

Mapping the Ideological Marketplace

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I develop a method to measure the ideology of candidates and contributors using campaign finance data. Combined with a data set of over 100 million contribution records from state and federal elections, the method estimates ideal points for an expansive range of political actors. The common pool of contributors who give across institutions and levels of politics makes it possible to recover a unified set of ideological measures for members of Congress, the president and executive branch, state legislators, governors, and other state officials, as well as the interest groups and individuals who make political donations. Since candidates fundraise regardless of incumbency status, the method estimates ideal points for both incumbents and nonincumbents. After establishing measure validity and addressing issues concerning strategic behavior, I present results for a variety of political actors and discuss several promising avenues of research made possible by the new measures.

Ideology is a pervasive and powerful feature of American politics. In essence, ideology is a means of systematically simplifying politics with the “knowledge of what goes with what” (Poole 2005, 12). Yet a single ideological dimension has become such a convincing and often used account of American politics because it does more than summarize and simplify complex phenomena into a form that is easier to understand; it also structures political discourse, voting, elections, and policymaking. This places ideology among the most useful conceptual tools available to political scientists.

Spatial models of politics that serve to illuminate ideology’s importance in determining political outcomes abound and have focused, for example, on electoral competition (Ansolabehere, Snyder, and Stewart 2001; Downs 1957), legislative behavior (Cox and McCubbins 2006; Krehbiel 1998), the executive and bureaucracy (Epstein and O’Halloran 1994; Ferejohn and Shipan 1990; Gailmard and Patty 2007), and the courts (Marks 1988; McNollgast 1995; Rodriguez and Weingast 2003). It should not come as a surprise that ideology also structures the market for political donations. Political action committees (PACs) and individual donors alike have preferences over policy, and the decision to donate to one candidate rather than another is shown in this article to be seldom independent of ideological considerations. As representatives of an interest group or institution, corporate and special-interest-group PACs often weigh ideology against

other considerations, such as whether the candidate is in a position to address the group’s concerns. Yet ideology dominates for the quickly growing ranks of private citizens and ideological organizations that have entered the political marketplace. Ideology, above all else, is the key to understanding the contribution behavior of these donors.

In this article, I present a new method to estimate the ideology of candidates and contributors using a comprehensive database of campaign finance records from state and federal elections. The idea underlying the ideological measures is straightforward. Contributors are assumed—at least in part—to distribute funds in accordance with their evaluations of candidate ideology. That is, contributors will on average prefer ideologically proximate candidates to those who are more distant. The pattern of who gives to whom allows me to simultaneously locate both contributors and recipients. Adopting terminology from Poole (1998), I refer to the resulting ideal point estimates as common-space campaign finance scores (CFscores).

The goal of this article is to develop and illustrate a unified framework for measuring the ideology of political actors engaged in American politics. Federal and state election agencies collect and disclose contribution records with the stated goal of safeguarding our democracy through increased transparency. However, these databases double as vast repositories of observational data on revealed political preferences. The impressive scale and scope of campaign finance data cover any candidate who

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actively fundraises, a requirement that nearly all serious (and many nonserious) campaigns satisfy. This includes not only candidates for Congress and state legislatures but also for presidential, gubernatorial, judicial, and other statewide offices such as attorney general and secretary of state. In addition, some of the more troubling identification issues associated with scaling roll calls are remedied here by virtue of the data. The numerous donors who give to candidates for different offices form an army of bridge observations that can be used to identify the scaling across institutions and levels of politics. Moreover, both contributors and candidates remain active across election cycles, thus helping to identify the measures across time.

These new ideological measures stand to benefit research on American politics in three ways. First, they place a wide range of political actors from state and federal politics in a common ideological space, thus facilitating the study of state and federal institutions in a comparative framework. Second, they include ideal points for both successful and unsuccessful nonincumbent candidates. Third, they open up new avenues of research into the ideological preferences of interest groups, bureaucrats, corporations, and individual donors. Importantly, all this is accomplished without any trade-off with respect to the validity, reliability, or precision of the measures.

Here I focus on the substantive research my method facilitates after a brief methodological discussion. Via their widespread usage, NOMINATE and other roll-call scaling methods have amply demonstrated the value of quantitative measures of ideology for empirical research.¹ In extending ideal point estimation beyond the confines of voting bodies, the common-space CFscores represent a major breakthrough in the types of questions that can be addressed with quantitative measures of ideology. Rather than focus on one or two illustrative applications, I structure the article as a general overview of where the new measures apply. The next section reviews the literature on ideal point estimation. This is followed by a discussion of the data and scaling methodology. I then establish measure validity and address concerns raised by models of strategic-giving behavior. The remaining sections provide an overview of the recovered ideal points with illustrative examples for an assortment of political actors.

¹In fact, Poole and Rosenthal document, in a less than exhaustive survey, 107 distinct empirical applications performed with the NOMINATE scores alone (Poole and Rosenthal 2007, chap. 11), while their combined research on ideal point estimation has been cited several thousand times. Many more applications have been published in recent years.

Measuring Ideology

The widespread adoption of spatial models of politics has generated enormous interest in ideological measurement. Ideological measures of political actors and institutions are essential for testing theories about political behavior and institutions and are commonplace in research topics ranging from public opinion, elections, and representation to legislative and judicial behavior and political institutions. Poole and Rosenthal (1985, 1991, 1997) pioneered the use of quantitative scaling methods to measure ideology with the introduction of NOMINATE, a method to recover ideal point estimates of legislators from roll-call voting records. As NOMINATE scores became widely adopted, methodologists began to devote a great deal of energy to ideal point estimation, leading to the development of dynamic estimation (McCarty, Poole, and Rosenthal 1997), Bayesian IRT models (Clinton, Jackman, and Rivers 2004; Londregan 2000; Martin and Quinn 2002), and nonparametric estimation (Poole 2000). Others have developed methods to better integrate theory and estimation (Clinton 2007; Clinton and Meirowitz 2004), to incorporate variables of interest other than voting records in the scalings, such as constituent preferences (Clinton 2006) and party influence (Clinton, Jackman, and Rivers 2004; Cox and Poole 2002; McCarty, Poole, and Rosenthal 2001), and to compare ideal points of actors across voting institutions and groups of actors (Bailey 2007; Epstein et al. 2007; Shor, Berry, and McCarty 2010; Shor and McCarty 2011). The growth in ideological measurement is not limited to roll-call methods. In recent years, methodologists have developed methods to measure ideology from candidate surveys (Ansolabehere, Snyder, and Stewart 2001; Burden 2004), political text (Laver, Benoit, and Garry 2003; Monroe and Maeda 2004; Monroe, Colaresi, and Quinn 2008; Slapin and Proksch 2008), and survey data (Bafumi and Herron 2010; Tausanovitch and Warshaw 2012; Treier and Hillygus 2009).

McCarty and Poole's (2006) PAC-NOMINATE was the first scaling method applied to contribution data. PAC-NOMINATE retooled NOMINATE for use on PAC contribution data by restructuring the PAC's choice problem as a series of binary votes between incumbent-challenger pairs. By mirroring the structure of roll-call voting data, they were able to scale PAC contributions with a slightly modified version of NOMINATE that allows for abstention. Despite the promise of recovering ideal points for challengers, PAC-NOMINATE gained little traction in the ideal point estimation literature, largely due to concerns about measure validity.

Building on the conceptual groundwork of McCarty and Poole, I develop a simple model of spatial giving

that provides the theoretical foundation for my scaling methodology. Rather than structure the contributor's choice problem as a series of binary votes, the model treats contributor-candidate pairs as the unit of observation and structures the contributor's choice as an allocation problem. This approach yields substantial improvements in measure quality, an important part of which comes from using information revealed in the magnitude of the contribution and not just, as in PAC-NOMINATE, its occurrence. In an earlier article, I used an item response theory (IRT) count model to estimate ideal points from PAC contributions (Bonica 2013a). Although I adopt the same general measurement strategy here, scaling the comprehensive database of contributions made by individuals and organizations to state and federal elections required a new estimation strategy capable of handling large data sets. In the following section, I present the spatial model of giving and introduce the common-space CFscore methodology.

A Spatial Model of Giving

A core tenet of spatial models of politics is that actors prefer ideologically proximate outcomes to those that are more distant (Enelow and Hinich 1974). In the more familiar context of spatial voting, the proximity assumption predicts that when presented with a choice between outcomes located in a policy space, voters will select the outcome nearest their ideal point. Likewise, in its most basic form, spatial giving posits that contributors prefer ideologically proximate candidates to those who are more distant.

Formally, contributor i considers the set of possible recipients, denoted as $j \in \{1, \dots, J\}$, and allocates the vector of contribution amounts, $y_{1,\dots,J}$, that maximizes the following objective function:

$$\arg \max_{y_{1,\dots,J}} : \left[\sum_j (b_i(y_j) - c_i(y_j) - y_j(\delta_j - \theta_i)^2) \right], \quad (1)$$

subject to $y_j < clim_j$, where $clim_j$ is the maximum legal amount a contributor can give to a recipient j during a single election period, δ_j is candidate j 's ideal point; θ_i is contributor i 's ideal point; $b_i(\cdot)$ is a function describing the combined instrumental and expressive utility derived from the act of giving, and $c_i(\cdot)$ is a cost function that captures the marginal cost of contributing given the total amount already allocated. Together, $b_i(\cdot)$ and $c_i(\cdot)$ represent contributor i 's propensity to contribute. Note that contributor i 's maximum contribution amount may be

less than $clim_j$ depending on the functional forms of $b_i(\cdot)$ and $c_i(\cdot)$.

In a related article, I develop an IRT negative-binomial count model derived from equation (1) to estimate ideal points from PAC contributions (Bonica 2013a). An advantage of the IRT model is that it can control for nonspatial candidate characteristics such as incumbency status and committee assignments that are known to influence PAC contributions. While the model is designed for use with the data set of PAC contributions, computational costs preclude fitting a similar model to the much larger data set of individual campaign contributions, which amounts to a contribution matrix of several million rows by tens of thousands of columns.

The common-space CFscore methodology instead derives from an augmented version of correspondence analysis (hereafter CA), which scales two-way frequency tables by decomposing a transformed matrix of χ^2 distances (Benzecri 1992; Greenacre 1984, 2007). CA is an attractive modeling strategy because it offers a close approximation of a statistical ideal point model at a much-reduced computational cost. Although CA is not explicitly derived from a model of campaign contributions, aspects of the method can be interpreted as such. Several authors have noted that CA is nearly equivalent to a log-linear ideal point model (Lowe 2008; ter Braak 1985). Moreover, the χ^2 distance metric normalizes the matrix by reweighting rows and columns that are more populated than others, which serves a function similar to including candidate and contributor fixed effects.

The method relies on the numerous donors who give to candidates for a variety of offices to bridge across institutions and levels of politics. In any given state, between 70% and 90% of contributors who fund state campaigns also give to federal campaigns, providing an abundance of bridge observations that is far in excess of what is needed to reliably identify the scaling. Candidates who run for both state and federal office provide additional bridge observations.

The method begins by running CA restricted to federal elections. Having estimated federal-level ideal points, it then scales each state separately, using contributors who have given to both state and federal campaigns to anchor the state-level scalings. A final set of bridging techniques is applied to ensure that contributors are on the same scale as candidates, providing for valid distance comparisons. The scaling is identified up to a normalization such that the weighted mean and weighted standard deviation of contribution amounts are set to zero and one, respectively. The scaling methodology and identification strategy are discussed in detail in the supplemental materials.

Unlike the IRT count model, the CA methodology cannot directly control for nonspatial covariates. This should not present a serious problem. Whereas the literature on giving by corporations and special interest groups has traditionally emphasized the role of quid pro quo transactions between PACs and legislators in organizing the market for contributions (Baron 1989; Denzau and Munger 1986; Snyder 1990), evidence of strategic-investment behavior among individual donors is far less forthcoming. In fact, nearly all existing research on individual donors suggests that the choice of recipient represents a genuine expression of the donor's ideology (Ensley 2009; McCarty, Poole, and Rosenthal 1996). These findings are largely consistent with the claim made by Ansolabehere, de Figueiredo, and Snyder (2003) that contributions are best understood as consumption goods that fulfill the desire to participate in politics. Indeed, the vast majority of donors give amounts so diminutive that it is difficult to conceive of the contribution as an investment. Although some evidence exists regarding strategic giving by corporate executives donating as individuals (Gordon, Hafer, and Landa 2007), it remains unclear whether such behavior is widespread or leads contributors to allocate funds in a manner inconsistent with their spatial preferences. In a later section, I address strategic giving in much greater depth. Results from a battery of tests add to previous findings that individual contributors select recipients primarily on the basis of ideology and go on to demonstrate that concerns about bias introduced by strategic behavior are largely unfounded.

Data

The database of contribution records was compiled from data made available by the Federal Election Commission (FEC), the Center for Responsive Politics, the National Institute for Money in State Politics (NIMSP), various state reporting agencies, and the Sunlight Foundation.² The Center for Responsive Politics (CRP) provides additional information on industry and sector codings. In total, the database currently contains over 103 million records made between 1979 and 2012 by 13.4 million individuals and 511,141 organizations to 51,572 candidates and 6,408 political committees.

Processing the database so that individual donors can be tracked across election cycles and states was a major

²The first wave of states to implement disclosure requirements came in 1990. All but a handful of the remaining states followed suit by the end of the decade, with the final states doing so in 2001.

undertaking. The FEC and state reporting agencies require that donors disclose their name, address, occupation, and employer but do not assign unique identifiers to individual donors. I dealt with this problem by developing identity-resolution software to assign unique contributor IDs using a custom record linkage algorithm applied to information on names, addresses, occupations, and employers disclosed to the FEC and state reporting agencies. Additional details on data collection, processing, and validation are included in the online supplemental information.

I impose several restrictions on which contribution records are included in the scaling. First, I exclude several types of transactions, including loans and transfer payments.³ Second, I exclude all contributions made by individuals to labor, corporate, and trade PACs, as these PACs simply pool donations from their respective employees or industry members. As a precaution, I also exclude corporate and trade PACs during the estimation stage due to the greater tendency for these groups to combine ideological and strategic motives. In order to be included in the scaling, a contributor must give to at least two recipients, and a candidate must receive donations from two or more contributors. This leaves a total of 3.93 million individuals and 261,828 committees and organizations as contributor (row) observations and a total of 13,189 federal candidates, 55,737 state candidates, and 9,436 campaign committees as recipient (column) observations. An additional 9.75 million individuals who only gave to a single recipient do not factor directly into the estimation but are projected onto the recovered space as supplementary observations.

Measure Validity

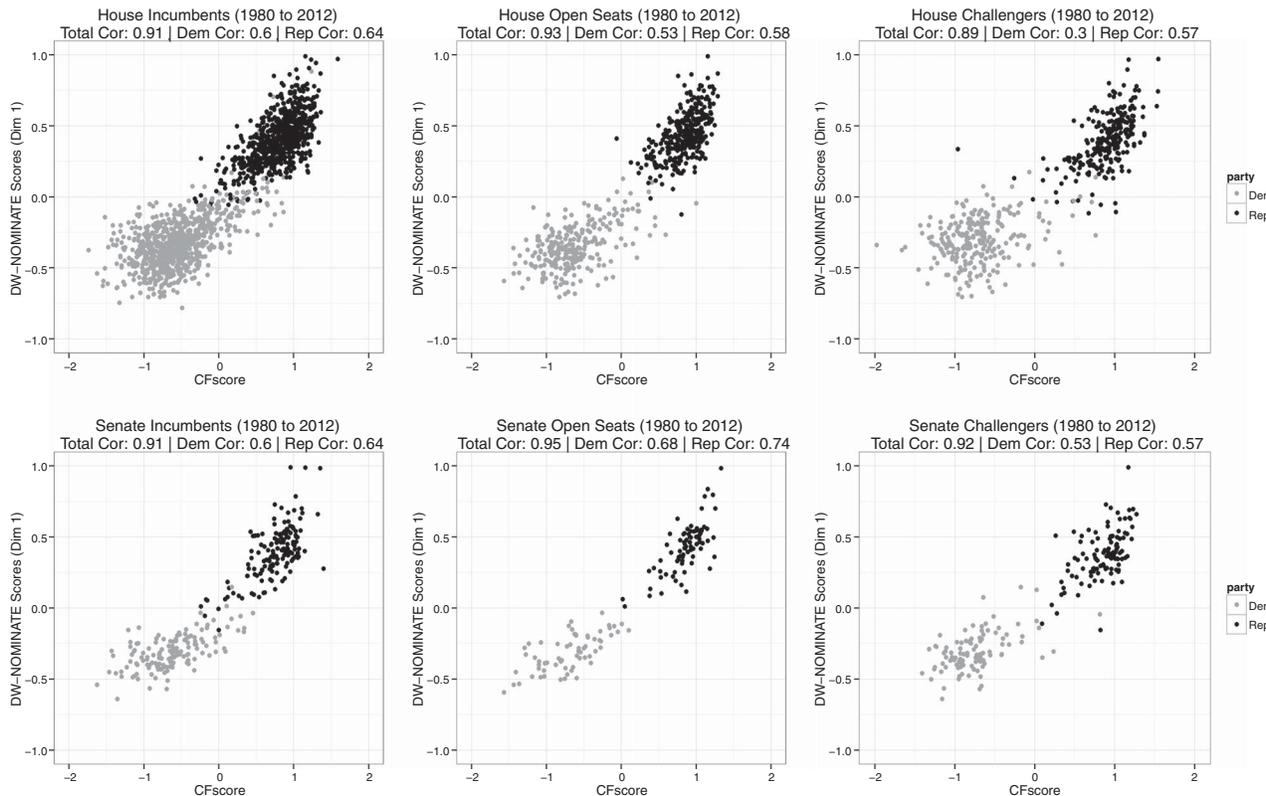
In this section, I perform an extensive battery of tests designed to evaluate the measures. I divide the analysis into two parts. I first compare the measures to DW-NOMINATE scores as a means of establishing external validity. I then assess the measures in terms of their internal consistency.

External Validity

As a first-stage test of external measure validity, I compare candidate CFscores to DW-NOMINATE scores. The

³All direct and in-kind contributions are included, as well as independent expenditures made on behalf of a candidate. Independent expenditures made against a candidate are excluded.

FIGURE 1 Scatter Plots of Incumbent and Nonincumbent CFscores against DW-NOMINATE Scores



bivariate correlation between candidate CFscores and common-space DW-NOMINATE scores is $r = 0.92$, thus confirming that common-space CFscores map onto the same liberal-conservative dimension recovered from roll-call data.⁴ As partisanship is highly collinear with DW-NOMINATE scores, the within-party correlations are particularly informative in distinguishing between ideological and partisan giving. The within-party correlations are strong for both the House ($r = 0.56$ for Democrats and $r = 0.66$ for Republicans) and Senate ($r = 0.64$ for Democrats and $r = 0.72$ for Republicans).

Among the noted advantages of the common-space CFscores is the ability to recover reliable ideal point estimates for nonincumbent candidates. One way to assess the nonincumbent estimates is to compare the ideal point estimates recovered for successful nonincumbent candidates with their future DW-NOMINATE scores. In order

to facilitate these comparisons, I recover separate incumbent and nonincumbent positions by holding the contributor ideal points fixed and reestimating two distinct ideal points for each candidate, one from contributions received as a nonincumbent and the other from contributions received as an incumbent. Thus, the nonincumbent estimates only reflect contributions made prior to the candidate having an established voting record in Congress. Figure 1 plots common-space CFscores against DW-NOMINATE scores separately for incumbent, open-seat, and challenger candidates for the House and Senate. With respect to Senate candidates, the relationship between nonincumbent CFscores and future DW-NOMINATE scores is no weaker than it is for the incumbent CFscores. With the exception of Democratic challengers, where the relationship is somewhat weaker, the finding holds for nonincumbent House candidates.⁵ Likewise, I can assess this relationship more generally by comparing

⁴The common-space DW-NOMINATE estimates were downloaded from Poole and Rosenthal’s website, voteview.com. The specific set of estimates is from a joint scaling of the House and Senate for the 1st–112th Congresses. Unlike chamber-specific scalings of the House or Senate, the common-space DW-NOMINATE scores model legislator ideal points as constant rather than dynamic trends.

⁵It is also possible to compare the estimates with scores from the National Political Awareness Test (NPAT) administered by Project Vote Smart (Ansolabehere, Snyder, and Stewart 2001). For nonincumbents campaigning during the 1996 elections, the correlation between the measures is $r = 0.89$ overall, $r = 0.51$ for Republicans, and $r = 0.52$ for Democrats.

nonincumbent and incumbent CFscores. The correlations between nonincumbent and incumbent CFscores for federal candidates is $r = 0.96$ overall, $r = 0.93$ for Republicans, and $r = 0.88$ for Democrats. The within-party correlations, in particular, indicate that candidate CFscores are largely robust to changes in incumbency status. The results are consistent across state and federal offices.

Although comparisons with roll-call estimates provide a useful means of establishing external validity, it is not my intention to present roll-call estimates as the “true” or definitive measures of ideology. When assessing the differences between CFscores and DW-NOMINATE scores, one should consider that contribution records arguably offer a more complete measure of candidate ideology than does legislative voting. Contributors are free to consider the many ways in which candidates express their ideology beyond how they vote, such as public-speaking records, stated policy goals, endorsements, the issues they champion, authored and cosponsored legislation, or cultural and religious values. As such, perfect correspondence between the two measures is neither expected nor necessarily desirable.⁶

This is made apparent when examining outlier candidates whose CFscores and DW-NOMINATE scores disagree. Henry Cuellar (D-TX) is an example of a Democrat whose conservative credentials belie his moderate-liberal voting record. Cuellar endorsed George W. Bush for president in 2000, was appointed Secretary of State by Texas Governor Rick Perry, and received a rare endorsement from the conservative Club for Growth during the 2006 Democratic primaries. His DW-NOMINATE score places him at the 69th percentile within his party in terms of conservatism. In contrast, his CFscore ranks him at the 92nd percentile among his party. The liberal pugilist Alan Grayson is another example of a candidate whose rhetoric and public persona are at odds with his voting record. His DW-NOMINATE score positions him near the center of his party, but his CFscore places him at the extreme.

Roll-call records offer another approach to validate the measures. The standard way to measure the predictive power for roll-call scaling methods is to calculate the percentage of votes that can be correctly classified

⁶If the end objective were to replicate measures recovered from roll-call voting as closely as possible, one could simply pin ideal points for members of Congress to their DW-NOMINATE score and use the contribution data to impute ideal points for all candidates who never served in Congress. I do not believe this to be a particularly useful approach. Rather, the two measures should be viewed as complementary. One is a measure of ideological voting while the other is a measure of ideological giving. As such, each provides a validity check on the other.

TABLE 1 Percentage of Votes Correctly Classified (96th–112th Congresses)

	House	Senate
CFscores	0.880 (0.638)	0.870 (0.607)
DW-NOMINATE	0.896 (0.687)	0.882 (0.644)
TURBO-ADA	0.886 (0.659)	0.873 (0.621)
TURBO-CCUS	0.880 (0.641)	0.871 (0.613)
Party	0.863 (0.588)	0.838 (0.514)

Note: Aggregate proportional reduction in error (APRE) is in parentheses.

using a cutting-line procedure.⁷ I apply the cutting-line procedure to CFscores, DW-NOMINATE scores, interest group ratings compiled by Americans for Democratic Action and the U.S. Chamber of Commerce, and party affiliation. Table 1 reports the total classification rates for roll-call votes cast in the 96th–112th Congresses. I find that the CFscores perform nearly as well as the roll-call measures. To help place these results in context, I note that whereas DW-NOMINATE scores and interest group ratings condition directly on roll-call data, the CFscores do not. Thus, the predictions made by the CFscores are not merely made out of sample; they are taken from an entirely different type of data. This in itself offers compelling evidence of predictive validity for the CFscores.

Internal Validity

Poole and Rosenthal rely in part on the stability of legislator ideal points over time to make the case that DW-NOMINATE scores are valid measures of ideology. Poole (2007) argues that over-time stability has important implications for the sensitivity of DW-NOMINATE scores to strategic voting. He shows that legislators’ ideological voting patterns are remarkably consistent from one period to the next, leading him to conclude that strategic factors pointed to by researchers as affecting congressional voting—“shirking,” redistricting, agenda change,

⁷For each roll call, the cutting-line procedure draws a maximally classifying line through the ideological map that predicts that those voting “yea” are on one side of the line and those voting “nay” are on the other. The correct classification rate is the percentage of vote choices correctly predicted by the cutting lines. The classification rate for the partisan model is calculated as the percentage of vote outcomes correctly predicted by assuming that each legislator votes with the majority of her party.

conversion, etc.—can at most account for less than 1.6% of congressional roll-call voting since the end of World War II.

I perform a similar analysis here by applying a one-period-at-a-time estimation procedure developed by Nokken and Poole (2004) to the CFscores. They first estimate a static DW-NOMINATE scaling with all legislator ideal points held constant across time. Using the roll-call parameters recovered from the static DW-NOMINATE scaling, they then recover period-specific legislator estimates that are allowed to move freely from one Congress to the next. I adapt this technique to estimate period-specific CFscores. Holding contributor ideal points constant across periods, I estimate a distinct ideal point for each period in which a candidate is active. Nokken and Poole require that legislators cast 25 or more votes in a given period to be included. I likewise require that candidates raise funds from at least 25 unique contributors during a given election cycle to be included.

With both sets of period-specific measures in hand, I compare the measures in terms of temporal stability by regressing the period-specific ideal points on the static ideal points and reporting the explained variance for the subset of candidates who are active in multiple periods. The results indicate that the CFscores exhibit greater intertemporal stability than DW-NOMINATE scores. The R^2 associated with static CFscores is 0.97 for the entire sample, 0.89 for Democrats, and 0.86 for Republicans. To compare, the R^2 associated with static DW-NOMINATE scores is 0.96 for the House (0.86 for Democrats and 0.70 for Republicans) and 0.96 for the Senate (0.72 for Democrats and 0.85 for Republicans).

Additional evidence of internal consistency of the measures is found in the relationship between contributor and candidate ideal points. Most candidates are also active political donors. As a result, a sizable number of candidates are included in the database both as contributors and as recipients.⁸ Comparing the candidate and contributor CFscores for the set of contributor candidates who had made at least five contributions to campaigns other than their own reveals a correlation of $r = 0.94$ overall, $r = 0.78$ among Democrats, and $r = 0.68$ among Republicans. In other words, after accounting for attenuation bias, the ideological information revealed by a candidate's fundraising activity closely maps onto the information revealed by her contribution patterns. That is, both activities appear to be genuine expressions of the same latent ideological preferences.

⁸In a less than exhaustive search, I was able to identify a total of 29,913 candidates who had made contributions to campaigns other than their own. Out of these, 10,406 had donated to at least five distinct recipients.

Sincere versus Strategic Giving

In this section, I compare the performance of the ideological model of contribution behavior with competing models of strategic giving. I consider two general models of giving that provide theoretical rationales for strategic behavior. The first is the investor model, which views contributions as payments in a market for votes, legislative services, and access. It posits that funds will be directed toward the legislators who can provide desired services at the lowest cost (Denzau and Munger 1986; Snyder 1990). I refer to the second as the partisan electoral model, which views donors as ideologically motivated but posits that they engage in electorally minded strategies which lead them to direct funds to candidates in marginal races in order to influence the partisan composition of Congress (Wand 2007, 2012).

It is helpful to first consider the different ways strategic behavior could enter into the data-generating process and what each might mean for the measurement process. I distinguish between three possible scenarios. The first scenario arises when economic factors motivate contributors to invest in the political process but do not necessarily influence the choice of which candidates to support. Of the three scenarios, this presents the least cause for concern. In fact, rather than introduce bias into the estimates, the practical effect would be to generate additional data that could be used to more precisely locate ideal points. The second scenario is when individuals with weak or nonexistent preferences over policy are paired with strong economic incentives to invest in the political process. As a result, these donors will allocate funds randomly across the ideological spectrum, which will, on average, cause the contributor to locate at the center of the space and risk biasing certain candidates toward the center. The third scenario involves mixed-motive strategies that arise when individuals have preferences over policy but also face competing incentives to deviate from their personal preferences when deciding where to allocate their contributions. This will introduce noise into the estimates and could potentially bias the estimates if the resulting spatial errors violate the normality assumptions made by the model's error structure. I address the last two scenarios in turn.

I first consider whether a significant proportion of individuals allocate funds randomly with respect to ideology. McCarty, Poole, and Rosenthal (2006) propose a simple summary statistic to assess the extent to which contributors give on the basis of ideology. They first rank order candidate ideal points and normalize them to the interval $[-1, 1]$. They then calculate the money-weighted standard deviation of a contributor's contribution profile. If a

contributor gives randomly with respect to candidate ideology, on expectation, its money-weighted standard deviation will equal 0.577, whereas lower values are reflective of ideological motivations.⁹ I replicate McCarty, Poole, and Rosenthal's findings that ideological giving is pervasive among the most active individual donors. Out of the 49,418 individuals who have made 25 or more contributions to federal elections during the 2004 through 2012 election cycles, only 167 (0.3%) have money-weighted standard deviations greater than 0.577, while the mean value is 0.20 for the entire sample, well below the theoretical baseline.

Having found that it is very rare for individual donors to be uninfluenced by ideology, I turn to assessing the ideological, investment, and partisan electoral models in terms of their explanatory power. To facilitate this, I employ a maximum-likelihood method that approximates the estimation stage for contributors from the IRT count model used to scale PAC contributions. I perform the analysis for three groups of donors: (1) a sample of 5,000 individuals drawn randomly from the set of donors who have made at least 25 contributions to federal elections between 2004 and 2012, (2) a group of 124 labor PACs, and (3) a group of 1,312 corporate and trade PACs. I begin by collapsing dollar amounts into count values that range from 0 to 10. For PACs, I round up to \$1,000 intervals, which reflects the \$10,000 maximum allowable contribution amount to a candidate over a two-year election cycle. For individual donors, I round up to \$400 intervals with any value over \$4,000 taking on the maximum value of 10, which reflects the maximum allowable contribution amount to a candidate over a two-year election cycle during the 2004 election cycle.¹⁰ I then fit the following right-censored negative binomial model separately for each individual:

$$\lambda_{ijt} = e^{(\alpha_i + \gamma_j - \tau_i(\delta_j - \theta_i)^2 + \beta_i X_{jt})}$$

$$f(y_{ijt} | \lambda_{ijt}, \sigma_i) = \begin{cases} \text{NegBin}(y_{ijt} | \lambda_{ijt}, \sigma_i) & \text{if } y_{ijt} < \text{lim}_{jt} \\ \left(1 - \sum_{k=0}^{\text{lim}_{jt}-1} \text{NegBin}(k | \lambda_{ijt}, \sigma_i)\right) & \text{if } y_{ijt} = \text{lim}_{jt} \end{cases}$$

⁹To see why 0.577 represents the baseline, let N represent recipients receiving contributions from contributor i , and let K represent the total number of potential recipients. When candidates are rank ordered and normalized to the interval $[-1, 1]$, the standard deviation is calculated as $sd = \frac{N}{\sqrt{1/3 * K}}$. As the number of candidates approaches infinity, the standard deviation of their rank-ordered values will approach $\frac{1}{\sqrt{(1/3)}} = 0.577$.

¹⁰Federal contribution limits for individuals adjust with inflation, increasing to \$5,000 by 2012. The \$4,000 limit was selected to maintain uniformity.

where y_{ijt} is the amount contributed to candidate j in period t ; lim_{jt} is the maximum allowable limit on contributions to candidate j in period t , taking on the value of 5 for candidates who do not make it past the primary elections and a value of 10 for candidates who continue on to the general elections; σ_i is a contributor-specific overdispersion parameter; δ_j and θ_i are the ideal points for candidate j and contributor i ; α_i and γ_j are contributor and candidate fixed effects; and X_{jt} is a matrix of candidate-specific traits that vary across elections. Rather than treat the δ_j 's and γ_j 's as parameters to be estimated, I set the candidate ideal point parameters to their common-space CFscores and set the value for γ_j to the log of the mean contribution received by candidate j .

Included in X_{jt} are covariates that correspond to testable implications of strategic models of giving. A key implication of the investor model is that donors will direct contributions to legislators who occupy positions of power. As such, when testing the investor model, X_{jt} includes indicator variables for whether the candidate is an incumbent (Jacobson 1985; Stratmann 1991), has a high likelihood of election (Snyder 1990), and is a member of the majority party (Cox and Magar 1999; McCarty and Rothenberg 1996), a committee chair, or a party leader. I additionally include fixed effects for members of power committees (Grier and Munger 1991; Romer and Snyder 1994) and a variable for seniority based on the number of years served in Congress.

The main testable implication of the partisan electoral model is that donors will direct funds to competitive races in order to maximize their preferred party's seat share. As such, when testing the partisan electoral model, X_{jt} includes variables for party and electoral competitiveness. Specifically, it includes one indicator variable for party affiliation, another for candidates in competitive seats with a margin of victory of fewer than 10 percentage points, and an interaction term so as to allow contributors to treat candidates from each party differently with respect to electoral competitiveness.

I fit six models for each group of donors. The first is the unrestricted model, which accounts for both ideological and strategic giving and includes the complete set of candidate characteristics identified above. The second is the ideological model, which excludes X_{jt} and models the data solely on the basis of ideological distance. The third is the partisan electoral model. The fourth and fifth are related to the investor model. One version constrains the coefficients for the nonspatial covariates to be positive so as to correspond with theoretical predictions that increased institutional power is associated with increased fundraising. The other is unconstrained and allows the coefficients for the nonspatial covariates to take on

TABLE 2 Comparison of Model Fit for Ideological and Strategic Giving

	Individual Donors		Labor PACs		Corp. & Trade PACs	
	LogLik	R_{Dev}	LogLik	R_{Dev}	LogLik	R_{Dev}
Unrestricted Model	-1275233	0.652	-220766	0.593	-1597962	0.454
Ideological Model	-1334200	0.601	-231022	0.528	-1694458	0.344
Partisan Electoral Model	-1405855	0.529	-248167	0.471	-1741476	0.287
Investor Model	-1504601	0.412	-252936	0.348	-1695149	0.342
Unconstrained Investor Model	-1468435	0.457	-252238	0.355	-1687949	0.351
Baseline Model	-1520312	0.394	-264635	0.271	-1770673	0.241

Note: The ideological model only includes a measure of the ideological distance between the contributor's ideal point and each potential recipient. The investor model includes variables for incumbency status, probability of election (safe seat), majority party status, committee chairs, party leaders, membership status on the Appropriations, Ways and Means, and Energy and Commerce Committees, and seniority status. The partisan electoral model interacts partisanship with an indicator variable for whether a candidate faces a competitive election.

negative values. Lastly, I include a baseline model that is restricted to the contributor and candidate fixed effects, α_i and γ_j , and the overdispersion parameter, σ_i .

In Table 2, I report the total log-likelihood summing over all contributors as well as values from a deviance-residual summary statistic proposed by Cameron and Windmeijer (1996) to aid in interpreting model fit.¹¹ The results reveal stark differences in the giving behavior of individuals and labor PACs compared with that of corporate and trade PACs. With respect to individual donors, the ideological model easily outperforms both models of strategic giving. The investor model barely improves upon the lower bound set by the baseline model. The unconstrained investor model does slightly better, indicating that much of what little variation in contribution patterns that is explained by the nonspatial covariates associated with the investor model is because donors are acting in a manner opposite of the investor model predictions. In fact, for only 5% of individual donors does the investor model fit the data better than the ideological model. The results for labor PACs are largely consistent with the results for individual donors in terms of the relative explanatory power of the models. The key difference is that the investor model is associated with a much larger improvement over the baseline model as compared to the sample of individual donors.

The partisan electoral model performs much better than the investor model for both individuals and labor PACs. However, given that partisanship can be viewed as a coarsened measure of ideology, it is difficult to distinguish between the variance explained by party versus

ideology. At the same time, the ideological model significantly improves model fit over a partisan model, indicating the importance of accounting for within-party ideological variation.

As expected, the investor model performs much better in explaining the giving behavior of corporate and trade PACs. Yet even for the set of PACs that best fits the investor model, its explanatory power remains on par with the ideological model. These results are used in part to justify the decision to exclude corporate and trade PACs when estimating ideal points.

While the analysis above reveals that the ideological model best accounts for the contribution decisions for the vast majority of donors, the results do still show that nonspatial covariates improve the explanatory power for a small percentage of donors. It is possible, however, to test the extent to which the candidate CFscores are sensitive to deviations from sincere spatial giving. If strategic behavior is systematically biasing the candidate estimates, we should observe shifts in the estimated ideal points following changes in features such as incumbency status, majority-party control, and electoral contexts. In order to directly assess the sensitivity of the measures to strategic considerations, I extend the earlier analysis on temporal stability by regressing the period-specific candidate CFscores on a panel of time-varying candidate characteristics linked to strategic giving. I find that controlling for these covariates barely increases explanatory power over a model that only includes the static CFscores, suggesting that the CFscores are robust to changes in nonideological characteristics associated with hypothesized accounts of strategic giving. In fact, replicating the analysis using DW-NOMINATE scores suggests that roll-call measures are *more* sensitive to these factors.¹²

¹¹The deviance-residual summary statistic calculates the marginal improvement in log-likelihood of the estimated parameters over the baseline of setting γ at its mean: $R_{Dev} = 1 - \frac{(LL(\hat{\gamma}) - LL(\lambda))}{(LL(\hat{\gamma}) - LL(\bar{\gamma}))}$, where $LL(\cdot)$ is the log-likelihood function.

¹²See the supplementary materials for complete results.

In sum, both the existing literature and the results presented here suggest that spatial giving is a more appropriate model for individual campaign contributions than market transaction models developed with special interest PACs in mind. Insofar as institutional power and electoral competitiveness induce contributions from certain segments of the donor population, there is little evidence that these factors significantly bias the ideal point estimates. Strategic considerations may cause donors to give more but do not appear to cause them to deviate from their personal preferences when deciding how to allocate their funds.

Ideological Measures of Political Elites

The overwhelming majority of those who claim influence over the political process are included in the data set—either as a contributor, a candidate, or both. As a result, the CFscores represent the most comprehensive ideological mapping of American political elites to date. To illustrate the scope of the measures, Figure 2 displays the ideological distributions for many—but not all—of the types of actors for whom I have estimated ideal points.

In this section, I present examples for candidates for a variety of political offices. These examples are selected to highlight the method's contributions in terms of (1) facilitating cross-institutional comparisons, (2) expanding the reach of ideal point estimation to nonincumbents and other political actors that had previously lacked reliable measures, and (3) complementing existing measures of legislative ideology.

State Politics

The common-space CFscores join a fledgling literature on estimating ideal points for state politics (Aldrich and Battista 2002; Berry et al. 1998, 2007; Gerber and Lewis 2004; Kousser, Lewis, and Masket 2007; Shor and McCarty 2011; Wright 2007). The most widely used measures of state-level ideology were developed by Berry et al. (1998). Their measurement strategy relies on ADA interest group ratings of the members of each state's congressional delegation. They do not measure the ideology of state politicians directly. Rather, they infer aggregate measures of state-level ideology from congressional ADA scores. As a result, their measures rest on the untested assumption that the mean ideal points of members of the state congressional delegations are sound proxies for the ideology of governors and parties in state legislatures. In a much anticipated update to the literature, Shor and McCarty

(2011) extend roll-call scaling methods to legislatures in all 50 states. Their identification strategy relies on NPAT candidate surveys to recover measures that are comparable across states. Although their common-space scores represent a major step forward in measuring state-level ideology and are an important complement to campaign-finance-based measures, the measures are subject to the same limitations associated with scaling roll calls, namely that they are limited to members of voting bodies and cannot recover ideal points for most nonincumbent candidates.

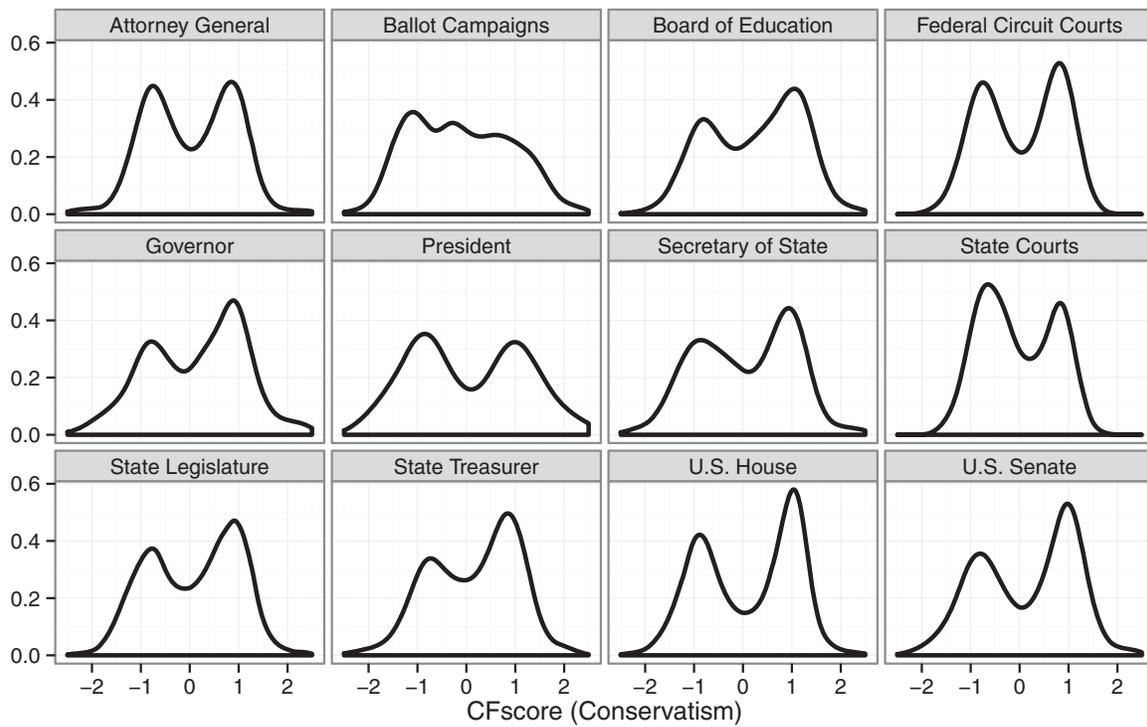
The common-space CFscores provide a comprehensive set of state-level measures of ideology. Since state and federal candidates draw from the same general pool of donors, only the unheroic and verifiable assumption that the donors have the same ideal points when giving to state or federal candidates is required.¹³ At the aggregate level, CFscores are largely consistent with McCarty and Shor's roll-call-based estimates. The chamber medians as measured by CFscores and NPAT common-space scores for 2000 through 2010 correlate at $r = 0.86$ for upper chambers and $r = 0.83$ for lower chambers. The party medians in the lower and upper chambers correlate at $r = 0.59$ and 0.64 for Republicans and $r = 0.53$ and 0.61 for Democrats.

Figure 3 summarizes state-level ideology during the 2009–2010 election cycle. For each state, it displays ideal points for the governor, attorney general, secretary of state, median members of the upper and lower legislative chambers, the median member of the court of last resort,¹⁴ and the mean value for all state and federal candidates successfully elected from their state between 1990 and 2012. This admittedly crowded figure conveys a great deal about state-level politics. On the one hand, it reveals a strong correspondence between the median members of the upper and lower chambers, and to a lesser extent, state supreme courts. On the other hand, there is little evidence of convergence on the median voter by statewide officeholders. A cross-state comparison shows that the ideal points of statewide officials exhibit high levels of partisan polarization. A total of 33 governors, 35 attorneys general, and 35 secretaries of state locate to the extreme of the mean state legislator from their respective party. The distance between the ideal points of the mean

¹³I recovered a set of contributor ideal points strictly from federal contributions and another set strictly from state contributions. The correlations between state and federal ideal points is $r = 0.88$ for all contributors and $r = 0.93$ for contributors who have donated to 10 or more candidates.

¹⁴Contributor ideal points are used for some of the appointed secretaries of state, attorneys general, and unelected state supreme court justices.

FIGURE 2 Ideal Point Distributions of Candidates and Campaigns by Office (1979–2012)



Democrat and mean Republican is 1.48 for governors and 1.57 for attorneys general. The distance is even greater at 1.81 for secretaries of state who serve as their state’s chief election officials, exceeding the 1.66 distance between the parties in Congress at the time. For better or worse, those charged with overseeing elections regularly rank among the most ideologically extreme state officials.

Nonincumbent Candidates

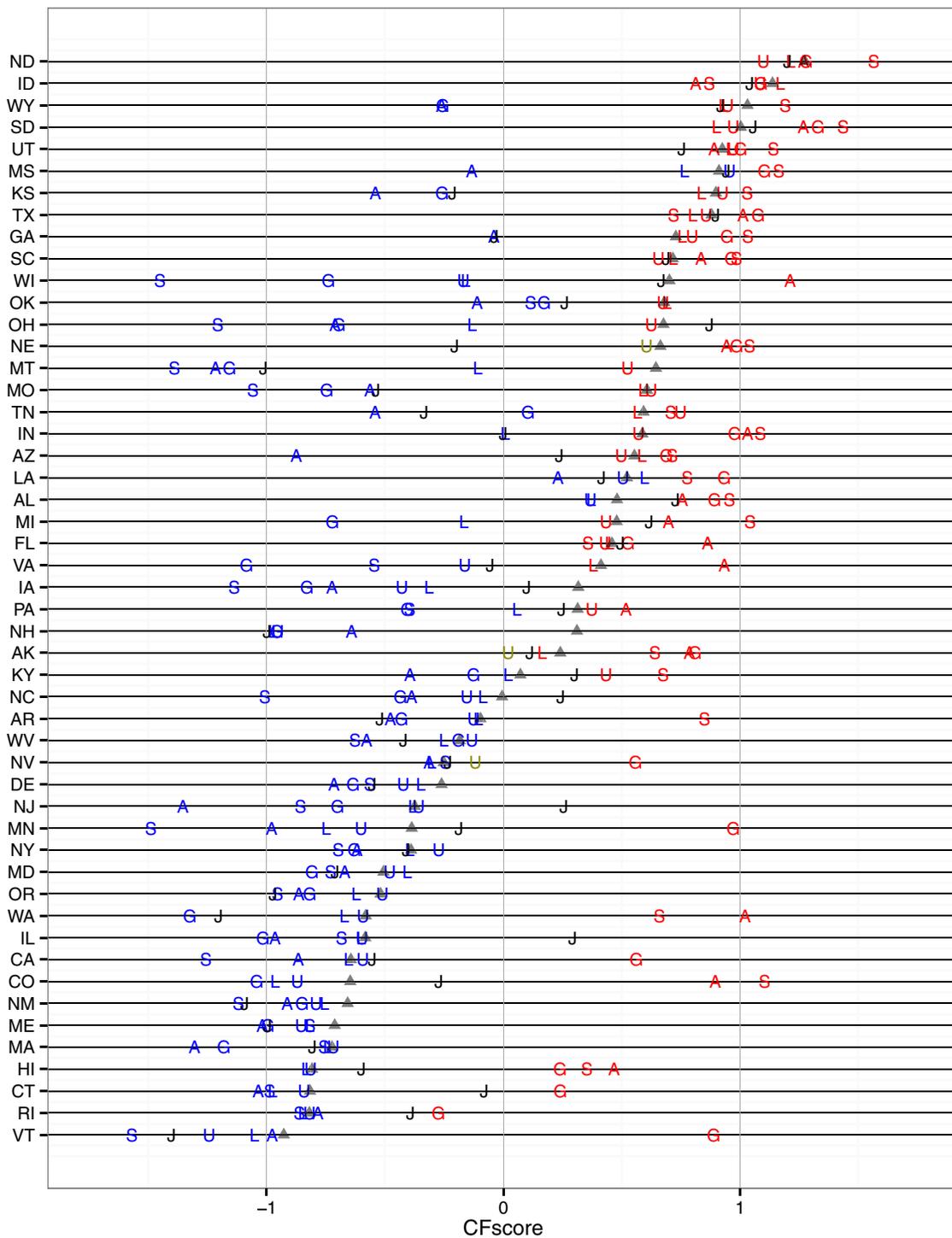
Despite the volume of research on ideal point estimation, relatively little progress has been made in recovering ideal points for nonincumbents. The most commonly used measures of nonincumbent ideology are derived from NPAT candidate surveys (Ansolabehere, Snyder, and Stewart 2001). Although candidate surveys overcome some of the limitations of roll-call data, low response rates and potential selection bias limit their usefulness. The NPAT response rate, which peaked at 64% (532 of 830) of major-party general-election candidates in the 1996 congressional elections, has fallen to about a third in recent elections (McGhee et al. 2013). Campaign finance records do not share these limitations. As incumbents and nonincumbents alike fundraise, the method recovers ideal points for nonincumbents in the same manner as incumbents. This includes candidates who do not make it

past the primaries, which, among other things, is helpful for understanding and testing theories of candidate entry.

The nonincumbent estimates facilitate systematic analyses of candidate positioning. Figure 4 reproduces a figure from Ansolabehere, Snyder, and Stewart’s (2001) seminal article on candidate positioning in House elections. The diagonal line indicates the expected position if Republicans and Democrats converged district by district. I uncover the same pattern of divergence. The Republican candidate, with the exception of a single race, is always more conservative than the Democratic opponent. The one instance of overlap occurred in a race between Leonard Boswell and his Republican opponent Jay Marcus, who had previously run for office as a member of the Natural Law Party.

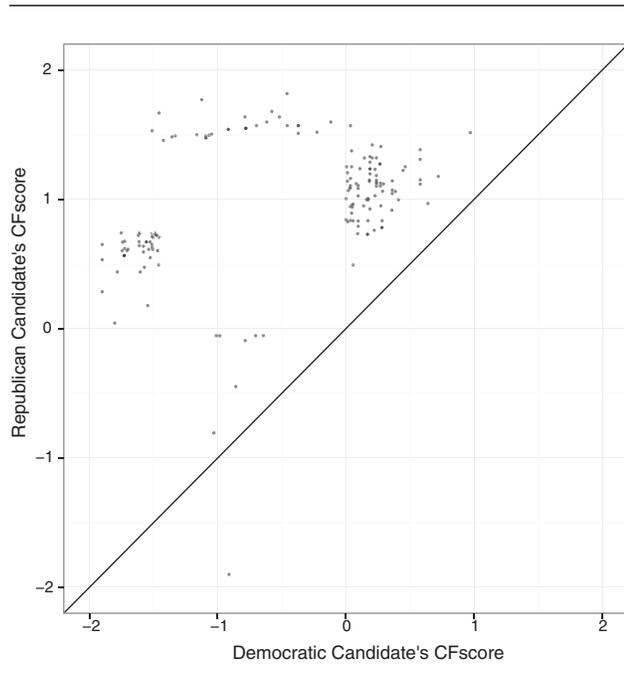
I also replicate Ansolabehere, Snyder, and Stewart’s test for the effect of district responsiveness on Democratic two-party vote share with my nonincumbent estimates. Their model specification regresses Democratic two-party vote share on the estimated midpoint between the opposing candidates in the general election, controlling for district-level presidential vote share, incumbency, and whether the candidate has held prior elected office. I use Kernell’s (2009) composite measures for district partisanship. As these measures are only identified within decades, I estimate separate models for each decade. The

FIGURE 3 Ideological Summary of State Politics (2010)



Note: The symbols are interpreted as follows: G = Governor, A = Attorney General, S = Secretary of State, J = State Supreme Court (median), L = Lower Legislative Chamber (median), U = Upper Legislative Chamber (median), black triangle = mean ideal point of candidates elected in the state. The symbols are color coded by party (Dem = Blue; Rep = Red).

FIGURE 4 Candidate Positioning: Republicans versus Democrats (1979–2012)



results, which are presented in Table 3, are consistent with Ansolabehere, Snyder, and Stewart’s (2001) finding that candidate positioning matters, but only slightly, to voters. Moving the midpoint two standard deviations to the right increases Democratic vote share by about four percentage points for the 1996 election, slightly higher than the three percentage-point effect reported by Ansolabehere, Snyder, and Stewart.

Curiously, the effect of candidate positioning appears to have declined with time. The estimated change in vote share associated with moving the midpoint two standard deviations (0.28 units) to the right falls from 5.1 percentage points during the 1980s to just 1.96 percentage points during the 2000s. This suggests that voters are now less likely than they once were to reward ideological responsiveness.

Congress

Roll-call-based measures of ideology are widely viewed as the gold standard in the ideal point estimation literature. This is for good reason. The spatial model of voting provides a solid theoretical foundation, and the various roll-call scaling methods have been shown to produce reliable measures in hundreds of applications across dozens of voting bodies. CFscores complement roll-call measures of congressional ideology in two ways. First, CFscores provide external validity for roll-call measures by reproducing the liberal-conservative dimension recovered from

voting records. More importantly, as CFscores are estimated independently of voting records, they sidestep many of the well-known problems associated with using ideal points recovered from roll calls to test theories of legislative behavior (Krehbiel 2000; Snyder and Groseclose 2000).

The CFscores also provide a new perspective on certain features of congressional ideology. For example, the two measures provide differing accounts of congressional polarization. Figure 5 tracks the growth in the distance between party means since 1979.¹⁵ As the two measures are not on the same scale, they need to be normalized in order to be meaningfully compared. I normalize both sets of measures such that each set of candidate ideal points has a standard deviation of one. I also report the percentage increase in the distance between party means using the 96th Congress as a baseline. Two notable features distinguish the trends. The first is that the CFscores suggest the parties were less polarized at the beginning of the period. The second is the relative rates of growth. The two polarization trends closely track one another through the early 1990s but diverge after the 1996 elections, as the DW-NOMINATE trend slows while the CFscore trend continues to increase. This is especially apparent during the past decade. Whereas the DW-NOMINATE trend is almost flat between 2004 and 2010, the CFscores enter a period of accelerated growth.

By the 112th Congress, the two measures arrive at nearly identical levels of partisan polarization. However, the CFscores not only suggest a different pace but also a different account of how the parties polarized. Much has been made of the evidence of asymmetric polarization of congressional voting patterns revealed by DW-NOMINATE (Hacker and Pierson 2005, 2010; Mann and Ornstein 2012). Tracking changes in the party means from DW-NOMINATE scores shows that the Republican Party has moved further to the right than the Democratic Party has moved to the left in recent decades. To be specific, the DW-NOMINATE scores show that since 1980, the mean Democrat moved 0.20 standard deviations to the left while the mean Republican moved 0.44 standard deviations to the right. In contrast, the CFscores show a near reversal in which the mean Democrat moved 0.50 standard deviations to the left while the Republicans moved 0.31 standard deviations to the right. Given the importance of political polarization to understanding

¹⁵Both measures assume that legislators have fixed ideal points that do not change with time. As such, the trends track polarization resulting from member replacement but exclude polarization resulting from ideological adaptation (Bonica 2013b; Jacobson 2007; Theriault 2008).

TABLE 3 Predicting the Vote Share of Democratic House Candidates

	DV: Democratic candidate's share of two-party vote			
	1996	1982–1990	1992–2000	2002–2010
(Intercept)	50.36*	52.89*	53.34*	49.90*
	(1.53)	(0.83)	(0.64)	(0.72)
District Conservatism	−7.53*	−6.81*	−7.05*	−7.57*
	(0.56)	(0.35)	(0.23)	(0.25)
Midpoint	7.44*	7.98*	4.60*	1.71*
	(1.58)	(0.98)	(0.65)	(0.52)
Democratic Incumbent	8.15*	10.95*	6.05*	6.71*
	(1.25)	(0.79)	(0.52)	(0.53)
Republican Incumbent	−3.41*	−10.52*	−7.24*	−5.36*
	(1.24)	(0.79)	(0.56)	(0.53)
Held Elected Office (Dem)	5.76*	0.92	4.52*	6.12*
	(0.92)	(0.60)	(0.43)	(0.44)
Held Elected Office (Rep)	−6.63*	−1.12	−7.69*	−7.42*
	(1.12)	(0.64)	(0.44)	(0.47)
N	325	1246	1498	1330
R ²	0.85	0.73	0.84	0.88

Note: Election fixed effects are included for models with multiple elections. *p ≤ 0.05.

contemporary politics, a thorough accounting of these differences is a worthwhile line of inquiry.

Presidential Elections

In addition to bridging state and federal politics, the method extends measurement beyond Congress to presidential candidates, executive appointees, and other federal-level political actors. Ideal point estimates for presidential candidates, who typically raise funds from many thousands of donors, should rank among the most precisely estimated. In total, the method recovers ideal points for 369 presidential candidates, including members of third parties. As an illustration, Figure 6 displays the ideal points for presidential candidates from the 2012 Republican field. The upper panel plots the proportion of funds raised from pro-life versus pro-choice sources against their CFscores.¹⁶ The lower panel displays the

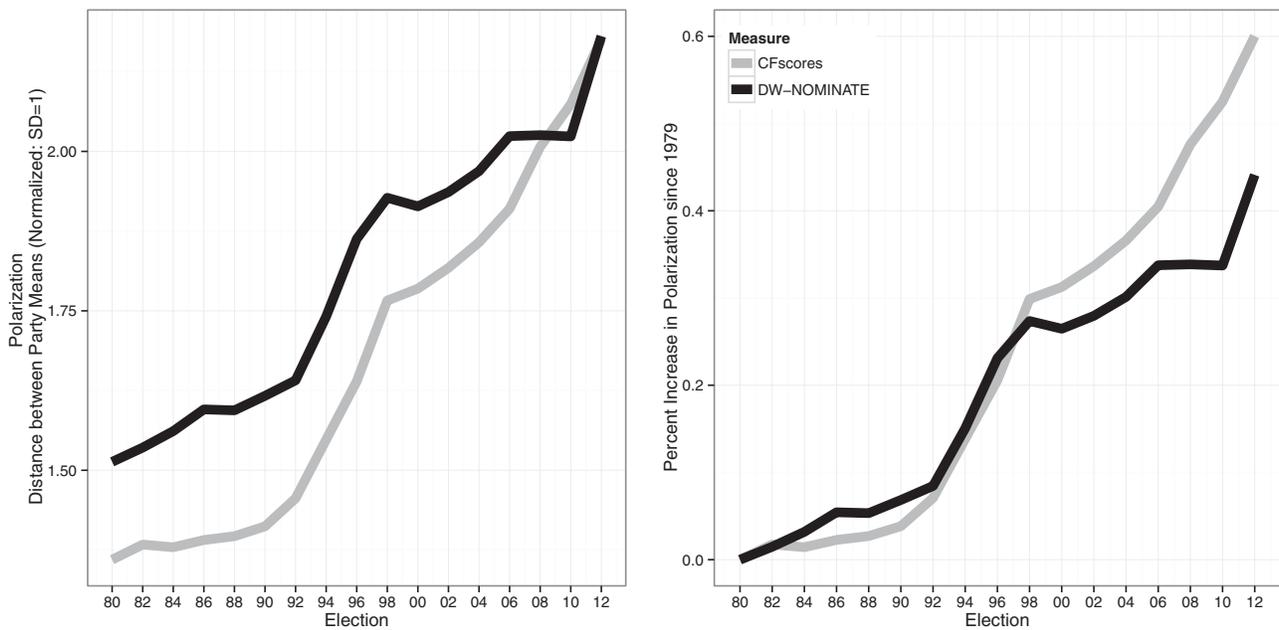
ideal point distribution of all Republican candidates running for federal office in the 2012 election cycle. This provides a sense of how the presidential candidates locate with respect to the party as a whole. It shows that most 2012 Republican presidential candidates located to the right of the party mean.

There is substantial variation in the positions on the issue-specific abortion dimension. Rick Santorum, who jockeyed hard to position himself as a champion of conservative social values, has the highest percentage of abortion activists in his donor pool (all of whom are pro-life). Mitt Romney and Jon Huntsman, who both raised significantly more from pro-choice donors than from pro-life donors, locate on the other end of the scale. This is surprising when one considers that, with the exception of Gary Johnson, the candidates uniformly oppose abortion rights. There are two ways to interpret this result. On the one hand, it suggests that the first dimension primarily reflects candidate positions on economic issues and that a candidate's position on abortion is a secondary consideration for most Republican donors (at least for those who are pro-choice). Alternatively, it might reflect that a candidate's expressed preferences (as revealed by his or her stated position or voting record on the issue), which can

¹⁶I calculate the pro-life ratios by first identifying the subset of contributors in the database who have given to one of the many PACs or ballot measures that specifically advocates a pro-life or pro-choice cause. I then classify each contributor as pro-life or pro-choice depending on whether he or she has donated to a pro-life or pro-choice organization. For example, anyone who has made a political contribution to Right to Life, to the Susan B. Anthony List, or in favor of the South Dakota abortion-ban referendum is coded as pro-life, whereas anyone who has donated to NARAL, to the Republican Majority for Choice, or against the South Dakota

abortion-ban referendum is coded as pro-choice. I then calculate the pro-life proportions as $y_j = \frac{prolife_j}{(prolife_j + prochoice_j)}$.

FIGURE 5 Congressional Polarization



Note: The left panel tracks the distance between party means when both measures are normalized to have a standard deviation of one. The trends in the right panel track the percentage increase in the distance between party means using the 96th Congress as a baseline. The party means pool members of the House and Senate.

be as much a function of political expediency as of personal conviction, are not always sufficient to win over potential supporters. After all, talk is cheap and so is casting nonpivotal votes. Rather, it seems that a candidate’s history of proactive advocacy is more important to convincing potential supporters that he or she is devoted to the issue and would remain devoted to the cause if elected to office.

Measures of Donor Ideology

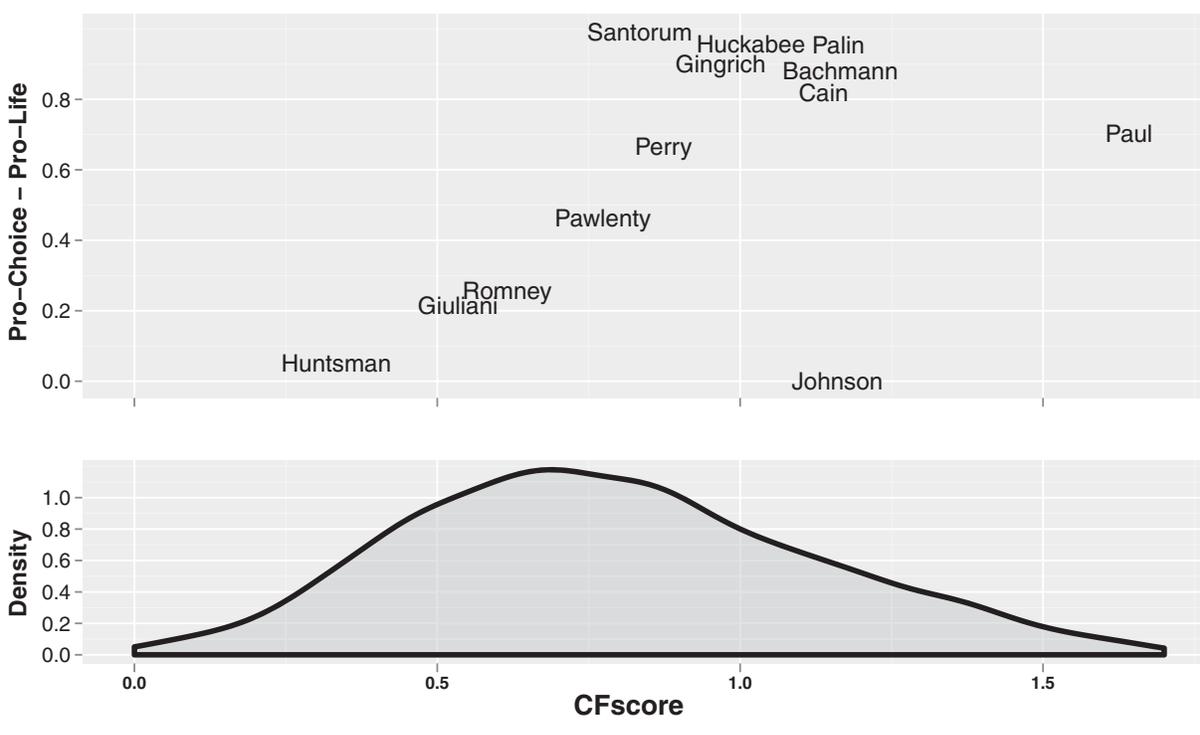
The contributor ideal points contain a wealth of information about the fundraising landscape and its influence on the ideological composition of elected politicians. The information disclosed by donors allows for varying levels of disaggregation. To illustrate, I present results aggregated at the level of industry/occupation.

Figure 7 displays the ideological distributions of members of several major industries who made donations during the 2004–2012 election cycles. The extent to which industries and occupations have sorted along ideological lines is among the more striking patterns revealed by the data. In some industries, ideological sorting easily exceeds the levels of sorting observed along geographic or economic lines. The figure is ordered with respect to

the ideological alignment of industries, with left-aligned industries in the top row, unaligned or divided industries in the middle row, and right-aligned industries in the bottom row. The list of left-aligned industries includes some of the usual suspects. Donations made by employees of colleges and universities, Hollywood, and newspaper, magazine, and book publishers all skew heavily to the left. In fact, the mean contributor ideal point for each industry is to the left of the mean Democratic candidate. The newcomer to the group is the fast-growing online computer-services industry, which emerged in the last decade as a vital Democratic fundraising source.¹⁷ Right-aligned industries tend to be from more established sectors. The oil, gas, and coal industry is the most reliably conservative, accompanied by the agricultural, mining, and construction industries.

Among other things, industry-level measures of ideology might provide new insights on the political behavior of industries. In an analysis of industry-wide political mobilization of industries that are exposed to international trade, Busch and Reinhardt (2000) find that increased geographic concentration positively affects political mobilization. They theorize that geographical concentration reduces transaction costs associated with lobbying and

¹⁷Google, Oracle, and Facebook are examples of firms within the online computer-services industry.

FIGURE 6 Republican Presidential Field for the 2012 Elections

political mobilization. A complementary hypothesis is that ideological concentration makes it easier to overcome coordination problems. When an overwhelming majority of an industry share a common ideological perspective, it likely removes a barrier to agreeing on which candidates and policies to support.

Conclusions and Future Work

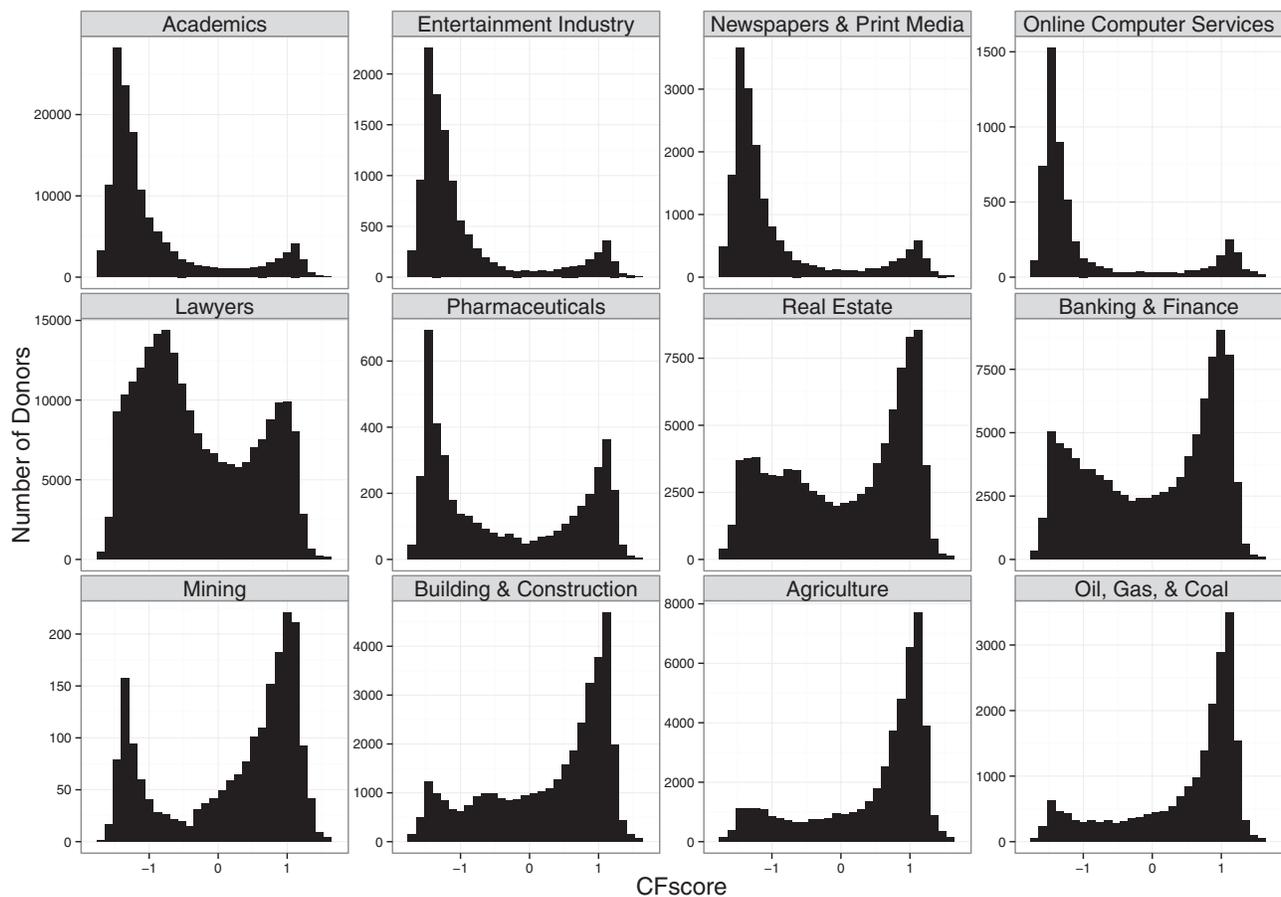
This article introduced a new method for recovering ideological measures for an expansive range of political actors using contribution records. In harnessing this rich data source, we gain a unified framework for estimating ideal points that are comparable across states, institutions, and types of political actors. This has important implications for empirically testing theoretical models and should help fuel the growing interest in state politics.

Among the method's key contributions is the ability to recover ideal points for nonincumbents. The measures of nonincumbent ideology are not limited to congressional candidates but also include a complement of nonincumbent estimates for practically every type of elected office. The lack of a comprehensive set of ideal point estimates for nonincumbent candidates has limited our ability to fully grasp key questions about American politics. For example, existing research on congressional polariza-

tion has focused on explaining the disappearance of moderates through attrition (McCarty, Poole, and Rosenthal 1996; Theriault 2008) or processes internal to Congress (Aldrich 1995; Jacobson 2007; Roberts and Smith 2003). Arguably, the more relevant question is why a new generation of moderates never arrived in Congress to replenish their ranks. A comprehensive account of the root cause of congressional polarization must account for both officeholders and office seekers. The new measures make this line of inquiry possible.

In addition to contributing to our knowledge of candidate ideology, the database containing records from millions of individual contributors provides a wealth of information of its own. While we stand to learn a great deal from analyzing contributor ideal points aggregated to the level of industry or firm, there is tremendous value added from recovering ideal points for prominent donors, corporate board members and executives, lobbyists, and non-elected political elites such as bureaucratic and judicial appointees. By assigning contributor IDs that track the giving patterns of individual donors, the database stands to further our understanding of the dynamics of contribution behavior and the vital role individual donors play in shaping the political landscape. The contributor IDs make it possible to explore a diverse set of concepts about donor behavior, such as partisan loyalty and ideological consistency across time, donor fatigue,

FIGURE 7 Ideological Distributions of Industries/Occupations



Note: Includes all donors from each industry/occupation who made contributions to at least two distinct recipients between 2003 and 2012.

elite endorsements, redistricting effects, and political inequality.

Beyond their methodological contribution, the CF-scores represent a breakthrough in our ability to empirically test theoretical models of legislative and judicial behavior, electoral competition, and interacting institutions. Although I only briefly address each area, the analysis of contributor behavior and illustrative examples of the measures produce several substantively interesting results. The analysis of sincere versus strategic giving reveals much about the motives and giving patterns of the most active individual donors by showing that ideology trumps strategy in explaining their contribution decisions. In addition, the comparison of the polarization trends recovered from common-space CF-scores versus DW-NOMINATE scores suggests differing patterns of polarization for contributions and roll-call voting. I replicate Ansolabehere, Snyder, and Stewart’s (2001) finding that candidate positioning had a positive but moderate effect on district vote shares in the 1996 con-

gressional elections, but I also expand upon their results to show that voters have become less willing to reward candidates for ideological responsiveness than they had been in decades past. The analysis of donor ideal points produces the most novel findings. The high degree of ideological sorting across occupations and industries has important implications for understanding how industries coordinate, mobilize, and otherwise engage in the political process. These initial findings highlight the impressive range of applicability of the new measures and hint at the potential for new discoveries.

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Supporting Information

Additional Supporting Information may be found in the online version of this article at the publisher's website:

- Figure S1.** Candidate vs. Contributor CFscores.
- Figure S2.** Candidate vs. Contributor CFscores.
- Figure S3.** Money-Weighted Ideological Standard Deviation versus CFscores.
- Table S1.** Sensitivity of Period-Specific CFscores to Changes in Candidate Characteristics.
- Table S2.** Sensitivity of Period-Specific DW-NOMINATE scores to Changes in Candidate Characteristics (House).
- Table S3.** Sensitivity of Period-Specific DW-NOMINATE scores to Changes in Candidate Characteristics (Senate).
- Figure S4.** Increase in Correct Classification of DW-NOMINATE over CFscores.
- Figure S5.** Comparison of common-space CFscores, scores recovered from an IRT negative binomial count model applied to PAC contributions, and DW-NOMINATE scores.
- Figure S6.** Comparison of common-space CFscores, Turbo-ADA, and DW-NOMINATE scores.
- Figure S7.** Candidate CFscores recovered as Incumbent as Nonincumbents by office.
- Figure S8.** Comparison of Partisan Trends from CFscores and DW-NOMINATE.
- Figure S9.** Party Medians and Distributions for Members of Congress.

Supplemental Materials

A Common-space CFscore Scaling Methodology

The common-space CFscores are estimated as follows. The first step involves organizing the contribution data into a an n by m contingency matrix \mathbf{R} where the rows index contributors, the columns index recipients and recipient committees, and each entry R_{ij} stores the total amount contributor i gives to recipient j . I implement an initial layer of normalization that helps to adjust for variation in contribution limits by converting contribution amounts from dollar amounts to count values. The conversion is based on federal contribution limits. Contributions between \$1 and \$100 are coded as 1, contributions between \$101 and \$200 are coded as 2, and so on. Contributions of \$5,000 or greater are capped at 50.¹ The matrix is then standardized by dividing each cell by $\sum_i \sum_j R_{ij}$. The next step performs singular value decomposition on the matrix $\mathbf{K} = \mathbf{D}_r^{-\frac{1}{2}}(\mathbf{R} - \mathbf{r}\mathbf{c}^\top)\mathbf{D}_c^{-\frac{1}{2}}$, where \mathbf{r} and \mathbf{c} are vectors of row and column sums, and \mathbf{D}_r and \mathbf{D}_c are diagonal matrices of \mathbf{r} and \mathbf{c} . Ideal points are then calculated as $\boldsymbol{\theta} = \mathbf{U}\mathbf{D}_c^{-\frac{1}{2}}$ for contributors and as $\boldsymbol{\delta} = \mathbf{V}\mathbf{D}_r^{-\frac{1}{2}}$ for recipients, where the left singular vectors \mathbf{U} are the eigenvectors of $\mathbf{K}\mathbf{K}^\top$, \mathbf{D} is a diagonal matrix of singular values, and the right singular vectors \mathbf{V} are the eigenvectors of $\mathbf{K}^\top\mathbf{K}$.

Although using CA to scale federal elections is straightforward, the model must be augmented to bridge across state and federal elections. Difficulties arise in the presence of overlapping pop-

¹In addition to the normalization introduced by the chi-square distance metric, capping contribution amounts adjusts for organizations such as 527s and ballot campaign committees that can raise funds in unlimited amounts. Nonetheless, I find that the conversion barely affects the results. The correlation between candidate ideal point estimates recovered with and without the conversion to counts is 0.992.

ulations. It is typical for donors to give to both federal campaigns and candidates for state-level office in their home states, but giving to state-level candidates in different states, although not uncommon, is not the norm.² As a result, bridges that connect state elections to federal elections are abundant but bridges between states are relatively sparse. The solution utilizes the communality of federal elections to recover measures of liberal-conservative ideology that can be used to anchor the state-level estimates.

Having estimated federal-level ideal points, the next step is to scale each state separately, using contributors that have given to both state and federal campaigns as bridge observations. The bridging technique as applied to each state is implemented as follows. Let \mathbf{S} be the set of contributors who have donated to elections in the state and \mathbf{F} be the set of contributors that have donated to federal elections. Bridge contributors are denoted as $i \in \mathbf{S} \cap \mathbf{F}$. I denote ideal points derived from the federal scaling as $\theta_{\mathbf{F}}$ and denote ideal points the state is represented by $\theta_{\mathbf{s}}$. The χ^2 matrix for state s is represented by \mathbf{K}_s . I factor \mathbf{K}_s with an iterative method known as alternating least-squares (Gabriel and Zamir 1979).³ The algorithm factors \mathbf{K}_s one dimension at a time by iteratively switching between estimating the contributor and recipient ideal points while holding the other set of ideal points fixed, such that the following objective function is optimized:

$$\text{minimize} \sum_i^n \sum_j^m (K_{s_{ij}} - \theta_i \delta_j) \quad (1)$$

The bridging algorithm is as follows:

²In contrast, the majority of contributions to federal candidates come from out of state.

³ It is also possible to implement the identification strategy using reciprocal averaging which is less computationally demanding. Greenacre (1984) demonstrates equivalency between the two techniques in recovering a single dimension. The more general alternating least-squares technique allows for greater flexibility and, if desired, additional dimensions.

1. Recover starting values for state recipients by using $\theta_{F_i \in S \cap F}$ and minimizing equation 1 subject to δ .
2. Recover contributor estimates by minimizing equation 1 subject to θ_S .
3. For the set of bridge contributors, regress $\theta_{F_i \in S \cap F}$ on $\theta_{S_i \in S \cap F}$ using an error-in-variable specification and rescale θ_S using the estimated coefficients.
4. For the set of bridge contributors, combine information from contributions to state and federal elections using the mean of their state and federal ideal points weighted by the proportion of their contributions going to state and federal elections. Let ρ_i be the total percentage of contributor i 's contributions going to state elections: $\theta_{S_i} = \rho_i \theta_{S_i} + (1 - \rho_i) \theta_{F_i}$.
5. Recover recipient estimates by minimizing equation 1 subject to δ .
6. Set δ to values recovered from the federal scaling for state candidates that also ran for federal office.
7. Return to step 2 and repeat until convergence.
8. Set $\theta_{F_i \in S \cap F} = \theta_{S_i \in S \cap F}$.

After scaling each state separately, I jointly re-estimate the entire set of recipient ideal points in order to reintroduce information from contributors that give to elections in multiple states. Finally, I normalize the scaling such that the weighted mean and weighted standard deviation of contributions by amounts are set to zero and one, respectively.

A.1 Between-Set Identification

The method faces one last identification problem in making distance comparisons between row (contributor) and column (recipient) coordinates (ideal points). The well-known between-set identification problem applies to CA as well as most other scaling methods (Carroll, Green, and Schaffer 1986; Greenacre 2009). In fact, variants of the between-sets identification problem are common in the literature on ideological measurement. In roll call analysis, for example, the cutpoints are identified with respect to the legislator ideal points but the positions of the yea and nay outcomes are not. Issues arising from this problem have been addressed in the context of ideological scaling of political texts (Laver, Benoit, and Garry 2003; Lowe 2008). With respect to scaling data using CA, the axes for row and column coordinates will be brought into coincidence so that they share

common dimensionality but not a common scale. This is because the contributor ideal points may be arbitrarily shifted and stretched with respect to the recipient ideal points. To see this, consider the transition formula for contributor ideal points: $\theta_i = \frac{\sum_j \delta_j y_{ij}}{\sum_j y_{ij}}$. The weighted averaging shrinks donor ideal points toward the center of the space. Left unadjusted, the donors will artificially appear more centrist than the candidates.

A less than satisfactory, yet typical, approach to this problem is to assume that both sets of ideal points have weighted means of zero and weighted standard deviations of one. This approach, however, is highly problematic given that many potential applications of the common-space CFs-core measures involve making distance comparisons between the ideal points of contributors and candidates. Fortunately, the rich structure of campaign finance data provides a solution to the problem. A sizable number of committees and candidates are included in the data both as contributors and as recipients. This has the practical effect of giving contribution data the unusual property of having an substantial percentage of column observations also appear in the database as row observations. This, in turn, makes it possible to rescale the estimates by regressing donor ideal points on to corresponding candidate ideal points using an error-in-variable specification to adjust for attenuation bias. The estimated coefficients are then used to project contributors onto the same space as candidates. The projection is performed using a subsample of 29,913 candidates (roughly half the total sample) that have been matched up with their contribution records. The regression coefficients are 0.017 for the intercept and 0.975 for the slope, indicating that only a slight adjustment is needed.

A.2 Adjusting Ideal Points for Presidential Nominees

The special status of those nominated by their party for president as temporary standard bearers of their party presents a distinctive set of issues. The narrowed choice set and campaign finance

provisions that permit presidential nominees to jointly fundraise with their party typically cause sudden shifts in their estimated ideal points subsequent to being named the presumptive nominee. In order to account for these changes, I estimate separate pre- and post- nomination ideal points for presidential nominees. The pre-nomination ideal point are based on all contributions received prior to the month that the candidate secured his position as presumptive nominee. The post nomination ideal points are based on all contributions received from that point on until the candidates end their bids for president. For presidential nominees, such as Senators Kerry and McCain, who return to their prior offices after losing the election, all contributions raised for their senate re-election campaigns count toward their pre-nomination ideal points. Given the concerns noted above, the pre nomination estimates are likely more accurate measures of the candidates true ideology.

B Candidate Versus Contributor CFscores

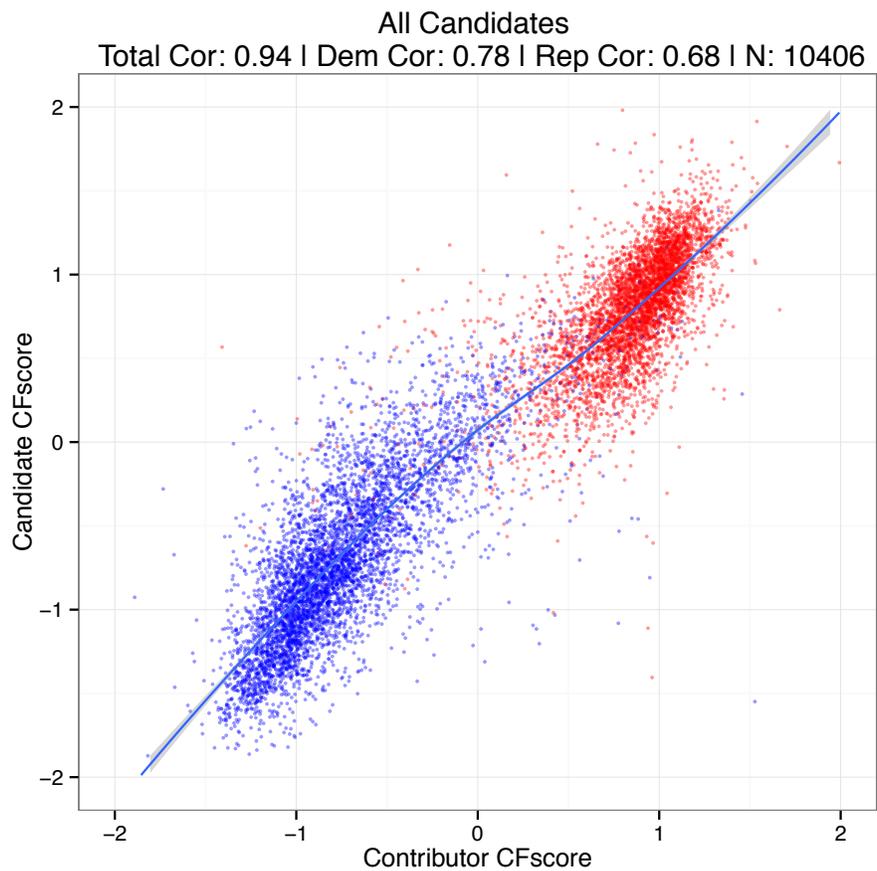


Figure 1. Candidate vs. Contributor CFscores

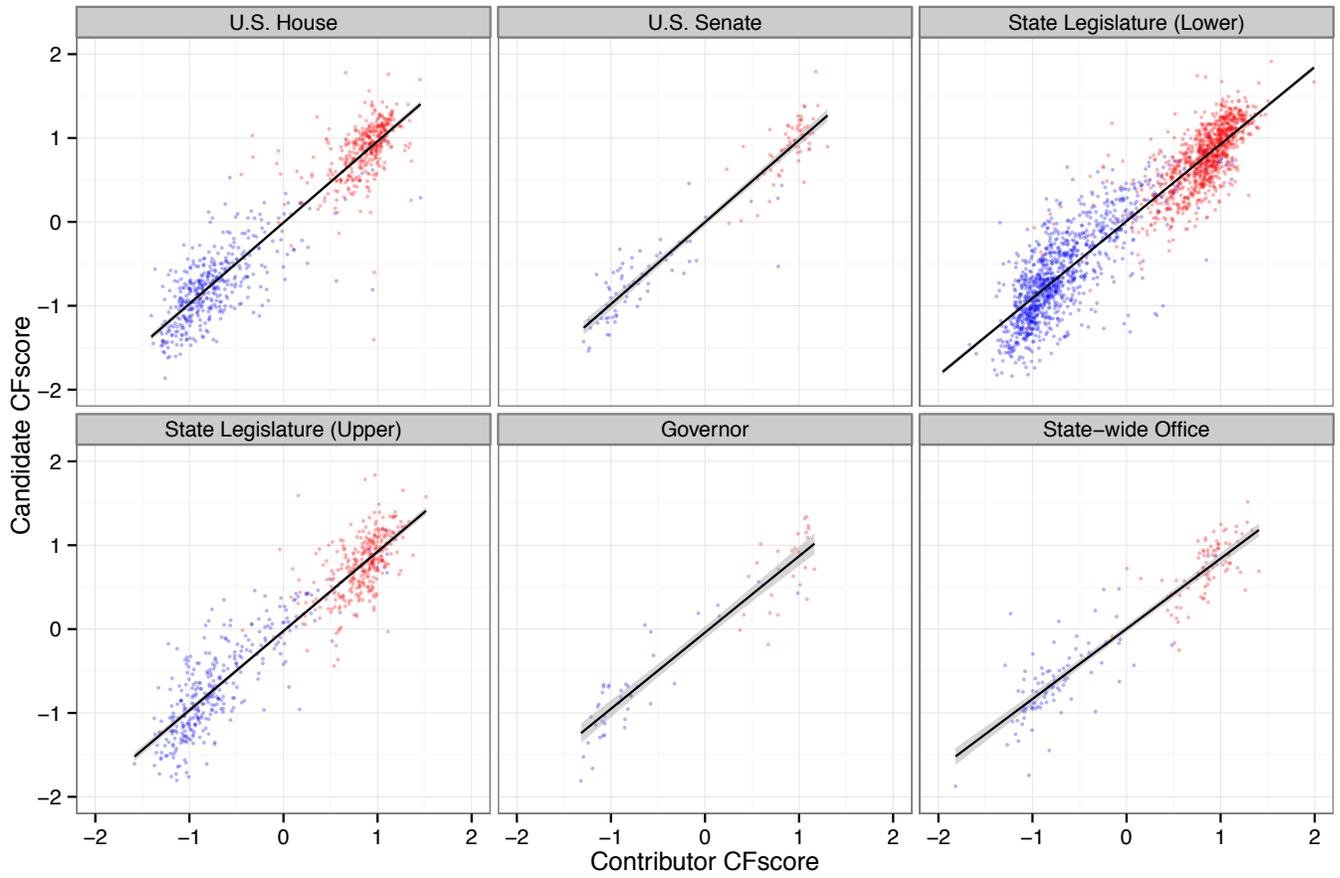


Figure 2. Candidate vs. Contributor CFscores

C Record Linkage and Validation

The identity resolution software links records using information on names, addresses, occupations, and employers disclosed to the FEC and state reporting agencies. The software loads a reference record associated with each individual, queries the database for all records with key similarities, and applies a carefully refined set of decision rules to determine which of these contribution records were made by the same individual. This task is complicated by donors who fail to disclose the requested personal information in entirety or do so inconsistently across records, while others relocate and change addresses once or more during the past three decades. The disclosure rates for all categories are above 95 percent for recent election cycles but are significantly lower for address and occupation in the 1980's and early 1990's. Another issue is that donors often report slight variations of their personal information. The algorithm accounts for these inconsistencies with a combination of fuzzy matching and supervised machine learning methods. The identity resolution software is written in R and MySQL. Both the software and access to the database will be made available by the author upon request.⁴

I selected corporate board members as the training set because they are often among the most difficult cases to code. They are typically affiliated with more than one institution and have multiple residences. In 57 percent of the cases, the algorithm correctly assigned a single ID to all contributions made by the individual. In 42 percent of the cases, the algorithm split contributions made by the individual into two or more groups (type 1 errors). However, in only 13 percent of

⁴The Center for Responsive Politics also assigns IDs for individual donors reported by the FEC, but the IDs only apply for a single election cycle and cannot be used to track donor activity across election cycles. In addition, the CRP's coding scheme is not made transparent and appears to be far less reliable than my linkage algorithm, with both a lower linkage success rate and a higher number of erroneously linked records.

these cases did the algorithm fail to assign at least 90 percent of the individual's contributions to a single ID. That is, in most of these cases, the algorithm correctly grouped most of the individual's records but left off a few hard to code stragglers. There were only two instances where the algorithm erroneously grouped contributions made by separate individuals (type 2 errors). Both cases involved family members associated with the same employer or organization. The first is William Gates, Jr. and his father William Gates, Sr., both of whom serve as directors for the Gates foundation. The second case erroneously grouped members of the Walton family, heirs to the WalMart fortune. It is important to note that type 1 errors, which result in a loss of information, are far less problematic than type 2 errors, which have the potential to introduce bias. It is reassuring that even among the most difficult to code individuals type 2 errors are exceedingly rare.

D Ideological Consistency in Contribution Patterns

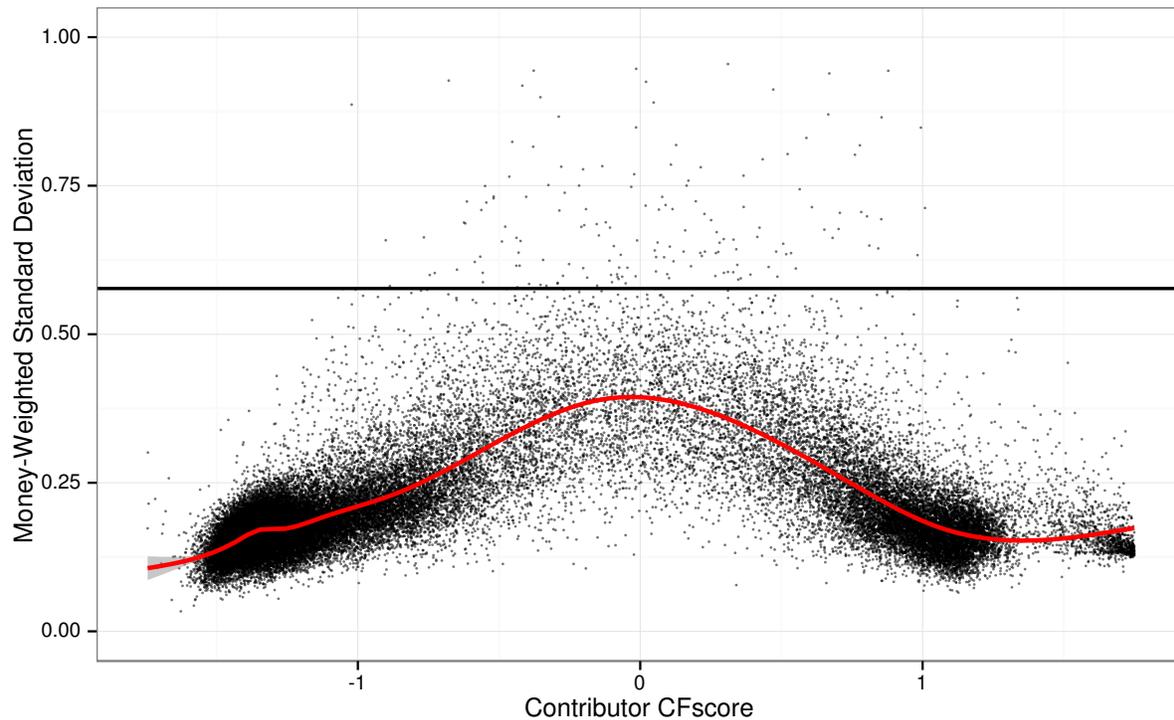


Figure 3. Money-Weighted Ideological Standard Deviation versus CFscores

Note: Each point represents an individual donor that made at least 25 contributions to federal candidates and committees during the 2004 through 2012 election cycles ($N = 49,418$). The smoothing line is a LOESS curve that weights each donor equally. The horizontal line indicates the theoretical limit at .577 for non-ideological giving. See McCarty, Poole, and Rosenthal (2006) for details on the summary statistic.

E Robustness to Changes to Non-Spatial Covariates

I extend the analysis on temporal stability to assess the sensitivity of the estimates to changes in candidate characteristics and electoral contexts associated with strategic behavior. If investment behavior is systematically biasing the candidate estimates, we should observe sizable shifts in the estimated ideal points following changes in incumbency status, seniority, majority-party control, and other characteristics associated with the ability to more efficiently provide legislative services. Likewise, if electoral considerations are biasing the results we should expect a candidate's ideal point to vary with election-specific characteristics such as electoral competitiveness or committee assignment. I assess the sensitivity of the measures to these factors using with a panel of period-specific candidate CFscores and time-varying electoral and candidate characteristics linked to strategic giving.

Table 1 reports results from two model specifications. The first model regresses the period-specific CFscores on the static CFscore estimates. The second model adds covariates for several time-varying electoral and candidate characteristics unrelated to ideology. The included variables cover incumbency status, office sought, competitiveness of seat, committee assignment, rank within party, status as a party leader or committee chair, and membership of the majority party. The table also reports results from models restricted by party that should detect centripetal and centrifugal effects that will be asymmetric with respect to party.

The model results show that controlling for the set of non-spatial covariates barely increases explanatory power over a model that only includes the static CFscores, which by itself explains nearly all of the variance. This is strong evidence that the CFscores are robust to large shifts associated with incentive to give strategically. At the same time, the results do reveal statistically significant effects for several of the covariates. Incumbency status and majority party status shifts

DV: Period-specific Candidate CFscores (House and Senate Candidates)

	<u>All MCs</u>		<u>Democratic MCs</u>		<u>Republican MCs</u>	
	(1)	(2)	(1)	(2)	(1)	(2)
(Intercept)	0.001 (0.001)	0.029 (0.028)	-0.014* (0.004)	-0.060 (0.035)	-0.013* (0.005)	0.077 (0.045)
Static CFscore	0.974* (0.002)	0.972* (0.002)	0.954* (0.005)	0.937* (0.005)	0.992* (0.006)	0.959* (0.006)
Incumbent		0.007 (0.004)		0.060* (0.006)		-0.042* (0.005)
Senate Seat		0.006 (0.004)		0.031* (0.006)		-0.014* (0.005)
Competitive Seat		-0.007* (0.003)		-0.041* (0.005)		0.023* (0.004)
High-ranking		-0.014 (0.016)		-0.022 (0.024)		0.000 (0.020)
Mid-ranking		0.002 (0.006)		-0.010 (0.008)		0.015 (0.009)
Committee Chair		-0.007 (0.004)		-0.005 (0.007)		0.000 (0.006)
Tenure in Office		-0.002* (0.000)		-0.002* (0.000)		-0.002* (0.000)
Majortiy Party		-0.010* (0.003)		0.017* (0.004)		-0.024* (0.003)
Party Leader		-0.018 (0.028)		-0.008 (0.034)		-0.017 (0.044)
Committee FEs	N	Y	N	Y	N	Y
R ²	0.974	0.975	0.887	0.895	0.864	0.874
Num. obs.	10564	10564	5477	5477	5075	5075

* $p < 0.05$

Table 1. Sensitivity of Period-Specific CFscores to Changes in Candidate Characteristics
 Note: Some models include fixed effects for assignments to thirteen committees.

members of both parties slightly toward the center, whereas competing in a closely contested race shifts members toward the extremes. However, these effects only seem to matter at the margins. To put the size of these effects in context, the largest are associated with a shift of between 0.03 and 0.05, or about a twentieth of a standard deviation of candidate CFscores. This corresponds to a shift of a dozen or so ranks.

As a point of comparison, replicating the analysis using DW-NOMINATE scores suggests that roll call based measures are slightly *more* sensitive to changes in candidate characteristics. Since the Nokken-Poole period specific estimates are not estimated in a common-space framework, I separate the analysis by legislative chamber. Controlling for a similar set of candidate characteristics increases the within party R^2 from 0.860 to 0.864 for House Democrats and from 0.698 to 0.751 for House Republicans. Including the covariates increases the within party R^2 from 0.715 to 0.745 for Senate Democrats and from 0.843 to 0.845 for Senate Republicans.

By these measures, the CFscores exhibits greater inter-temporal stability than DW-NOMINATE scores. It is also the case that CFscores are, on the whole, less sensitive than DW-NOMINATE scores to changes in non-spatial covariates. This is despite the fact that incumbency status, which is included as a covariate in the regression for CFscores, is excluded due to lack of availability the regressions for DW-NOMINATE. In combination with the finding in Table 2 that covariates linked to strategic models of giving have very little explanatory power as compared to a simple spatial model, the analysis performed here should do much to address concerns about strategic giving biasing the ideal point estimates.

To be clear, this is not to claim that ideological proximity is the sole determinant of contribution patterns. Strategic giving can matter at the margins, as shown by the small but statistically significant estimated coefficients for several of the covariates included in Table 1. Rather, the claim is simply that the omitted non-spatial covariates (1) explain a relatively minuscule proportion of

DV: Period-specific DW-NOMINATE scores (House)

	All MCs		Democratic MCs		Republican MCs	
	(1)	(2)	(1)	(2)	(1)	(2)
(Intercept)	-0.002 (0.002)	-0.113* (0.036)	-0.117* (0.005)	-0.108* (0.030)	0.034* (0.011)	-0.143 (0.074)
Static DW-NOMINATE	0.962* (0.002)	0.966* (0.002)	0.827* (0.006)	0.817* (0.006)	0.934* (0.012)	0.930* (0.011)
Competitive Seat		-0.010 (0.006)		0.015* (0.006)		-0.013 (0.011)
High-ranking		0.041* (0.020)		-0.026 (0.019)		0.106* (0.032)
Mid-ranking		0.030* (0.008)		0.005 (0.007)		0.053* (0.014)
Committee Chair		-0.011 (0.007)		0.001 (0.006)		-0.050* (0.011)
Tenure in Office		0.002* (0.000)		-0.002* (0.000)		0.008* (0.001)
Majority Party		0.041* (0.004)		0.004 (0.004)		0.099* (0.008)
Party Leader		0.029 (0.035)		-0.002 (0.029)		0.004 (0.073)
Committee FEs	N	Y	N	Y	N	Y
R ²	0.962	0.964	0.860	0.864	0.698	0.751
Num. obs.	6007	6007	3302	3302	2705	2705

* $p < 0.05$

Table 2. Sensitivity of Period-Specific DW-NOMINATE scores to Changes in Candidate Characteristics (House)

Note: This table replicates the analysis found in Table ?? using DW-NOMINATE scores rather than CFscores. The sample is restricted to members of the House. The scores have been rescaled to have a standard deviation of 1.

DV: Period-specific DW-NOMINATE scores (Senate)

	All Senators		Democratic Senators		Republican Senators	
	(1)	(2)	(1)	(2)	(1)	(2)
(Intercept)	0.002 (0.004)	0.030* (0.012)	-0.040* (0.015)	0.151 (0.122)	-0.094* (0.015)	-0.070* (0.025)
Static DW-NOMINATE	0.963* (0.005)	0.961* (0.005)	0.889* (0.022)	0.868* (0.025)	1.082* (0.019)	1.071* (0.020)
Competitive Seat		-0.009 (0.012)		0.048* (0.015)		-0.064* (0.017)
Committee Chair		-0.009 (0.010)		0.010 (0.012)		-0.019 (0.015)
Tenure in Office		0.000 (0.001)		-0.002* (0.001)		0.002 (0.001)
Majority Party		-0.017* (0.008)		0.005 (0.009)		-0.029* (0.012)
Committee FEs	N	Y	N	Y	N	Y
R ²	0.963	0.965	0.715	0.745	0.843	0.855
Num. obs.	1274	1274	637	637	637	637

* $p < 0.05$ **Table 3.** Sensitivity of Period-Specific DW-NOMINATE scores to Changes in Candidate Characteristics (Senate)

Note: This table replicates the analysis found in Table 1 using DW-NOMINATE scores rather than CFscores. The sample is restricted to members of the House. The scores have been rescaled to have a standard deviation of 1.

variance in contribution decisions compared to spatial proximity and (2) appear to be largely orthogonal to ideological considerations. As is the case with all ideal point measures, researchers should be mindful of the potential ways that even small amounts of bias present in the “off-the-shelf” estimates can impact their results and make an effort to make appropriate adjustments. It is my hope that by making all the data and code used to estimate the CFscore accessible as publically available database, researchers will be able to make adjustments directly to the scaling model.

F Roll Call Classification, cont.

Another point to consider when interpreting these classification results is the increased rates of partisan overlap apparent in CFscores as compared with DW-NOMINATE scores. Figure 4 plots the gain in correct classification associated with DW-NOMINATE scores over CFscores against legislator CFscores. It reveals CFscores tend to be relatively poor predictors of the voting behavior of moderate legislators who overlap members of the opposing party. What is more, when a two-cutpoint model devised by McCarty, Poole, and Rosenthal (2001) test for party effect is used, the classification gap between the two measures narrows substantially for close votes but not for lopsided ones, suggesting that much of classification boost over the CFscores associated with DW-NOMINATE scores is due to party effects (Bonica 2013).

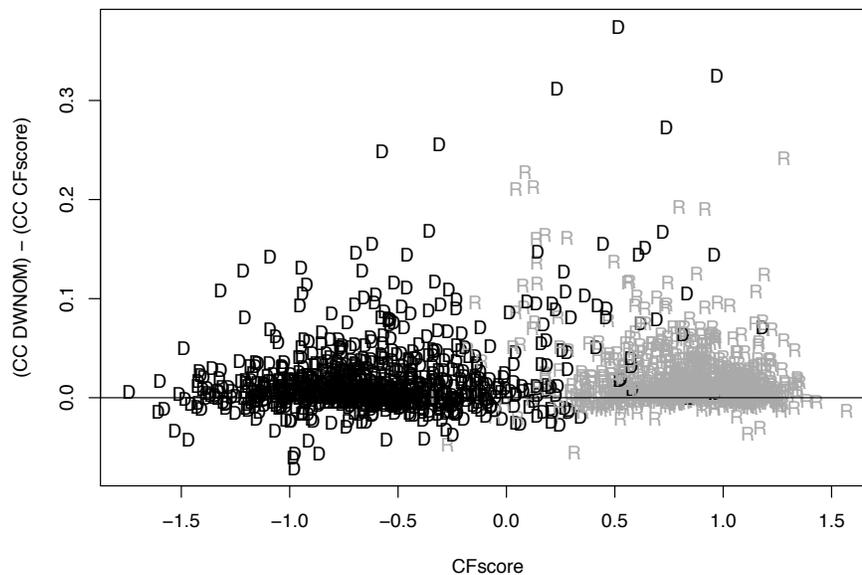


Figure 4. Increase in Correct Classification of DW-NOMINATE over CFscores

Note: The y-axis plots for each legislator the percentage of votes correctly classified by DW-NOMINATE scores less the percentage of votes correctly classified by CFscores. Values above 0 indicate the DW-NOMINATE better classifies the voting record of the legislator.

G Additional Ideal Point Comparisons

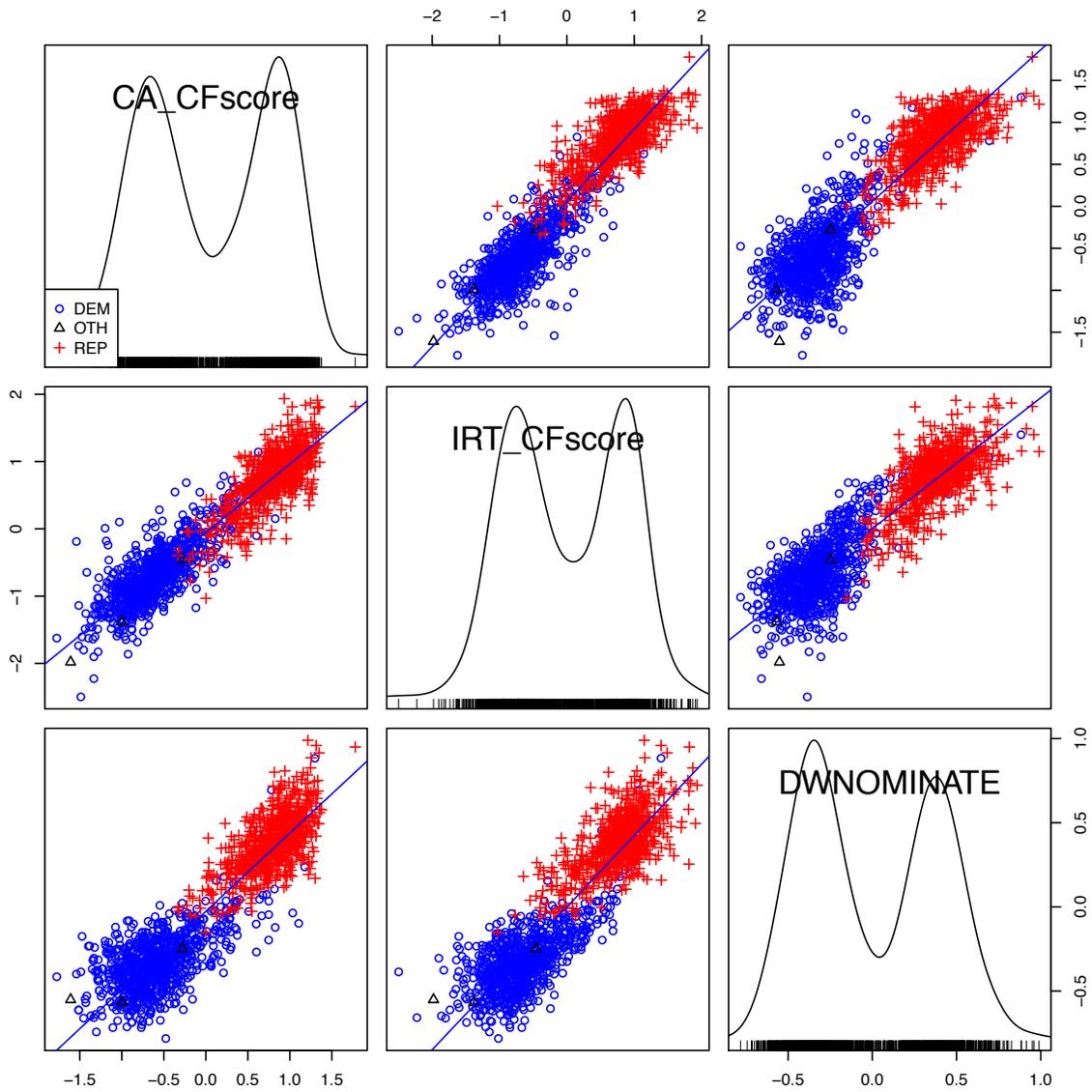


Figure 5. Comparison of common-space CFscores, scores recovered from an IRT negative binomial count model applied to PAC contributions, and DW-NOMINATE scores

Note: This figure compares the common-space CFscores for candidates CFscores with the ideal point estimates recovered from the IRT negative binomial model applied to PAC contributions. The two measures correlate at $r = 0.94$.

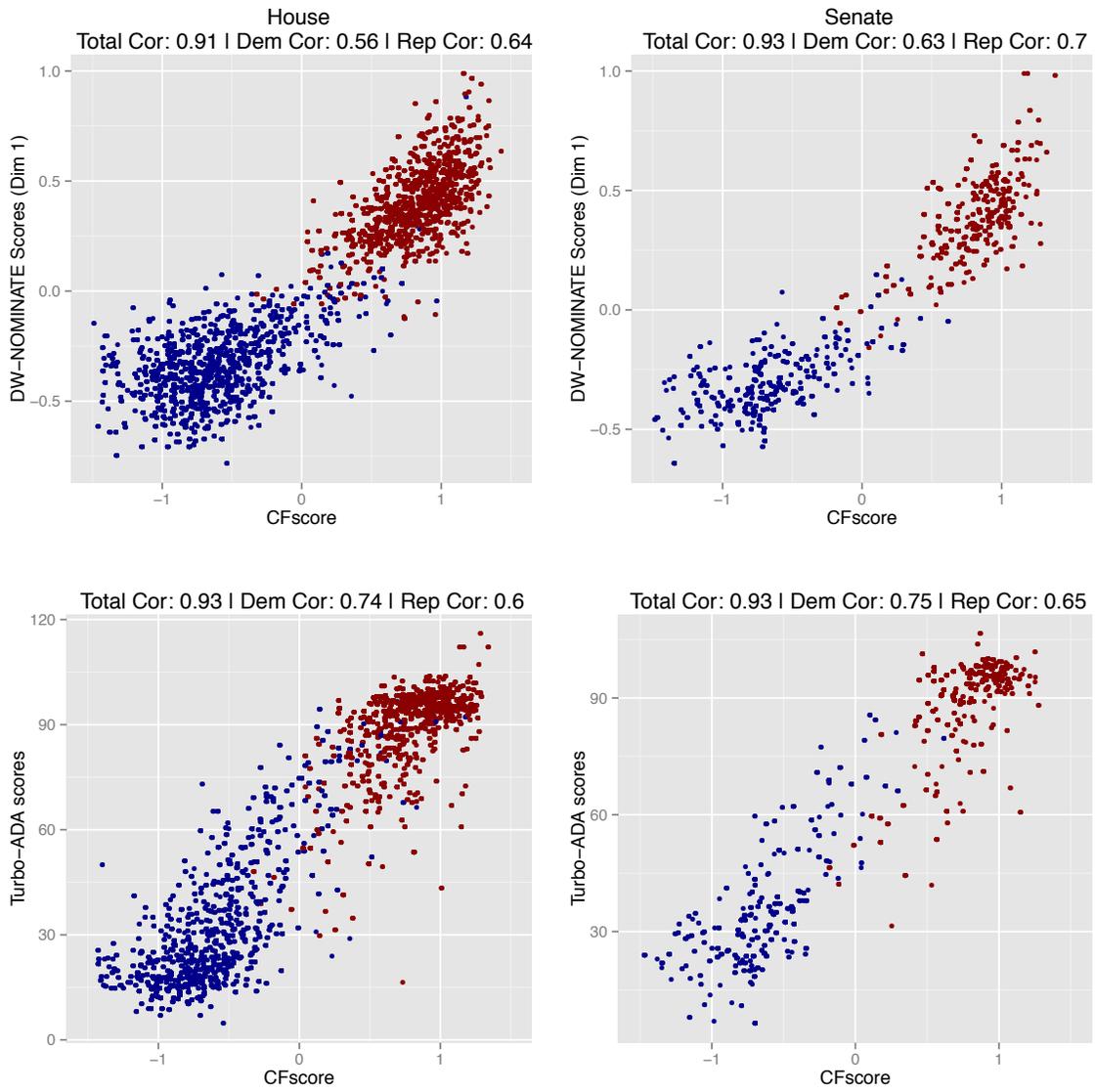


Figure 6. Comparison of common-space CFscores, Turbo-ADA, and DW-NOMINATE scores

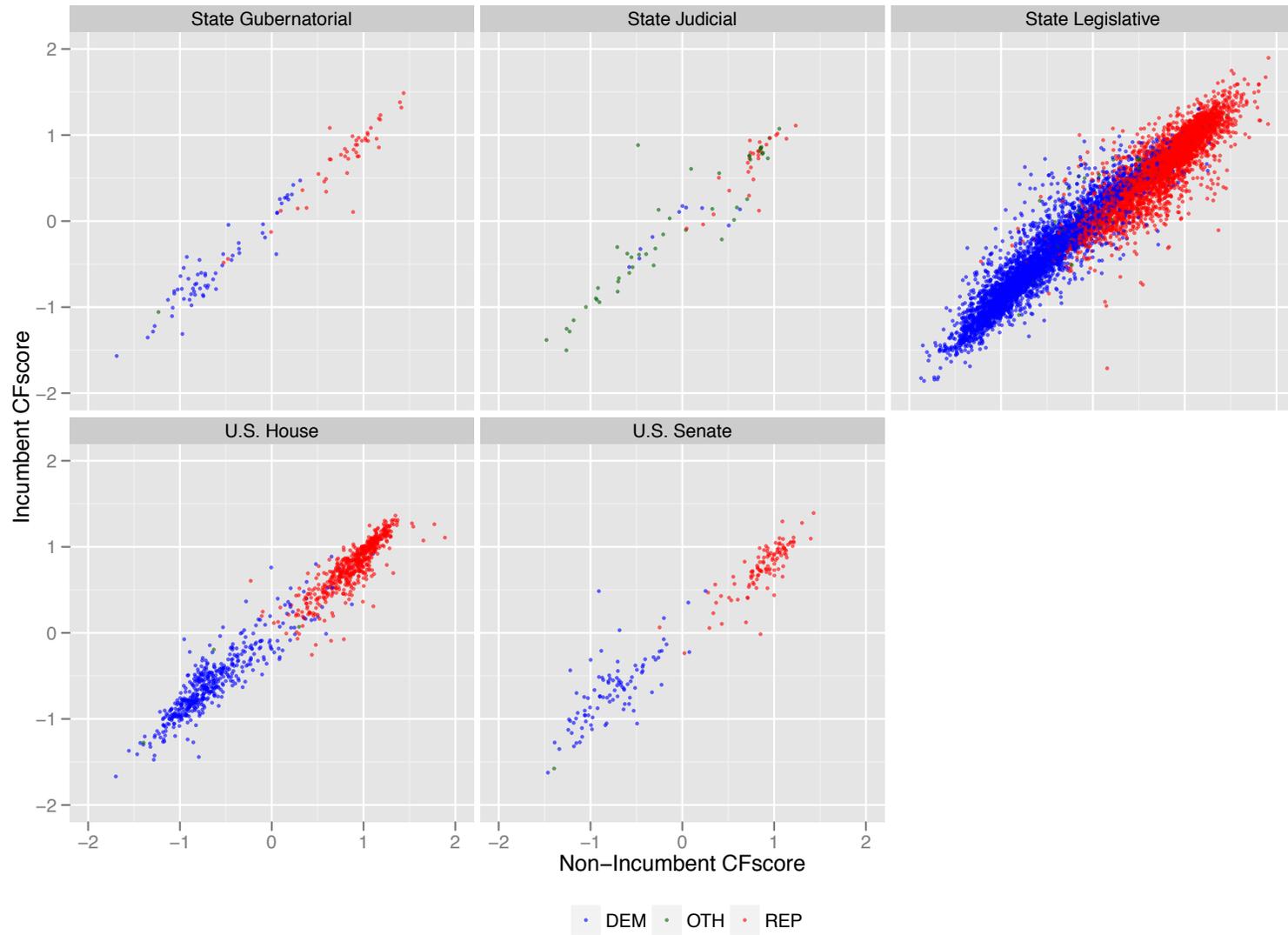


Figure 7. Candidate CFscores recovered as Incumbent as Non-incumbents by office

H Party Mean Trends

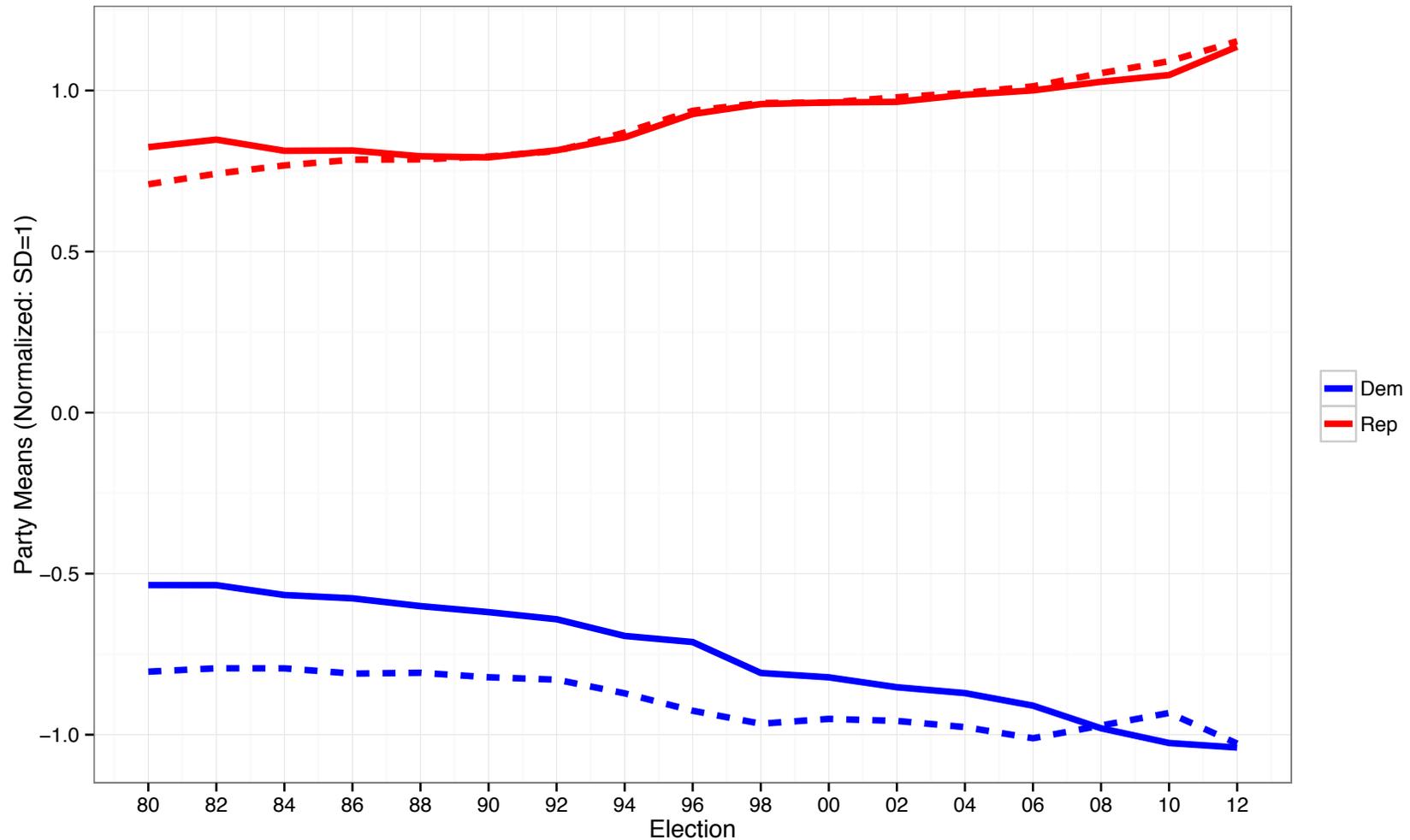


Figure 8. Comparison of Partisan Trends from CFscores and DW-NOMINATE

Note: The solid lines are the CFscore party mean and the dotted lines are the DW-NOMINATE party means. Both measures have been commonly rescaled to facilitate meaningful comparisons.

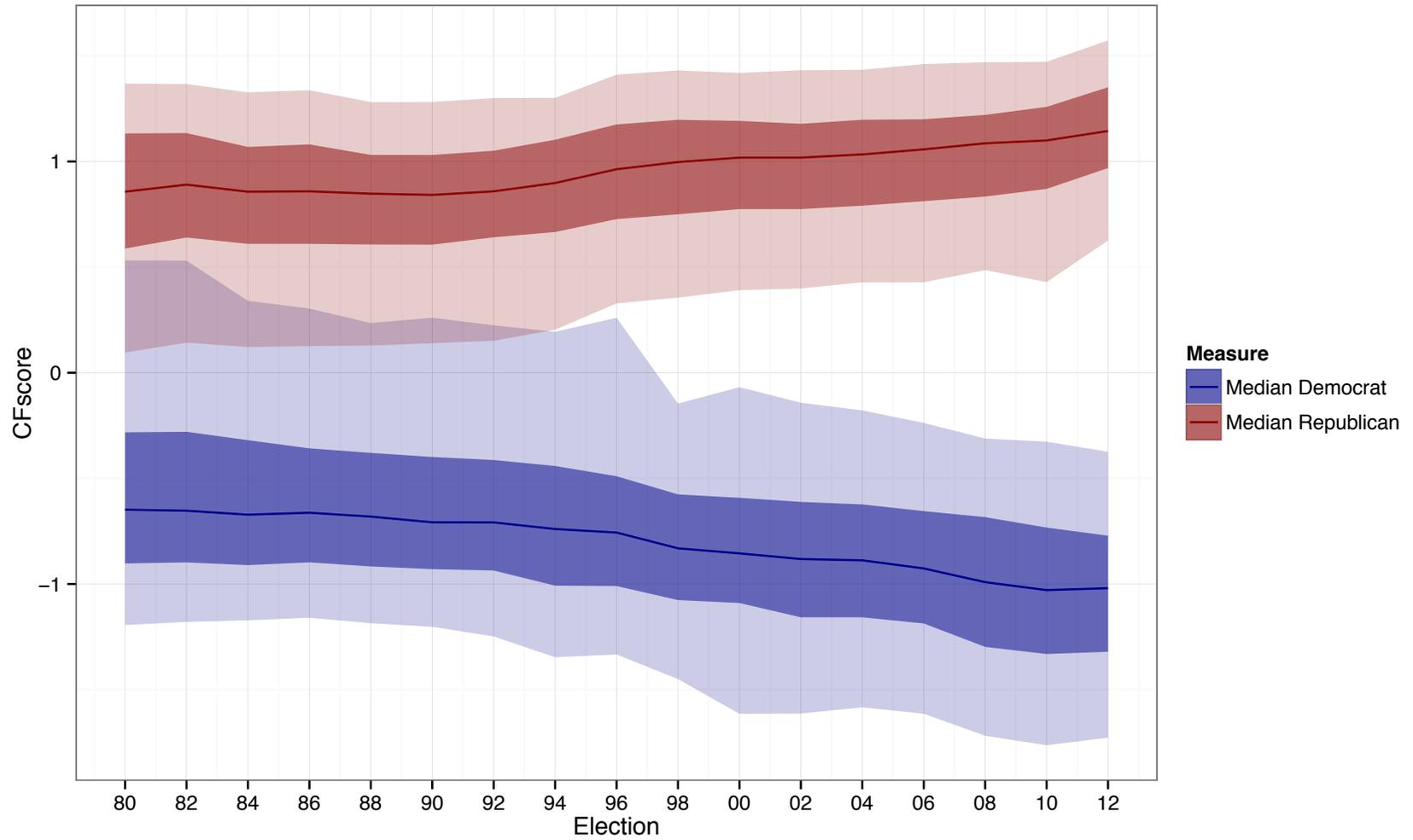


Figure 9. Party Medians and Distributions for Members of Congress

Note: Ribbon bars are plotted for the .25th to .75th and .05 to .95 percentiles for each party.

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