

Fake News: Can We Correct It All and Does It Matter If We Don't?

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Abstract: This paper looks to identify if correcting fake news articles is sufficient to prevent people from making decisions based on factually incorrect information. Through an experiment, I find that correcting a fake news article makes a person less likely to put money towards the issue that the fake story supported. I also find that over time people are more likely to forget the corrections but that it does not change their economic decision at a statistically significant rate.

I. Introduction

This paper looks to identify the effects of fake news on economic decision making and whether correcting the information is sufficient to combat the initial exposure to incorrect information. I use an experiment that shows the subjects both fake and real news articles followed by questions that test whether the readers were able to correctly remember the right answers and a choice between a charity that is associated with either the fake or real story. This identifies if exposure to false information has a real impact on how people choose to make decisions about where they put their money. I found that exposure to a fake article and its corrected version makes a reader less inclined to spend money on that issue. I also find that as time goes on the reader is less likely to remember the correct information but that this does not impact which charity they select. This is promising for the success of correcting articles however, it may also mean that when stories are not corrected people may put a disproportionate amount of trust in them or conversely dismiss issues entirely if they see fake news surrounding them rather than looking into the topic further. This also means that fake news may be less problematic than previously thought if misremembering the details of a story does not impact a person's economic decisions.

II. Background

After Donald Trump was elected President in 2016 many questioned whether fake news tipped the election in his favor. In the year since he was elected, fake news has been discussed on both sides of the aisle as problematic. Donald Trump recently called into question the validity of the Access Hollywood tape that came out just prior to the election in which he

discussed women in grotesque terms.¹ As technology improves it is increasingly possible to fabricate news and evidence or to dismiss real facts as fake. This is a significant problem because a democracy cannot function properly if people are choosing their President or making any other political decisions based on false information. It also hinders the ability of markets to reach an optimal point if large groups of people are not allocating resources based on actual conditions. While the term “fake news” has risen in popularity since the election, the concept of false or misleading information influencing people’s choices is not new. The Bill of Rights grants the rights to freedom of speech and the press. In theory, if there is free press, the truth will be reported and neither the government nor anyone else will be able to prevent it. Unfortunately, this was not always the case and as technology advanced it became easier for false information to spread.

a. Market for fake news

The presence of echo chambers, the lack of a barrier to entry for publishing information, and the rise of social media all combine to provide an opportunity for fake news to thrive. An echo chamber is the environment that people create for themselves when they filter out the information that they do not agree with and only read information that “echoes” their preexisting beliefs. While the internet and the wide range of information it provides should make it difficult for fake news to go unchecked, this is often prevented by ideological segregation in echo chambers. Gentzkow and Shapiro (2011) found that segregation in online news is worse than offline news and that compared to face to face interactions this difference is even more substantial. This means that the rising level of dependence on the internet for news will lead to

¹ Haberman, Maggie, and Jonathan Martin. “Trump Once Said the ‘Access Hollywood’ Tape Was Real. Now He’s Not Sure.” *The New York Times*, The New York Times, 28 Nov. 2017, www.nytimes.com/2017/11/28/us/politics/trump-access-hollywood-tape.html.

less ideologically diverse information. This environment can allow for a fake news story to come out that would not be debunked if it is not in the interest of anyone in the echo chamber to prove the story wrong.

Social networking sites make the development of echo chambers easy. Platforms like Facebook and Twitter use algorithms to suggest articles and posts that are similar to what a person has clicked on in the past. The more that people reinforce their views the more difficult it becomes to convince them that they may be wrong. Bakshy, Messing, and Adamic (2015) revealed that on top of the already biased set of information provided by social networks, users tend to self-select articles from that set that are even more biased towards their preexisting views. Allcott and Gentzkow (2017) found that social networking sites were huge sources for traffic to fake news websites. While social networking sites are still not a major source of news for most people, they are the biggest source of traffic for fake news sites.

The internet made it simpler to share information, but social media significantly lowered the barriers to entry in the market for news. Anyone can post anything because social networking sites are not designed to be news sources and do not have tools in place to verify that information is not biased or an outright lie. New technology that can alter video and audio is also on the rise, which can present a new challenge to credibility as well as making it easy to deny video and audio evidence.² In terms of the 2016 election, Allcott and Gentzkow (2017) found that fake news existed in large quantities and that people who had highly segregated networks and used social media as their main source of news were exposed to fake news at a higher rate. They also found that many of the sites responsible for publishing fake articles

² “Fake News: You Ain’t Seen Nothing Yet.” *The Economist*, The Economist Newspaper, 1 July 2017, www.economist.com/news/science-and-technology/21724370-generating-convincing-audio-and-video-fake-events-fake-news-you-aint-seen.

relevant to the election no longer exist. This reflects the low barrier to entry. Part of this low barrier is created by advertising. Pires (2014) studied choices that newspapers make about ideological slant and found that newspapers within larger advertising markets could use multi-ideology strategies since the cost of writing articles directed at a narrower audience was reduced. Articles posted on the internet outside of mainstream media rely on advertising over subscribers which provides them with more incentive to produce news that is partisan or even completely false. Well established news sources that rely more on subscribers must verify their information in order to maintain their reputation. Fake news websites can exist for a short time and still profit from advertisements before people realize that the news is not credible. As fake news is allowed to grow it increases the risk that people will make important decisions with incorrect information.

b. Persuasive Power

In order to find a solution, it is necessary to identify both the circumstances that allow it to persist as well as the extent of the problem. The presence of the news is not inherently bad. What makes it a problem is when people use incorrect information to make decisions. One example is a man who attacked a pizzeria with a gun after reading a fake news article that the restaurant was part of a child abuse ring led by Hillary Clinton.³ Possibly the most controversial problem today is the 2016 Presidential Election and the fake news that still surrounds the actions of the President and his adversaries to this day. If people chose to support a candidate based on false information about him and his opponents, then this is a major problem. This is also an issue for policy decisions. A significant factor in how Congress will vote on issues like

³ Goldman, Cecilia Kang and Adam, "In Washington Pizzeria Attack, Fake News Brought Real Guns," The New York Times, The New York Times, 05 Dec. 2016. 25 Apr. 2017, <<https://www.nytimes.com/2016/12/05/business/media/comet-ping-pong-pizza-shooting-fake-news-consequences.html>>.

healthcare or taxes is the opinions of their constituents. Many people call their representatives to let them know what they want them to do. If people are forming their opinions on specific policy or even on which representative to put in office on incorrect information about the costs and benefits of these plans, then the government will not make the socially optimal choice.

Several articles look at how certain factors can impact the persuasiveness of information. Prior, Sood, and Khanna (2015) measured interpretation of economic measures and found that people would use the same measures as evidence of economic improvement or worsening depending on if their party was in office or not. Both DellaVigna and Kaplan (2007) and Enikolopov, Petrova, and Zhuravskaya (2009) studied the impact of the slant of news on television channels on voter turnout. DellaVigna and Kaplan looked at Fox News and found that while it did not convince non-conservatives to vote Republican it did increase turnout among Republicans. Enikolopov, Petrova, and Zhuravskaya looked at the impact that access to a non-government run news channel in Russia had on voters. They found that it increased turnout and it made people more likely to vote for the opposition party. Both studies demonstrate that the source of information, whether people are aware of the bias or not, does have an impact on actions taken.

Conspiracy theories have effects similar to fake news and when Bowman and Rugg (2013) studied beliefs in conspiracies they found that about ten percent of the population will believe any given conspiracy. When they looked more generally at skepticism of the government they found that even more people believe that the government is hiding information. This establishes the lack of trust that allows fake news to spread. Spenkuch and Toniatti (2016) found that people can be persuaded by biased information through studying the effects of political advertisements. In the Allcott and Gentzkow study they predict that the persuasion rate

of fake news is less than advertisements but that is not necessarily true since advertisements are not presented as factual news. Using this assumption, they do not conclude that fake news tipped the election in Donald Trump's favor, but they do determine that a substantial amount of people believe these articles.

a. Proposed Solutions

While people can produce fake news at an extremely low private cost there is a large negative externality. A society cannot function as a democracy if the choices people make are based on false information. This poses a challenge because while externalities are often dealt with through regulation, allowing the government to make decisions on what types of news can and cannot be distributed also poses a risk to democracy. Facebook and similar platforms have been called upon to tackle this issue and essentially choose to serve as an arbiter of truth or to allow their users to continue to curate their own content. Neither of these options are sufficient since having a corporation decide what is and is not true can pose risks and letting people filter for themselves clearly is not working. Facebook has attempted to deal with this issue through partnering with independent fact checkers to flag articles as disputed or fake. People have questioned the effectiveness of the feature since a disputed tag rarely appears, but Facebook has reported that when a post is marked as disputed its future impressions drop by 80 percent.⁴

One frequently discussed solution is promoting news literacy. A media literacy challenge was recently started by the New York Times to encourage people to reflect on their news diet.⁵

⁴ Levin, Sam. "Way Too Little, Way Too Late": Facebook's Factcheckers Say Effort Is Failing." *The Guardian*, Guardian News and Media, 13 Nov. 2017, www.theguardian.com/technology/2017/nov/13/way-too-little-way-too-late-facebooks-fact-checkers-say-effort-is-failing.

⁵ Schulten, Katherine. "Media Literacy Student Challenge | Explore Your Relationship With News." *The New York Times*, The New York Times, 2 Nov. 2017, www.nytimes.com/2017/11/02/learning/media-literacy-student-challenge-explore-your-relationship-with-news.html.

The News Literacy Project, an organization dedicated to providing education on how to decipher fact from fiction in the digital age, was started in 2009 and as of January 2017 the curriculum is used by over 220,000 students in all 50 states.⁶ If it is true that knowing that a story is false is not sufficient to undo the effects it has on decision making, then new solutions need to be looked at more seriously. In DellaVigna and Kaplan's study on "The Fox News Effect" they assumed that after a few years the effect of a conservative slant would go away because people would understand that the source is right leaning and would factor that in to the information provided. This assumption might not hold true today as many people can read news from sources that they have never heard of before.

Song et. al. (2017) looked at how fake news impacts businesses when false information is spread about their products. They conducted a model with two firms where one firm promoted false information about the other. This ended up harming both firms but the firm who was responsible for the fake news was hurt more making it an ineffective marketing tactic. This model assumes that people find out that the news is fake and from a competitor. Even though in this model it hurts the source of the news more than the victim it still hurts the victim firm and often there is no easy way to identify the source of the false information. While people have the option to look for other sources, this costs time and sometimes money especially if they want to reference a reputable newspaper that is accessible only through a subscription. Additionally, it is now possible for a person to find several sources that repeat the same falsehood. Falkinger (2008) used a theoretical approach to demonstrate how attention becomes a scarce resource in an information rich economy. This means that news needs to be interesting enough at first glance to

⁶ "Origin and History." *The News Literacy Project*, The News Literacy Project, www.thenewsliteracyproject.org/about/origin-and-history.

get a person to spend time reading about the topic. This both incentivizes using highly controversial or even blatantly misleading and false headlines, and increases the opportunity cost of a person spending extra time looking up more information on what they just read.

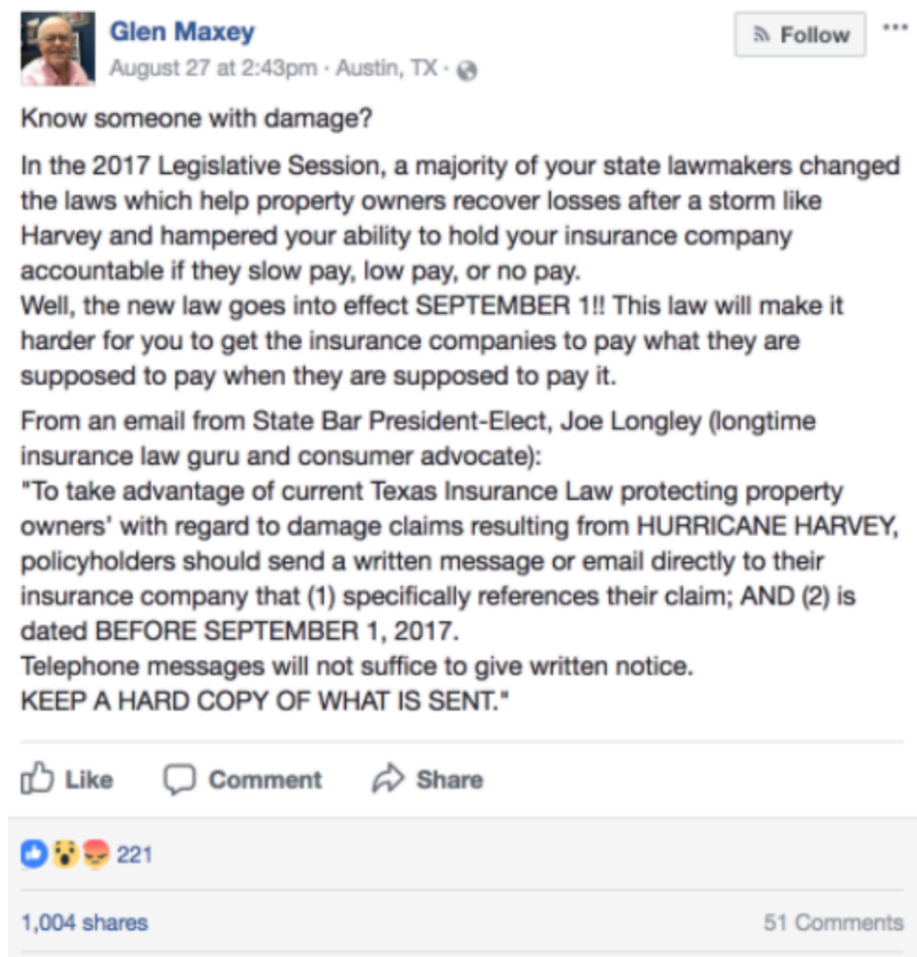
This experiment will expand on Allcott and Gentzkow's research on how much Fake News impacted the 2016 election by quantifying the persuasiveness of a given fake story. The experiment will be similar to the methods used in Dewan, Humphreys, and Rubenson, (2013). Their research studied the effect of endorsements on a person's likelihood of voting yes on a referendum. They randomly assigned canvassers to hand out pamphlets that either did not include any endorsers or one of four and then analyzed the impact. My experiment will present people with one of two fake stories and the resources to learn more with the only cost being the time it takes to read. I will then measure the subsequent change in charity selection as an indicator of the level of persuasion of a fake story. For some this cost may still be too high because they cannot account for the negative externality that can result from false information if they do not yet know that the information is false.

This research will look to answer the question of whether combating fake news with correct information is an effective solution. It will measure both if people are able to identify the correct information and further if they take that information into account when they are making choices. I will also look at how this effect changes over time. It is possible that while a person may remember the correction initially, as time goes on the information in the fake article that tends to be more tied to emotion and memorable might be remembered as true instead of the correction. Corrections are also often more specific. The articles in this study are all significantly longer than the initial fake stories. This makes it easier for a person to just skim the corrections and not fully understand the difference. My experiment does not force anyone to read the correction

thoroughly, similar to reality, which gives a more realistic idea of how impactful corrections are since people will not always follow up on every social media post or misleading headline they are shown.

III. Method

I used an experimental method to study this topic. The experiment used human subjects from Amazon Mechanical Turk (MTurk) and received IRB approval. I created two online surveys using google forms that asked demographic questions to make sure that there are not any problematic differences between the two groups. Both surveys presented information on the same two topics: Hurricane Harvey and a school that had removed religious statues. All of the news sources used in the survey, both real and fake, were at one point published online. Each survey started with demographic questions and the subject was then brought to the next page that showed a fake story either about Hurricane Harvey or a Catholic school that had removed religious statues.



The social media post with misleading information that was shown in the Harvey survey.

The next page of the online survey had a link to a Snopes article that was described as a source of context for the previous story. It is likely that the subjects had already realized that the first stories were fake since the title of the survey was “Fake News Survey” but the inclusion of the Snopes article meant that they were all informed that what they had just read was either totally false or misleading. The next page had a link to an additional Snopes article about the other topic. This meant that the subjects were all shown one fake story accompanied by corrections and one story on the other subject that was true. It is not possible to verify that every person actually read every article, but this is similar to real life. If corrections are used as an

antidote to fake news they will only work if it is reasonable for people to actually take time to read them. This means that there is a higher cost of time and attention required for reading complex corrections than there are for reading a short and straight forward piece even though it is fake. Not forcing the subjects to read the corrections or to read closely allows the effect of the higher time cost to be a factor in the results just as it is in real life.

The surveys were posted on MTurk, were listed as “News Survey 1.0” and “News Survey 1.1,” and were made available to all users located in the United States above the age of 18. MTurk allows requesters to limit who can work on their surveys which allowed me to prevent people from completing both versions once I had marked them as having completed either 1.0 or 1.1. Survey 1.0 is the Harvey survey and it includes a fake story about Hurricane Harvey while Survey 1.1 is the statues survey and includes a fake story about statue removal. This also allowed me to send out follow ups to the same people who completed the original surveys. One limitation was that if someone managed to complete both surveys before they were given a label it was not possible to identify which survey they sent in first. This only happened with one person and I was able to prevent them from filling out the follow up survey. To get paid the workers just had to put the completion code that was shown to them at the end of the google form in the appropriate space on MTurk. One person completed the survey without submitting the code so there is one additional response on the statue survey. The Harvey survey was completed by 70 people and the statue survey was completed by 71. One person on each survey did not select the box to agree to informed consent at the beginning of the survey so their results were removed leaving 69 subjects from the Harvey survey and 70 from the statue survey.

Both google forms were titled “Fake News Survey” and the Harvey survey began with social media posts about a new law in Texas scheduled to go into effect on September 1st, 2017,

just a few days after Hurricane Harvey hit. The first post is from a private citizen who claimed in a Facebook status that she was sharing information that “came from State Rep. Glen Maxey, and has been verified with several other lawyers.” She went on to write that anyone with damage as a result of the hurricane who does not file their insurance claims before September 1st would fall under the new law that “makes it harder for you to get the insurance companies to pay what they are supposed to pay when they are supposed to pay it.” The second post was a tweet from Joaquín Castro who is a Congressman from Texas. The tweet itself does not state that he is a Congressman, but he does have a verified check mark that gives some inclination that he might be a reliable source. He writes, “Texans: be sure to file for #Harvey relief before Sept 1. #TXlege passed a bill making it harder to dispute weather-related property claims.” The third post is from former State Representative Glen Maxey who is referenced in the first post. He also wrote on Facebook, where he is not a verified user, that people should write to their insurance company prior to September 1st in order to take advantage of the prior law.

The Snopes article that followed the social media posts explained that while a new law would go into effect on September 1st that makes it more difficult to dispute a claim, this is only applicable if the insurance company has not paid the claim in full or on time and a complaint was filed before September 1st. This means that the day that people file their claims is most likely irrelevant because it would likely be too soon to file a complaint that the insurance company had failed to pay within just a few days. The lawsuit needs to be filed in a court before September 1st and there is no benefit to filing the original claim by this date. The social media posts could give people an unnecessary fear or anger at the Texas legislature when in fact this would likely not impact most of the Harvey victims.



The statue survey began with a link to a fake news story that was published on World Net Daily (WND) which calls itself “the Digital Pioneer in Independent Online News Since 1997.” The Washington Post described World Net Daily as a “fringe” and “far-right” association in a 2016 article titled “There’s the major media. And then there’s the ‘other’ White House press corps.”⁷ The WND article is titled “Catholic School Removes Jesus Statues to Be ‘More Inclusive.’” The article writes that a California Catholic school made a decision to “remove and relocate more than 160 statues of Jesus, Mary and historic Church figures from the campus.” The story then details parents’ complaints that “articulating an inclusive foundation appears to mean letting go of San Domenico’s 167-year tradition as a Dominican Catholic school and being both afraid and ashamed to celebrate one’s heritage and beliefs.” WND cites the chair of the board of trustees as saying that there are 18 statues remaining out of the original 180.

⁷ Bruno, Debra. “There’s the Major Media. And Then There’s the ‘Other’ White House Press Corps.” *The Washington Post*, WP Company, 21 Feb. 2016, www.washingtonpost.com/lifestyle/style/theres-the-major-media-and-then-theres-the-other-white-house-press-corps/2016/02/21/f69c5f92-c460-11e5-8965-0607e0e265ce_story.html?utm_term=.fc8fa951cb86.



WORLDNETDAILY.COM THE DIGITAL PIONEER

20
YEARS

IN INDEPENDENT ONLINE NEWS SINCE 1997



Parents of students at a Catholic school in the San Francisco Bay area are protesting the board's decision to remove and relocate more than 160 statues of Jesus, Mary and historic church figures from the campus in an effort to make the school more "inclusive."

Shannon Fitzpatrick, who has an 8-year-old son at [San Domenico School](#) in San Anselmo told the local Marin Independent Journal that "articulating an inclusive foundation appears to mean letting go of San Domenico's 167-year tradition as a Dominican Catholic school and being both afraid and ashamed to celebrate one's heritage and beliefs."

She said that during the time of her family's association with the K-12 independent school, "the word 'Catholic' has been removed from the mission statement, sacraments were removed from the curriculum, the lower school curriculum was changed to world religions, the logo and colors were changed to be 'less Catholic,' and the uniform was changed to be less Catholic."

This article is then followed by a Snopes article which explains that while it is true that the school did remove statues, only six out of an original sixteen were removed. It is not true that dozens of statues were removed, that there were 180 statues originally, nor that there are

now 18 remaining. The Snopes article also explains that while the WND article mentions that the school is independent it fails to explain how this status leaves it outside the authority of an archdiocese and that of all of the students and parents, 80 percent of them do not identify as Catholic. This means that the shift away from Catholic tradition at the school should not necessarily be a surprise and that the majority of the community does not associate with the meaning behind the statues in the first place.

Each survey includes the Snopes article of both stories but only presents the fake information on one topic. The survey then asks four reading comprehension questions to see if the subjects read closely and were able to identify the correct answers which were given to all participants. The surveys ask:

1. When should Texas residents have filed insurance claims pertaining to Hurricane Harvey?
2. Did a Catholic school remove dozens of religious statues from its campus?
3. Did Texas pass a law making it more difficult for people to file insurance claims just prior to Hurricane Harvey?
4. What was the statue removal at San Domenica school a response to?

Providing the correct story tests whether people actually retain the correct information or if they only remember, or only read, the first fake article.

The final page will inform the subjects that as a reward for completing the survey they have the option to choose between two charities that \$100 of the research funding will be given to: Lone Star Legal Aid or National Trust for Historic Preservation. These charities were selected because they are relatively unknown in order to prevent preconceived ideas about the

merits of the charity from impacting the choice instead of which issue the person finds most compelling. One survey will be randomly selected as the decider of which charity will receive the donation. This provides more incentive for the subject to make a careful decision because there is a chance that the entire \$100 will be spent based on their choice alone. Choosing Lone Star Legal Aid suggests that the subject was persuaded by the article on Hurricane Harvey and National Trust for Historic Preservation suggests persuasion by the article on removal of statues.

One week after the original surveys were completed a follow up was sent out that included the same exact questions but did not include the news stories. These results measured both if people were able to correctly remember which facts were true after time passed and if this impacts their economic decisions. Since the workers were given a label to indicate which survey they had completed the follow ups could be sent to the same people at least one week after they had completed the original survey. This allows me to estimate the persuasiveness of seeing a fake article and its corrections and how that persuasiveness is altered when only the correct article is shown or as time passes.

I used a random utility model to analyze the survey results. This reveals how much exposure to the fake stories impacted an individual's decision of which charity to select. I then used Stata to analyze the relationship between seeing a fake story and getting the reading comprehensions questions right as well as the relationship between getting the questions right and which charity was selected. I used the data from the follow up surveys to see if these results changed after time had passed.

IV. Results

The more significant indicators of which charity a person donated to were education level, age, and amount of time spent following the news. As shown in table 1 in the appendix,

education level was significant at the five percent level in the original surveys but not in the follow ups. The amount of time consuming news was significant at the five percent level in the follow ups as shown in table 2. Higher education level and more time spent following the news both made a person more likely to donate to National Trust for Historical Preservation. This may be that people with more education care more about history and in the follow ups people who follow the news more closely may be more aware that Harvey is no longer the most pressing natural disaster.

The Harvey survey had 52.2% of people select Lone Star Legal Aid while the statues survey had 60%. This means that people who did not see the fake article about Hurricane Harvey insurance issues were more likely to donate to the cause than people who did see the original posts. This may be due more to people assuming that the fake story about the other topic would not have been as convincing as the one they just read. If people were surprised to find out that the story they read was fake they might be more concerned that other people will be fooled. People may also overestimate their ability to realize that the other story is fake when they read only the corrections. This can be problematic since people are not typically presented with corrections to fake news when they are exposed to it.

The fake news shown to the subject was pulled entirely from the Snopes article and repeated in the article which means that the subjects did know that fake news was circulated around each subject. It also means that technically both surveys showed the subjects the same information. Even though people knew that they might be shown a fake article they did not know what was fake in it and this may have made people feel more surprised by reading the corrections. It also may have made those who did not expect the article to be fake pay more attention to the corrections because they were surprised. The difference between the two

conditions is not statistically significant at the five percent level but is approaching significance so I proceeded with my analysis to see what the data suggests.

V. Random Utility Model

To analyze the results, I used a random utility model. I used the data from the survey results to find the probability that a person selects the charity associated with one story or the other given the fact that they saw the fake story connected to the charity. The social media posts about Hurricane Harvey are considered Fake(X) and Lone Star Legal Aid is charity X. The WND article about the removal of statues is Fake(Y) and National Trust for Historic Preservation is charity Y.

$$P(i = X | \text{Fake}(X)) = 0.51$$

$$P(i = Y | \text{Fake}(Y)) = 0.40$$

Assuming that the consumer maximizes their utility $U_i(X, Y) = U_i(X) + U_i(Y)$ and that $X + Y = 1$

$$U_i(X) = \alpha_0 + \alpha_1 \text{Fake}(X) + \epsilon_i$$

$$U_i(Y) = \beta_0 + \beta_1 \text{Fake}(Y) + \gamma_i$$

The difference of two normal random variables is normal so my model assumes that ϵ_i and γ_i are assumed to be normally distributed with a mean 0 and a variance of 0.5. Participant i selects X if and only if $U_i(X) > U_i(Y)$. I also make the assumption that $\alpha_1 = \beta_1$ which means that both fake stories have the same incremental impact on the utility of giving to one charity over the other. $\epsilon_i - \gamma_i$ has distribution F . $\beta_0 = 0$. Using these assumptions, I was able to derive the values of β_1 , α_0 , and α_1 . I plugged these values into the utility function to get:

$$U_i(X) = 0.139 - 0.114(\text{Fake}(X)) + \epsilon_i$$

$$U_i(Y) = 0 - 0.114(\text{Fake}(Y)) + \gamma_i$$

Using these formulas, I can identify the change in probability of selecting a certain charity based on whether or not a fake article was shown on that topic.

$$\begin{aligned} P(i = X \mid \text{NoFake}) &= P(U_i(X) > U_i(Y) \mid \text{NoFake}) \\ &= .51 - .56 = \mathbf{-.04} \end{aligned}$$

The probability of a person selecting Lone Star Legal Aid if they had not seen any fake articles was 0.56 meaning that there is a four percent decrease in a person's chance of selecting Lone Star Legal Aid if they saw a fake article and its corrections versus only seeing accurate information.

$$\begin{aligned} P(i = Y \mid \text{NoFake}) &= P(U_i(Y) > U_i(X) \mid \text{NoFake}) \\ &= .40 - .44 = \mathbf{-.04} \end{aligned}$$

The probability of a person selecting National Trust for Historical Preservation is 0.44 if they had not seen any fake articles meaning that there is also a four percent decrease in an individual's likelihood of selecting National Trust for Historical Preservation if they saw a fake article and its corrections versus only seeing accurate information.

a. Follow Ups

In the follow up surveys the Harvey survey had 46% of people select Lone Star Legal Aid while the statue survey had 47.4%. 50 subjects responded to the Harvey survey while 57 responded to the statue survey. The surveys could only be completed by those who had taken the initial survey so the response time varied between one and five weeks after taking the initial survey. I again used a random utility model to analyze these results.

$$P(i = X \mid \text{Fake}(X)) = 0.44$$

$$P(i = Y \mid \text{Fake}(Y)) = 0.53$$

Using the same assumptions, I was able to derive the value of α_1 , α_0 , and β_1 to get these utility functions:

$$U_i(X) = -0.113 - 0.038(\text{Fake}(X)) + \epsilon_i$$

$$U_i(Y) = 0 - 0.038(\text{Fake}(Y)) + \gamma_i$$

I then identified the change in probability of selecting a certain charity based on whether or not a fake article was shown on that topic.

$$\begin{aligned} P(i = X \mid \text{NoFake}) &= P(U_i(X) > U_i(Y) \mid \text{NoFake}) \\ &= .44 - .46 = \mathbf{-.02} \end{aligned}$$

The probability of a person selecting Lone Star Legal Aid if they had not seen any fake articles was 0.46 meaning that there is a two percent decrease in a person's chance of selecting Lone Star Legal Aid if they saw a fake article and its corrections.

$$\begin{aligned} P(i = Y \mid \text{NoFake}) &= P(U_i(Y) > U_i(X) \mid \text{NoFake}) \\ &= .53 - .54 = \mathbf{-.01} \end{aligned}$$

The probability of a person selecting National Trust for Historical Preservation is 0.54 if they had not seen any fake articles meaning that there is a one percent instead of four percent decrease in an individual's likelihood of selecting National Trust for Historical Preservation if they saw a fake article and its corrections.

Probability	Initial Survey	Follow Up	Difference
P(X FakeX)	0.51	0.44	-0.07
P(Y FakeY)	0.40	0.53	0.13
P(X NoFake)	0.56	0.46	-0.10
P(Y NoFake)	0.44	0.54	0.10
P(X FakeX) - P(X NoFake)	-0.04	-0.02	0.02

$P(Y FakeY) - P(Y NoFake)$	-0.04	-0.01	0.03
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The results of this model suggest that people are less likely to choose a charity that is associated with a fake story. However, this effect diminishes as time goes on. Both stories saw a decrease in the impact of seeing a fake article on whether people change their donation choice. This is likely due to the fact that people remember less of what they read over time. These results are promising because while the corrections become slightly less persuasive they still had a negative effect on willingness to support an associated charity. This means that over time the fake article is not becoming significantly more persuasive or more memorable.

Part of the negative effect of the fake article on charity selection could be that people knew that this was a fake news study and wanted to select the charity that was not associated with the fake article. However, the amount of people who selected Lone Star Legal Aid was slightly over 50% in the first round and slightly under in the follow ups. Since the two surveys varied in which fake story was shown but still had the same shift from preferring Lone Star Legal Aid initially to preferring National Trust for Historical Preservation in the follow up, this suggests that selecting a charity because it was assumed to be the answer the study was looking for was not a large factor. Likely the size of the donation also provided more incentive for the subject to select the charity they cared about more rather than attempt to guess what the study was expecting.

The reduced number of people supporting Lone Star Legal Aid is likely due to the fact that the issue is not as significant as it was when the original survey was sent out. However, people who took the statue survey experienced almost double the decline in probability of selecting Lone Star Legal Aid. This means that the change was probably not entirely attributable

to the hurricane becoming less significant but to the corrections of the statues story becoming less memorable. For example, incorrectly answering the question about the reasoning behind the statue removal became a slightly more significant indicator of charity selection in the follow ups than in the original survey. 87 percent of people who took the original statue survey correctly answered that inclusivity was the main reason for taking down statues versus just 71 percent when they took the follow up. 86 percent of people who took the Harvey survey also answered correctly the first time but that number only dropped to 81 percent in the follow up. Since the drop is larger in the group that saw the fake story it is possible that the emotional argument made in the fake article was more persuasive than the corrections in the Snopes article.

Responses to “What was the statue removal at San Domenica school a response to?”

Response	Statue Survey	Statue Follow Up	Harvey Survey	Harvey Follow Up
Inclusivity	87%	71%	86%	81%
Political Correctness	7%	5%	1%	0%
Calls to remove confederate statues	3%	23%	6%	10%
Declining Enrollment	1%	0%	6%	6%
Community Complaints	3%	2%	0%	2%

The difference in percent of correct answers to the inclusivity question between the original and follow up survey is statistically significant at the five percent level. Every question had a statistically significant decline in the percent of correct answers except for the question about the Texas law as shown in tables A, B, C, and D in the appendix. Since the ability to correctly identify the true answers to the questions declined at a statistically significant rate but the choice of charity did not change at a statistically significant rate, this suggests that the problem of fake

news may be smaller than expected. The fact that people are not correctly remembering specific facts and details might not matter if it does not actually impact their actions in a substantial way.

VI. Conclusion

This paper looked to determine the extent of persuasion caused by fake news and whether corrections are sufficient to combat the risks of exposure to false information. My data suggests that a corrected fake news article does make an individual less likely to support the issue covered. However, as time goes on this effect is slightly diminished. I did find statistically significant declines in ability to correctly answer questions about the topic after time passed. This suggests that the while people may be misled slightly by fake news, one article is probably not sufficient to change their ultimate decisions on where to spend money.

The nature of fake news makes creating a completely realistic experiment difficult. Since the topics are news it can grow or decline in significance over time. The survey was conducted between late October and early December of 2017. During this time, the presence of Hurricane Harvey in the news diminished as several other natural disasters occurred during the fall. Conversely, the issue of statue removal has remained in the news as discussions continue about whether or not statues of confederate figures should be torn down. This issue is highly controversial which may lead people to choose to support the National Trust for Historical Preservation not because the article was convincing but because of preexisting beliefs and values.

Allcott and Gentzkow's 2017 article on whether or not fake news tipped the election found that people viewed and remembered between one and five fake news stories during the period leading up to the election. Using their estimated persuasion rate they concluded that fake news did not tip the election. My research supports this conclusion since age, education, and amount

of time spent consuming news were much larger factors in a person's decision than seeing a fake article. This suggests that it takes a substantial amount of exposure to fake stories before a person will change a decision on a choice as significant as who to vote for President. This research is promising for the effects of correcting fake news. My results that reading a corrected fake article made a person less likely to spend money on that issue are consistent with Facebook's method of marking articles as disputed to reduce impressions.

Future research should be done as more data becomes available from social media efforts to halt the spread of fake news. This research focuses on the impact of fake news that can be corrected but as new technology develops the problem of people accusing factual information from reputable sources of being fabricated may grow. This study suggests both that the strategy of correcting news or labelling it as false can have a negative effect on its persuasive power. It also shows that while people may misremember details this problem is less important if they are not changing their actions. This analytical framework can be applied to more data that includes more options. It would be useful to study whether reading multiple articles rather than just one has a stronger impact on economic decisions. If fake news continues to grow or certain subsets of people are exposed to more than others, then more aggressive solutions may be necessary.

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Appendix

1. Regressions

Table 1: Original Survey

Source	SS	df	MS	Number of obs = 133		
				F(11, 121) = 1.37		
Model	3.64562102	11	.331420093	Prob > F = 0.1936		
Residual	29.1814466	121	.241168981	R-squared = 0.1111		
				Adj R-squared = 0.0302		
Total	32.8270677	132	.248689907	Root MSE = .49109		
legal_aid	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
statue_survey	.0602954	.0874141	0.69	0.492	-.1127639	.2333547
age	.0017888	.0043272	0.41	0.680	-.006778	.0103556
male	.0446926	.0899086	0.50	0.620	-.1333052	.2226904
educ	-.0819584	.0255136	-3.21	0.002	-.1324693	-.0314474
party	.0410953	.0551759	0.74	0.458	-.06814	.1503305
news_time	-.0008358	.0107064	-0.08	0.938	-.022032	.0203604
source	-.0280768	.0403711	-0.70	0.488	-.108002	.0518483
file_date	-.0083302	.0886249	-0.09	0.925	-.1837865	.1671261
dozens	.0153008	.0957511	0.16	0.873	-.1742637	.2048654
texas_law	-.0015899	.0921897	-0.02	0.986	-.1841037	.1809239
inclusivity	-.0307641	.0536322	-0.57	0.567	-.1369432	.075415
cons	.7719698	.2536011	3.04	0.003	.2698996	1.27404

Table 2: Follow Up Survey

Source	SS	df	MS	Number of obs = 107		
				F(11, 95) = 1.71		
Model	4.3926988	11	.399336254	Prob > F = 0.0837		
Residual	22.2428152	95	.234134897	R-squared = 0.1649		
				Adj R-squared = 0.0682		
Total	26.635514	106	.251278434	Root MSE = .48387		
legal_aid	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
statue_survey	.074634	.1053875	0.71	0.481	-.1345866	.2838546
age	.0103227	.0051775	1.99	0.049	.0000442	.0206013
male	.0578081	.109412	0.53	0.598	-.1594022	.2750184
educ	-.0492084	.031784	-1.55	0.125	-.1123076	.0138908
party	-.048106	.0648419	-0.74	0.460	-.1768335	.0806214
news_time	-.0291051	.0119498	-2.44	0.017	-.0528284	-.0053818
source	-.032954	.0490244	-0.67	0.503	-.1302797	.0643718
file_date	-.1044573	.0736062	-1.42	0.159	-.2505842	.0416696
dozens	-.0104818	.1286452	-0.08	0.935	-.2658748	.2449111
texas_law	-.0013675	.100655	-0.01	0.989	-.2011931	.198458
inclusivity	-.0498579	.0521492	-0.96	0.341	-.1533871	.0536712
cons	.6855404	.3199648	2.14	0.035	.0503299	1.320751

Table A

. reg inclusivity follow_up statue_survey						
Source	SS	df	MS	Number of obs = 246		
Model	3.41736309	2	1.70868154	F(2, 243) = 2.08		
Residual	199.541987	243	.821160438	Prob > F = 0.1270		
				R-squared = 0.0168		
				Adj R-squared = 0.0087		
Total	202.95935	245	.828405509	Root MSE = .90618		
inclusivity	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
follow_up	.2377519	.1165906	2.04	0.043	.0080948	.4674091
statue_survey	-.000195	.1156611	-0.00	0.999	-.2280213	.2276314
_cons	.2950622	.096438	3.06	0.002	.105101	.4850234

Table B

. reg file_date follow_up statue_survey						
Source	SS	df	MS	Number of obs = 246		
Model	21.0308424	2	10.5154212	F(2, 243) = 27.83		
Residual	91.8187511	243	.377854943	Prob > F = 0.0000		
				R-squared = 0.1864		
				Adj R-squared = 0.1797		
Total	112.849593	245	.460610586	Root MSE = .6147		
file_date	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
follow_up	.5821033	.0790883	7.36	0.000	.4263172	.7378893
statue_survey	-.1122908	.0784578	-1.43	0.154	-.2668349	.0422533
_cons	.8982759	.065418	13.73	0.000	.7694173	1.027135

Table C

. reg dozens follow_up statue_survey						
Source	SS	df	MS	Number of obs = 246		
Model	2.84112787	2	1.42056393	F(2, 243) = 6.95		
Residual	49.6791973	243	.204441141	Prob > F = 0.0012		
				R-squared = 0.0541		
				Adj R-squared = 0.0463		
Total	52.5203252	245	.214368674	Root MSE = .45215		
dozens	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
follow_up	.2165046	.0581746	3.72	0.000	.1019137	.3310954
statue_survey	-.0186427	.0577109	-0.32	0.747	-.13232	.0950347
_cons	.6065107	.0481192	12.60	0.000	.5117267	.7012947

Table D

. reg texas_law follow_up statue_survey						
Source	SS	df	MS	Number of obs = 246		
Model	.480337797	2	.240168898	F(2, 243) = 0.99		
Residual	59.2269793	243	.243732425	Prob > F = 0.3748		
				R-squared = 0.0080		
				Adj R-squared = -0.0001		
Total	59.7073171	245	.243703335	Root MSE = .49369		
texas_law	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
follow_up	.0885132	.0635194	1.39	0.165	-.0366056	.213632
statue_survey	.0081833	.063013	0.13	0.897	-.1159381	.1323046
_cons	.5426415	.0525401	10.33	0.000	.4391493	.6461337

2. Summary Statistics

Summary statistics of the Harvey and statue surveys

Variable	Obs	Mean	Std. Dev.	Min	Max
legal_aid	137	.5547445	.4988178	0	1
statue_sur~y	139	.5035971	.5017953	0	1
age	137	34.65693	10.23793	21	68
male	139	.5971223	.4922504	0	1
educ	139	3.726619	1.780758	1	8
party	137	.919708	.7864514	0	3
news_time	139	5.428058	4.481266	0	20
source	139	1.985612	1.135626	0	4
file_date	139	.8417266	.5283141	0	3
dozens	139	.5971223	.4922504	0	1
texas_law	139	.5467626	.4996089	0	1
inclusivity	139	.294964	.8292937	0	4

Summary statistics of the Harvey survey

Variable	Obs	Mean	Std. Dev.	Min	Max
legal_aid	68	.5147059	.5034996	0	1
statue_sur~y	69	0	0	0	0
age	67	35.40299	11.15057	21	68
male	69	.5652174	.4993602	0	1
educ	69	3.768116	1.750167	1	7
party	69	.8695652	.6622831	0	2
news_time	69	5.956522	4.878478	1	20
source	69	1.927536	1.228567	0	4
file_date	69	.9130435	.5352056	0	3
dozens	69	.5942029	.4946431	0	1
texas_law	69	.5652174	.4993602	0	1
inclusivity	69	.3333333	.8517571	0	3

Summary statistics of the statue survey

Variable	Obs	Mean	Std. Dev.	Min	Max
legal_aid	69	.5942029	.4946431	0	1
statue_sur~y	70	1	0	1	1
age	70	33.94286	9.306201	22	64
male	70	.6285714	.4866755	0	1
educ	70	3.685714	1.822109	1	8
party	68	.9705882	.8972693	0	3
news_time	70	4.907143	4.019241	0	20
source	70	2.042857	1.041678	0	4
file_date	70	.7714286	.5155953	0	2
dozens	70	.6	.4934352	0	1
texas_law	70	.5285714	.5027873	0	1
inclusivity	70	.2571429	.8108988	0	4

Summary statistics of the follow up Harvey and statue surveys

Variable	Obs	Mean	Std. Dev.	Min	Max
legal_aid	107	.4672897	.5012768	0	1
statue_sur~y	107	.5327103	.5012768	0	1
age	107	35.16822	10.35819	21	68
male	107	.5794393	.4959721	0	1
educ	107	4.11215	1.62717	1	8
party	107	.9345794	.8041288	0	4
news_time	107	5.425234	4.375534	1	20
source	107	1.971963	1.111331	0	4
file_date	107	1.420561	.7142404	0	2
dozens	107	.8130841	.3916786	0	1
texas_law	107	.635514	.4835506	0	1
inclusivity	107	.5327103	.9935429	0	4

Summary statistics of the follow up Harvey survey

Variable	Obs	Mean	Std. Dev.	Min	Max
legal_aid	50	.46	.5034574	0	1
statue_sur~y	50	0	0	0	0
age	50	39.1	12.80027	24	68
male	50	.7	.46291	0	1
educ	50	4.16	1.595402	1	7
party	50	.9	.6776309	0	4
news_time	50	6.01	4.533875	1	20
source	50	1.84	1.113186	0	4
file_date	50	1.46	.7342913	0	2
dozens	50	.84	.370328	0	1
texas_law	50	.6	.4948717	0	1
inclusivity	50	.48	1.034901	0	4

Summary statistics of the follow up statue survey

Variable	Obs	Mean	Std. Dev.	Min	Max
legal_aid	57	.4736842	.5037454	0	1
statue_sur~y	57	1	0	1	1
age	57	31.7193	5.814865	21	49
male	57	.4736842	.5037454	0	1
educ	57	4.070175	1.667544	1	8
party	57	.9649123	.9056354	0	3
news_time	57	4.912281	4.20472	1	20
source	57	2.087719	1.106486	0	4
file_date	57	1.385965	.7008766	0	2
dozens	57	.7894737	.4113064	0	1
texas_law	57	.6666667	.4755949	0	1
inclusivity	57	.5789474	.9626483	0	4

3. Random utility model derivation

a. Original surveys

$1 - F(\beta_0 - \alpha_0 - \alpha_1) = P(i = X \mid \text{Fake}(X))$ $1 - F(\beta_0 - \alpha_0 - \alpha_1) = 0.51$ $1 - F(-\alpha_0 - \alpha_1) = 0.51$ $F(-\alpha_0 - \alpha_1) = 0.49$ $* \alpha_0 - \alpha_1 = -F^{-1}(0.49)$	$1 - F(\beta_0 - \alpha_0 + \beta_1) = P(i = Y \mid \text{Fake}(Y))$ $1 - F(\beta_0 - \alpha_0 + \beta_1) = 0.40$ $1 - F(\beta_1 - \alpha_0) = 0.40$ $F(\alpha_1 - \alpha_0) = 0.60$ $* \alpha_1 - \alpha_0 = F^{-1}(0.60)$
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$$\alpha_0 + \alpha_1 = 0.025$$

$$\alpha_1 - \alpha_0 = -0.253$$

$$\alpha_1 = -0.253 + \alpha_0$$

$$\alpha_0 - 0.253 + \alpha_0 = 0.025$$

$$2\alpha_0 = 0.025 + .253$$

$$2\alpha_0 = 0.278$$

$$\alpha_0 = \mathbf{0.139}$$

$$\alpha_1 = -0.253 - 0.139$$

$$\alpha_1 = \mathbf{-0.114}$$

$P(i = X \mid \text{NoFake}) = P(U_i(X) > U_i(Y) \mid \text{NoFake})$ $= P(.139 + \epsilon_i > \gamma_i)$ $= P(\epsilon_i - \gamma_i > -.139) = \mathbf{0.56}$	$P(i = Y \mid \text{NoFake}) = P(U_i(Y) > U_i(X) \mid \text{NoFake})$ $= P(\gamma_i > .139 + \epsilon_i)$ $= P(-.139 > \epsilon_i - \gamma_i) = \mathbf{.44}$
$P(i = X \mid \text{Fake}(X)) - P(i = X \mid \text{NoFake})$ $= .51 - .56 = \mathbf{-.04}$	$P(i = Y \mid \text{Fake}(Y)) - P(i = Y \mid \text{NoFake})$ $= .40 - .44 = \mathbf{-.04}$

b. Follow up surveys

$1 - F(\beta_0 - \alpha_0 + \beta_1) = P(i = Y \mid \text{Fake}(Y))$ $1 - F(\beta_0 - \alpha_0 + \beta_1) = 0.53$ $1 - F(\beta_1 - \alpha_0) = 0.53$ $F(\alpha_1 - \alpha_0) = 0.47$ $* \alpha_1 - \alpha_0 = F^{-1}(0.47)$	$1 - F(\beta_0 - \alpha_0 + \beta_1) = P(i = Y \mid \text{Fake}(Y))$ $1 - F(\beta_0 - \alpha_0 + \beta_1) = 0.53$ $1 - F(\beta_1 - \alpha_0) = 0.53$ $F(\alpha_1 - \alpha_0) = 0.47$ $* \alpha_1 - \alpha_0 = F^{-1}(0.47)$
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$$\alpha_0 + \alpha_1 = -0.151$$

$$\alpha_1 - \alpha_0 = 0.075$$

$$\alpha_1 = 0.075 + \alpha_0$$

$$\alpha_0 + 0.075 + \alpha_0 = -0.151$$

$$2 \alpha_0 = -0.226$$

$$\alpha_0 = -0.113$$

$$\alpha_1 = 0.075 - 0.113$$

$$\alpha_1 = -0.038$$

$P(i = X \mid \text{NoFake}) = P(U_i(X) > U_i(Y) \mid \text{NoFake})$ $= P(-.113 + \epsilon_i > \gamma_i)$ $= P(\epsilon_i - \gamma_i > .113) = .46$	$P(i = Y \mid \text{NoFake}) = P(U_i(Y) > U_i(X) \mid \text{NoFake})$ $= P(\gamma_i > -.113 + \epsilon_i)$ $= P(.113 > \epsilon_i - \gamma_i) = .54$
$P(i = X \mid \text{Fake}(X)) - P(i = X \mid \text{NoFake})$ $= .44 - .46 = -.02$	$P(i = Y \mid \text{Fake}(Y)) - P(i = Y \mid \text{NoFake})$ $= .53 - .54 = -.01$