Did Republican or Democrat voters experience more difficulty voting in the 2020 election?

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1 Importance and Context

Voter turnout is essential to a functioning democracy, and although not every American experiences difficulties in the voting process, many circumstances can interfere with one's ability to vote. Some barriers are more systemic and tied to the voter registration process, such as difficulties obtaining a ballet or proving residency in a certain district. Other obstacles may present themselves on Election Day itself, such as lack of accessibility to a polling location or inability to find time in the work schedule to submit a ballot. During the 2020 election, the COVID-19 pandemic may have also led more Americans to vote by mail - surveys have indicated that 46% of 2020 voters voted by mail or absentee compared to 21% of voters in the 2016 election [1]. This rise in mail-in voting may have presented its own challenges as many voters navigated the process for the first time.

In this analysis, we aim to investigate sources of voting difficulty that affected American voters in the 2020 election. Specifically, we hope to address the following research question with a statistically sound approach:

Did Republican or Democrat voters experience more difficulties voting in the 2020 election?

Observing if voting difficulty may be a partisan issue can also shed some insights into opportunities to make elections more accessible to all Americans. Of course, people's voting experiences are affected by much more than just their party affiliation, so we must be careful to not draw any unjustified causal conclusions from the results of our analysis. However, the observations made can lead to additional investigations about how a variety of other socioeconomic factors, in conjunction with political values or party affiliation, might cause obstacles in the voting process.

2 Data and Methodology

To answer this research question, we are utilizing data from the 2020 Time Series Study, hosted by the American National Election Studies (ANES). This dataset is nationally representative since ANES conducted a fresh cross-sectional sample that was a random draw from the USPS computerized delivery sequence file, with residential addresses across the 50 states and Washington DC having equal probability of selection. Respondents to the study were asked a variety of questions centered around various election-related and socioeconomic topics. The respondents to the 2020 Time Series Study are drawn from two sample compositions for a total of 8,280 individuals:

- 5,441 interviews were drawn from a cross-section of all US eligible voters
- 2,839 interviews were performed on previous respondents of the 2016 ANES Time Series Study

It is important to note a few definitions that we have for terms in this study so that others may understand the limitations of our results. We categorized respondents based on their self-reported party affiliation. It is important to note that individuals had the option to respond with "Independent-Democrat" and "Independent-Republican" to reflect more moderate views; we did not exclude these responses, as studies have shown that many Americans may de-emphasize their partisanship as a matter of self-presentation[2]. We excluded respondents that declined to answer this question or that answered "Independent" with no party leaning.

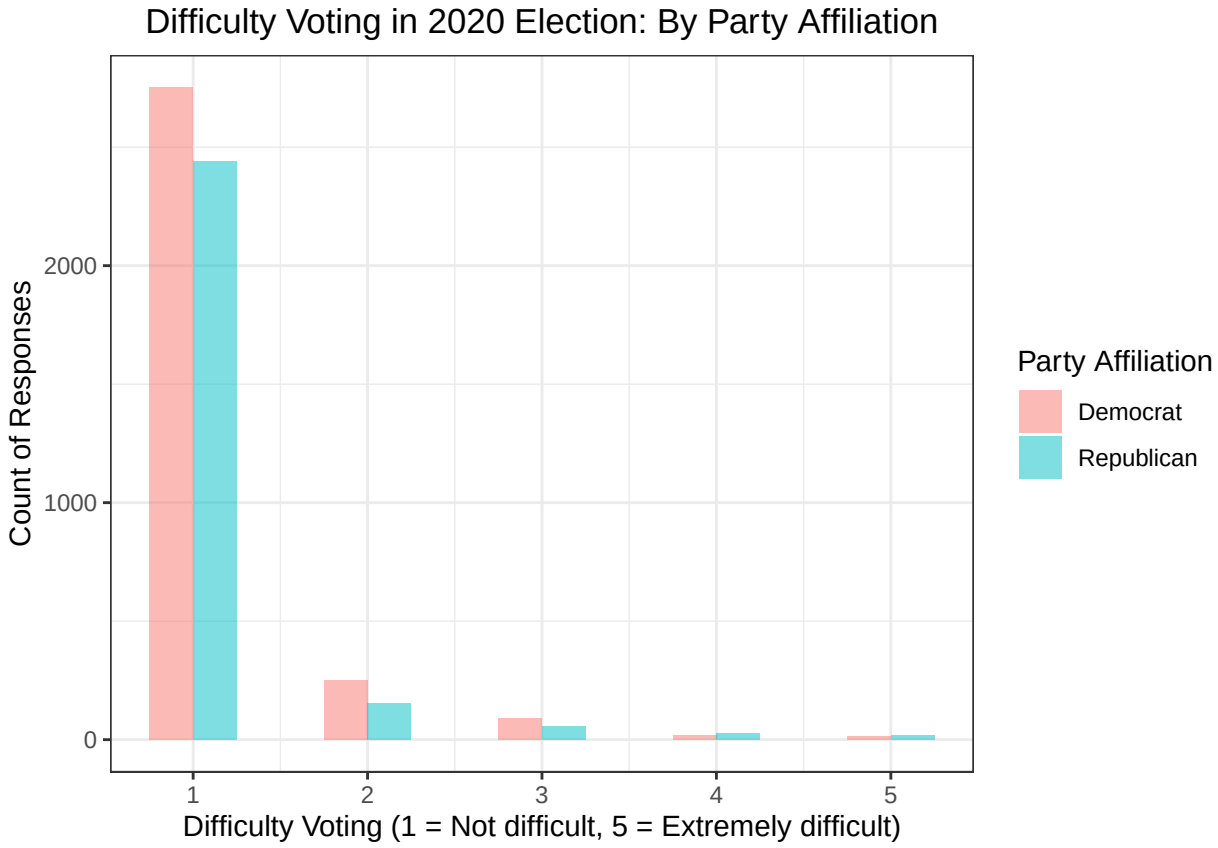
We also exclude participants who did not vote in the 2020 election. Noting these definitions, after cleaning the data based on these parameters, we were left with 3,128 Democrat and 2,700 Republican (5,828 total) respondents who voted in the 2020 election.

The survey also include specific questions concerning voting accessibility and any potential issues voters faced in the voting process. For the main question posed to respondents on this topic "How difficult was it

[1] FiveThirtyEight. "What Absentee Voting Looked Like In All 50 States." (2020).
[2] Petrocik: "Measuring party support: Leaners are not independents." (2009)

to vote?", data was reported on a 5-point Likert scale ranging from 1 ("Not difficult at all") to 5 ("Extremely difficult"). Data from follow-up questions concerning specific problems (voter registration, work schedule, mailing issues etc.), were reported with binary variables (0 and 1, with 1 recorded if the specific problem was mentioned by the respondent).

Preliminary visualization of the distribution of how respondents reported voting difficulty is shown below. Overall, 635 of the 5,828 respondents in our cleaned dataset reported experiencing any difficulty in voting.



To test our research question, we proceeded with a Wilcoxon rank-sum test, which is a nonparametric test well-suited for comparing outcomes between two independent groups. As we are dealing with ordinal data (voting difficulty was captured on a Likert scale), specifically the hypothesis of comparisons version of the Wilcoxon rank-sum test will be used.

The null hypothesis of our Wilcoxon rank-sum test will be stated as follows:

> **Null Hypothesis:** *The probability that a draw from the Republican voter pool ranks higher than a draw from the Democrat voter pool is the same as the probability that a draw from the Democrat voter pool ranks higher than a draw from the Republican voter pool.*

To ensure that the Wilcoxon rank-sum test is suitable for our purposes and our data, we must verify the following assumptions: data is independent and identically distributed (IID), data is on an ordinal scale (for the hypothesis of comparisons version of the test), and data be sufficiently normal (sample size is large enough that the Central Limit Theorem ensures convergence).

- Ordinal data: Likert scale is ordinal. Although the items have a clear rank order, they are not evenly distributed and it would not make sense to conduct arithmetic operations on the data.
- IID: The ANES study uses a nationally representative sample of individuals across the USPS computerized delivery sequence file. In theory, each residential address had an equal probability of selection. We acknowledge potential response bias as respondents were offered money for their participation.

Additionally, there is opportunity for geographical clustering of respondents, where people who live nearby may have similar voting experiences. However, both of these effects are relatively minimal given the size of the dataset.

- Normal: The large sample size (5,828) implies a normal sampling distribution per the Central Limit Theorem.

3 Results

The results of the Wilcoxon rank-sum test are shown below.

```
wt = wilcox.test(diffvote ~ party_self, data = anes_voted_party_clean,
            alternative="two.sided",
            conf.int = TRUE,
            conf.level=0.95)
```

The resultant test statistics (W = 4323774, p = .0035) leads us to reject the null hypothesis. Consequently, we conclude that **the probability that a draw from the Republican voter pool ranks higher than a draw from the Democrat voter pool is not the same as the probability that a draw from the Democrat voter pool ranks higher than a draw from the Republican voter pool**. Although the test is statistically significant, the metric of this test is *not* very intuitive. Thus, we proceeded to calculate 3 different metrics to interpret the effect size to gauge practical significance:

1) The Hodges-Lehman estimator of effect size, which is very small (difference in location = 3.19e-05):

```
wt$estimate
```

2) The correlation effect size for a Wilcoxon rank-sum test $r = \frac{Z}{\sqrt{N}}$, which is also very small (-0.035):

```
z = qnorm(wt$p.value)
N = count(anes_voted_party_clean)
eff_corr = z/sqrt(N)
as.numeric(eff_corr)
```

3) Cohen's D metric, which specifies how many standard deviations away from the population is one distribution from another one, which is also very small (d estimate = 0.033):

```
cohen.d(diffvote ~ party_self, data = anes_voted_party_clean)
```

All metrics indicate that the test results are not practically significant, despite their statistical significance. The differences in distributions is ultimately quite small.

4 Discussion