	Which political party people voted for during the provincial elections, made specific for Province of Limburg
Q2_NoordBrabant	Which political party people voted for during the provincial elections, made specific for Province of Noord-Brabant
Q2_NoordHolland	Which political party people voted for during the provincial elections, made specific for Province of Noord-Holland
Q2_Overijssel	Which political party people voted for during the provincial elections, made specific for Province of Overijssel
Q2_Utrecht	Which political party people voted for during the provincial elections, made specific for Province of Utrecht
Q2_Zeeland	Which political party people voted for during the provincial elections, made specific for Province of Zeeland
Q2_ZuidHolland	Which political party people voted for during the provincial elections, made specific for Province of Zuid-Holland
RejScN	Total rejection of science, after seen negative tweet
RejScN_n	Total rejection of science, after seen negative tweet - recoded
RejScP	Total rejection of science, after seen positive tweet
RejScP_n	Total rejection of science, after seen positive tweet - recoded

sciencit_1	Scientific literacy of respondent, question 1 - recoded, 5 points 1 – Completely untrue 5 – Completely true
sciencit_2	Scientific literacy of respondent, question 2
sciencit_3	Scientific literacy of respondent, question 3
sciencit_4	Scientific literacy of respondent, question 4
sciencit_5	Scientific literacy of respondent, question 5
sciencit_6	Scientific literacy of respondent, question 6 - reverse recoded
sciencit_7	Scientific literacy of respondent, question 7 - reverse recoded
sciencit	Scientific literacy of respondent, combined
sentiment	Sentiment of the tweet
socialmedia	Hours spent on average per day on social media
topic	Topic of the tweet
trstinstit_1	Trust in institutions, question 1, 5 points 1 – Completely distrust 5 – Completely trust
trstinstit_2	Trust in institutions, question 2
trstinstit_3	Trust in institutions, question 3
trstinstit_4	Trust in institutions, question 4
trstinstit_5	Trust in institutions, question 5
trstinstit_6	Trust in institutions, question 6
trstinstit_7	Trust in institutions, question 7
trstinstit_8	Trust in institutions, question 8
trstinstit_F	Trust in institutions, combined
trstinstitN_1	Trust in institutions, recoded
TrstscsN	Trust in science, after seen negative tweet
TrstscsP	Trust in science, after seen positive tweet
TrstscsV10	Trust in science, after seen negative tweet from vignette 1
TrstscsV11	Trust in science, after seen positive tweet from vignette 1
TrstscsV20	Trust in science, after seen negative tweet from vignette 2
TrstscsV21	Trust in science, after seen positive tweet from vignette 2
TrstsctN	Trust in scientists, after seen negative tweet
TrstsctP	Trust in scientists, after seen positive tweet
TrstsctV10	Trust in scientists, after seen negative tweet from vignette 1
TrstsctV11	Trust in scientists, after seen positive tweet from vignette 1
TrstsctV20	Trust in scientists, after seen negative tweet from vignette 2
TrstsctV21	Trust in scientists, after seen positive tweet from vignette 2
trustparty	Trust in party, combined, 5 points 1 – Completely distrust 5 – Completely trust
trustparty_cda_0	Trust in party, after seen negative tweet from CDA
trustparty_cda_1	Trust in party, after seen positive tweet from CDA
trustparty_pvda_0	Trust in party, after seen negative tweet from PvdA
trustparty_pvda_1	Trust in party, after seen positive tweet from PvdA
trustparty_pvv_0	Trust in party, after seen negative tweet from PVV
trustparty_pvv_1	Trust in party, after seen positive tweet from PVV
trustparty_vvd_0	Trust in party, after seen negative tweet from VVD
trustparty_vvd_1	Trust in party, after seen positive tweet from VVD
trustpol	Trust in politicians, combined, 5 points 1 – Completely distrust 5 – Completely trust
trustpol_cda_0	Trust in politicians, after seen negative tweet from CDA
trustpol_cda_1	Trust in politicians, after seen positive tweet from CDA
trustpol_pvda_0	Trust in politicians, after seen negative tweet from PvdA
trustpol_pvda_1	Trust in politicians, after seen positive tweet from PvdA
trustpol_pvv_0	Trust in politicians, after seen negative tweet from PVV
trustpol_pvv_1	Trust in politicians, after seen positive tweet from PVV
trustpol_vvd_0	Trust in politicians, after seen negative tweet from VVD
trustpol_vvd_1	Trust in politicians, after seen positive tweet from VVD

trustscience	Trust in science, combined 1 – Completely distrust 5 – Completely trust
trustscience_cda_0	Trust in science, after seen negative tweet from CDA
trustscience_cda_1	Trust in science, after seen positive tweet from CDA
trustscience_pvda_0	Trust in science, after seen negative tweet from PvdA
trustscience_pvda_1	Trust in science, after seen positive tweet from PvdA
trustscience_pvv_0	Trust in science, after seen negative tweet from PVV
trustscience_pvv_1	Trust in science, after seen positive tweet from PVV
trustscience_vvd_0	Trust in science, after seen negative tweet from VVD
trustscience_vvd_1	Trust in science, after seen positive tweet from VVD
tvsoc	Average hours per day spent watching social media, recoded
tvtime	Average hours per week spent watching television, recoded
tweet	Tweet 1 or 2 (women's quota or fireworks)
undscien_1	Understanding of science, question 1, 5 points 1 – Completely disagree 5 – Completely agree
undscien_2	Understanding of science, question 2
undscien_3	Understanding of science, question 3
undscien_4	Understanding of science, question 4
undscien_5	Understanding of science, question 5
undscien_6	Understanding of science, question 6
undscien_7	Understanding of science, question 7
undscien_8	Understanding of science, question 8
undscien_9	Understanding of science, question 9
verb_lokpartij	How connected respondent feels to the political (s)he voted for during the provincial elections
verb_lokpartij_r	How connected respondent feels to the political (s)he voted for during the provincial elections, recoded to exclude NA
verb_natpartij	How connected respondent feels to the political (s)he voted for during the national elections
verb_natpartij_r	How connected respondent feels to the political (s)he voted for during the national elections, recoded to exclude NA
vote_1	Likelihood to vote for PvdA, 5 points 1 – Very unlikely 5 – Very likely
vote_2	Likelihood to vote for CDA, 5 points
vote_3	Likelihood to vote for VVD, 5 points
vote_4	Likelihood to vote for PVV, 5 points
vote_CDA	Likelihood to vote for CDA, 5 points 1 – Very unlikely 5 – Very likely
vote_PvdA	Likelihood to vote for PvdA, 5 points
vote_PVV	Likelihood to vote for VVD, 5 points
vote_VVD	Likelihood to vote for PVV, 5 points