How much influence does $1 buy me?

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December 10, 2014

Abstract

This paper seeks to explore and understand the role of money within politics. We explore two data sources, campaign finance data and voting data, independently constructing induced graphs of politicians based on shared campaign finance data and similar voting behaviour. Using centralities on the induced campaign finance graph, we find that newer politicians tend to garner a wider spectrum of funding sources. We dig deeper into the title question and answer whether there exist correlations between an organization supporting a bill and the funding the organization gave to politicians. Correlations did not appear in our data. Attempting even more granularity, we ask whether politician's votes are affected by the views of the organizations that fund them and we discover once again that there is little correlation.

1 Introduction and context

"It is a truth universally acknowledged that a single person in possession of a good fortune, must be in want of power"

The influence of money has been a prominent issue in American politics since the 1974 'Watergate amendments' to the Federal Election Campaign Act established the Federal Election Commission. The issue took front stage again in 2010 when the *Citizens United vs. Federal Election Commission* Supreme Court ruling removed limits on the amounts corporations and organizations could spend on political advocacy. In that same year, a Federal Court of Appeals ruled in *SpeechNow.org v. Federal Election Commission* that there could be no limits on the amounts that corporations, unions, associations and individuals were allowed to give to independent political committees (referred to as "Super PACs") that do not directly support candidates. Opponents of these new rules claim that they allow the wealthy to exert a disproportionate influence on the outcome of votes and elections.

Our aim is to shed some light on the issue by answering the question: *how much influence in politics does $1 buy me*? To answer this question, we investigate links between amounts of funding given by organizations and outcomes of bills they have opinions on and we look deeper at politician's behaviour relative to the opinions of their funding organizations.

For this goal, we work in parallel on two datasets. The first is campaign finance data for the 2010 and 2012 Congressional election cycles. This data can be considered as a mapping from influence groups to politicians they financially support. The second dataset is Congressional voting data: which way did each politician vote on each bill that went to Congress. We can consider the second as a mapping from politicans to bills. Both of these datasets induce graphs of connected politicians which we first analyze. Then, by combining these two datasets we can construct direct links between influence groups and the legislative process.

It should be noted that in this report, a 'donor' is meant in a broad sense. Super-PACs are prohibited from directly donating to candidates, however, we consider them as 'donor' to a candidate if they were behind actions in favour of that candidate.

1.1 Review of relevant prior work

1.1.1 Party coalitions and interest group networks[2]

This paper utilizes network theory to analyze the structure of political parties and more importantly the structure of interests groups within this network. Interest groups tend to support politicians with two main goals in mind: electoral (just getting a candidate elected) and legislative (influencing a politician to vote on or push legislation in a certain way). After reviewing some relevant literature they ultimately find that interest groups, when choosing to fund primary or general campaigns, tend to not stray too much from party lines, while these party lines become much more blurred when interest groups target funding for legislative purposes directly. We investigate how election finance data (i.e. campaign finance data) relates to legislative influence.

One of the most interesting goals of the paper was to somehow identify internal conflicts within the party coalition networks, whether this came from within the parties themselves or from the choices of funding by the interest groups. The authors only provided some basic qualitative results to this question.

1.1.2 Campaign contributions and regulatory outcomes in telecommunications [1]

This paper studies the influence of campaign contributions on regulatory outcomes. More precisely, they look at the price of "local loops", which are a part of the telecommunications network that historic regional telecom monopolies are required to let competitors access. The price at which these parts are leased to competitors is set by regulators at the state level, which are not independent from the state legislature. The authors used campaign contributions to candidates to the state legislature from the telecommunications industry in the period 1995-2002, and "local loops" price data, broken up by state, controlling for other effects on price. The authors find a significant correlation between the relative level of contribution of local telecom actors and the pricing of local loops.

The approach developed in this paper is interesting because it focuses on policy outcomes, which is a more direct measure of outcome than roll-call data. However, this approach forces the authors to add a significant amount of work controlling for reasons for the price variation other than political decisions. This in turn means that such a study could not be replicated at a more global level.

2 Exploratory work

We first explore each dataset individually in order to understand its characteristics and properties.

2.1 Campaign funding

2.1.1 Data collection

We collect campaign finance data using the Sunlight Foundation's API, which covers data from the Sunlight Foundation (`sunlightfoundation.com`) as well as the Center for Responsive Politics (`opensecrets.org`).

For each Congress member, we get a list of the top 1000 largest contributions to his or her campaign. We justify using only the top 1000 because they will contain the majority of the funding. This data is split into 27 different contribution types, which include direct contributions to a candidate, as well as spending by outside groups for and against a candidate.

After processing the data, we get three JSON files: one for the people in Congress, one listing the contributors, and one file listing contributions for each candidate:

Listing 1: Sample Congressperson data


```
{
 "congress_numbers": [
  113
 ],
 "current": true,
 "description": "Representative for New York's 2nd congressional district",
  "firstname": "Peter",
  "id": 400219,
  "lastname": "King",
}
```


Listing 2: Sample contributor data


```
{
  "contributor_ext_id": "C00096156",
```

```
        "contributor_name": "Honeywell International",
        "contributor_type": "C",
    }
```

Listing 3: Sample contribution data

```
    {
        "recipient_id": 300002,
        "contributors": [
            {
                "amount": "5000.00",
                "transaction_type_description": "Contribution Made to Non-Affiliated",
                "contributor_ext_id": "C00347955"
            }
        ]
    }
```

2.1.2 Summary of campaign funding results

The donations in our dataset total \$1b for candidates vying for Congressional seats, split into just under 400k contributions. A further \$700m is related to the Obama Presidential Campaign. Here is a short summary of the main contribution types, excluding the Obama campaign data:

Contribution type	Contributions count($\times 10^3$)	Total amount($\$ \times 10^6$)
"Contribution"	209	263
"Contribution Made to Non-Affiliated"	140	281
"Independent Expenditure For"	2.6	46
"Independent Expenditure Against"	2.5	207

We notice that individual contributions, while numerous, are almost equalled in amount given by super-PACs ('Independent Expenditure') campaigning against a candidate.

Below we visualize three of the induced graphs as force-directed graphs. Figure 1a shows the graph built from connecting two Representatives who were campaigned against by a common organization. There are two distinct clusters - representing Democrats (blue) and Republicans (red). This provides a high level initial justification for our method of graph creation - that we see a high level split between the parties.

Figure 1b shows a more complete picture. Here we connect politicians who either share a funding source *or* were campaigned against by a common organization. This is both a more connected graph and a graph with a less clear boundary between the clusters of Democrats and Republicans.

Figure 1c shows the same graph as figure 1b but for Senators rather than Representatives. Since Senators are only voted in every 6 years, $\frac{2}{3}$ of the Senators in the graph will not have been directly on the campaign trail during the 2012 cycle.

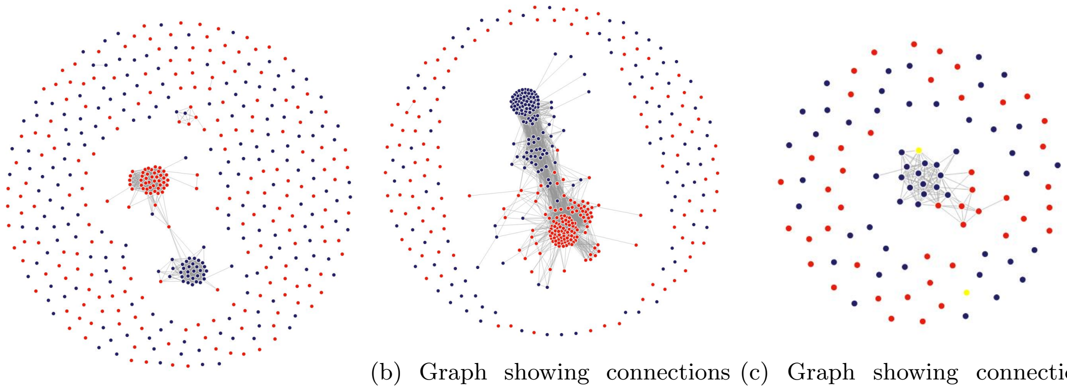
The most striking feature from these graphs is their sparsity; most nodes have a degree equal to zero, which is surprising to us because many super-PACs support a large number of candidates in several races. One explanation is that a smaller number of hotly contested elections attract most of the outside funding, while more secure seats do not attract as much funding from outside groups with broader goals.

2.2 Congressional voting data

2.2.1 Collecting data and building networks

All data for congressional voting (both Senate and House) is available at `govtrack.us`, with data since 1989 being readily available in JSON format via API calls. We use some previously written open source scripts from `github.com/unitedstates/congress` to help us in collecting this data.

We build a network for either house over a two-year time period, corresponding to distinct Congressional sessions. The people in the particular house correspond to the nodes in the network. Each edge weight w_e is the fraction of votes on which two members agree over the total number of votes in which they both participate. More precisely, for edge $e = (u, v)$ where $w_e \in [-1, 1]$, $w_e = 1$ if politicians u and v always vote the same way (in all shared votes) and $w_e = -1$ if the two politicians vote differently in all shared votes.



(a) Graph showing connections between Representatives who were campaigned against by the same source

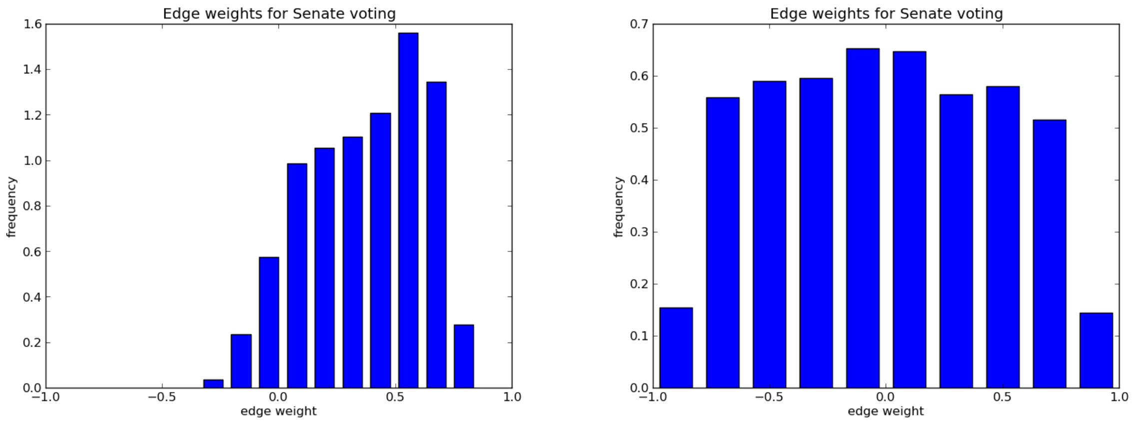
(b) Graph showing connections between Representatives who were funded by the same source or who were campaigned against by the same source

(c) Graph showing connections between Senators who were funded by the same source or who were campaigned against by the same source

2.2.2 Results

The signed edges of our voting networks allow for analysis via balance theory (cf. project milestone), however it did not lead to any meaningful conclusions.

We look at the repartition of positive and negative edges, and we observe many more positive edges than negative edges within these networks, as shown in 2a. One probable reason for this behaviour is that hard-fought votes, those that split the voters on ideologies and beliefs, may be rare compared to many procedural votes or vote on less controversial bills. This in turn impacts the design of meaningful influence metrics: it seems that the swing voters in "close" votes hold more influence than those who always vote with the majority. Looking only at close votes in figure 2b, we get a much more symmetric distribution around 0.



(a) Edge weights for all votes in Senate session 101 (1989-1990). 624 total votes

(b) Edge weights for "close" votes in Senate session 101. 50 total votes

Figure 2: Edge weight distributions for Senate session 101

2.3 Centrality

2.3.1 Betweenness Centrality

We want to measure centrality in our induced graphs, as an exploration of what it means to be central. We first consider the betweenness centrality of the nodes in the largest connected component of the campaign finance graph for the House. The most central nodes are a mix of Democrat and Republican, as shown in the table below. These most central candidates are all relatively new to the House, emerging in 2010 and 2012, implying that donors from a broader spectrum of places are willing to fund new candidates (in the hope of influencing them perhaps?). Further inspection of the least central nodes show them to be politicians who have been members of the House for many years. The longer a politician stays a member of House, the less central they become in terms of funding.

Politician name	Political party	Betweenness Centrality Score
Joe Garcia	Democrat	2532
Tom Marino	Republican	2253
Michael Grimm	Republican	2136
Tammy Duckworth	Democrat	1649
Kerry Bentivolio	Republican	1414

2.3.2 Latent centrality

We build our graph from a bipartite graph, and so we define a different graph centrality measurement, where centrality here is seen as 'central to the political process' from the point of view of the donors. Since it is built using 'hidden' nodes (the donor nodes), we call it latent centrality. We include 4 key points in defining our measure of centrality:

- The relative importance of your donors, that is, how much money your donors give overall
- The fraction of that amount that they give to you
- The number of donors you have
- The number of other people your donors support

We define $w_{(d,p)}$ as the weight of edge (d,p), i.e. the amount by donor d to person p. One straightforward way of implementing this is to define the centrality of person p as:

$$\begin{aligned}
c_p &= \sum_{d \in \text{donors}} \text{degree}_d \times \text{donor relative importance} \times \text{relative importance of } p \text{ for donor} \\
&= \sum_{d \in \text{donors}} \text{degree}_d \frac{w_{(d,p)}}{\sum_p w_{(d,p)}} \frac{\sum_p w_{(d,p)}}{\sum_d \sum_p w_{(d,p)}} = \sum_{d \in \text{donors}} \text{degree}_d \frac{w_{(d,p)}}{\sum_d \sum_p w_{(d,p)}} \\
&= \frac{1}{\sum_d \sum_p w_{(d,p)}} \sum_{d \in \text{donors}} \text{degree}_d w_{(d,p)}
\end{aligned}$$

Trivially, we have $\frac{w_{(d,p)}}{\sum_d \sum_p w_{(d,p)}} \leq 1$, thus $\sum_d \text{degree}_d \leq |E|$ where E is the edge-set.
For this reason, we can redefine

$$c_p = \frac{1}{|E|} \frac{1}{\sum_d \sum_p w_{(d,p)}} \sum_{d \in \text{donors}} \text{degree}_d w_{(d,p)}$$

And now $0 \leq c_p \leq 1$
Here are the most central people in Congress:

Name	House (S or R)	Party	Latent centrality($\times 10^{-7}$)
Roger Williams	R	Republican	41.4
Michael McCaul	R	Republican	19.8
Jeff Flake	S	Republican	16.3
George Holding	R	Republican	9.24
John Boehner	R	Republican	5.15

3 Combining campaign finance and voting datasets to measure influence

3.1 Top level impact metric

Our first analysis is a high level measurement of the power of each politician and influence scores for each donor. We define the power metric of a politician as the proportion of the time the vote went the way the politician wanted. Mathematically we define $X_{i,j}$ as the event that politician i voted the same way as the result of bill j and we calculate:

$$power(\text{politician } i) = \frac{\sum_{j \in \text{congress bills}} X_{i,j}}{\sum_{j \in \text{congress bills}} 1}$$

A quick look at the results on the 2013-2014 cycle shows that the Republican's scores are between $0.8-1$ and the Democrats tend to be between $0.3-0.6$. This makes sense since the Republicans were the majority in the House at this time. For each donor d we calculate a sum of politicians' powers weighted by the proportion of d's funds donated to politicians. For example if donor d gave half its money to politician p and half to politician q then we take the impact of donor d as half of the power of politician p plus half of the power of politician q. Below are the top organizations by impact score, along with a plot of the values of impact score for each organization that donated more than $\$20,000$. The top organizations are all Republican related, unsurprisingly. If you invested \$1 in these organizations, you could expect the politicians who they fund to have their way about 95% of the time.

Organization name	Influence score
Iowa Leadership Fund	0.966
Lucas-Roberts Victory Committee	0.959
David Joyce	0.956
Schock Victory Committee	0.955
Womack Majority Fund	0.953

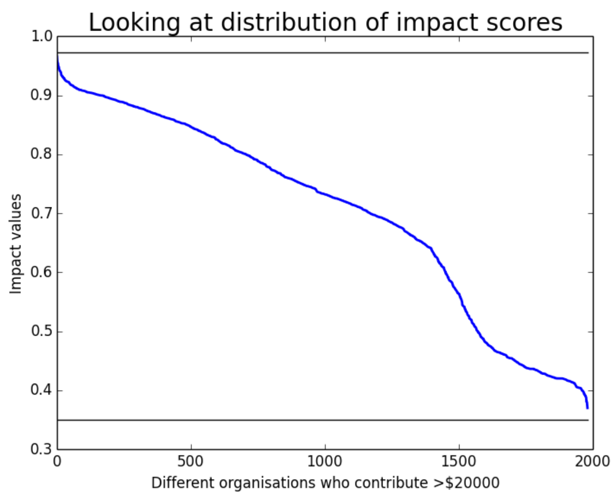


Figure 3: Looking at distribution of impact scores amongst the top donors

There are three regions in the above graph. The changes occur at ranks 1400 and 1600. For ranks lower than 1400, there is a linear progression. The story is the same for ranks about 1600. Between ranks 1400 and 1600 there is a sharp drop. There are therefore very few organizations who support mostly Democrats but a few Republicans. This general metric provides a useful baseline as an influence metric, but does not investigate correlation between funding and voting.

3.2 How do donations affect the overall success of the agendas of the organizations?

The top level metric in 3.1, however, fails to capture the true agendas of the donating individuals and organizations. Most groups that donate are not concerned with every single bill that goes through Congress, but rather they are concerned with a small fraction of the votes that directly intersect with their interests. To quantify this measure of impact, we need to know exactly which bills each donating group supports and opposes. Our previous data from `govtrack.us` does not include these sets for donating groups nor does it include useful tags or classifications of the bills for determining this information ourselves. We may supplement our previous data with additional data from `opencongress.org`, which contains webpages for some individual bills that list organizations that support and oppose that bill. Although the website does not have an API, we use the python package Scrapy (`scrapy.org`) to help us scrape this information for each bill once we know the bill identification number. Note that the majority of bills do not have any specifically listed organizations supporting or opposing them; for example, only 218 of the 1156 House of RepresenCative bills for the current congressional session have an organization listed on the webpage.

We define the agenda of each organization as the list of bills it supports, together with its opinion on those bills. Organizations, then, presumably donate to candidates in hopes of pushing their own agendas by passing bills they support and rejecting bills they oppose. By taking the overlap of the organizations from `opencongress.org` and those in our funding data, we examine the impact each organization has in pushing its own agenda. Figure 4 shows these results for the past two congressional sessions, with each data point representing a single organization, the x-axis representing the total amount that organization donated for that cycle and the y-axis representing the percent of votes that matched the organization's agenda during that session.

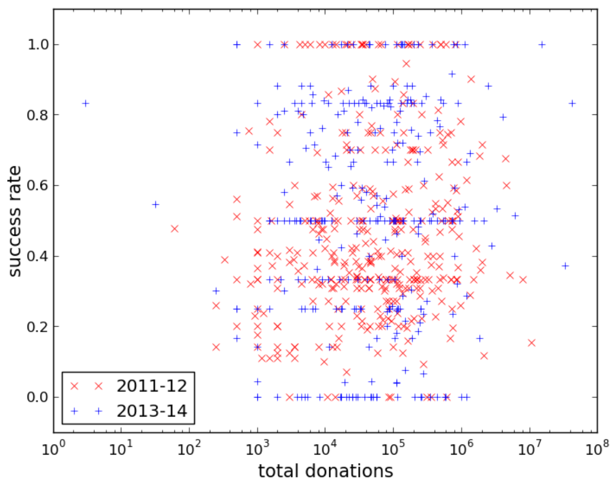
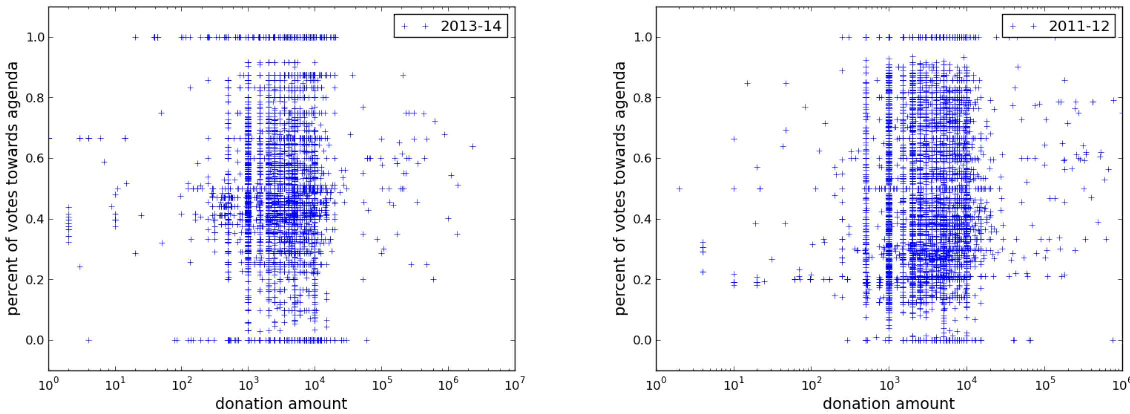


Figure 4: Total amount of donations for an organization against the success rate of its agenda on all bills for which it held an opinion.

We observe no real trends in this figure. The total amount of money donated by an organization seems to have no correlation on the success it has in pushing its agenda, for this data. However, many of the donating groups from our funding data are not included within this plot at this time because we do not have specific agenda information for these organizations; we think it would be possible to group similar organizations together based on interests to expand our sparse organizational agenda data and create a more complete picture of donation impact.

3.3 How do donations affect the voting behaviour of the politicians?

The previous section, again, limits the scope of impact of donations to just the measure of pushing an organizational agenda through Congress. We do not observe any correlations between the size of donations and the results of Congressional votes matching certain agendas. Perhaps a better measure of financial influence directly takes into account the votes of the politicians; we would expect that a politician receiving funds from a specific organization would vote in line with that organization's agenda, and a higher donation size would make this agenda-aligned voting more likely. Figure 5 shows these results for each of the past two Congressional sessions, where each data point represents the donation of a single organization to a single candidate, the x-axis represents the size of this donation and the y-axis represents the percent of votes on which the candidate follows the organization's agenda.



(a) Congressional session 113

(b) Congressional session 112

Figure 5: Amount donated to a given candidate by an organization against the rate at which he/she voted with that organization's stated agenda on all bills.

Again we observe no correlations between donation totals and the voting of individual politicians on organizational agenda specific bills. However, our data is limited again because we do not have data on all donating organizations nor the full agendas of each organization. We can calculate a new impact score for each organization but with this extra information. Calculation of impact score is explained more in the next paragraph. Figure 6 shows the impact of each organization, in terms of percent of money donated that goes towards votes for its own agenda regardless of the bill outcome.

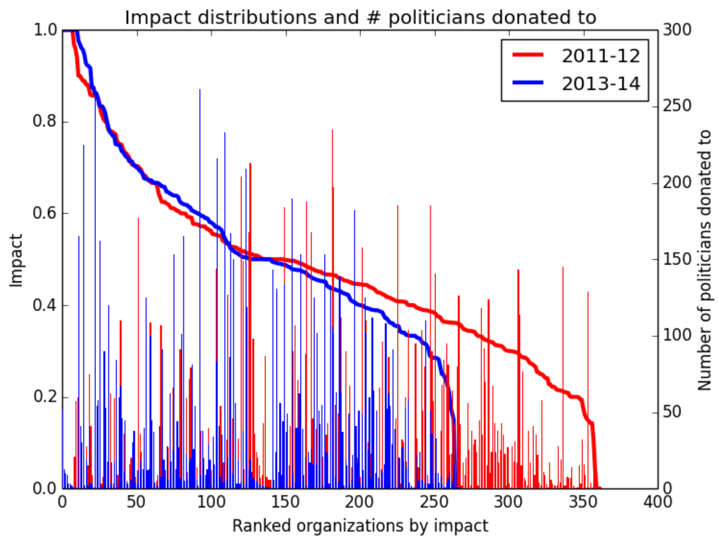


Figure 6: Descending impact scores for each organization. The bar plots below show the number of candidates each of these organizations donated to as well.

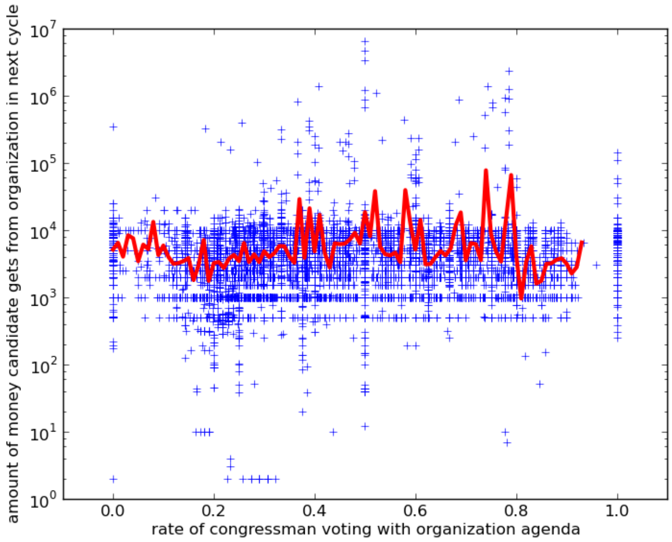


Figure 7: Percent of votes aligned for a candidate with an organization agenda in House (2011-2012) vs donation amount from organization to that candidate for next cycle. Red line represents average donation amounts over all points with a given success rate.

Previously we characterized impact as the percent of money going towards winning votes within Congress. However, with slightly more information, we have redefined impact to account for specific bills on which an organization may support or oppose (its agenda), so that we disregard the winning sides of the votes for our data in figure 6 but rather look at the possible influence money has on the direct votes of politicians. A score of 1 indicates that every politician an organization gives money to always votes the correct way the organization wants (on those bills in its agenda), while a score of 0.25 indicates that only 25% of an organization's money goes towards voting that is aligned with its agenda; to compute these scores, we simply weight each individual contribution of the organization to a politician by the percent of votes on which that politician votes with the orginazation's agenda. We see somewhat similar shapes in the impact curves that we saw before, but note that we see sharp drops near the end of the curves. These drops show that very few organizations actually achieve smaller impact scores below 0.25 or so, giving a baseline of what organizations might expect from a candidate to which they donate. Finally, we plot on that figure as well the number of politicians each of these organizations donated to, expecting that the extremes of the curve have fewer candidate donations. We do observe this trend at the very extremes of the curves, but we observe no other trends in this portion of the plot.

3.4 Does voting behaviour affect financing?

We have seen no substantial correlations between donations to candidates and voting on organizations' agendas for the subsequent Congressional session and so we also consider an opposite trend: perhaps the voting of politicians on certain bills influences future donations. We plot this data in figure 7, where each data point corresponds to a politician's voting record (in 2011-2012) with an organization's agenda from which he receives money for the next session and the red line averages donation amounts over all data points of a certain success rate. We observe no real correlations but rather see a pretty flat trend in the average. Regardless of past voting records with an organization agenda, the organization seems to usually donate thousands of dollars to the candidate in the next cycle.

4 Conclusions and Future Work

From a broad view, we see that donating to candidates within a majority party of Congress gives more influence to organizations because these politicians, taken together, wield more power to push a bill through a vote. However, these notions of influence and power ignore all opinions or agendas of the funding organizations themselves. Taking these ideas into account when determining the impact of money within Congress, we observe no real trends or correlations between the amount of donations a candidate receives from an organization and his/her voting record on bills specifically on that organization's agenda. These results indicate no relationships between funding and Congressional voting. However, we believe there are a few reasons for these observations. First, our dataset is still incomplete; we do not know the agendas of all donating organizations or if our current agendas are complete. Second, we weight all bills in each organization's agenda evenly. In reality, an organization may care most about a few bills and less (but still hold an opinion) about others. They may therefore give money to candidates under the condition they vote the desired way in these most important bills but may allow the candidate to stray from the agenda on other votes. This behaviour would explain some low success rates we observed for organizations that donated a lot of money to some candidates. The proper weighting of importance of these bills to organizations is very difficult to assign. Finally, many of these votes with stated supporting and opposing organizations are highly contested, so both sides would have high donation totals and one side must lose, deflating the observed success rates of the organizations.

Additionally, our analysis only focuses on the passing or not of bills in Congress. For this reason our underlying hypothesis is that groups funding political campaigns seek to influence whether a given bill is passed, which is how we defined their agenda. However, because the direct buying of votes or favors is looked down upon (or even downright illegal), it is just as likely that the kind of influence that these organizations are looking for applies in much subtler ways. In particular, these organizations may be looking to influence the content of a bill, for example trying to water down a bill imposing new regulations, or making their view heard by author of a bill even before it is crafted.

We propose a number of directions for future work. We believe there is a huge amount of information to mine and model here. As stated earlier, the overlap between our organizational agenda data and our organizational funding data is quite small, making our analysis very difficult. We would like to expand this overlap and complete our data analysis. One approach for this task we consider and actually started to work on, is to use LDA analysis on the text of the bills to classify them according to topic and, using what we already have, expand upon the organization agenda dataset to more fully describe the impact of donations. This expansion would help us estimate and analyze the amount of money spent in advocation and opposition of each bill, which we can not currently do very well. We hypothesize that in fact the correlation lies between the difference in spending from the two sides rather than the absolute values of each side. Often large amounts of money would be spent on close races and large amounts would be spent on both sides, in some sense cancelling each other out. We would like to see if this correlation exists. Lastly, we would like to create an easy front end for using the APIs we accessed. They were non-trivial to use and we have built the machinery and could easily convert it to a web front end.

5 Our Contributions

We believe that our contributions were equal.
Nolan: the voracious visualizor.
Adrien: the verbose visionary.
Neeloy: the vituperative vocalizor.

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[1] De Figueiredo, R. J. P., and Edwards, G. Does private money buy public policy? campaign contributions and regulatory outcomes in telecommunications. *Journal of Economics & Management Strategy 16*, 3 (2007), 547–576.

[2] Grossman, D. Party coalitions and interest group networks. *American Politics Research 37*, 5 (September 2009), 767–800.