

Echo Chambers - Fact or Fiction?

Analyzing News Consumption and Participation in the Chamber

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1. Introduction

There has been a lot of debate recently regarding the existence of “echo chambers” on social media platforms such as Facebook, Twitter, Reddit, etc. An “echo chamber” is described in a metaphorical way as a situation in which beliefs are amplified or reinforced by communication and repetition inside a closed system and insulated from rebuttal. [\[1\]](#) Research has shown that a social network rapidly devolves into segregated, homogenous communities, and the emergence of echo chambers is somewhat inevitable given the mechanisms of social media platforms. [\[2\]](#) There is also evidence that polarization is rampant in online communities and news consumption is biased with little diversity. [\[3, 4, 6\]](#) One social media platform that is ripe for the existence of echo chambers is Reddit. Reddit, also known as “the front page of the internet”, is divided into thousands of communities based on topics, called “subreddits”. Reddit users are called “redditors” and can post in these subreddits, participate in discussions in comment threads, and vote a post up - an “upvote”, or vote it down - a “downvote”. Since these subreddits are communities centered around a common topic, they can encourage the development of echo chambers. Comment threads can repetitively reinforce common beliefs and downvote unpopular beliefs out of visibility.

In this paper, I aim to study whether certain political subreddits display characteristics of an echo chamber. Specifically, I look at three subreddits - “r/conservative”, “r/politics”, and “r/neutralnews”. r/conservative, as the name suggests, is a community of conservatives that leans heavily to the right, while r/politics, even though it is not supposed to represent an ideology, is known to lean towards the left. r/neutralnews is a control subreddit which says it is a community for discussion on “current events from reputable sources”. It would be safe to say that a subreddit displays symptoms of an echo-chamber if most of the posts have links from news outlets that are known to be biased, and its subscribers participate less in other subreddits than the average redditor, consuming non-diverse content. To determine the degree to which these subreddits act as echo chambers, I first analyze the bias of the news outlets that are highly consumed in that subreddit. Then, I analyze the participation of the subscribers of that subreddit in other subreddits across the platform.

I devise two hypotheses -

- a. r/conservative and r/politics consume biased news. r/conservative consumes news mostly from outlets that have a right bias, r/politics consumes news mostly from outlets that have a left bias, and r/neutralnews consumes news mostly from outlets that don't display a bias.
- b. r/conservative and r/politics users' participation in other subreddits is less than that of the users of r/neutralnews.

2. Analyzing Biased News Consumption in Subreddits

A. Data Collection and Processing

I used PRAW [\[8\]](#) - a Reddit API Wrapper for Python - to collect the top 1000 posts made between 3rd November 2020 (11/03/2020) and 3rd December 2020 (12/03/2020) on each of the following subreddits - r/conservative, r/politics, and r/neutralnews. I then obtained the URLs that were linked in these posts, while filtering out commonly occurring non-news websites such as Youtube, Imgur, etc. After obtaining the top-level-domain [\[9\]](#) and counting the number of times they occur, I plotted the top 20 occurring sources using Python's matplotlib library. [\[10\]](#) The code for data collection and processing is in the Github repository. [\[12\]](#)

I used www.allsides.com to obtain the Media Bias Rating for each of the news outlets. AllSides categorizes each outlet into one of "Left", "Lean Left", "Center", "Lean Right", and "Right". They use multiple methods for rating news outlets based on scientific, multi partisan analysis. Their methods include "Blind Bias Survey", "Editorial Review", "Third Party Analysis", "Independent Review", and "Community Feedback". [\[11\]](#)

B. Results

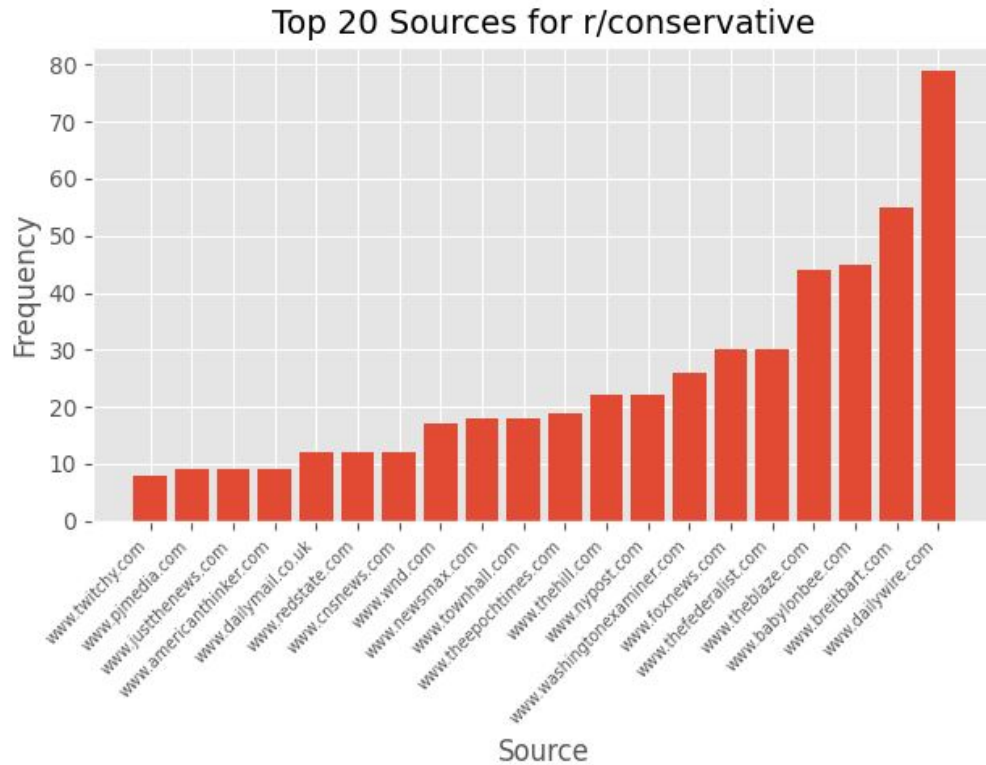


Figure 1. The top 20 most commonly linked news outlets on the r/conservative subreddit in the top 1000 posts from 11/03/2020 - 12/03/2020

www.dailywire.com (79)	Right Bias
www.breitbart.com (55)	Right Bias
www.theblaze.com (44)	Right Bias
www.thefederalist.com (30)	Right Bias
www.foxnews.com (30)	Leaning Right Bias
www.washingtonexaminer.com (26)	Right Bias
www.nypost.com (22)	Leaning Right Bias
www.thehill.com (22)	Center
www.theepochtimes.com (19)	Right Bias
www.townhall.com (18)	Right Bias
www.newsmax.com ((18)	Leaning Right Bias
www.wnd.com (17)	Right Bias
www.cnsnews.com (12)	Right Bias
www.redstate.com (12)	Right Bias
www.dailymail.co.uk (12)	Right Bias
www.americanthinker.com (9)	Right Bias

www.justthenews.com (9)	Center
www.pjmedia.com (9)	Right Bias
www.twitchy.com (8)	Right Bias

Table 1. Bias Ratings from www.allsides.com for the top 20 most commonly occurring news sources on r/conservative

Figure 1. plots the frequency of the occurrence of the top news sources in r/conservative from 11/03/2020 - 12/03/2020 and Table 1 shows the bias rating given to these sources by www.allsides.com. In summary, 14 out of 19 websites have a rating of “Right”, 3 out of 19 websites have a rating of “Lean Right”, and 2 out of 19 websites have a rating of “Center”. I excluded www.babylonbee.com because it is a satire website.

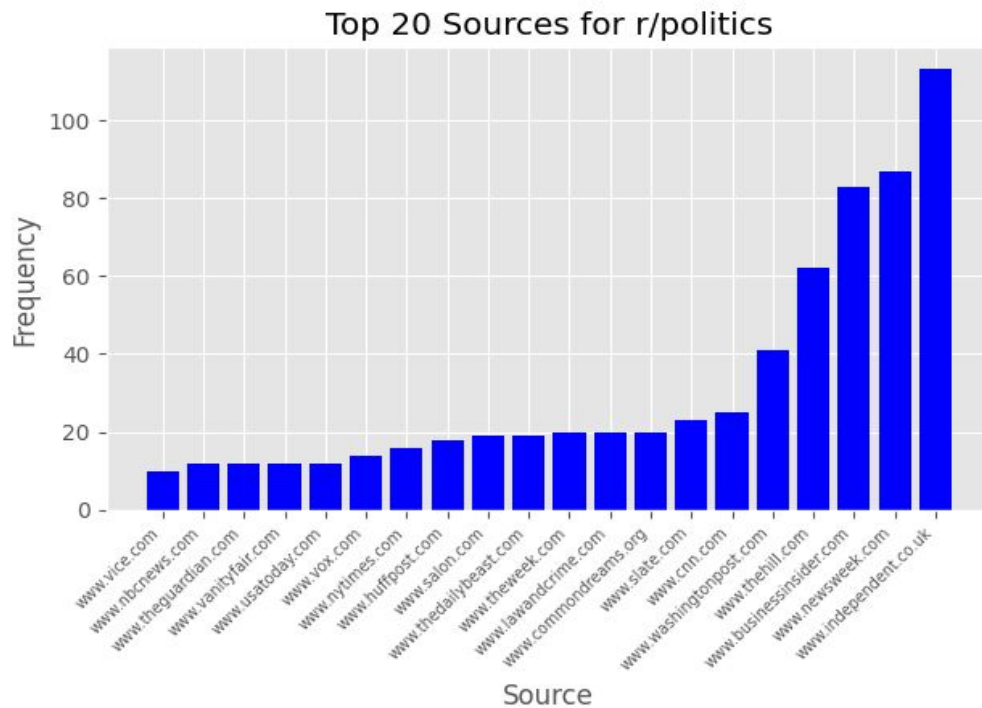


Figure 2. The top 20 most commonly linked news outlets on the r/politics subreddit in the top 1000 posts from 11/03/2020 - 12/03/2020

www.independent.co.uk (113)	Leaning Left Bias
www.newsweek.com (87)	Left Bias
www.businessinsider.com (83)	Center

www.thehill.com (62)	Center
www.washingtonpost.com (41)	Leaning Left Bias
www.cnn.com (25)	Left Bias
www.slate.com (23)	Left Bias
www.commondreams.org (20)	Left Bias
www.lawandcrime.com (20)	Not rated
www.theweek.com (20)	Center
www.thedailybeast.com (19)	Not rated
www.salon.com (19)	Left Bias
www.huffpost.com (18)	Left Bias
www.nytimes.com (16)	Leaning Left Bias
www.vox.com (14)	Left Bias
www.usatoday.com (12)	Center
www.vanityfair.com (12)	Leaning Left Bias
www.theguardian.com (12)	Leaning Left Bias
www.nbcnews.com (12)	Leaning Left Bias
www.vice.com (10)	Left Bias

Table 2. Bias Ratings from www.allsides.com for the top 20 most commonly occurring news sources on r/politics

Figure 2. plots the frequency of the occurrence of the top news sources in r/politics from 11/03/2020 - 12/03/2020 and Table 2 shows the bias ratings given to these sources by www.allsides.com. I did not include two websites (“www.thedailybeast.com” and “www.lawandcrime.com”) in my final calculations because they were not rated by AllSides. In summary, 8 out of 18 websites have a rating of “Left”, 6 out of 18 websites have a rating of “Lean Left”, and 4 out of 18 websites have a rating of “Center”.

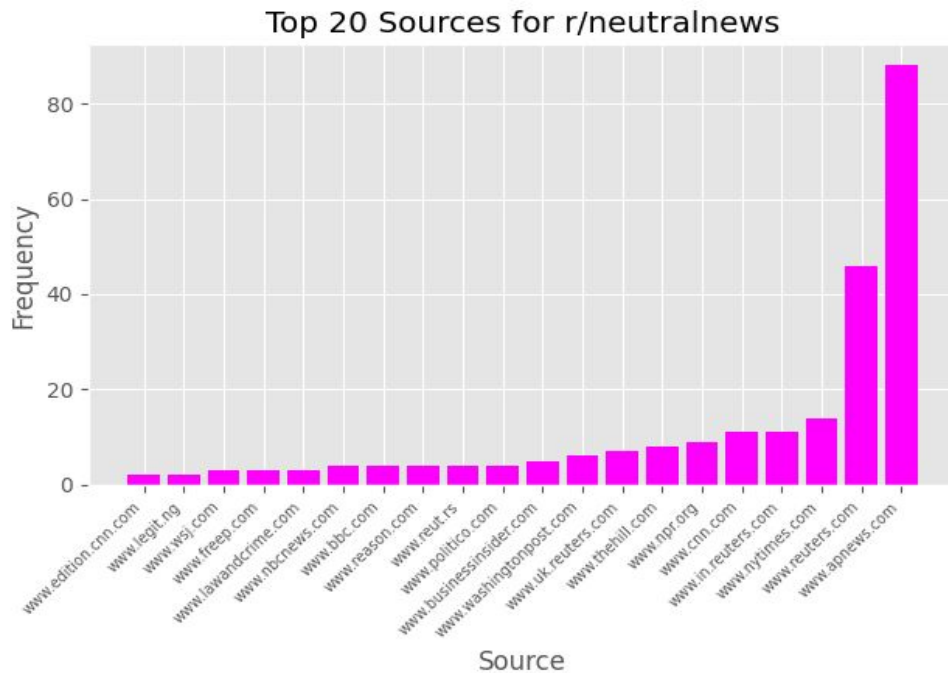


Figure 3: The top 20 most commonly linked news outlets on the r/neutralnews subreddit in the top 285 posts from 11/03/2020 - 12/03/2020

www.apnews.com (88)	Center
www.reuters.com (68)	Center
www.nytimes.com (14)	Leaning Left Bias
www.cnn.com (13)	Leaning Left Bias
www.npr.org (9)	Center
www.thehill.com (8)	Center
www.washingtonpost.com (7)	Leaning Left Bias
www.businessinsider.com (5)	Center
www.politico.com (4)	Leaning Left Bias
www.reason.com (4)	Leaning Right Bias
www.bbc.com (4)	Center
www.nbcnews.com (4)	Leaning Left Bias
www.lawandcrime.com	Not rated
www.freep.com	Not rated
www.wsj.com (3)	Center
www.legit.ng (2)	Not rated

Table 3. Bias Ratings from www.allsides.com for the top 20 most commonly occurring news sources on r/conservative

Figure 3. plots the frequency of the occurrence of the top news sources in r/neutralnews from 11/03/2020 - 12/03/2020 and Table 3 shows the bias ratings given to these sources by www.allsides.com. I did not include two websites (“www.freep.com” and “www.lawandcrime.com”) in my final calculations because they were not rated by AllSides. I combined different domain names that obviously belonged to the same outlet (like www.in.reuters.com and www.uk.reuters.com). In summary, 7 out of 13 websites have a rating of “Center”, 5 out of 13 websites have a rating of “Lean Left”, and 1 out of 13 websites have a rating of “Lean Right”.

	r/conservative	r/politics	r/neutralnews
Left Bias	0.0	0.444	0.0
Leaning Left Bias	0.0	0.333	0.385
Center	0.105	0.222	0.538
Leaning Right Bias	0.158	0.0	0.077
Right Bias	0.737	0.0	0

Table 4. The percentage of news outlets observed with different bias ratings for r/conservative, r/politics, r/neutralnews

Table 4 summarizes the percentage of news outlets with different bias ratings on the three subreddits. We see that news on r/conservative comes mostly from outlets with a heavy bias to the right, on “politics” comes mostly from outlets with a heavy bias to the left and also from outlets that lean left, and on r/neutralnews comes mostly from neutral outlets but also from

outlets that lean left. However, this table does not give the full picture since I did not account for the number of links from these different sources.

	r/conservative	r/politics	r/neutralnews
Left Bias	0.0	0.361	0.0
Leaning Left Bias	0.0	0.344	0.182
Center	0.069	0.295	0.801
Leaning Right Bias	0.155	0.0	0.017
Right Bias	0.776	0.0	0.0

Table 5. The percentage of links coming from news outlets with different bias ratings for
r/conservative, r/politics, r/neutralnews

Table 5. solves this issue by summarizing the percentage of links coming from outlets with different bias ratings for the three subreddits. r/conservative remains mostly the same - consuming news mostly from outlets with a heavy right bias. r/politics shifts a little bit away from its bias. r/neutralnews sees the most difference - a heavy majority of links coming from outlets that don't display a bias.

3. Analyzing Engagement of Users in Different Subreddits

A. Data Collection and Processing

As before, I used PRAW [\[8\]](#) to collect usernames from the comment sections of the top 1000 posts between 11/04/2020 - 12/04/2020 as well as from the "hot" section from r/conservative,

r/politics, and r/neutralnews. I selected a random sample of 1000 usernames for each of r/conservative and r/politics and gathered 914 usernames from r/neutralnews. I wrote a script that gets the top 1000 comments made by each user between 11/04/2020 - 12/04/2020, and counted the number of subreddits they participated in. I restricted the comments to this time frame because if I looked at users' complete comment history, the time it took to compute was very high (~ 1 hour per 100 users). Moreover, this time frame matched the time frame I chose for the posts I analyzed for calculating the bias. Then, I calculated the mean, median, and standard deviation for the number of subreddits each user participated in.

To focus solely on participation in political and news subreddits, I also ran a modified version of the previous script that only accounted for participation in a selected list of political and news subreddits. The list of subreddits is given below in Figure 4. The code for this data collection and processing is in the Github repository. [\[12\]](#)

```
['politics', 'Conservative', 'worldnews',  
'news', 'worldpolitics', 'Worldevents', 'business', 'Economics',  
'environment', 'energy', 'law', 'education', 'government', 'history',  
'PoliticalPDFs', 'WikiLeaks', 'SOPA', 'worldnews2', 'AnarchistNews',  
'LGBTnews', 'politics2', 'economics2', 'uspolitics', 'AmericanPolitics',  
'Libertarian', 'Anarchism', 'socialism', 'progressive', 'americapirateparty',  
'democrats', 'Liberal', 'new_right', 'Republican', 'egalitarian', 'demsocialist',  
'LibertarianLeft', 'Liberty', 'Anarcho_Capitalism', 'alltheleft', 'neoprogs',  
'tea_party', 'voluntarism', 'labor', 'blackflag', 'GreenParty',  
'democracy', 'IWW', 'Marxism', 'Objectivism', 'LibertarianSocialism',  
'peoplesparty', 'Capitalism', 'Anarchist', 'feminisms', 'republicans',  
'Communist', 'socialdemocracy', 'Postleftanarchism', 'RadicalFeminism',  
'AnarchoPacifism', 'conservatives', 'republicanism', 'Conspiracy',  
'911truth', 'climatesceptics', 'infograffiti', 'conspiracyhub', 'Liberal',  
'The_Donald', 'Uncensorednews', 'Neoliberal', 'PoliticalDiscussion', 'WayOfTheBern',  
'OurPresident', 'SandersForPresident', 'collapse', 'geopolitics', 'ukpolitics',  
'PoliticalCompassMemes', 'stupidpol', 'Coronavirus']
```

Figure 4. The list of political and news subreddits I calculated participation on

The more of these subreddits a user participates in, the more diverse content and conflicting opinions they would consume.

B. Results

	r/conservative	r/politics	r/neutralnews
Mean number of subreddits users participated in	19.956	21.618	24.770
Median number of subreddits users participated in	14.0	15.0	18
Standard Deviation	21.906	20.781	25.725

Table 6. Mean, median, and standard deviation of the number of subreddits the users of r/conservative, r/politics, and r/neutralnews participate in.

Table 6. summarizes the mean, median, and standard deviation of the number of subreddits the users of the three subreddits participated in. It is evident that users of r/conservative participate less in other subreddits than the users of r/politics and r/neutralnews. Unsurprisingly, users of r/neutralnews participate the most in other subreddits, consuming diverse content. This points towards r/conservative and r/politics (to a lesser degree) displaying a key characteristic of echo chambers - consumption of non-diverse content.

	r/conservative	r/politics	r/neutralnews
Mean number of political & news subreddits users participated in	2.327	2.405	1.857
Median number of political & news subreddits users participated in	2.0	2.0	1.0
Standard Deviation	1.644	1.470	1.983

Table 7. Mean, median, and standard deviation of the number of political and news subreddits the users of r/conservative, r/politics, and r/neutralnews participate in.

Table 7. summarizes the mean, median, and standard deviation of the number of political and news subreddits the users of the three subreddits participated in. Surprisingly, users of r/neutralnews participated considerably less in other political and news subreddits than the users of r/conservative and r/politics. Users of r/conservative participated less in other political and news subreddits than the users of r/politics, although the difference is small. Overall, most users do not participate in a lot of different political and news subreddits.

4. Discussion

The evidence I gathered provides useful insights into the activity of users who participate in three political and news subreddits. Out of the three subreddits analyzed, r/conservative consumes the most biased news. r/politics also consumes biased news, but to a lesser extent. r/neutralnews seems to mostly consume news from unbiased sources, although most of the links were only from two outlets - www.reuters.com and www.apnews.com.

The results of the second experiment were more surprising. The users of r/neutralnews participate much less in other political and news subreddits than those of r/conservative and r/politics. This evidence does add some support to research that says politically inclined users on social media tend to avoid echo-chambers. [7] Although, this might be because the users of r/neutralnews are untrusting of other subreddits, or that they don't feel the need to consume news from diverse sources since they believe they are already consuming unbiased news. Even though users of r/conservative and r/politics engage in more political and news subreddits, the numbers are still pretty small. Most users seem to participate in not more than 2 or 3 political

and news subreddits in total. This is problematic, especially if further research shows that these other subreddits are also biased in the same direction.

5. Limitations and Further Work

I was restricted by the design of Reddit's API since it does not allow access to historical data. For example, I was only able to look at posts from the "top", "hot", "new", and "controversial" sections. "Top" and "controversial" posts can be obtained from the past day, week, month, year, or all. At most, Reddit's API allows 1000 posts to be returned from any query. I believe my data would have been stronger if I was able to obtain all posts between a certain time frame and not be limited to 1000.

I could not conduct the second experiment on a larger set of usernames because of technical limitations of my laptop, even though I had about 20,000 usernames for each r/conservative and r/politics. Therefore, the results might not be very satisfying. Further, it would be helpful to look at specifically what other political and news subreddits the users of r/conservative, r/politics, and r/neutralnews use. For instance, if the users of r/conservative mostly participate in another subreddit with a heavy bias to the right, it would reinforce the echo chamber hypothesis.

It would also help to use a group of subreddits as the control rather than just r/neutralnews. I plan on doing that in further research, since that would allow for a more accurate representation of an average redditor, and better comparisons.

6. Conclusion

To combat the effects of echo-chambers, it is important to consume news from diverse sources and to be exposed to diverse and conflicting views. The existence of echo-chambers on Reddit and other social media platforms has been debated. In this paper, I provide strong evidence that supports my first hypothesis - users of r/conservative and r/politics consume news from biased sources, as opposed to users of r/neutralnews. Evidence for my second hypothesis is weak. It is not clear if the participation of the users of r/conservative and r/politics in other subreddits, particularly political and news subreddits, is enough to counteract the effects of biased news on the two subreddits. Further research with more data would make this clearer. Till then, it is clear that social media platforms like Reddit encourage the formation of segregated, homogenous groups, and that its users do not prefer to participate in a lot of different communities.

References

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- [2] <https://link.springer.com/article/10.1007/s42001-020-00084-7>
- [3] <https://academic.oup.com/poq/article-abstract/80/S1/298/2223402?redirectedFrom=fulltext>
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[12] <https://github.com/aryan096/echo-chambers-project>