The Allocation of Campaign Contributions by Interest Groups and the Rise of Elite Polarization*

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*I thank Walter Mebane and Jas Sekhon for conversations and insights at critical times in this project. This work went through a number of different incarnations and benefitted at different stages from the comments of many people, including David Baron, Fred Boehmke, Sarah Cherny, Gary King, Ted Lowi, Paul Sniderman, Chris Way, and Barry Weingast, and participants at the political economy seminar at the Hoover Institute. For research assistance, I am indebted to Nidia Banelos, Katie Easterbrook, Aron Kirschner, Justin Ma. Doug Rivers, the Center for Responsive Politics, and the Federal Election Commission kindly made data available for this project. The generous financial support from the Robert Wood Johnson Foundation, the Stanford University VPUE program, and the Political Science Summer Research College directed by Michael Tomz made parts of this project possible. I am solely responsible for errors and omissions. Version 4.6

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Abstract

I demonstrate that special interest group (SIG) campaign contributions to U.S. House candidates in open seat races became increasingly partisan following the 1994 elections. Prior to 1994, SIG contributions were allocated more often to the candidates from either party who were likely to win, a pattern consistent with seeking access and influence with individual House members, and generically referred to as investor behavior. After 1994, SIGs predominantly allocated contributions across races to maximize the number of candidates elected from the party most sympathetic to the group's interests, behavior generically referred to as partisan. Business and labor groups in particular abetted the growing polarization of American politics by spending less money investing in candidates on the basis of being likely winners and more money on candidates of their preferred party in close races. I derive a unified theoretical model of contributor behavior, and develop empirical methods for distinguishing patterns of partisan and investor behavior.

1 Introduction

In the years following the 1994 Congressional elections, special interest groups (SIGs) gave greater amounts of money in a partisan manner when funding election campaigns for open U.S. House seats, in contrast to patterns of investor behavior found by Snyder (1990) during the early 1980s. SIGs increasingly eschewed spending the most money in support of sure winners from both parties in favor of spending money on candidates from their preferred party who were in the most competitive races. In so doing, SIGs primarily supported the candidates most likely to change the partisan composition of the House, and ultimately the party who controls the majority. The results presented here demonstrate that the change in the majority party not only affected the amount of money that went to candidates of each party (Cox and Magar, 1999), but also changed the way in which different types of SIGs allocated their contributions across candidates within each party. Empirically identifying a preponderance of partisan contribution behavior provides a new basis for integrating research on interest groups with research on parties, legislative organization, and policy production (e.g., Cox and McCubbins, 1993, 2006), rather than the traditional focus on finding evidence of narrow quid pro quo relationships between contributors and individual members of Congress. Once the long period of Democratic dominance in House came to an end, a partisan battle waged by SIGs reemerged as a pivotal cleavage in the financing of U.S. Congressional elections.

The changes in SIG behavior lag behind the observed trends of increasing partisan polarization in Congress since the 1970s (e.g., Poole and Rosenthal, 1997; McCarty, Poole, and Rosenthal, 2006), and increasing party unity (e.g., Rohde, 1991). While this sequence of changes is in accord with the claim that PAC contributions were not the initial stimulus of polarization (McCarty, Poole, and Rosenthal, 2006), my results demonstrate how SIG contributions in open seats now predominantly conform to a partisan cleavage. The changes in the manner interest groups allocate their contributions help to underwrite partisan polarization by spending money to maximize partisan strength and reducing spending which could cultivate bipartisan coalitions. The Political Action Committees (PACs) responsible for the increase in partisan-like spending are groups tied to business and labor interests, rather than the overtly ideological PACs, which have a relatively minor role in direct contributions to candidates. While business PAC investments in Democrats and lack of overt partisan allocations to Republicans provided a slight counterbalance to the efforts of the parties during the 1980s and early 1990s, I provide evidence where this is no longer true.

Although changes in contributor behavior have occurred among both labor and business groups, the major parties have primarily focused their threats and inducements on affecting contribution behavior of business groups. During the 1980s, Democratic Congressional Campaign Committee (DCCC) Chair Tony Coelho in particular used the threat of the party's apparent monopoly on the majority in the House to extort the support of business for Democratic candidates (Jackson, 1988; Wright, 2000).

Despite the threats and inducements, business groups nonetheless gave a greater amount of money to Republicans in open seats. Moreover I show that business contributions to Democrats were mostly given in situations when a Democratic candidates was a sure winner, and not when both parties were competitive. During this era of Democratic majorities, however, I also do not observe significant partisan support for Republicans among aggregate business interests. Following their 1994 victory of a majority in the House, Republican party leaders attempted to induce business groups to increase support for their candidates and to shun Democrats. During the same period, I observe increased contributions in a partisan manner by business to Republican open seat candidates. In contrast, the real and nominal value of business contributions to Democrats fell and the allocation became increasingly investment-oriented in appearance—supporting even more generously the Democratic candidates most likely to win.

The analytical distinction and empirical tests of the competing theories of investor and partisan contributor behavior in this paper are based on how SIGs allocate contributions across candidates in different races. The patterns of contributions are shown to give insight into the different motives for private giving in public elections. Prior research has either focused on one type of contributor behavior in isolation, or relied on ad hoc combinations of single-motive theories of contributor behavior. In this study, I derive a unified theoretical model of contributor behavior in which candidates can raise money from both investors and partisan contributors. Drawing upon the qualitative features of the unified formal model, I develop empirical methods to test for partisan or investor behavior among groups of contributors.

The results from the empirical analysis, in turn, suggest paths for future theoretical research. Given the Republican party has advanced policies that are more favorable toward business interests and Democrats have favored labor interest, there is a puzzle as to why business groups have not acted consistently over time as Republican partisans in House races. As Morton and Cameron (1992) note, SIGs may give for either investor or partisan reasons, or both, but "the circumstances in which one motivation is predominant is not well understood" (83). One answer could be a demand-side explanation of the Coelho and "K street project" variety where party leaders are able to manipulate large scale changes in the allocation strategies of SIG contributions. I propose another explanation that is not contingent on changes in group preferences or the power of persuasion of a single party's leaders: partisan support is contingent on the belief that the preferred party could win a majority of seats, and thereby provide a reasonable payoff for gambling on close races. This is not the same as the effect of changing expectations for an individual race in the context of existing theories of partisan or investor contributor behavior—in that context, the probability of a candidate being part of the majority party may increase the value of a quid pro quo relationship or the value of each seat but by construction would not alter the strategy of the contributor. A theory of conditional partisan behavior among contributors suggests new areas of research on how the alignment of interests and aggregate

election expectations affect the supply-side of contributions, in contrast to the past focus on quid pro quo relationships and the demand-side threats of party leaders.[1]

This study proceeds as follows. In the next section, I review previous studies of the effects of changes in partisan control of Congress, and their connections to campaign finance behavior. I then derive the equilibrium for a unified contributions game where both investors and partisans are potential contributors to candidates competing for elected office. In section 4, I describe a new collection of data and the research design that is the basis of the empirical tests of contributor behavior. The analysis draws upon a new project that classifies PACs by their primary interests rather than the self-designated category declared to the FEC. The research design focuses on races that were known to be open seats prior to the filing deadline for the major party primaries. In section 5, I examine the relationship between the relative allocation of contributions across candidates and expectations about the election outcomes, and draw on the qualitative features of the game's equilibrium to motivate tests based on the shapes of these relationships.

2 Partisan Politics and Campaign Finance

Any group or individual seeking the implementation of a policy through legislative action may pursue two types of action: (1) persuading existing elected representatives of the merit of the policy, or (2) (re)electing sufficient numbers of candidates who are predisposed to be in favor of the policy. Each course of action may be implemented through a variety of methods and neither course of action is in principle more socially desirable, although particular methods are condemned and prohibited by law (e.g., bribery). The manner in which interest groups allocate campaign contributions across candidates running for election will be shown to give insight into the relative importance of these two courses of action. The approach based on electoral change will be shown in this analysis to be an increasingly dominant characterization of the manner in which special interest groups allocate their money across open seat House races. Given the current concern over polarized politics, some might lament the loss of an era where quid pro quo relationships were more likely to bring together Representatives from both sides of the aisle.

The observed partisan behavior among SIGs has an understandable basis given the differences in the recent policies of each party. In particular, since the latter half of the twentieth century, there have been persistent and notable differences between the contemporary parties on public policies that

[1]The term "conditional partisan behavior" intentionally seeks to draw a connection to the conditional party government literature (e.g., Rohde, 1991; Aldrich, 1995; Cooper and Brady, 1981). Just as ambitious politicians are argued to turn to the party to achieve their goals "only when parties are useful vehicles for solving problems that cannot be solved effectively, if at all, through other means" (Aldrich, 1995, 5), the efforts by SIGs to influence a party or individual members will also vary. There is a fruitful opportunity for future research to integrate the broader insights of the conditional party literature into the study of SIG behavior.

have widespread costs and benefits for labor and business interests. Quinn and Shapiro (1991) show that Democrats and Republicans have pursued opposite policies to redistribute tax burdens between businesses and wage-earners.[2] Democrats and Republicans have also had distinctly different effects on short-term unemployment and inflation rates (Hibbs, 1987; Alesina, Roubini, and Cohen, 1997). The control of different parties has also been shown to influence the decisions of regulatory agencies that affect the balance between business and labor interests, such as the membership and decisions of the National Labor Relations Board (Moe, 1985; Cooke et al., 1995). Of course, the particular alignments of groups and parties are not intrinsic, and over long historical periods the espousal of particular economic policies by parties is subject to variations and reversals (Keech, 1995). And over shorter periods the policies enacted by government are also subject to variations in control of different branches (Fiorina, 1992; Alesina and Rosenthal, 1995) or the promises made in particular election campaigns (Alt, 1985). Overall, the contemporary pattern of differences in economic outcomes provide the basis for expecting different partisan preferences among business and labor groups, all else being equal. As such, I will refer to the Republican party as the preferred party of business, and the Democratic party as the preferred party of labor. However, the dominant pursuit of partisan advantage via contribution allocations by business PACs are not seen until the Republicans win the House majority in 1994.

Preferences are essential for putting into context how groups behave and how their behavior changes. Much has been made of the Republican leadership's "K street" project and their simultaneous efforts to increase the level of business PACs contributions to Republicans and reduce contributions to Democrats (e.g., Hacker and Pierson, 2005). The implied threat by Republicans was that business groups that failed to comply could credibly be excluded from access and influence in the Republican majority House. Business groups increased the relative amounts of money given to Republicans compared to Democrats, but business also changed how they allocated money across Republican candidates. I show that while business money was predominantly investor oriented in the years prior to 1994, it experienced a significant shift to being partisan after the Republicans took the majority. A question that is raised by these results is why business groups did not allocate the money they were already giving in a manner that would maximize the chance of Republicans winning additional seats throughout the 1980s and 1990s.

The new Republican majority's efforts to influence SIG contributions are also coincident with the loss of credibility of the earlier threats by Democrats that they would control the majority in the House in the foreseeable future and punish businesses who did not support Democratic candidates. Despite the attention on Republican efforts, the prior effectiveness of the Democratic party's efforts to influence business behavior is perhaps more striking than the later responsiveness of business to

[2]The evidence for the influence of the number of business PACs on policy was mixed in their study spanning the years 1954–79, and subject to substantial criticisms (Williams and Collins, 1997). However, the association of benefits to different groups under each party is uncontested by both Quinn and Shapiro (1991) and Williams and Collins (1997).

Republican leadership efforts in light of the policy differences between the parties. In contrast to the demand-side explanations that hinge on the ability of each party to have lopsided influence over PACs at different times, I offer the alternative explanation that hinges on the probability that Republicans could win a majority in the House. The lower the expectations that Republicans could win a majority, the lower the incentive for business groups to focus their resources on Republicans in risky, close races.

In contrast to business groups, labor groups have consistently been the largest supporter of Democrats and supported their candidates in a partisan manner. The amount labor groups have given to Republicans is tiny, has generally come from a small set of unions, and is given in an investor manner. While labor has not changed the qualitative pattern of their contributions during the periods studied, labor groups did adjust on the margin how they allocated money after the Democratic loss of the House majority. The AFL-CIO concentrated decision making authority over direct contributions since the 1996 election cycle (Gerber, 1999, 82), and I show that this coincided with increased partisan-like contribution behavior among labor PACs. These changes were part of a wider political effort on the part of the AFL-CIO that also included well-funded political education campaigns (Jacobson, 1999).

Studies that have used campaign finance behavior to understand the impact of partisan change or partisan polarization have generally focused on contributions to incumbents. McCarty, Poole, and Rosenthal (2006) show that while there is increasing ideological consistency of campaign contributions, as measured by the declining variance of ideal points of recipient incumbents, they also argue that PACs adopting investor behavior still outnumber and out-give those groups who give in a partisan manner.[3] Cox and Magar (1999) showed how the average amount of money given to candidates in each party changed with the change of the majority party in the House following 1994 elections. Other statistical analysis of contributor behavior in the allocation of contributions have also generally relied on races with incumbents (e.g., Welch, 1980; Poole and Romer, 1985; Poole, Romer, and Rosenthal, 1987). The universe of races with incumbents, however, is mostly composed of races where one candidate (i.e., the incumbent) is usually electorally safe and the marginal contribution is least likely to affect an election outcome.

In contrast to studies that focus on contributions to incumbents or the difference between incumbent versus non-incumbent candidates, this study considers how groups allocate money in open seats. The previous empirical research closest to this study has also relied on open seats (Snyder, 1990). The restriction to open seats focuses the analysis on contributions given for prospective benefits whose ex-

[3]Investigations of investor behavior in which contributors are hypothesized to buy legislative votes have provided weak and mixed results. See Table 1 in Ansolabehere, de Figueiredo, and Snyder (2003) for a summary of nearly 40 studies. The strongest evidence of other forms of legislative influence is provided by Hall and Wayman's (1990) analysis of the allocation of time and effort by House Representatives. Given the legal prohibitions and the likely reluctance of most politicians to enter into explicit quid pro quo relationships, the difficulty of finding obvious links between money and influence is not surprising.

pected value is a function of the probability of a candidate winning. Candidates in these districts are also more comparable in their baseline characteristics, in particular none have seniority in the House. The main feature that is not constant is the likelihood of being a member of the majority party, and the empirical analysis considers elections by periods of the majority party as a rough proxy for these differences. While pure open seats constitute less than ten percent of races, they are more likely to be competitive than races with incumbents and the primary conduit for membership change in the House. In recent years, over two-thirds of House members were initially elected in open seat races (Gaddie and Bullock, 2000). Understanding open seat races is a major component of understanding changes in the composition of Representatives in the House and partisan polarization.

My approach to empirically testing the theories is most similar to previous work based on formal political asset models that imply how contributors would spend their money under the premise of investor motives (e.g., Snyder, 1990). However, unlike previous studies that focus on a single-theory of contributor behavior, this analysis is able to posit specific alternatives against which to evaluate a maintained hypothesis. Empirically, the analysis allows for the possibility that groups give to candidates of one party predominantly with one motive and have another predominant motive when giving to candidates of the other party. Groups seeking to maximize the number of Democrats elected may still give to Republicans who are sure winners. Thus, groups may be designated as pursuing a partisan strategy when giving to Democrats and acting as investors when giving to Republicans. Other groups may be Republican partisans and invest in Democrats, or indeed act as investors when giving to candidates of both parties.

3 Unified Game of Partisans and Investors

A key feature of the unified game derived in this section is the modeling of separate investor contributor and partisan contributor players, each of whom is a potential financial supporter of a particular candidate. In contrast, existing formal analysis have extended single motive models by means of endowing individual players with multiple strategies: a candidate may sell services and also self-finance as a partisan (Baron, 1989a), or an investor may also give extra money to improve the odds of a candidate winning (Grossman and Helpman, 1996, 2001; Levitt, 1998). The current model highlights how players with competing motives will interact and allocate money in equilibrium rather than how players choose particular motives.

The unified game draws on the functional forms of canonical models of investor behavior (Baron, 1989a) and partisan behavior (Snyder, 1989). As in the original single-motive game, I treat the partisan group supporting each candidate as a unitary actor who decides how much to contribute.[4] A core

[4] As such, the problem of collective action is not modeled; incorporating a framework such as Austen-Smith's (1981) remains an area for future research.

feature of the equilibrium partisan behavior found in the single-motive model still holds in the interior equilibrium of this unified game. Specifically, the original quadratic relationship between money and expectation remains, although in the joint game partisans subtract a fraction of the expected investor money. The investor behavior in the joint equilibrium is distinct from the investor-only model of Baron (1989a), but is similar to the equilibria posited in the investor-only model of Snyder (1990) and derived in a variation of the game by Baron (1989a) where a candidate is also able to self-finance.

3.1 The Model

The game considers an election with two candidates, identified by Democratic (d) and Republican (r) party labels, each of whom desires the utility of winning office. The source of the utility may be a function of such things as the desire to shape legislation, the opportunity cost of holding office, or the long-term income streams from future lobbying after holding office. This utility is fixed prior to the election campaign for each candidate.

The other players in the game are four sets of potential contributors, each with either an investor or partisan motive for supporting a particular candidate. A candidate may raise money from her investors by selling promises of costly services. A candidate may also receive money from her group of partisans. The probability of a candidate winning the election is a function of exogenous characteristics of the district and fixed differences between the candidates, as well as the total amount of money each candidate raises from contributors. The utility functions and fixed exogenous parameters of the game are common knowledge, as are the facts that both investor and partisan money is available to fund individual candidates and all money raised by the candidates affects the probability of each candidate winning.

The game proceeds in two stages. The sequence is begun by each candidates making a private take-it-or-leave-it offer of a specific contribution-service pair to her set of potential investors. This is followed by the simultaneous contribution decisions of all potential contributors. The post-election fulfillment of the promises of services to investors is assumed to be credible.[5]

The formulation of this game focuses on the relationship between the competitiveness of candidates and their ability to raise electoral resources. In contrast to games where candidates compete over policy locations, these choices are captured by the utility parameters and not modeled. All promises of service are assumed to be either sufficiently small or difficult to detect such that they have no impact on the outcome of the race, except through the marginal provision of financial resources to the candidates.[6]

The service-contribution combination offered by candidate i is denoted by (s_i, c_i), where s_i is

[5]For an analysis of the credibility of promises see Baron (1989b).

[6]Other models have examined the relationship between service and outcomes, where the type and level of service to investors does have a potential effect on the electoral outcome. See in particular Baron (1994) and Mebane (1999).

the total value of services promised and c_i is the total value of the contribution amount set by the candidate. If no services are offered ($s_i = 0$), then no investor money will be raised. If an investor gives at least the required contribution amount specified by the candidate *and* the candidate wins the election, then the investor will receive the services promised by the candidate. The usefulness of these services is not equal across investors, and the type of investor k is represented by their intensity of desire for the service $\theta_{ik} \in (0, 1)$. The expected utility of each investor k is,

ASSUMPTION (A.1): $EU^I_{ik} = p_i s^a_i \theta_{ik} - x_{ik}$.

The probability that candidate i will win is denoted as p_i and the amount of money that investor k contributes is denoted as x_{ik}. The translation of services into utility may not be perfect, and the parameter $a \in (0, 1)$ takes into account the efficacy of the translation process: a approaching 1 is perfect efficiency and a approaching 0 is total failure to translate services into useful benefits.

The proportion of investors who will accept her service-contribution offer depends on the distribution of investor types θ. Following Baron (1989a), a closed form solution is provided by assuming for each candidate a uniform distribution of potential investors, $F(\theta_i) = \theta_i \in (0, 1)$. Note that for any given contribution pair (s_i, c_i) there exists a pivotal threshold of $\hat{\theta}_i$ such that all investors $\theta_{ik} > \hat{\theta}_i$ will contribute to the candidate; see Baron (1989a) and the Appendix for details. Thus, although θ is a continuous variable, there will be only two types of behavior observed (contribute the minimum or nothing). The total investor money in the district is,

$$X_i = c_i \int_{\hat{\theta}_i}^{1} f(\theta_i) d\theta_i = c_i[1 - F(\hat{\theta}(s_i, c_i; p_i))] = c_i(1 - \hat{\theta}_i) \tag{1}$$

A candidate derives utility from winning office, V_i, less the cost of providing the services promised ($b_i s_i(1 - \hat{\theta})$). The parameter b_i is the marginal cost of the providing services. If a candidate does not win, she neither receives the benefits of office nor provides the costly services promised. The expected utility of a candidate is,

ASSUMPTION (A.2): $EU^C_i = p_i(V_i - b_i s_i \left[1 - \hat{\theta}_i\right])$.

Partisans seek the utility of a seat, W, which reflects the value placed on the improved chances of obtaining the announced policy of the supported party. The marginal cost k_i of fundraising reflects the expenses of such activities as direct mail solicitations to individuals or the opportunity cost of allocating money to a political action committee budget. The expected utility of the partisan group for candidate i is,

ASSUMPTION (A.3): $EU^P_i = W p_i - k_i Y_i$.

For both investors and partisans, giving money is the only choice that can be made; it is not possible for a potential contributor to take money away from a candidate, thus,

ASSUMPTION (A.4): $Y_i \geq 0,\ x_{ik} \geq 0 \quad i \in \{d, r\}$.

The translation of money into votes on election day is not modeled, and instead the mapping between money and election outcome is represented by a standard reduced form equation of the probability of candidate d winning. A similar equation has been used previously, for example, in Baron (1989a,b, 1994) and Snyder (1989); for interpretations and history of the use of this election function see Baron (1989, 49). The competitiveness of the race is represented by the parameter β which ranges from 0 to 1. The Democratic candidate tends toward being a sure winner as β approaches 1, while conversely the Republican candidate is increasingly advantaged as β approaches 0. A neutral race exists when $\beta = \frac{1}{2}$. The function for the probability of the Democratic candidate winning is,

$$\text{Assumption (A.5):} \quad p_d \equiv 1 - p_r = \frac{\beta Z_d}{\beta Z_d + (1-\beta) Z_r} \qquad \beta \in (0,1).$$

The total resources available to each candidate are the weighted sum of the money raised from investor and partisan contributors,

$$Z_i = X_i + \lambda Y_i \qquad \lambda > 0, \quad i \in \{d, r\}. \tag{2}$$

The λ parameter allows for the possibility that contributions from partisans is associated with other unobserved electoral benefits, such as the electoral value of the endorsement from receiving money from particular groups. Additionally, though outside the scope of the formal description of this model, the multiplier could be used to represent other efforts by the groups, including voter mobilization efforts on behalf of the supported candidate (Jacobson, 1985–86, 612).

3.2 Allocation of contributions

Partisans contribute an amount of money such that the marginal utility of their spending is equal to the marginal cost of raising money. Given values $\bar{p}_d$, $\bar{X}_d$, and $\bar{X}_r$, partisans can solve $\partial EU_i^P / \partial Y_i = 0$ for their optimal contribution amount,

$$Y_i^* = \frac{W}{k_i} \bar{p}_d (1 - \bar{p}_d) - \bar{X}_i / \lambda. \tag{3}$$

Partisans, in part, "free-ride" on the efforts of investors, treating the investor money $\bar{X}_i$ as a partial substitute for their own resources. In cases were the investor money $\bar{X}_i$ is sufficiently large to make the amount Y_i^* negative, then no contribution is made,

$$\bar{Y}_i \;=\; \begin{cases} Y_i^* & \text{if } Y_i^* \geq 0 \\ 0 & \text{otherwise.} \end{cases} \tag{4}$$

In the cases where partisan supporters of each candidate choose to give money, $\bar{Y}_i > 0$, $\forall i \in \{d, r\}$,

substituting $\bar{Y}_d$ and $\bar{Y}_r$ into (A.5) and equating $p_d = \bar{p}_d$ yields,

$$\begin{aligned}\bar{p}_d &= \frac{\beta(\bar{X}_d + \lambda\frac{W}{k_d}\bar{p}_d(1-\bar{p}_d) - \bar{X}_d)}{\beta(\bar{X}_d + \lambda\frac{W}{k_d}\bar{p}_d(1-\bar{p}_d) - \bar{X}_d) + (1-\beta)(\bar{X}_r + \lambda\frac{W}{k_r}\bar{p}_d(1-\bar{p}_d) - \bar{X}_r)} \\ &= \frac{\beta k_r}{\beta k_d + (1-\beta)k_r}. \end{aligned} \tag{5}$$

The probability of the Democrat winning, $\bar{p}_d$, is determined by the marginal costs of partisan fundraising and the competitiveness of the district. This is the same equilibrium result as derived by Snyder (1989).

A closed form solution for the equilibrium amount of services can be derived for the case where $a = 1/2$ and both partisans contribute positive amounts. In this context, the equilibrium service is,

$$\bar{s}_i = \left(\frac{1}{2b_i k_i}\right)^2 \left((81 b_i^2 W^2 \lambda^2 + 12 b_i k_i^2 V_i)^{1/2} - 9 b_i W \lambda\right)^2 \tag{6}$$

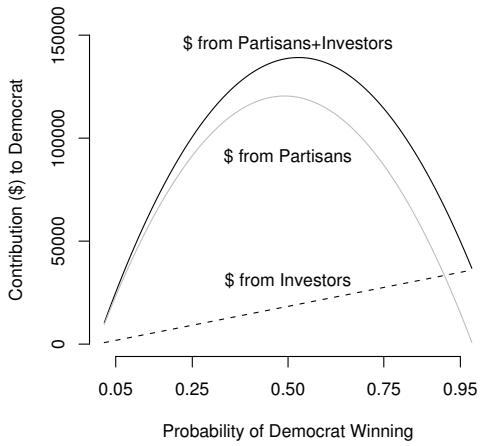
which is a function of only exogenous variables and is therefore a constant. Unsurprisingly, the amount of service promised increases with a candidate's utility from the seat ($\partial s_i/\partial V_i > 0$) and decreases with the marginal cost of providing the service ($\partial s_i/\partial b_i < 0$). The parameters which make partisan money more plentiful or more valuable also reduces the need for selling service to investors. The amount of service promised decreases with the value of winning to the partisan group ($\partial s_i/\partial W < 0$) and increases with the marginal cost of fundraising ($\partial s_i/\partial k_i > 0$). Service is also reduced as the multiplier to partisan money increases ($\partial s_i/\partial \lambda < 0$).

The equilibrium contribution amount is,

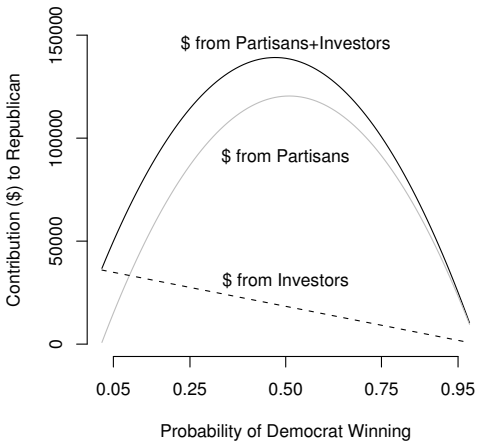
$$\bar{c}_i = \bar{p}_i \; \bar{s}_i^a \hat{\theta} \tag{7}$$

where both $\bar{s}_i^a$ and $\hat{\theta} = \frac{1}{2-a}$ are constants determined by exogenous variables. The equilibrium total contributions from investors are thus $\bar{X}_d = \bar{p}_d \; \bar{s}_d^a \; \frac{1-a}{(2-a)^2}$ and $\bar{X}_r = (1-\bar{p}_d) \; \bar{s}_r^a \; \frac{1-a}{(2-a)^2}$. These contribution totals are simply linear functions of the equilibrium probability of winning. The derivations of $\bar{s}$ and $\hat{\theta}$ are presented in the Appendix. These results can be summarized as,

Proposition 1. *For the game defined by Assumptions (A.1)–(A.5), an interior Nash equilibrium* $(\bar{s}_d, \bar{s}_r, \bar{c}_d, \bar{c}_r, \bar{Y}_d, \bar{Y}_r, \bar{p}_d)$ *is characterized by equations (3)–(7). In an interior equilibrium,*
(a) partisans allocate their resources as a quadratic function of the probability of a candidate winning, and treat investor money to their preferred candidate as a partial substitute for their own resources;
(b) the probability of a candidate winning is determined by the marginal costs of partisan fundraising and the competitiveness of the district;
(c) the promised amount of service is a fixed amount determined by exogenous parameters; and
(d) the amount of investor money to a candidate is a linearly increasing function of the candidate's probability of winning.



(a) Decomposition of Democratic money



(b) Decomposition of Republican money

FIGURE 1: Relationship between the probability of Democratic candidate winning, the total money raised from different sources by each candidate in a district from different sources.
Source: Equilibria of unified model with $V_d/b_d = V_r/b_r$ and $W/k_d = W/k_r$; see footnote 7 for details.

Assuming evenly matched contributors available to fund each candidate ($V_d/b_d = V_r/b_r$ and $k_d = k_r$), Figures 1(a) and 1(b) illustrate the equilibrium relationship between a candidate's probability of winning and the level of support from investors and partisans when both investors and investors support each candidate ($\bar{Y}_i > 0$ and $\bar{X}_i > 0$).[7] In these figures, the variation in the probability in winning is determined by differences in the relative competitiveness of the candidates β, and in this case with $k_d = k_r$ the equality $\beta = \bar{p}_d$ holds. The curves of the contributions to the Republican are the mirror image of the curves of the contributions to the Democrat.

Figure 2 plots equilibrium relationships from single motive games of investor and partisan behavior. These figures illustrate features which may distinguish the unified game and single motive game. In comparison with Snyder's (1989) partisan-only results, changes in the allocation decisions of partisans arise in the joint equilibrium because partisan contributors treat the money raised by a candidate from investors as a partial substitute for their money. Partisan behavior still forms a single-peaked curve, but is offset toward expected losers due to more likely winners receiving greater amounts of investor money. At either extreme of competitive advantage and disadvantage, partisans

[7]The values are $V_d = V_r = 1e6$, $b_d = b_r = 1e-6$, $W_d = W_r = 4e5$, $k_d = k_r = 0.8$, $\lambda = 4$, $a = 1/2$. The candidate utility V_j was chosen from the lower range of the estimated value of a House seat (Groseclose and Milyo, 1999). The other values were chosen to approximate the curves found for business PACS contributions in 1996. Business PACs gave on average approximately $120,000 to Republicans in close races, and a similar peak value was used for the partisan curves. Business PACs gave on average approximately $30,000 to Democrats in races where they are clearly favored to win, and a similar peak value is used for the investor curves.

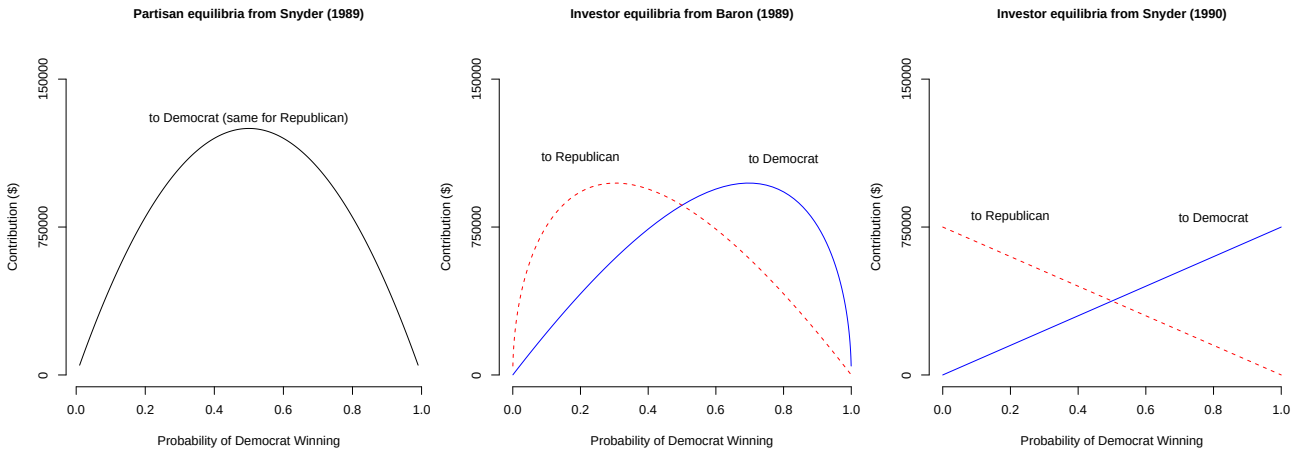


FIGURE 2: Alternative equilibrium relationships between the probability of Democratic candidate winning and the total money raised from different sources by each candidate in a district from different sources.

still give little money in equilibrium, but as a preferred candidate becomes more advantaged partisans pull back more resources.

In equilibrium, investors give an amount of money that is linearly increasing in the probability of victory by the recipient candidate. This comparative static is similar to that posited in the investor-only game of Snyder (1990) and derived in a variation of the game by Baron (1989a) in which a candidate is also able to self-finance. In contrast, the comparative statics from the investor-only model of Baron (1989a) showed incumbents with a competitive advantage reducing both the amount of service offered and the amount of money they raised.

Observing a monotonic relationship between the probability of winning and the amount of money given would provide support for investor-only behavior as proposed by Snyder (1990). However, observing only unimodal relationships would not enable us to distinguish a partisans-only theory (Snyder 1989) from an investors-only theory (Baron 1989) without additional assumptions that identified tests based on the location of the mode. The joint game is distinguished by the proposal that that there are two sets of contributors for each candidate, one that will give monotonically and another that will give unimodally with respect to the probability of winning.

In translating the theoretical model to an empirical test of contributor behavior, I will discuss how the parametric assumptions can be relaxed. Because of the limitations of the available measures for probability of a candidate winning, only the features of the quadratic and linear forms that are preserved up to a monotonic transformation will be evaluated empirically. As such, the key features of Figures 1(a) and 1(b) that distinguish the two types of contributor behavior are the unimodal partisan behavior and the monotonically increasing (or decreasing) investor behavior.

	Departing Incumbent			
	Democratic	Republican	New Seat	Total
1980	19	13	0	32
1982	15	13	22	50
1984	9	12	0	21
1986	16	19	0	35
1988	7	13	0	20
1990	7	16	0	23
1992	25	18	20	63
1994	26	19	0	45
1996	27	17	0	44
1998	13	14	0	27
2000	7	22	0	29
2002	8	17	14	39

TABLE 1: Number of pure open seats by year and party of departing incumbent.

4 DATA

To empirically investigate the motives of special interest groups who make campaign contributions, I draw upon data from U.S. House of Representatives elections and PAC contributions spanning the years 1980 to 2002. The research design of this study focuses attention on races in which the costs and benefits of supporting a candidate are primarily prospective by analyzing open seat races. The design further seeks to consider only cases in which each party had the opportunity to field their best candidate(s) in the absence of an incumbent by restricting analysis to "pure" open seats, in which no incumbent filed to compete in the primary or general election. Excluded from the analysis are cases in which the incumbent died or decided not to seek reelection after filing for the primary election, or the incumbent was defeated in the primary. Also excluded are districts in which a candidate publicly renounced money from PACs. In years with redistricting there may be no identifiable incumbent for a new district, the selection criterion is the same: districts in which no sitting member of the House chose to file for the election are used in this analysis. In the context of this study, the exclusion of sitting members has less to do with whether they are facing the same electorate than with their having the opportunity to perform service for potential contributors prior to the election. On average, 36 "pure" open seats per election have met these criteria since 1980. These races are found to be evenly divided with respect to the partisanship of the departing incumbent: each party loses on average 15–16 incumbents per election cycle prior to the filing deadlines for the primary. The number of open seats by year and party of the departing incumbent are shown in Table 1.

The analysis of open seats is advantageous for empirically testing theories of contributor behavior because it helps to minimize the number of potential alternative motivations for giving. With con-

tributions to incumbents it is not possible to distinguish among money given for legislative behavior which has been performed in the past, for action contemporaneous with a contribution, or for something which is contingent upon winning the next election. Only for this last case does the formal model presented in Section 2 provide insight; the same is also true for the antecedent single-motive formal models. The restriction to open seats focuses the analysis on contributions given for prospective benefits whose expected value is a function of the probability of a candidate winning.

Unlike previous studies of aggregate contributions, this analysis does not rely on the designations published by the Federal Election Commission (FEC) to classify PACs. The FEC classifications are broad and non-exclusive, and their meaning is further complicated by the self-selection of a category by each individual PAC. The problem of self-designation has has been noted for a long time (Sabato, 1984, 11), and has remained an unresolved issue (Gais, 1996, 49). In the FEC classification, ideological and single interest groups that are incorporated and multinational conglomerates can all share the designation of a corporation. An association of manufacturing companies and an association of dental hygienists can both have the designation of a trade group.

My re-classification of each PAC is determined by the types of organizations and interests that it represents. The categories at the highest level of aggregation remove ambiguities while retaining parallels to the standard self-designated FEC classifications. The new categories include business, labor, ideological and single interest, healthcare, lawyers/lobbyists. While my classifications and the FEC classifications group together many of the same PACs, there are also notable differences between the two coding schemes.

The business category of PACs includes individual companies, trade or membership groups of businesses, and groups of individuals in which the group is primarily identified as representing the interest of a business, an industry, or business development in general. Corporations without stock and cooperatives that represent businesses or associations of business are generally found to be part of the business category. Most groups classified as Trade/Membership/Health in FEC reports are found to be business related PACs. Treated as distinct from the designation of business are law firms, lobbying firms, health care providers, and most trade groups of individual professionals. Lawyers and lobbyists are placed in their category since they may represent (and spend money to advance) multiple points of view of different clients, or to advance their own interests. Groups of health providers, such as hospitals and physicians, are placed in their own category since in many cases they are difficult to classify as business or labor interests. This is also true of some trade groups of professionals. My re-classification of labor PACs generally matches the designations by the FEC.

The new categories provide a coherent path for future studies of less aggregated groups, thus avoiding a problem that industries have PACs in a number of aggregate FEC classifications. However, the key results of this current analysis do not hinge on the use of the aggregate re-classifications. The same conclusions can be drawn using the basic FEC classification of labor and corporate groups. A

summary of the re-classifications is presented in the Appendix.

The itemized money business and labor groups spend in pure open seats during the *general election* period is used as the basis for considering whether their allocations of contributions are consistent with investor or partisan motives. The restriction to itemized contributions in the general election period avoids pooling expensive intraparty competitions with the interparty competition that is the subject of this paper. This use of money given during the general election period, rather than the sum of money given during the entire election, also better matches the measure of general election expectations that are employed in this study. Table 2 summarizes the average itemized contributions given to a major party candidate during the general election period by election year, source, and party of the recipient. In addition to data from business and labor PACs, itemized contributions data from other PACs, official national party committees, and individuals[8] are also summarized for comparison. The columns for total money represent the average sum of itemized contributions to candidates from all sources, including those not enumerated in the table. All money is presented in unadjusted nominal values.

Business PACs have given more money to Republican than Democratic candidates in each election. Although the amount business groups spent on Democratic candidates peaked in the early 1990s, the overwhelming ascendancy of Republican support was reestablished in 1998. In 2000 business spent on average 17 times more on a Republican candidate in a pure open seat than on a Democratic candidate. In contrast, labor unions mainly give to Democrats, and the relative difference between the support for candidates from each party is even larger. These disparities between the amounts these groups give to each party have often been used as evidence of the partisan preferences of the SIGs (e.g., Sorauf, 1992), however these totals do not provide insight into how the money was allocated across races—all the money given to candidates by these sources could be entirely investor-oriented.

The money from business and labor groups constitute on average about one third of the itemized money raised by a candidate during the general election period. Ideological and single issue PACs and healthcare PACs are the next largest sets of SIGs and they are considerably less on average than business and labor PACs. Lawyer and lobbyist PACs provide even less money on average in these races. Official national party committees provide a token amount of direct financial support to candidates, and this amount has been on the decline since the 1990s, particularly among the Democrats. At the same time, leadership PACs formed by Representatives and party officials are sometimes more generous, but also more variable in their average contributions from election to election.

The largest source of money comes is individuals. Some of these individuals are executives or leaders in business and labor organizations which also have PACs, but their money is not counted in this study as part of the SIG contributions. It has been argued that SIG money is of diminished importance since it is a smaller fraction of an average candidate's resources than the amount from

[8]Small individual contributions are not itemized, and therefore the total amount of individual contributions are only summarized by the reporting periods of each candidate.

Contributors:	Business		Labor		Ideology/Single		Healthcare	
Candidates:	Dem	Rep	Dem	Rep	Dem	Rep	Dem	Rep
1980	7	42	19	0	3	7	1	4
1982	13	42	30	1	7	9	1	4
1984	8	76	42	1	9	16	2	5
1986	13	57	54	1	15	13	4	6
1988	20	58	64	2	17	13	4	7
1990	28	73	60	2	20	10	6	6
1992	23	48	47	1	15	6	7	7
1994	22	73	63	1	11	7	7	8
1996	26	82	70	1	11	8	7	8
1998	21	125	80	3	22	14	6	8
2000	10	174	85	2	26	25	6	14
Contributors:	Official Party		Leadership		Individuals		All sources	
Candidates:	Dem	Rep	Dem	Rep	Dem	Rep	Dem	Rep
1980	4	12	0	1	16	20	52	90
1982	3	16	2	2	20	30	81	107
1984	8	17	2	8	35	39	112	169
1986	4	11	10	8	31	54	141	157
1988	8	20	13	6	37	74	176	184
1990	4	15	6	4	55	86	189	202
1992	4	6	2	1	65	74	173	147
1994	5	8	8	7	86	117	212	234
1996	5	13	5	16	116	135	263	282
1998	3	10	13	43	145	148	315	365
2000	3	10	26	53	176	241	356	543

TABLE 2: Average amount of money ($1000s) contributed during the general election period to each party's candidate running for an open US House election, by year and types of groups. Dem = Democratic candidate; Rep = Republican candidate. Source: calculations based on FEC itemized contributions from qualified PACs and party committees, and individuals.

individuals, which are presumed to be given without ties. In the context of Tullock's puzzle, Ansolabehere, de Figueiredo, and Snyder (2003) state that "interest group contributions—the 'investors' in the political arena—have little leverage because politicians can raise sufficient funds from individual contributors" (116). This assertion that politicians could raise sufficient funds from individuals alone is in need of further empirical evidence. Given the widespread unpopularity of SIG contributions in elections,[9] if politicians could raise sufficient money from individuals then I conjecture there would likely be more than five open seat races from 1980–2002 where general election candidates renounced money from PACs.

Elections are grouped into three periods due to the relatively small number of open seat races in election cycle: 1980-1986, 1988-1992, and 1996-2002. The first two periods span the Democratic majority in the House, while the third period encompasses the Republican majority in the House. The first period grouping of elections also facilitates comparisons to previous work, since these years were also considered previously by Snyder (1990).

As a measure of the expected probability of a candidate winning, I consider both the Congressional Quarterly's (CQ) election forecast and the two-party vote share for individual races. The CQ forecast is the closer approximation to a measure of expectations, and has been previously used in similar types of studies (e.g., Erikson and Palfrey, 2000). In the studies of contribution behavior, the two-party vote share is also a commonly used measure (Erikson and Palfrey, 2000; Ansolabehere and Snyder, 2000; Glasgow, 2002).

The CQ forecasts employed are released after all races have completed their primary election, generally during October of an election year. The forecasts range from Safe Republican (SR) to Safe Democrat (SD) on a seven point scale with Favor Republican/Democrat (FR/FD), Lean (LR/LD) and No Clear Favorite (NF) in between. While there are increasing numbers of groups and individuals in the last decade who offer forecasts for each House race, CQ forecast have the desirable feature of having a long and stable history, including the years studied here. While a variety of sources of information are available to influence the electoral expectations of different potential contributors in each House

[9] Only 17 percent of respondents were more likely to vote for the candidate who accepted PAC money, while 71 percent were more likely to vote for the candidate who renounced PAC money, when posed with the following survey question:

> I would like to tell you about two candidates who are running for Congress and have you tell me which candidate you would be more likely to vote for. Congressman Smith receives almost half of his campaign contributions from Political Action Committees. He argues that running for Congress is very expensive and besides these political action committees represent groups he supports such as business, labor, environmental groups and teachers' associations. Mr. Jones feels that political action committees have far too much influence on Congress. He feels that you can't take money from political action committees and truly represent the people. For that reason he refuses to accept any contributions from these PACs. (American Viewpoint, March 28-April 1, 1992 telephone interviews with a national adult sample of 1,000.)

	SR	FR	LR	NF	LD	FD	SD	N
1980–1986	25	16	19	23	21	16	18	138
1988–1994	6	25	32	34	19	20	15	151
1996–2002	21	13	26	42	16	7	14	139

TABLE 3: CQ forecasts: Safe Democrat/Republican (SD/SR), Favor (FD/FR), Lean (LD/LR) and No Clear Favorite (NF).

	Minimum	1st Quartile	Median	3rd Quartile	Maximum	N
1980–1986	0.22	0.42	0.49	0.57	0.93	138
1988–1994	0.28	0.43	0.49	0.56	0.79	151
1996–2002	0.23	0.41	0.48	0.54	0.85	139

TABLE 4: Quantiles of Democrats proportion of two-party vote.

race, I treat the CQ forecasts as a summary of informed opinion and assume that the expectations of the average PAC contributor does not deviate radically from the CQ forecast classifications.

A summary of the distribution of CQ forecasts is presented in Table 3. In terms of the combined number of safe, favored, and leaning candidates for each party, Republicans generally have had a small but growing advantage in expectations over the three periods. In the following analysis, I pool the safe and favored categories since their outcomes in terms of wins/losses are essentially the same, and refer to the combined category simply as the favored races. For comparison, the distribution of the Democratic candidate's share of the two-party vote is summarized in Table 4. In terms of vote share up to 1994, the interquartile range is symmetric around 50 percent and the median is close to 50 percent. However, the safest Democrats won by larger margins than the safest Republicans. The interquartile range later skews toward the Republicans, but the safest Democrat still won by a larger margin.

5 Special Interest Group Contribution Behavior

In this section I consider empirically how special interest groups allocate money across open seat House races. Since groups may pursue different strategies when giving in support of candidates from different parties, each type of contributor group and party of the recipient combination is considered separately. Allocations of campaign contributions consistent with different motives are indeed observed for the same types of PACs when giving to candidates from different parties. While behavior consistent with partisan motives characterizes money from most special interest groups in the post-1994 elections, groups are also observed behaving to a lesser extent as investors when giving to a candidate from their

less preferred party. Labor groups give as partisans when supporting Democrats, while investing (a very small amount) in Republicans. Business groups acted as investors when giving to candidates of both parties during the period of the Democratic majorities, but after 1994 gave as partisans when supporting Republicans while continuing to invest a smaller amount in Democrats.

To focus on the patterns of contribution allocation across races, I use the ratio of the amount of money a set of groups gives to a candidate relative to the average amount the set of groups spends on candidates from a particular party within the same general election period. The numerator of the ratio, z_{ijt}, is the amount of money given by a particular source to a candidate from party j in race i during the general election period of election t. The denominator of the ratio for each election-party-SIG combination, $\mu_{jt} = \frac{1}{N_t} \sum_{i=1}^{N_t} z_{ijt}$, is presented in Table 2, where N_t is the total number of open seat races in election t. The ratio z_{ijt}/μ_{jt} is the basic building block of this section. This ratio is an appealing metric that facilitates the comparison of the relative concentration of resources using a common scale despite the heterogeneity of contribution amounts spent across groups and elections. A ratio $z_{ijt}/\mu_{jt} = 1$ reflects that the candidate received the average amount of money given by a particular type of group to candidates representing party j. Ratios of 1/2 and 2 indicates that half the average amount and twice the average amount was given, respectively.

As described in the previous section, expectations are measured by CQ forecasts and vote shares. The CQ forecasts are measures of expert expectations that are widely disseminated and highly regarded. The small number of forecast categories lump together heterogeneous races that might be further distinguished by a more refined forecasting model. However, the approach to classifying races into a small number of categories fits with the manner in which individual PACs fund candidates. Even if PACs ranked each individual race, most PACs give in small number of different amounts that suggest they have tiers at which they support candidates rather than pursuing unique actions for each race. Vote share is essentially a continuous measure, allowing for finer differentiation among races, but its use requires us to believe that the outcome is a good measure of expectations. Reassuringly, the results using these two measures are in agreement on the core results.

The relationship between expectations and the relative allocation of contributions is summarized by quantile regression (Koenker and Bassett, 1978; Koenker, 2005). The focus is on the median in the current analysis. The quantile regression approach has the attractive properties that it has some robustness to outliers in the dependent variable and minimizes assumptions about the distribution of the error terms, even in the case of censored observations. Indeed, as observed by Powell (1986), the conditional quantile of the response variable depends on the censoring threshold but not the density of the errors. The relative amounts of money are censored at zero since groups cannot contribute a negative amount to a candidate.

I also incorporate information about the qualitative implications of the competing hypothesized partisan and investor curves into the fitting of the empirical models. In addition to the unconstrained

models, I also fit models that are constrained to be either monotonic (investor) or unimodal (partisan). For the shape constrained regression of contributions on CQ forecast categories, the sequence of fitted medians θ_i conform to the following inequalities,

$$\theta_{FR} \leq \theta_{LR} \leq \theta_{NF} \leq \theta_{LD} \leq \theta_{FD} \qquad \text{(investor to Democrat)} \tag{8}$$

$$\theta_{FR} \geq \theta_{LR} \geq \theta_{NF} \geq \theta_{LD} \geq \theta_{FD} \qquad \text{(investor to Republican)} \tag{9}$$

$$\theta_{FR} \leq \theta_{LR} \leq \theta_{NF} \geq \theta_{LD} \geq \theta_{FD} \qquad \text{(partisan)} \tag{10}$$

Equations 8–10 assume the mapping between probabilities and forecast categories is a monotonic function: a Democrat is more likely to win in expectation with a Lean Democrat designation than with a No Favorite designation and so forth. If one estimates the mapping of CQ forecasts to outcome probabilities one finds that adjacent CQ forecast categories are not equally far apart on the metric of probabilities of Democratic victory. When moving from the theoretical model to empirical tests, these inequalities draw upon the qualitative features of the comparative static results that are invariant to a monotonic transformation of the measure of electoral expectations. In particular, the equilibrium linear increasing (decreasing) function of investor amounts in the unified equilibrium will remain monotonically increasing (decreasing), thought the relationship between CQ forecasts and investor money may exhibit curvature; the formal requirement is that the largest median amount is not achieved within the interior range of the CQ forecast categories. The quadratic function for partisans remains unimodal under affine transformation of expectations as well, and achieves a maximum interior to the range of expectations. I use a strong form of the partisan hypothesis where the "No favorite" (NF) category includes the range of probabilities where partisans would concentrate their greatest amount of contributions.

The analysis based on vote shares follows a similar logic. The median regression of relative contributions on a cubic B-spline representation of vote share (De Boor, 2001; Bates and Venables, 2006) provides a convenient set of restrictions on the regression coefficients for constraining the curve to be monotonic or unimodal. If in expectation someone who has a greater vote share has a greater probability of winning than someone who has a lower vote share, then investor contributions will be a weakly monotonic function of a candidate's vote share, and partisan contributions will be a unimodal, weakly concave function of a candidates vote share. Thus, again, investor money may exhibit curvature and yet still be consistent with the unified model—the formal requirement is that a maximum median value is not achieved at an interior point of the range of vote shares.

In the following subsections, I summarize the qualitative features of the estimated relationships between expectations and contributions for different sets of SIGs, and then discuss the results of the formal hypothesis tests based on the constrained and unconstrained models. In the following figures, the curves for the vote share based plots and the points for the CQ based plots are the fitted values from shape constrained median regressions selected by hypothesis tests. In the case where both

unimodal and monotonic constrained models are significantly worse fitting than the unconstrained model, the fitted values from the unconstrained model is plotted instead; this occurs in only one regression: business contributions to Democratic candidates regressed on CQ forecasts for the period of 1980–1986. Details regarding the estimation and testing are provided in the Appendix.

5.1 Allocation of resources across districts

As a point of reference, I begin with the behavior of parties. A party is expected to act as a partisan in its allocation across open seats, conditional on the total money the party committees decide to spend on non-incumbents (Jacobson and Kernell, 1983; Jacobson, 1985–86). The unified model predicts that partisans provide more money to candidates in close races in order to maximize the number of seats they will control in the House after the election. Such a pattern has also been observed in plots of the vote share of incumbent candidates versus the amount of contributions received from party committees.(Ansolabehere and Snyder, 2000; Glasgow, 2002). This prediction also fits with popular understanding of the strategies of parties, for example from the 2002 election, "because only a handful of the House's 435 races are competitive, the parties can target their money narrowly" (Washington Post, 2002).

Figure 3 illustrates the relationship between the two proxies for electoral expectations and the relative contributions from party committees. Overall, both parties give contributions in a manner consistent with partisan behavior, with a unimodal relationship between expectations and relative contributions. The one disagreement between the CQ and vote share based models for party contributions occurs in 1988-1994 period: the CQ-based regression is unimodal and significantly better fitting than the constrained monotonic curve, while neither the unconstrained nor the constrained unimodal models using vote shares is significantly different from the constrained monotonic model.

Post-1994, this unimodal pattern has become more accentuated with both parties concentrating relatively greater amounts of direct contributions in the closest races, and treating winning and losing candidates more symmetrically. Even so, both parties put more money into their own expected victors than into their losers across all periods. There are undoubtedly motives for party contributions other than those described in the formal model—including a coordination role where part of signaling support for a candidate requires giving money even if it is not optimal in isolation from other considerations. Incorporating the incentives of parties and groups to signal support to other potential contributors is an area for future research.

The fitted values for the contributions of business PACs are presented in Figure 4. After 1994, business is clearly allocating money in a partisan manner when contributing to Republicans, but prior to that their behavior was not significantly different from a pattern of investors. In all periods considered, business also contributed to Democrats in an investor manner, though after 1994 they

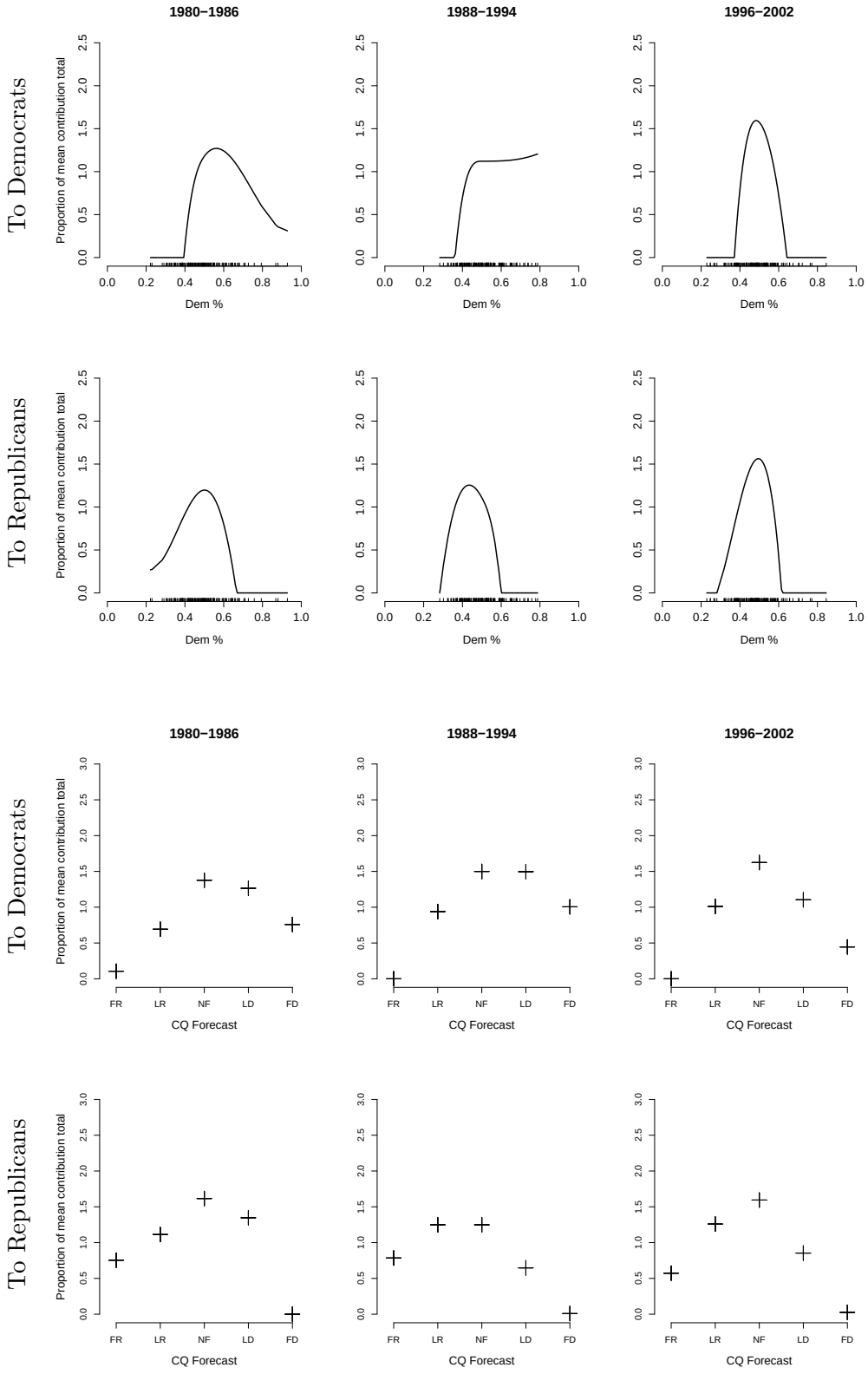


FIGURE 3: Relative allocation of contributions from party committees to open seat House candidates. Plotted curves and points are the fitted values from shape constrained median regressions selected by hypothesis tests summarized in Table 5.

invested even greater relative amounts in Democratic candidates who were more likely to win compared to those who were less likely to win.

The fitted values for the contributions of labor PACs are presented in Figure 5. Labor groups have consistently given above average amounts to Democrats in the closest races, compared to races where either the Democrat or Republican is favored. In this way, labor PACs behave like the Democratic party when giving to Democrats in all three periods. Conversely, labor acts like investors when giving to Republicans, concentrating money almost exclusive on those Republicans in safe races. The amount of money labor spends as partisans is almost two orders of magnitude greater than what they spend as investors, and labor also dwarfs parties and ideological groups with its direct contributions to Democrats. The largest source of partisan money supporting Democrats is clearly coming from one set of groups, and that is organized labor.

In all periods the concentration of resources helped Democrats in close races to compete with the greater total amount of money spent by business groups in support of Republicans. Labor's concentration of contributions in close races increased after 1994, and there was at the same time a switch from bolstering races leaning to Democrats to those which were less favorable to Democrats. During 1986-1990, labor groups outspent business interests in the closest races, and after that was not far outspent until 1998 and 2000. The accentuation of partisan-like behavior with the loss of the Democratic majority in the House also coincided with the AFL-CIO's subsequent decision to concentrate authority over the allocation of direct contributions: "PAC contributions were put entirely in the hands of Marta David, assistant director of the AFL-CIO's Political Department, who had spent years analyzing races and recommending contributions for COPE and for the Democratic Congressional Campaign Committee, where she had worked in the early 1980s" (Gerber, 1999, 82). The concentration on political instead of organizing has however been a notable change within the AFL-CIO since the election of Sweeney.[10] However, during 1998 and 2000, with the larger increases in total spending by business in open seats, the average total contribution from labor was less than 60 percent that of business in the closest races.

These empirical results update prior research in three critical ways. First, it is seen that labor and business treat candidates from each party differently. In contrast, Snyder (1990) pooled money from corporate, labor, trade, and cooperative PACs and found that the money given by these groups was allocated in a manner consistent with investor behavior during the 1980–1986 elections. The significant partisan pattern of behavior by labor when supporting Democrats during this same period is not apparent when pooling their money with other types of PACs. Second, the treatment of

[10] In 1996, AFL-CIO President John Sweeney also pledged to raise and spend $35 million to target freshman Republican House members for defeat (Jacobson, 1999). This money was spent on advertisements that did not advocate the election or defeat of specific candidates, and thus was not regulated by reporting requirements. Both the targeting of these ads at the defeat of freshman Republicans and the use of independent expenditure are outside the scope of this study of direct contributions to open seat candidates.

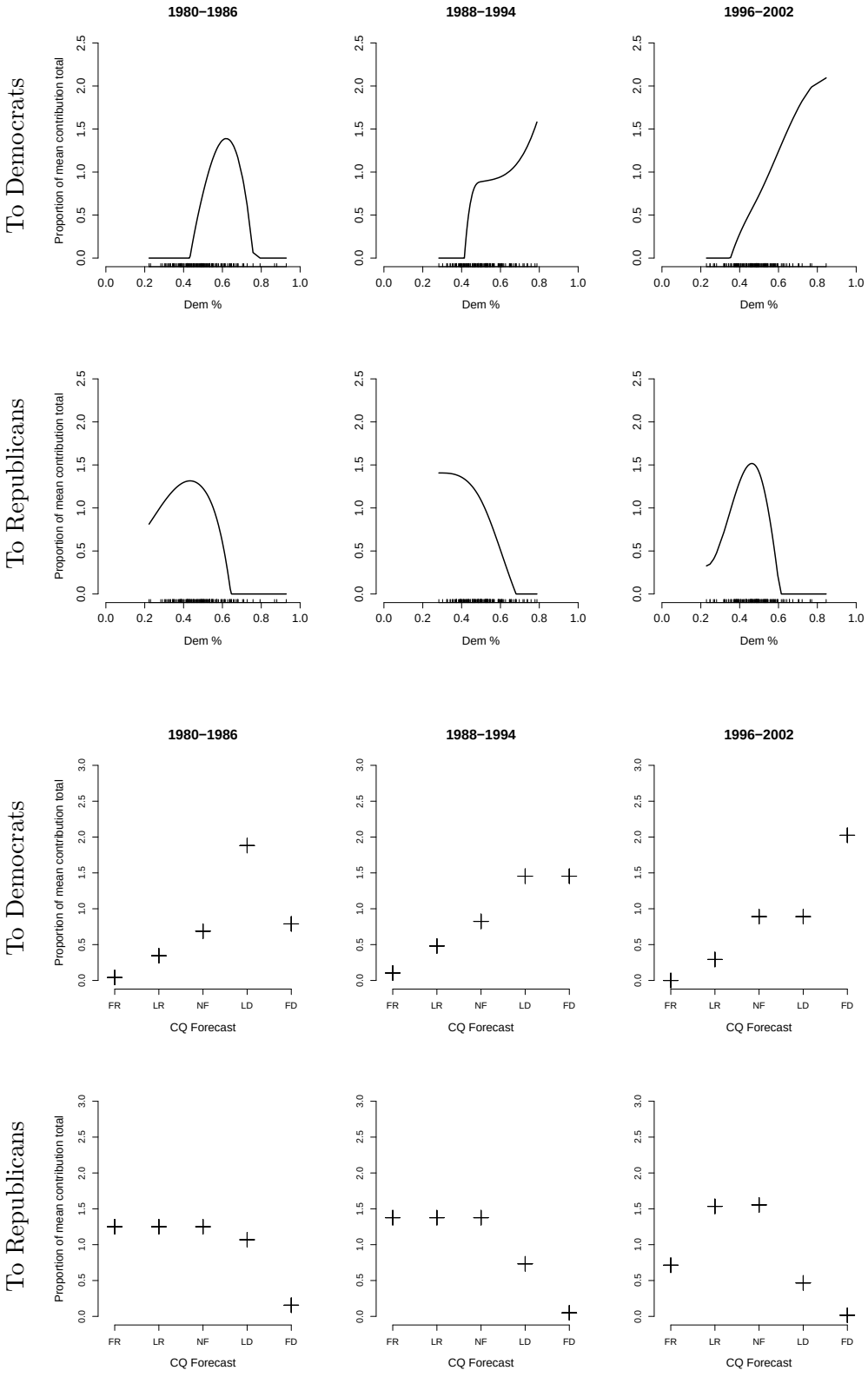


FIGURE 4: Relative allocation of contributions from business PACs to open seat House candidates. Plotted curves and points are the fitted values from shape constrained median regressions selected by hypothesis tests summarized in Table 5.

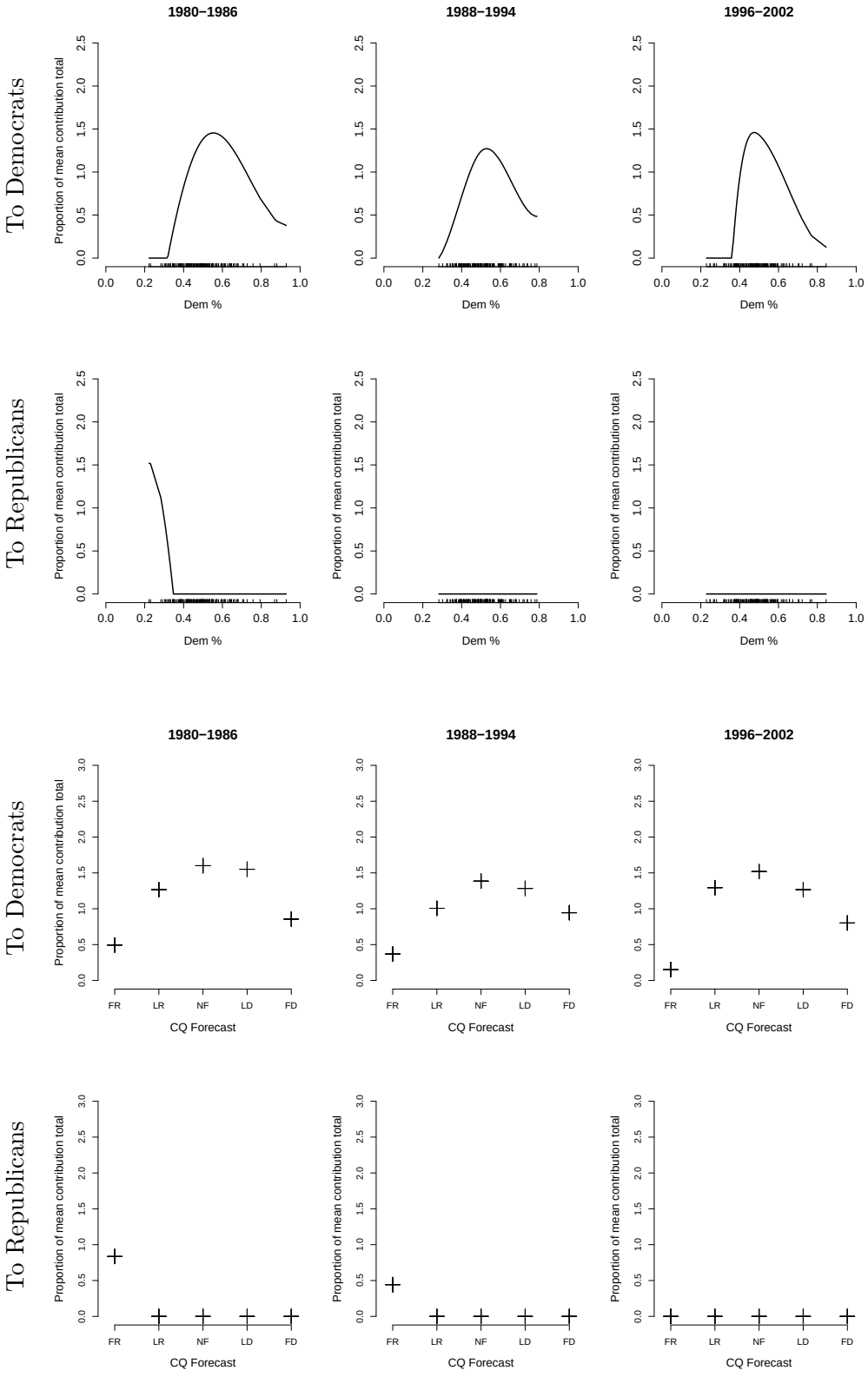


FIGURE 5: Relative allocation of contributions from labor PACs to open seat House candidates. Plotted curves and points are the fitted values from shape constrained median regressions selected by hypothesis tests summarized in Table 5.

candidates from a group's preferred party can depend on the political context: once the Republicans won the majority, business groups overall switched from focusing on safe Republicans to contributing in a partisan manner. In this way the victory of a new majority party not only changed the amount of money that went to candidates of each party (Cox and Magar, 1999), but also changed the way in which different types of SIGs allocated their contributions across candidates within each party. And third, I observe parties and large groups of PACs pulling on the same partisan oars in open seats: labor PACs behaving like the Democratic party when giving to Democrats, and business PACS post-1994 behaving like the Republican party when giving to Republicans. While it has been noted that party contributions have acted as slight counter-balance to PAC contributions, with parties giving more generously in close races and PACs giving more generously to safe incumbents, the post-1994 pattern of contributions in open seats highlights an area of complementary partisan efforts between parties and PACs.

After 1994, the two largest aggregate sources of SIG money were given to candidates of their preferred party in a partisan manner: labor contributions to Democrats and business contributions to Republicans (see Table 2). No other group of SIG money is of comparable magnitude. The treatment of the less preferred party in an investor manner is stable over time, though the value of investing in candidates changes with the party of the majority in the House. In particular, the pattern of labor and business PAC allocations of contributions to candidates from their less preferred party does not depend on which party holds the majority. However, the value to business of investing in Democrats is reduced when they are in the minority, as reflected in the average contributions. And the business contributions to Democrats were concentrated even more heavily post-1994 in the most lopsided winners—further reducing the relative amount of business money on both sides of close races. Labor groups did not change their level of investments in Republican open seat candidates, though they too were increasingly more selective about who received any money—after 1994, even the median Republican candidate among those who were essentially sure winners received no contributions from labor.

5.2 Hypothesis tests

Two types of hypothesis tests are considered for each curve mapping expectations to median contributions. First, I test whether a constrained curve has a significantly worse fit than the curve based on unconstrained parameters. If neither a monotonic nor a unimodal curve is a fair characterization of the data, then it is of limited interest whether one of the constrained curves is significantly better than the other. Second, given at least one constrained curve is empirically plausible, I test the hypothesis that one constrained curve is significantly better than the other. In this section, I outline the structure of the tests and the results; details of estimation and inference are provided in the Appendix.

The first type of test has a constrained null hypothesis and an unconstrained alternative. This family of tests was considered initially by Perlman (1969), and more recently by Wolak (1987, 1989) in the context of linear regression models. The tests are thus for the monotonic/investor curve

$$\theta \in \mathcal{C}_m \qquad \text{vs} \qquad \theta \in \mathbb{R}^5 \setminus \mathcal{C}_m \tag{11}$$

and for the unimodal/partisan curve,

$$\theta \in \mathcal{C}_u \qquad \text{vs} \qquad \theta \in \mathbb{R}^5 \setminus \mathcal{C}_u \tag{12}$$

where $\mathcal{C}_m$ is the parameter space of monotonically increasing medians defined in either equation (8) or 9, and $\mathcal{C}_u$ is the parameter space of unimodal medians defined in equation (10).

The second test is posed as the difference between the fitness of the monotonic and unimodal curve,

$$\theta \in \mathcal{C}_m \qquad \text{vs} \qquad \theta \in \mathcal{C}_u,$$

where the maintained hypothesis is that the curve is monotonic.

The results from the fitted models for each of the figures are presented in Table 5. The first two pairs of columns summarize the likelihood ratio test for the comparisons defined in equations (11) and (12) of the constrained versus unconstrained models. LR is the likelihood ratio value and p is the probability under the null that the value exceeds the critical value at the .05 level. The column 'H not rejected?' summarizes whether (I)nvestor or (P)artisan theories are consistent with the unrestricted fit based on the restricted versus unrestricted tests. If neither the monotonic nor the unimodal curve can be rejected, then both are listed. The penultimate pair of columns are for the likelihood ratio test of the two restricted models. The test is two-tailed, and the direction of a significant likelihood ratio provides information about which restricted model is significantly better than the other. If the value is significantly positive, then the monotonic/investor model can be rejected. If the value is significantly negative, then the unimodal/partisan model can be rejected.

The final summary is presented in the last column, stating which of the restricted curves characterizes the relationship between expectation and contributions. I treat investor behavior as the maintained hypothesis. If it is not possible to differentiate between a unimodal and the monotonic curve, and both of the constrained curves are not significantly different from the unconstrained curve, then that set of contributions is considered investor-like. It is possible for a curve to be weakly monotonically increasing and yet still conform to the unimodal constraints defined in equation 10. For example, with contributions to Democrats, $\theta_{FR} \leq \theta_{LR} \leq \theta_{NF} = \theta_{LD} = \theta_{FD}$, these sets of inequalities are a boundary condition of a unimodal set of parameters. Finding a significant decline in contributions among candidates who are more likely to win is essential to having evidence of partisan behavior.

	Mono vs Unres		Uni vs Unres		H not	Mono vs Uni		H not
	LR	p	LR	p	rejected	LR	p	rejected
Based on CQ forecasts:								
Party to Dem								
1980-1986	2.58	0.41	0	0.95	I/P	2.58	0.10	P
1988-1992	5.71	0.12	0	0.95	I/P	5.71	0.01	P
1994-2002	13.69	0.003	0	0.95	P	13.69	< 0.001	P
Party to Rep								
1980-1986	29.96	0.00	0	0.95	P	29.96	0.00	P
1994-2002	31.07	0.00	0	0.95	P	31.07	0.00	P
1988-1992	4.86	0.17	0.15	0.85	I/P	4.71	0.02	P
Business to Dem								
1980-1986	7.29	0.06	10.49	0.01	—	−3.20	0.22	—
1988-1992	0.49	0.85	3.94	0.16	I/P	−3.45	0.20	I
1994-2002	1.64	0.58	7.09	0.04	I	−5.46	0.07	I
Business to Rep								
1980-1986	4.11	0.23	2.03	0.37	I/P	2.08	0.14	I
1988-1992	0.11	0.95	0.02	0.92	I/P	0.09	0.66	I
1994-2002	20.50	< 0.001	0	0.95	P	20.50	0.00	P
Labor to Dem								
1980-1986	7.91	0.05	0	0.95	P	7.91	0.003	P
1988-1992	12.60	0.006	0	0.95	P	12.60	< 0.001	P
1994-2002	9.40	0.02	0	0.95	P	9.40	0.001	P
Based on vote shares:								
Party to Dem								
1980-1986	7.89	0.04	1.70	0.43	P	6.19	0.01	P
1988-1992	3.87	0.25	5.35	0.09	I	−1.48	0.52	I
1994-2002	59.64	0.00	0.10	0.87	P	59.54	< 0.001	P
Party to Rep								
1980-1986	15.80	0.002	0.16	0.84	P	15.63	< 0.001	P
1988-1992	7.37	0.06	2.78	0.27	P	4.59	0.03	P
1994-2002	25.92	< 0.001	0.88	0.60	P	25.04	0.00	P
Business to Dem								
1980-1986	12.71	0.005	1.58	0.45	P	11.14	0.00	P
1988-1992	1.41	0.63	2.13	0.36	I/P	−0.73	0.77	I
1994-2002	0.56	0.83	3.97	0.16	I/P	−3.41	0.20	I
Business to Rep								
1980-1986	5.75	0.11	0.57	0.69	P	5.17	0.02	P
1988-1992	0.96	0.73	0.99	0.58	I/P	−0.03	0.79	I
1994-2002	17.82	< 0.001	0.80	0.62	P	17.01	< 0.001	P
Labor to Dem								
1980-1986	6.93	0.07	0.99	0.58	I/P	5.95	0.01	P
1988-1992	20.80	< 0.001	12.83	0.003	I/P	7.97	0.003	I
1994-2002	7.73	0.05	0.78	0.63	P	6.95	0.003	P

TABLE 5: Likelihood ratio tests for the quantile regressions of relative contributions

In all but one case the unconstrained models of based on CQ forecasts and contributions from parties were unimodal—and thus the likelihood ratio values of 'Uni vs Unres' were zero. And in that one case which was not unimodal, the constrained unimodal model is not significantly different from the unconstrained model, and has a significantly better fit than the monotonic model ('Mono vs. Uni' LR is positive and large). Indeed, for all the regressions of party contributions, the unimodal constraint fits significantly better than the monotonic constraint. Similar conclusions are drawn from the models based vote shares, except for party contributions to Democratic candidates during 1988–1992; in this case it is not possible to reject that the curve is monotonically increasing.

For the models of business contributions and CQ forecasts, there is no significant differences between the monotonic and unimodal curves during the periods of Democratic majorities. After 1994, business groups gave to Democrats in a significantly monotonic manner and gave to Republicans in a significantly unimodal manner. The same holds for models based on vote shares, except in the first period 1980–1986 the unimodal curve fit better than the monotonic curve for both parties.

For the models of labor contributions based on CQ forecasts, the unconstrained curves are unimodal for Democratic candidates and monotonic for Republicans. In the case of contributions to Republicans, there is no difference between the fitted and observed value for most observations because the overwhelming majority of Republicans receive no contributions from labor groups, thus the sparsity function is zero for any reasonable bandwidth (see equations 29 and 30 in the Appendix). I list the fits of the models for the labor contributions to Republicans in the Appendix, but omit the values of the likelihood ratio tests that are undefined due to the zero-valued sparsity function. Given that the unconstrained curves are monotonic, it is fair to consider these investor. For the models of contributions to Republicans based on vote share, there is no such equivalence and indeed, as can be seen in the figures, the constrained curves both are essentially flat and equal to zero. Curves for higher quantiles (e.g., 66th percentile rather than the median) do have a monotonically increasing unconstrained curve.

6 Conclusion

Following the 1994 elections, the campaign contributions of SIGs to candidates in open seat U.S. House races have been primarily allocated in a manner consistent with changing the composition of the House and not quid pro quo relationships with individual candidates. The traditional opposition of business and labor interests is at the core of this partisan battle. Finding a prominent role for partisan SIG money in elections suggests the need for reconsidering the role of campaign finance in the efforts of groups to gain benefits, how this affects the behavior of legislators and parties as a whole, and the possible implications for the ability of voters to adjudicate this competition between special interests groups.

SIGs contributing in a partisan manner may simply expect that their interests are better advanced by having their preferred party in the majority rather than the alternative. The research challenge for studying partisan behavior of this variety is to understand why any one group, whose contributions are inconsequential, gives at all (Olson, 1971; Austen-Smith, 1981). One possibility has been described by Ansolabehere, de Figueiredo, and Snyder (2003) as the desire of some SIGs to consume politics and participate, which is similar to the D term in the voter turnout literature. Before resorting to a D term, however, it is worth investigating whether selective benefits do accrue to those who give.

Observing partisan contribution behavior among SIGs does not necessarily entail that there are no particularistic benefits sought or received. The benefits may not be any different from those that are stereotypically associated with investors, and partisan behavior may simply be an efficient route to achieving the same goals. To evaluate the theory that partisans are simply efficient investors, a new research agenda would mainly modify the units of analysis and not the types of question that are usually posed in studies of investor relationships. For example, instead of expecting that contributions have a uniform effect on all recipients, the "partisan-investor" theory distinguishes among recipients on the basis of whether they are part of the groups preferred party. For those recipients who are not members of the SIGs' preferred party, the analysis would be the same as in traditional investor behavior—generically, are there increases in quid pro quo behavior among recipients. To understand the behavior of Representatives in the SIG's preferred party, measuring mobilization by party leadership and party discipline could be the relevant indication of influence rather than contrasting the behavior of those who received contributions and those who did not.

Alternatively, partisan contributor behavior may be aimed at promoting a particular set of non-excludeable public policies by seeking to affect the agenda of their preferred party. Instead of mere consumption of political participation, these contributors seek the benefit of having their legislative priorities receive greater attention among a party's leadership. In this scenario, the varied groups seeking to influence a party's agenda share the common goal of maximizing the electoral strength the party, and thus appear to act in unison. However, the apparent unity among partisan SIGs observed in the allocation of contributions in the aggregate may belie the internal competition for attention and priority within their preferred party.

This "partisan agenda-setter" theory for why SIGs contribute as partisans is complementary to a theory of party government that emphasize the central role of agenda control in policy making, such as the cartel theory of Cox and McCubbins (2006). The ability of groups of SIGs to underwrite a party's electoral battle for the majority is a good reason why the majority party leaders have an incentive to use their procedural cartel to ensure the party's legislative accomplishments adequately reward those groups most likely to help sustain their majority status in future elections. Schattschneider (1960) highlighted the captive relationship of business groups to the Republican party, and of labor groups to the Democratic party, however, this observation only explains the lack of a group's credible threat

to defect to the other party. A reward for partisan contributions might nonetheless be extracted by the threat that these groups could alternatively spend the money that we observe as campaign contributions on other productive political and non-political activities (e.g., lobbying, union membership drives). While Cox and McCubbins (2006) describe interest groups as either seeking influence in the late stages of legislative action (cf p.191) or being part of a variety of actors who seek to simply drum up public interest in issues (cf p.106), having SIGs play a marginal role is not intrinsic to a theory of parties as cartels.

Insofar as SIGs pursue a partisan contribution strategy, these groups are helping to define the brand label that each party uses to sell itself to the electorate. As such SIGs, candidates, and ultimately journalists and voters are able to identify parties with a certain set of SIG and the policy issues they advocate. A partisan linkage between a party and a set of SIGs may help voters better hold parties responsible for the special interests they promote, but as previously noted this partisan behavior also helps to support polarization in Congress. Whether the consequences of SIGs pursuing partisan goals is on the whole better for voters than SIGs pursuing investor goals, which is presumably harder to monitor, remains an open question.

Appendix A

The derivation of the equilibrium amount of service in equation (6) begins by taking the FOC of a candidate's expected utility function (A.2) with respect to s_i,

$$\begin{aligned}
\frac{\partial EU_i^C}{\partial s_i} &= \frac{\partial p_i}{\partial X_i}\frac{\partial X_i}{\partial s_i}\left(V_i - b_i s_i\left[1-\hat{\theta}_i\right]\right) - p_i b_i((1-\hat{\theta}) - s_i\frac{\partial \hat{\theta}}{\partial s_i}) = 0 \\
0 &= \left[p_i(1-p_i)(\lambda Y_i + X_i)^{-1}\right]\left[\hat{\theta}\ ca/s_i\right]\left(V_i - b_i s_i\left[1-\hat{\theta}_i\right]\right) \qquad (13)\\
&\qquad -p_i b_i((1-\hat{\theta}) - s_i\left[-a\hat{\theta}/s_i\right]) \\
&= \left[\frac{k}{W\lambda}\right]\left(V_i\left[\hat{\theta}\ ca/s_i\right] - \left[\hat{\theta}\ ca\right] b_i\left[1-\hat{\theta}_i\right]\right) - p_i b_i\left[(1-\hat{\theta}) + a\hat{\theta}\right] \qquad (14)
\end{aligned}$$

From Baron (1989a), the equilibrium the value of $\hat{\theta}$ that produces positive investor contributions is only a function of the efficiency variable a, $\hat{\theta} = \frac{1}{2-a}$. All investors with even greater intensity of desire for the service ($\theta_{ik} > \frac{1}{2-a}$) will contribute c_i to candidate i. This relationship holds irrespective of whether there are exogenously resources or (potential) partisan contributions available to candidates. In any equilibrium candidates will equate marginal cost of providing service with the marginal returns of their sale, and thus Baron's derivations apply in more general settings. The investor type $\theta_{ik} = \hat{\theta}_i = \frac{1}{2-a}$ is indifferent between $x = 0$ and $x = c_i$ because $EU_{ik}^I = 0$. At this value of θ_{ik}, solve (A.1) for c_i.

$$c_i = p_i s_i^a \hat{\theta}_i = p_i s_i^a/(2-a) \qquad (15)$$

Substituting into equation (14) the equilibrium value of $\hat{\theta}$ and equation (15) for c, and rearranging,

$$\bar{s}_i = \frac{V_i}{b_i}\left(\frac{W\lambda p_i}{k_i a p_i \bar{s}_i^a/(2-a)} + \frac{1-a}{2-a}\right)^{-1}$$

Finding a general solution to this equation in terms of $\bar{s}$ is difficult because of the fractional power a in the function; however, numerical solutions are easy to find for particular values of the exogenous parameters. It is also possible to solve for particular cases, such as $a = 1/2$. There are two non-negative roots,

$$\bar{s} = \begin{cases} \left(\frac{1}{2b_d k_d}\right)^2 \left(-9b_d W\lambda + (81b_d^2 W^2\lambda^2 + 12b_d k_d^2 V_d)^{1/2}\right)^2 \\ \left(\frac{1}{2b_d k_d}\right)^2 \left(-9b_d W\lambda - (81b_d^2 W^2\lambda^2 + 12b_d k_d^2 V_d)^{1/2}\right)^2 \end{cases} \tag{16}$$

but only the first is valid. The second root is invalid because it exceeds the maximum amount of service a candidate would sell and would result in negative utility for the candidate. This can be proved by noting again that the candidate is bound by the following inequality from her utility function,

$$\frac{V_d}{b_d(1-\theta)} \geq s_d, \tag{17}$$

expanding the second root and substituting in this equality we have

$$3\frac{V_d}{b_d} \geq \left(\frac{W\lambda}{k_d}\right)^2 + \frac{9}{2b_d k_d^2}\left(81b_d^2 W^2\lambda^2 + 12b_d k_d^2 V_d\right)^{1/2} W\lambda + 3\frac{V_d}{b_d} \tag{18}$$

$$0 \geq \left(\frac{W\lambda}{k_d}\right)^2 + \frac{9}{2b_d k_d^2}\left(81b_d^2 W^2\lambda^2 + 12b_d k_d^2 V_d\right)^{1/2} W\lambda \tag{19}$$

which can never be true. Similarly, one finds that for all valid parameter values the first root holds,

$$0 \geq \left(\frac{W\lambda}{k_d}\right)^2 - \frac{9}{2b_d k_d^2}\left(81b_d^2 W^2\lambda^2 + 12b_d k_d^2 V_d\right)^{1/2} W\lambda \tag{20}$$

$$\left(\frac{W\lambda}{k_d}\right)^2 \leq \frac{9}{2b_d k_d^2}\left(81b_d^2 W^2\lambda^2 + 12b_d k_d^2 V_d\right)^{1/2} W\lambda \tag{21}$$

Appendix B

This appendix provides the details of the statistical calculations that are presented in Section 5. For a given quantile of interest, τ, the fitted models minimizes as a function of γ the loss function,

$$V(\gamma \mid \tau) = \sum \rho_\tau \left(z_{ijt}/\mu_{jt} - \max[0, f(x_{ijt})^\top \gamma]\right) \tag{22}$$

where

$$\rho(u) = u(\tau - I(u < 0)), \tag{23}$$

and $I()$ is the indicator function. The variable x_{ijt} is either the two-party Democratic vote share or an indicator for each CQ forecast category, and z_{ijt}/μ_{jt} is the ratio of contributions relative to the average amount defined in the main text of the paper. In the analysis using vote shares, $f(x_{ijt})$ is a vector containing the cubic B-spline basis function expansion of x_{ijt} with a a knot at 1/2. For the following results it will probably be most intuitive to think of γ as a vector of medians for the five ordered CQ forecast categories, but they also are the same when γ is the vector of coefficients of the vote-share regression.

Statistical tests commonly have a null hypothesis that can be framed as a set of r linear equality constraints on the parameters of the model in question, however, this is not the case in this analysis. Standard linear equality constraints can be written as $R\gamma = c$, where R is a $k \times r$ matrix, and c is length vector of length r. However, the maintained hypothesis in this analysis is that the allocation of contributions have a particular ordering of medians. The set of parameter values that respect the constraints of a particular postulated ordering can be described by a set of linear inequality constraints. The set of parameters that are monotonic increasing for example is defined by $\gamma \in \mathbb{R}^5 \mid R\gamma \geq 0$, where,

$$R = \begin{pmatrix} -1 & 1 & 0 & 0 & 0 \\ 0 & -1 & 1 & 0 & 0 \\ 0 & 0 & -1 & 1 & 0 \\ 0 & 0 & 0 & -1 & 1 \end{pmatrix}.$$

And the set of parameters that are monotonic decreasing is defined by by $\gamma \in \mathbb{R}^5 \mid -R\gamma \geq 0$. The set of unimodal parameters simply combines portions of the monotonic increasing and monotonic decreasing boundaries, $\gamma \in \mathbb{R}^5 \mid Q\gamma \geq 0$, where

$$Q = \begin{pmatrix} -1 & 1 & 0 & 0 & 0 \\ 0 & -1 & 1 & 0 & 0 \\ 0 & 0 & 1 & -1 & 0 \\ 0 & 0 & 0 & 1 & -1 \end{pmatrix}.$$

The values for the loss function with and without restrictions on the parameter space is as follows. The unrestricted model is,

$$\tilde{V}(\tau) = \min_{\gamma \in \mathbb{R}^5} V(\gamma \mid \tau) \tag{24}$$

the monotonic increasing model is,

$$\acute{V}(\tau) = \min_{\gamma \in \mathbb{R}^5 | R\gamma \geq 0} V(\gamma \mid \tau) \tag{25}$$

and the unimodal model is,

$$\hat{V}(\tau) = \min_{\gamma \in \mathbb{R}^5 | Q\gamma \geq 0} V(\gamma \mid \tau) \tag{26}$$

The test for comparing the constrained versus unconstrained models is based on a statistic of the form proposed by Koenker and Bassett (1978),

$$LR = -2\left[\tilde{V}(\tau) - \hat{V}(\tau)\right] \frac{1}{\tau(1-\tau)s(\tau)}, \tag{27}$$

with suitable substitutions of $\hat{V(\tau)}$ for the cases based on other constrained models. The statistic for the comparison of monotonic increasing versus unimodal models is

$$LR = -2\left[\acute{V}(\tau) - \hat{V}(\tau)\right]\frac{1}{\tau(1-\tau)s(\tau)}. \tag{28}$$

The test statistics are a function of the sparsity function, $s(\tau)$, which is the density of of observations near the quantile of interest. The sparsity function,

$$s(\tau) = [f(F^{-1}(\tau))]^{-1} \tag{29}$$

can be estimated using the difference in the empirical quantiles of the observed residuals (Siddiqui, 1960; Koenker, 2005),

$$\bar{s}(\tau) = \left[\bar{F}^{-1}(\tau + h) - \bar{F}^{-1}(\tau - h)\right]/2h \tag{30}$$

where F is the cdf of the residuals $u_i = y_i - \max[0, f(x_{ijt})^\top \bar{\gamma}]$. For each set of contributions that are wrung through the different tests, I use one estimate of the sparsity function which is based on the least favorable configuration of all the constrained hypotheses, namely that the median contribution is constant across all CQ categories or vote shares. As a sensitivity check I consider bandwidth parameters ranging from 0.05 to 0.1, which straddle the optimal values derived by Bofinger (1975), and the conclusions drawn do not depend on the bandwidth choice in this range. I discuss only the results based on the 0.075 bandwidth in Tables 5 and 6.

Inference based on parameters constrained by a convex cone, $H_0 : \gamma \in \mathcal{C}$, versus an unrestricted alternative $H_1 : \gamma \in \mathbb{R}^k \backslash \mathcal{C}$ was considered initially by Perlman (1969), and more recently by Wolak (1987, 1989) in the context of linear regression models. For general treatments of estimation and inference of convex analysis applied to statistical models see Barlow et al. (1972), Robertson, Wright, and Dykstra (1988), and Silvapulle and Sen (2005).

All of these results discussed also apply to the five parameters multiplied against the B-spline expansion of vote-share. The B-spline regression has the attractive property that monotonicity of the fitted curve can be determined by evaluating a linear function of the parameters γ. If B-spline expansion includes an intercept term (i.e., γ_0 is the intercept at $x = 0$), then the fitted curve is monotonic iff $\gamma_j - \gamma_{j-1} \geq 0$ for every $j > 0$.

The estimation of quantile curves using B-spline regressions subject to convex constraints on the parameters has received recent treatment (He and Ng, 1999; Koenker and Ng, 2005), while the estimation of censored quantile regression is more established (Powell, 1984, 1986; Fitzenberger, 1996). There are standard algorithms for these separate estimation problems, however the two together has not been previously considered. While it is possible to adapt Fitzenberg's censored QR to incorporate inequality constraints, I adopt an alternative approach based on the GENOUD genetic algorithm

		$s(\tau)$	$\sum\rho$, with CQ			$\sum\rho$, with vote-share		
			Unres	Mono	Uni	Unres	Mono	Uni
Party to Dem	1980-1986	1.98	44.48	45.13	44.48	45.74	47.70	46.16
	1988-1992	1.47	35.90	36.90	35.90	38.69	39.40	39.67
	1994-2002	3.91	36.68	43.38	36.68	40.25	69.43	40.30
Party to Rep								
	1980-1986	1.18	41.42	45.84	41.42	41.89	44.22	41.91
	1988-1992	2.69	47.03	48.66	47.08	47.70	50.18	48.64
	1994-2002	2.54	24.87	34.74	24.87	29.90	38.13	30.18
Business to Dem								
	1980-1986	1.88	48.93	50.64	51.40	50.89	53.88	51.26
	1988-1992	2.75	52.39	52.56	53.74	53.83	54.31	54.56
	1994-2002	2.28	52.08	52.55	54.10	55.25	55.41	56.38
Business to Rep								
	1980-1986	1.89	30.25	31.22	30.73	32.65	34.01	32.79
	1988-1992	2.89	37.60	37.64	37.61	41.14	41.48	41.50
	1994-2002	2.31	25.46	31.38	25.46	28.64	33.79	28.87
Labor to Dem								
	1980-1986	3.08	37.18	40.22	37.18	35.95	38.62	36.33
	1988-1992	1.16	33.90	35.73	33.90	33.59	36.61	35.45
	1994-2002	2.68	31.13	34.28	31.13	33.69	36.28	33.95
Labor to Rep								
	1980-1986	0.00	67.67	67.67	69.00	66.73	68.37	68.99
	1988-1992	0.00	74.52	74.52	75.50	74.96	75.5	75.17
	1994-2002	0.00	69.50	69.50	69.50	67.58	69.50	68.49

TABLE 6: Loss function and sparsity function estimates.

(Sekhon and Mebane, 1998; Mebane and Sekhon, 2006). This computationally intensive approach is attractive even without inequality constraints since the censored QR is not a convex function of the parameters, and the existing algorithms can stop at local minima of the loss function. In this application, the GENOUD optimizer has found in a number of cases better fits than the standard algorithm based on linear programming.

Table 6 presents the estimates of the loss functions and sparsity functions for each series of data. The first column, $s(\tau)$, is the sparsity estimate defined in equation (29). The sets of three columns under $\sum\rho$ summarize the value of the loss function for the quantile regressions defined in equation (22) under the three different specifications: unrestricted parameters, constrained monotonic parameters, and constrained unimodal parameters.

New Category	FEC Category	N
Business		
	Corporation	1717
	Trade/member/health	488
	Corp w/o stock	63
	Cooperative	48
	Unconnected	47
	Unclassified	15
Labor	Labor	310
	Trade/member/health	3
	Corp w/o stock	1
Ideological/Single interest	Unconnected	246
	Unclassified	104
	Trade/member/health	45
	Corporation	17
	Corp w/o stock	12
Health care	Trade/member/health	112
	Corporation	36
	Unconnected	4
	Unclassified	3
	Corp w/o stock	2
	Cooperative	1
Attorney/Lobby	Unconnected	38
	Corporation	36
	Unclassified	28
	Corp w/o stock	8
	Trade/member/health	4
	Cooperative	1

TABLE 7: FEC PAC categories and new PAC categories.

APPENDIX C

Table 7 summarizes the number of cases that were moved between each FEC category and the new category definitions.

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