Nikhil Deshpande
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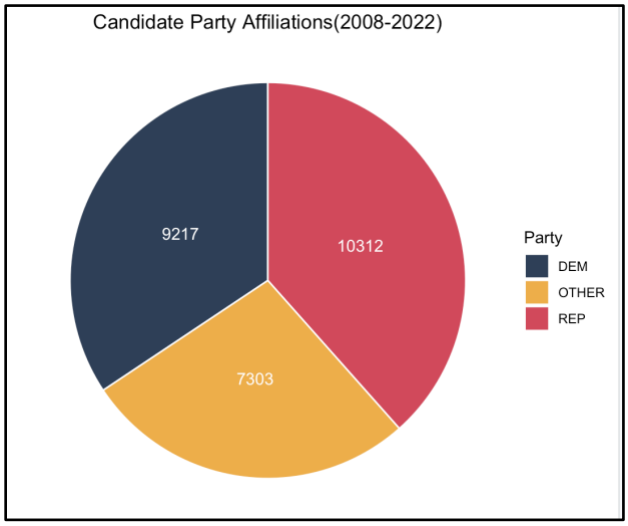
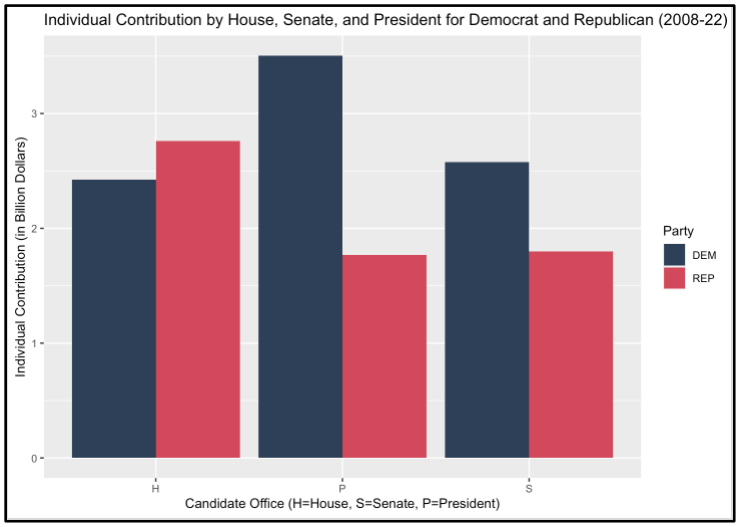
Assignment 2: Visual Data Exploration

PART 1



The visualization identifies the total number of candidates that have campaigned from 2008-2022 based on which political party they are affiliated with. In this time frame, Republicans have had the most candidates run for office at 10312 with Democrats following behind with 9217 candidates. All the remaining parties and independent candidates sum up to be less than either party, meaning that we will be focusing on the Democratic and Republican parties going forward in the report.

This visualization focuses on the total individual contribution of Democratic and Republican candidates between 2008 - 2022 categorized by the office that they are running for. The total individual contribution includes both itemized and unitemized contributions received in campaigns for different candidates. There seems to be more contributions provided for Democratic presidential and senate campaigns compared to their counterparts. On the other hand, Republican House candidates seem to get more campaign contributions than their Democratic challengers.



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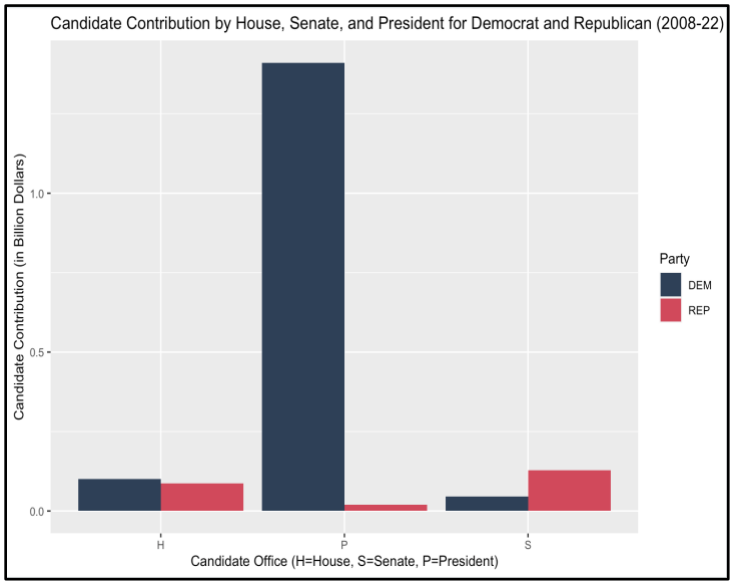
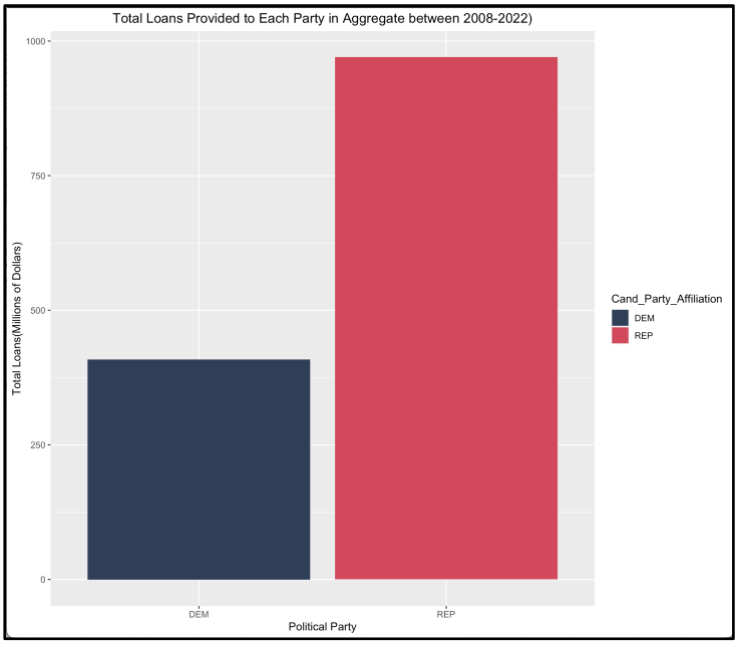


This visualization focuses on the personal contribution of Democratic and Republican candidates between 2008 - 2022 categorized by the office that they are running for. Candidates for both parties that are running for House invest roughly the same in their personal campaigns, with democratic candidates investing marginally more. On the other hand, Republican candidates running for Senate personally contribute more than their Democratic counterparts. The most surprising observation is that for presidential campaigns, it seems that Democratic candidates personally contribute significantly more than their Republican competitors.



This visualization focuses on comparing the aggregate loans received by all Democrat and Republican candidates over the time period of 2008 - 2022. We can identify that Republicans have received twice as much money in loans to put towards their campaigns compared to their Democratic challengers. This could indicate that Republicans rely more heavily on loans to fund their campaign efforts.

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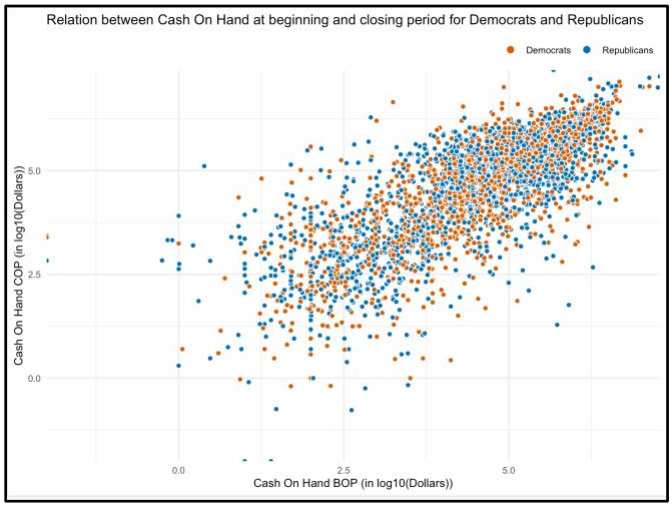
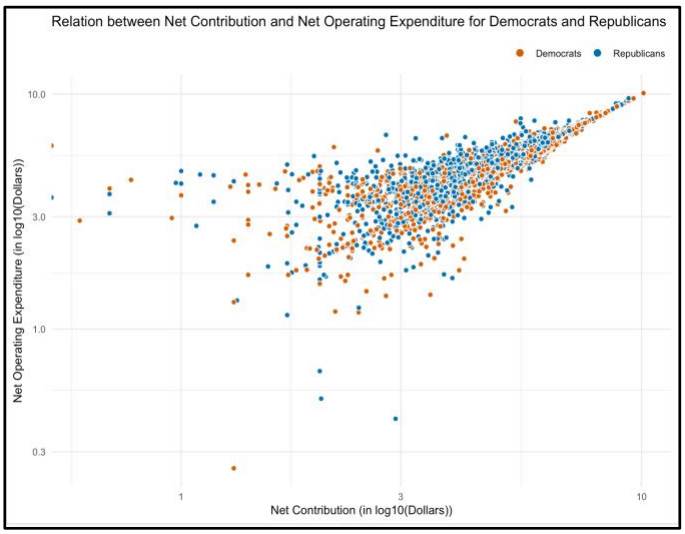


This visualization shows the cash at the beginning and end of the campaign period for both Democrats and Republicans from 2008 - 2022. We are able to identify that both Democrats and Republicans seem to be burning through cash at similar rates. It looks like most candidates seem to spend more cash than what they began with as their closing period cash balance is negative, meaning that they had a net loss for the campaign.



This visualization shows the relationship between the Net Contributions and Net Operating Expenditures between Democratic and Republican candidates from 2008-2022(factored by log 10). There looks to be a strong correlation between these two variables because as net contributions increase, there seems to be a proportional increase in net operating expenditure as well. Another observation is that overall, Democratic candidates seem to be having slightly higher operating expenditures compared to Republican candidates. This could mean that Republican candidates could be running a more cost effective operation than Democrats.

PART 2

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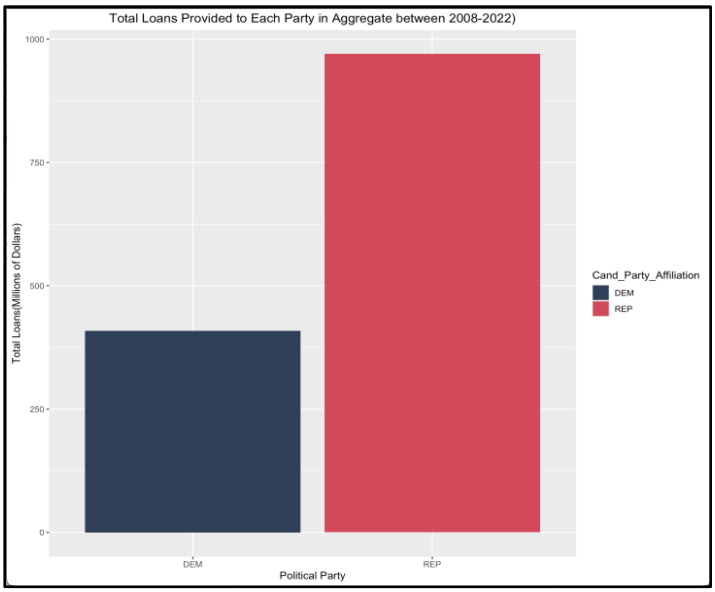
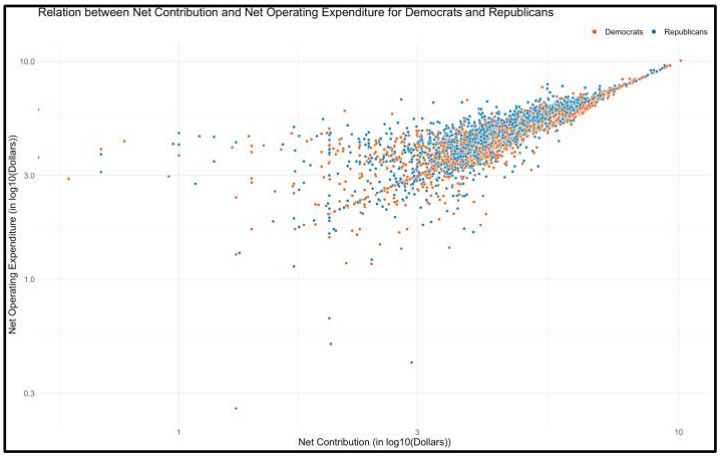
Hypothesis 1: Republican candidates come from more wealthy and affluent backgrounds, meaning that their access to capital is more than their Democratic counterparts since banks and other lobbyists will be more willing to provide them loans. Being wealthy allows their campaigning efforts to be easier as they can easily take bigger loans from the bank.



We can see from this visualization that over the past 14 years, Republicans have accrued right under 1 billion dollars in loans to support their campaigning efforts while Democrats have half of that at around 400 million. Getting access to loans easier can allow them to put their efforts towards campaigning. Additionally, it allows Republicans to be more comfortable spending their money as they know they can easily get an additional loan. This is bolstered by the visualization on the right as Republicans(in blue) overall seem to have higher net operating expenditures compared to Democrats. This leads us to believe that our hypothesis is right. This is because if Republicans have an easier time raising capital through loans, they are more comfortable with spending more on their campaigning efforts. Democrats have to dedicate more energy and resources towards persuading potential donors to support their campaign, putting them potentially at a slight disadvantage.



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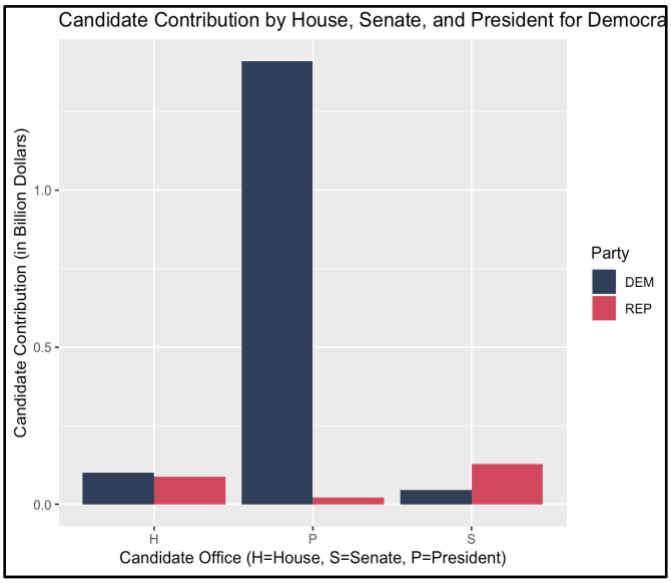
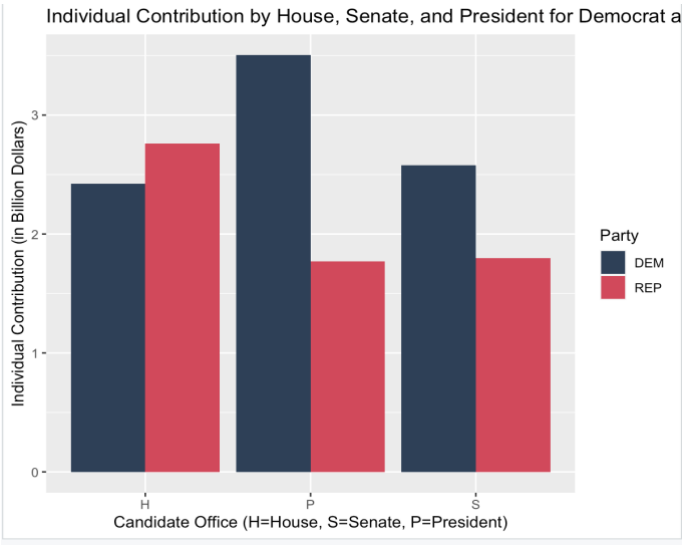
Hypothesis 2: Across the different offices, Democratic candidates will raise slightly less money through campaign contributions(personal, itemized, and unitemized) compared to their Republican challengers.





Both visualizations focus on contributions received by candidates grouped by the office they are running for and the party they are affiliated with. The visualization on the right shows the personal contributions made while the visualization below shows the total contributions given to each candidate. We can see that Democratic presidential candidates personally contribute a lot more than any other candidate running for office. Also, Democratic candidates running for house personally contribute more as well. Additionally, the bottom visualization shows that Democrats raise more contributions for both Presidential and Senate candidates compared to their Republican challengers while having nearly the same amount raised for Senate candidates. This leads us to refute our hypothesis that Democratic candidates raise less money than Republicans as Democratic candidates look to rely more on contributions through fundraising rather than loans to fuel their campaign efforts.

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Group Contribution

Viraj Vijaywargiya mainly created the following visualizations: Individual Contribution by House, Senate, and President for Democrats and Republicans; Candidate Contribution by House, Senate, and President for Democrats and Republicans; and Relation Between Cash On Hand at Beginning and Closing Period for Democrats and Republicans.

Nikhil Deshpande mainly created the following visualizations: Candidate Party Affiliations(2008-2022), Total Loans Provided To Each Party in Aggregate(2008-2022), and Relation Between Net Contribution and Net Operating Expenditures for Democrats and Republicans.

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CODE

```
df<-read.csv("https://www.ics.uci.edu/~algol/teaching/informatics143w2022/fec_2008-2022.csv")

CandOffice <- unique(df$Cand_Office)

IndCont <- c(sum(df[which(df$Cand_Office == "P" &
(df$Cand_Party_Affiliation=="DEM")),]$Individual_Contribution),
          sum(df[which(df$Cand_Office == "H" &
(df$Cand_Party_Affiliation=="DEM")),]$Individual_Contribution),
          sum(df[which(df$Cand_Office == "S" &
(df$Cand_Party_Affiliation=="DEM")),]$Individual_Contribution),
          sum(df[which(df$Cand_Office == "P" &
(df$Cand_Party_Affiliation=="REP")),]$Individual_Contribution),
          sum(df[which(df$Cand_Office == "H" &
(df$Cand_Party_Affiliation=="REP")),]$Individual_Contribution),
          sum(df[which(df$Cand_Office == "S" &
(df$Cand_Party_Affiliation=="REP")),]$Individual_Contribution))

CandCont <- c(sum(df[which(df$Cand_Office == "P" &
(df$Cand_Party_Affiliation=="DEM")),]$Cand_Contribution),
           sum(df[which(df$Cand_Office == "H" &
(df$Cand_Party_Affiliation=="DEM")),]$Cand_Contribution),
           sum(df[which(df$Cand_Office == "S" &
(df$Cand_Party_Affiliation=="DEM")),]$Cand_Contribution),
           sum(df[which(df$Cand_Office == "P" &
(df$Cand_Party_Affiliation=="REP")),]$Cand_Contribution),
           sum(df[which(df$Cand_Office == "H" &
(df$Cand_Party_Affiliation=="REP")),]$Cand_Contribution),
           sum(df[which(df$Cand_Office == "S" &
(df$Cand_Party_Affiliation=="REP")),]$Cand_Contribution))

df2 <- data.frame(Office = CandOffice, IC = IndCont, CC = CandCont, Party = c("DEM", "REP"))
```

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Graph 1:

```
g2<-
data.frame(Party=c("DEM","REP","OTHER"),value=c(nrow(dem_cand),nrow(rep_cand),nrow(ot
her_cand)))
ggplot(g2, aes(x="",y=value,fill=Party)) + geom_bar(stat="identity", width=1, color="white") +
coord_polar("y", start=0) + scale_fill_manual(values = c("#2e4057", "#edae49", "#d1495b")) +
theme_void() +  geom_text(aes(label = value), position = position_stack(vjust = 0.5),color=
"white") +  ggtitle("Candidate Party Affiliations(2008-2022)") +   theme(plot.title =
element_text(hjust = 0.5))
```

Graph 2:

```
ggplot(df2, aes(x = Office, y = IC/1000000000, fill = Party)) +
  geom_bar(position = "dodge", stat = "identity") +
  scale_fill_manual(values = c("#2e4057", "#d1495b")) +
  theme(text = element_text(size=10)) +
  labs(x = "Candidate Office (H=House, S=Senate, P=President)", y = "Individual Contribution (in
Billion Dollars)",
       title = "Individual Contribution by House, Senate, and President for Democrat and
Republican (2008-22)")
```

Graph 3:

```
ggplot(df2, aes(x = Office, y = CC/1000000000, fill = Party)) +
  geom_bar(position = "dodge", stat = "identity") +
  scale_fill_manual(values = c("#2e4057", "#d1495b")) +
  theme(text = element_text(size=10)) +
  labs(x = "Candidate Office (H=House, S=Senate, P=President)", y = "Candidate Contribution
(in Billion Dollars)",
       title = "Candidate Contribution by House, Senate, and President for Democrat and
Republican (2008-22)")
```

Graph 4:

```
g1 <- df[which((df$Cand_Party_Affiliation=="DEM" | df$Cand_Party_Affiliation=="REP")),]
ggplot(g1, aes(x = Cand_Party_Affiliation, y = Total_Loan/1000000, fill =
Cand_Party_Affiliation)) + geom_bar(stat = "identity") + labs(x = "Political Party", y = "Total
Loans(Millions of Dollars)") + scale_fill_manual(values = c("#2e4057", "#d1495b")) +
ggtitle("Total Loans Provided to Each Party in Aggregate between 2008-2022)") +
  theme(plot.title = element_text(hjust = 0.5))
```

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Graph 5:

```
df6 <- df[which(df$Cash_On_Hand_BOP>0 & df$Cash_On_Hand_COP>0 &
(df$Cand_Party_Affiliation=="DEM" | df$Cand_Party_Affiliation=="REP")),]

#Vis 5
ggplot(df6, aes(x = log10(Cash_On_Hand_BOP), y = log10(Cash_On_Hand_COP), fill =
Cand_Party_Affiliation)) +
  geom_point(pch = 21, size = 1.8, color = "white") +
  scale_y_continuous(expand = c(0, 0)) +
  scale_x_continuous(expand = c(0, 0)) +
  scale_fill_manual(
    values = c(DEM = "#D55E00", REP = "#0072B2"),
    breaks = c("DEM", "REP"), labels = c("Democrats", "Republicans"),
    name = NULL, guide = guide_legend( direction = "horizontal",
                                override.aes = list(size = 3))) +
  theme_minimal() +
  theme(text = element_text(size=10), legend.position = "top",
        legend.justification = "right", legend.box.spacing = unit(3.5, "pt")) +
  labs(x = "Cash On Hand BOP (in log10(Dollars))", y = "Cash On Hand COP (in
log10(Dollars))") +
       ggtitle("Relation between Cash On Hand at beginning and closing period for Democrats
and Republicans")
```

Graph 6:

```
df5 <- df[which(df$Net_Contribution>0 & df$Net_Operating_Expenditure>0 &
(df$Cand_Party_Affiliation=="DEM" | df$Cand_Party_Affiliation=="REP")),]
view(df5)

#Vis 6
ggplot(df5, aes(x = log10(Net_Contribution), y = log10(Net_Operating_Expenditure), fill =
Cand_Party_Affiliation)) +
  geom_point(pch = 21, size = 1.8, color = "white") +
  scale_y_log10() +
  scale_x_log10() +
  scale_fill_manual(
    values = c(DEM = "#D55E00", REP = "#0072B2"),
    breaks = c("DEM", "REP"), labels = c("Democrats", "Republicans"),
    name = NULL, guide = guide_legend( direction = "horizontal",
                                override.aes = list(size = 3))) +
  theme_minimal() +
  theme(text = element_text(size=10), legend.position = "top",
        legend.justification = "right", legend.box.spacing = unit(3.5, "pt")) +
  labs(x = "Net Contribution (in log10(Dollars))", y = "Net Operating Expenditure (in
log10(Dollars))",
       title = "Relation between Net Contribution and Net Operating Expenditure for Democrats
and Republicans")
```