Political Analysis, 8:3

The Time to Give: PAC Motivations and Electoral Timing

Nolan McCarty
Columbia University

Lawrence S. Rothenberg
University of Rochester

There has been much discussion about how members of Congress desire money early in the campaign season. However, theoretical models of how contributions are allocated during the electoral cycle have been lacking. Our analysis attempts to remedy this gap by providing and testing a model which specifies how the process of bargaining between members of Congress and organized interests produces the pattern of donations observed over the course of the electoral cycle. Most notably, our results suggest that strategic incumbents can receive money early in the campaign if they desire but that they are generally unwilling to pay the price of lower aggregate fundraising and greater provision of access. These findings buttress earlier empirical findings that question the instrumental value of early money. In addition, our results highlight that contribution choices are fundamentally influenced by short-term factors, especially electoral conditions, that do not lend themselves to the routinized behavior necessary for contributors to invest in incumbents for long-run payoffs.

1 Introduction

POLITICAL CAMPAIGNS ARE routinely described as dynamic processes characterized by early periods during which candidates are identified and selected and by later periods in which candidates compete for votes in the November election. At any point in the electoral cycle, candidates depend upon controlling sufficient financial reserves to sustain an effective campaign. Given the need to possess adequate cash on hand, it stands to reason that it matters not only *how much* total funds candidates receive during the campaign season, but *when* such monies are forthcoming.

One obstacle to adequate early funding is that candidates and contributors may possess diametrically opposed preferences about the ideal time to lend financial support, *ceteris paribus*. While politicians may prefer to receive money early, contributors may desire to provide it late. Intuitively, candidates should prefer to collect their campaign money early so that it can be spent when it has the greatest impact. Additionally, the availability of cash to an incumbent at a campaign's beginning may deter those who might be formidable challengers.

Authors' note: We gratefully acknowledge the support of the National Science Foundation (Grant SBR–9515347).

Copyright 2000 by the Society for Political Methodology

From the perspective of contributors, avoiding the opportunity costs associated with providing money early can furnish incentives to hang on to funds until the last possible moment. Most notably, contributors will likely consider money allocated to losing candidates as wasted and would be better put to other uses. Assuming that campaigns reveal information about candidates' chances of winning, contributors can update their relevant probability estimates about electoral outcomes to make more effective use of their political funds. Information generated during campaigns can provide data about where to get the largest expected return at the least risk from a contribution.

While suggesting that candidates want to receive money early and that contributors prefer to give it late might seem obvious, the implications of this observation have not been extensively explored. While a few scholars have begun to investigate the empirical patterns of contributions over the course of the electoral cycle (Box-Steffensmeier and Radcliffe 1997; Himmelberg and Wawro 1998; Krasno et al. 1994; Mebane and Wand 1999), there continues to be a dearth of work on the theoretical mechanisms that produce these patterns.

Our research is designed to address this situation by modeling the process by which contributions are given over a campaign. To do so, we present a dynamic model of the campaign contribution contract between groups and elected officials that incorporates key elements of intraelection timing. To validate our model, we test its implications using data on campaign contributions by large political action committees (PACs) to reelection-seeking incumbents.[1] Our findings allow us to draw inferences about how electoral timing reflects the relationship between contributor and representative and to suggest what ramifications this has for understanding the campaign contribution process.

2 Intraelection Contributions: Evidence to Date

While informative, the objectives and focus of existing research differ qualitatively from those of our analysis. Most of this contemporary work focuses largely on identifying the electoral implications of incumbents having substantial monies early in the campaign ("war chests") instead of how funds get distributed over the electoral season (Epstein and Zemsky 1996; Erikson and Palfrey 1998; Goldenberg et al. 1986; Hersch and McDougall 1994; Krasno and Green 1988; Squire 1991; but see Box-Steffensmeier 1993). These analyses alternatively hypothesize that, either because challengers are persuaded that incumbents will spend whatever is required for reelection or since early spending is an especially effective campaign tool, large amounts of cash on hand, growth in war chest levels, or early campaign expenditures from war chests deter challengers. What strategic incumbents must do in order to get these funds that they desire is not highlighted.

Interestingly, and despite the intuitive appeal of the idea that war chests should substantially deter candidate entry, empirical support is mixed. An obvious explanation for these results is that scholars disagree on what precise feature of war chests is fundamental for the electoral process. For example, it appears that, at least partially, discrepant findings are a function of whether aggregate war chest size or changes in the level of cash on hand are posited as crucial and whether the existence of funds in a campaign account or the expenditure of war chests are hypothesized as the mechanism that deters challengers and wins elections.

[1] We exclude the direct analysis of challenger contributions for reasons of manageability—the data set is extremely large with just incumbents—and practicality—while the timing of incumbent contributions varies considerably, challengers receive virtually no early contributions (e.g., Biersack et al. 1993; Krasno et al. 1994). We indirectly include the effects of challengers on contributions to incumbents by incorporating factors such as challenger quality and electoral vulnerability.

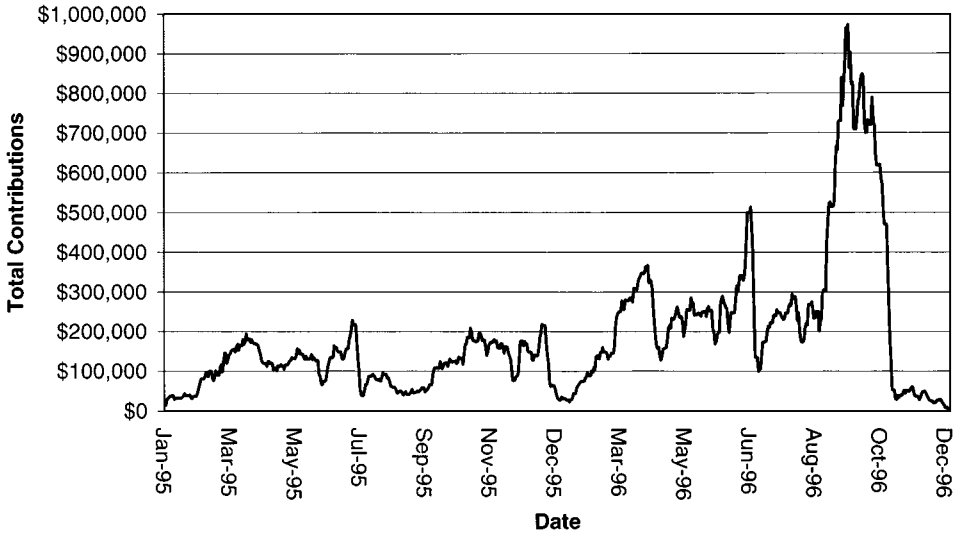

Fig 1 Total daily contributions—1996 electoral cycle (7-day) moving average.

However, in the spirit of our approach, a subtler explanation for the lack of strong empirical corroboration is that accruing early dollars generally involves providing incentives for contributors to donate in a campaign's beginning stages. As such, explaining why the vast majority of fundraising remains uncompleted before the electoral season starts is central for determining the efficacy of war chests. Figure 1, which presents the temporal flow of PAC monies to incumbents daily from 1995 through 1996, illustrates this well.[2] Funds flow in slowly early in the election season and increase somewhat during the primary and postprimary periods. The floodgates open roughly in August of the cycle's second year, with a spike typically witnessed in mid-October.

Certainly, this very late provision of funds seems anomalous if incumbents crave early money such that they are willing to make significant concessions to contributors to secure it. It presents an important puzzle to which no satisfactory solution currently exists—why early money is hard for incumbents to come by. Unlike conventional studies which investigate the electoral implications of campaign contributions, we focus on what generates money's temporal distribution. Similarly, while existing research concentrates on the strategic behavior of candidates vis-à-vis one another, we emphasize strategic interactions involving contributors as well.

3 The Dynamic Contribution Model

Our *dynamic contribution model* isolates the nature of contribution timing over the electoral cycle. For tractability, we simplify our approach in several respects. First, we focus exclusively on the relationship between an incumbent running for reelection and a single

[2]The observed pattern of contributions within election cycles shown in Fig. 1 is comparable to that in other election cycles [see Krasno et al. (1994) and data for 1991–1992 and 1993–1994 that we include on the *Political Analysis* website]. One alternative explanation for these patterns is that PACs themselves are receiving contributions late in the cycle. However, this itself may be a function of when money is most needed, i.e., a PAC's decision about when to expend effort fundraising ought to be determined primarily by when contributions to candidates are the most opportune.

interest group; as mentioned, we only indirectly incorporate the effects of challengers and other organized interests. Second, we take the actions of other special interests as given by the organization and focus only on the bargaining game between the incumbent and the group.

We make a number of basic assumptions about the motivations for, and the nature of, the exchange between an interest group and an incumbent legislator. First, consistent with the scholarly literature, we assume that a contribution may stem from both electoral and access motives. A group leader may contribute because of a good match with the incumbent's issue positions or due to a desire to purchase access or services from the incumbent to be delivered after the election.[3] Also, given these motives, and following much previous research (e.g., Baron 1989; Baron and Mo 1992; Snyder 1990), we assume that the incumbent may receive a campaign contribution by selling access or services subsequent to the election for the following term in office. Finally, we assume that this exchange process plays itself out via a sequence of take-it-or-leave-it offers from the incumbent to the group.[4]

Formally, we assume that the incumbent offers access in the amount of a_t to the group in period t and insists upon a contribution of $r_t(a_t)$, which denotes the maximum contribution that the group is willing to make to receive a_t units of access following the election. Thus, any of this access purchased before the election is subject to the risk that the incumbent loses. However, the group may also wait until after the election to purchase this access. We assume that these "spot" transactions take place contemporaneously with the relevant legislative activities which occur more or less uniformly throughout the next legislative session.

Our assumptions about the payoffs to the group from contributing are straightforward. First, the group's utility from access is $\theta u(a)$, where $u'(a) > 0$ and $u''(a) < 0$. Second, following work highlighting the importance of ideology for contribution behavior (e.g., Poole and Romer 1985; McCarty and Poole 1998), we assume that groups may care about the incumbent's general policy positions in addition to access and services. Therefore, g_I and g_C are the utility that the group receives from the incumbent's and the challenger's policy positions, respectively. Consequently, the utility that the group receives from reelecting the incumbent is $\theta u(\sum a_t) + g_I - \sum r_t$. Note that θ can be interpreted as a parameter reflecting how much the group cares about access relative to policy: a low value of θ signifies that the organization places very little weight on access, while a high score suggests that it cares a great deal.[5]

For the incumbent, we adopt the conventional assumption that the member is reelection-driven (e.g., Mayhew 1974). Formally, we specify that the successful incumbent receives utility W plus the utility derived from unspent campaign funds, r_T.[6] For the incumbent the

[3]Obviously, we ignore the ability of challengers to sell access contingent on their defeating the incumbent. Particularly since we concentrate exclusively on contributions to incumbents, empirically this seems sensible. Incorporating challenger access sales would be notationally cumbersome and very complex with little substantive payoff. Primarily, its effect would be to have interest groups discount gains from the incumbent's reelection by the utility of dealing with the challenger.

[4]The assumption of take-it-or-leave-it offers does not alter any of the substantive analysis. As we show, the relative timing of contributions is determined primarily by efficiency rather than by distributional concerns. Adopting different extensive forms for the bargaining game only shifts the surplus away from the incumbent, reducing contributions across the electoral cycle, and does not markedly change the temporal pattern of giving.

[5]With a slight modification to the model, θ may also reflect differential assessments of the probability that an issue on which the group wishes to be heard may emerge after the election.

[6]Our model requires only that incumbents derive utility from excess funds in future campaigns, not that leftover cash constitutes a personal windfall. That converting unspent money to private use is somewhat more difficult now for ex-members of Congress than in past years is not a problem.

cost of soliciting campaign funds is that of providing the agreed-upon access. The cost of furnishing a given level of access is given by $k(a)$ where $k'(a) > 0$ and $k''(a) > 0$. The incumbent's utility can then be given by $W + r_T - k(\sum a_t)$.

To characterize the dynamics of the campaign, we specify three stages that may, roughly, be characterized as preprimary, preelection, and postelection. We define the initial stage as the time following the end of the previous postelection period to when a challenger is selected. We assume that incumbents spend money during this period to affect the electoral conditions of the general election. This spending may be designed to deter credible, competent opposition, to enhance name recognition, or to perform well in a challenged primary.[7] We also assume that there are two electoral states of the world, $s \in \{G, B\}$, signifying good and bad conditions, respectively. We assume that the probability of obtaining good electoral conditions is a function of first-stage spending. Formally, we let $\mu_G(r_1) = \Pr\{s = G\}$ and $\mu_B(r_1) = \Pr\{s = B\} = 1 - \mu_G(r_1)$, where we assume that $\mu'_G > 0, \mu''_G < 0$.

We define the preelection stage as beginning with the determination of electoral conditions (i.e., challenger selection, name recognition, etc.) and concluding with the actual election. We assume that the incumbent's reelection is determined as a function of spending in this period and of electoral conditions. Formally, the probability of incumbent reelection is $\pi_s(r_2)$ for $s \in \{G, B\}$, where π_s is increasing and subject to diminishing marginal returns to campaign spending.[8]

The effects of electoral conditions, in turn, are captured by two assumptions.

Assumption A1: $\pi_G(r) > \pi_B(r)$ for all r.
Assumption A2: $\pi'_B(r) > \pi'_G(r)$ for all r.

Assumption A1 implies that, for any candidate spending level, the incumbent's chance of winning is higher in the good state. In a related vein, A2 states that the marginal impact of a dollar of campaign spending is greater in the bad state—since the likelihood of losing is so high to start with, the marginal benefits from expenditures reaped by an incumbent should be greater when facing a formidable challenge.[9]

Finally, we define the postelection stage as the period from when the election ends to when the next election begins.[10] In this third stage, the winning candidate may attempt to raise more campaign funds by selling additional access.[11] We assume that the incumbent derives utility from such funds, whether the money is used to retire previous campaign debts, to prepare for the next election, or for any other activity allowable under campaign laws.

[7] Thus, early money affects the general election only indirectly through electoral conditions.

[8] In order to isolate the bargaining between the incumbent and a single group, we assume that $\pi_s(0)$ captures the fundraising activity of the incumbent net of the transactions with the group. This includes dealings with other individuals and groups or the use of personal financial assets. We also assume that incumbents do not have access to perfect capital markets which can ensure them against electoral shocks. While candidates do borrow, the illegality of collateralizing the asset of "holding office" suggests an imperfection in this market. Therefore, $\pi_s(0)$ also captures any borrowing from an imperfect capital market.

[9] We implicitly assume that the "bad" state is not too bad. If the electoral conditions were so unfavorable that the marginal effect of spending goes down, the incumbent would likely withdraw from the race. Since our focus is those incumbents who actually seek reelection, this "very bad" state is not relevant.

[10] Unlike the Federal Election Commission's postelection reporting period that extends from the election to January 1 of the following year, our postelection period involves contributions exchanged for the provision of immediate access rather than future access.

[11] As mentioned, assuming that postelection access sales are possible is at odds with the assumption in most analyses that, despite no clear enforcement mechanism, candidates can precommit to not selling such access (for an extended discussion, see McCarty and Rothenberg 1996a).

Given this specification of the dynamic contribution model, the incumbent's optimization problem is choosing a_t^s to maximize

$$\sum_{s\in\{G,B\}} \mu_s(r_1(a_1))\pi_s\big(r_2^s(a_2^s)\big)\big[W + r_3^s\big(a_3^s\big) - k\big(a_1 + a_2^s + a_3^s\big)\big] \tag{1}$$

The set of access contracts that the group will accept imposes constraints on how the incumbent pursues fundraising activity.[12] The member's ability to exchange contributions in the initial two periods for postelection funding is limited by the need to compensate groups for the risk of giving money before electoral uncertainty is resolved. A group purchasing access in either of the first two periods faces the possibility of the incumbent losing and the value of its contribution being zero. The trade-off between early and late campaign contributions is characterized by Lemma 1.

Lemma 1. Let $\bar{a}$ solve $\theta u'(\bar{a}) = k'(\bar{a})$. Then the fundraising constraint imposed by the interest group can be represented as

$$r_3^s\big(r_1, r_2^s\big) = \theta u(\bar{a}) + \hat{g} - \big(r_2^s/\pi_s\big(r_2^s\big)\big) - \big(\pi_s(0)/\pi_s\big(r_2^s\big)\big) \times \Big(\Big(r_1 + \sum \mu_s(0)\pi_s(0)\hat{g}\Big)\Big/ \sum \mu_s(r_1)\pi_s(0)\Big).$$

Proof. See the Appendix.

Lemma 1 demonstrates that the set of contracts that the group will accept can be represented by a function relating postelection revenues to contributions in each of the preceding periods. From this lemma, the total amount of access that will be sold in any interior solution to the model, $\bar{a}$, is determined by the point at which the marginal utility of access to the group is equated to the marginal cost of providing that access by the incumbent. This access level and the equilibrium access value of the incumbent's electoral victory, $\theta u(\bar{a})$, is increasing in θ and decreasing in the marginal cost of access provision. Given the interpretation of $\hat{g}$ as the net policy utility of the incumbent winning, Lemma 1 shows that r_3 will equal the total access utility plus the ideological utility minus earlier contributions discounted by electoral conditions at the time that the contributions were made.

An attractive feature of Lemma 1, which we illustrate below, is that the values of a_t, which reflect the flow of access sold in a given period, fail to appear. Rather, access is found only in the term for the total utility that the group may receive from its provision, $\theta u(\bar{a})$. While total access and access flow are both problematic to measure directly, the former is much more easily proxied empirically than the latter. Indicators such as seniority, party, and committee assignments should be crucial determinants of the stock of access available to the incumbent for sale to the group.

Also, Lemma 1 allows us to simplify the incumbent's fundraising problem, as

$$\max_{r_t^s} \sum_{s\in\{G,B\}} \mu_s(r_1)\pi_s\big(r_2^s\big)\big[W + r_3^s\big(r_1, r_2^s\big) - k(\bar{a})\big] \tag{2}$$

Substituting the results from Lemma 1 and rearranging terms, we can rewrite this expression

$$\sum_{s\in\{G,B\}} \big\{\mu_s(r_1)\pi_s\big(r_2^s\big)[W - k(\bar{a}) + \theta u(\bar{a}) + \hat{g}] - \mu_s(r_1)r_2^s - \mu_s(0)\pi_s(0)\hat{g}\big\} - r_1 \tag{3}$$

[12] If complete, state-contingent contracts were feasible, a_t^s could be chosen *ex ante* to maximize (1) subject to the participation of the group. However, since there is no external enforcement agent, complete *ex ante* contracts seem unreasonable in the context of campaign contributions (see McCarty and Rothenberg 1996a).

The incumbent's choice of $\{r_1, r_2^G, r_2^B\}$ to maximize (3) generates the following proposition.

Proposition. The equilibrium contributions in each of the first two periods solve the following:

(i) $\pi_s'(r_2^{s^*})[W - k(\bar{a}) + \theta u(\bar{a}) + \hat{g}] = 1$;
(ii) $\mu_G'(r_1^*)((\pi_G(r_2^{G^*}) - \pi_B(r_2^{B^*}))(W - k(\bar{a}) + \theta u(\bar{a}) + \hat{g}) - r_2^{G^*} + r_2^{B^*}) = 1$.

Condition i implies that period 2 revenues will be chosen so as to equate the marginal effects of campaign spending across both electoral states so that $\pi_G' = \pi_B'$. Further, it implies that the total marginal utility of campaign spending to the incumbent *and* to the group from reelection will be equated to the total marginal cost of campaign spending. We define these *joint benefits of reelection* as $\omega(W, \theta, \hat{g}) = W - k(\bar{a}) + \theta u(\bar{a}) + \hat{g}$. Thus, condition i also implies that period 2 revenues are determined by efficient bargaining between the incumbent and the group. Condition ii shows that early revenue will be chosen to equate the marginal value of early money to the incumbent and the group to the marginal cost of raising the funds.

4 Theoretical Results

Additionally, as foreshadowed, the proposition permits us to solve for what contributions should be observed in each period as a function of total access demand rather than of access sold in each period. In turn, this allows us to generate a number of hypotheses that can be investigated empirically to test the validity of our dynamic contribution model.

4.1 *Electoral Conditions and Campaign Contributions*

As mentioned, an obvious and well-studied way in which raising early money might affect election outcomes is as a defensive reaction by candidates facing strong challengers (e.g., Jacobson 1980; Krasno and Green 1988). However, intuitively, while electorally motivated PACs will seek out close races, access-motivated PACs will shy away from endangered candidates, creating a tension between a candidate and access-motivated interest groups: When the incumbent finds funds the most valuable, many organizations are the most hesitant to donate.

Our dynamic contribution model generates insights into how this tension is likely to be resolved. Despite the intuition that access-driven groups might contribute less to incumbents in trouble, we hypothesize that interest group funding increases given poor electoral conditions. Condition i of the proposition implies that the group and the sitting member of Congress will agree on contributions that equate the marginal impact of spending under both electoral states, i.e., $\pi_G' = \pi_B'$. Combined with A2, this implies that revenues in the bad state must be higher than those of the good state, so that $r_2^{B^*} > r_2^{G^*}$. This result holds regardless of the extent of the group's access motivations.

> **Hypothesis 1.** Larger preelection contributions are generated when electoral conditions are worse, *ceteris paribus*.

However, Hypothesis 1 does not imply that the tension between group and incumbent objectives disappears, only that the incumbent offers services on more favorable terms in bad electoral times. Given *any particular offer of access*, the group may still be less willing to pay than when the incumbent is a sure winner. However, incumbents will always choose to discount access enough to generate the larger contributions.

Our dynamic contribution model also yields predictions about how other variables affect preelection contributions. By rewriting condition i as $\pi_s'(r_2^{s^*}) = \omega(W, \theta, \hat{g})^{-1}$ and recalling

that marginal returns to campaign spending are diminishing, it is clear that $r_2^{s^*}$ is increasing in W, θ, and $\hat{g}$.

> **Hypothesis 2.** Contributions received between the primary and the general elections should be higher, *ceteris paribus*, the greater the utility to the incumbent, the more the group cares about access relative to policy, and the better the ideological match between the incumbent and the group.

4.2 *The Role of Early Money*

Additionally, our model generates results pertaining to the role of early contributions. Recall that condition ii of our proposition indicates that the marginal impact of early money on the probability of good electoral conditions times the difference in incumbent payoffs across each state should equal the marginal cost of raising early money. We can apply this condition to demonstrate when an agreement on early campaign contributions will be optimal for the incumbent and the group.

To facilitate the analysis of the incumbent's desire to manipulate future electoral conditions with early spending, we specify two definitions pertaining to the relationship between reelection and spending. Let $\omega = \omega(W, \theta, \hat{g})$, then define $\Delta_1(\omega) \equiv \pi_G(r_2^{G^*}(\omega)) - \pi_B(r_2^{B^*}(\omega))$ and $\Delta_2(\omega) \equiv r_2^{B^*}(\omega) - r_2^{G^*}(\omega)$. The function $\Delta_1(\omega)$ represents the difference in period 2 equilibrium reelection probabilities when the joint benefit of reelection is ω, while $\Delta_2(\omega)$ is the difference in period 2 equilibrium spending. Therefore, Δ_1 is the equilibrium electoral benefit and Δ_2 is the equilibrium cost savings associated with the good state. Although the previous section demonstrated that $\Delta_2(\omega)$ is always positive, the sign of $\Delta_1(\omega)$ depends on the precise assumptions adopted about how electoral conditions affect reelection probability. If the level effect of electoral conditions A1 is substantial relative to its effect on the marginal impact of spending A2, then $\Delta_1(\omega)$ is positive.[13] Since the sign of $\Delta_1(\omega)$ plays a role in the analysis that follows, we simply assume that it is strictly positive. There are a number of justifications for this assumption. First, it seems reasonable that electoral conditions should have first-order effects on the probability of election and second-order effects on the marginal impact of spending. Second, condition i of the proposition suggests that, if $\Delta_1(\omega)$ were negative, the reelection probability would be higher in the bad state than in the good state. As empirical research consistently finds that electoral conditions, such as challenger quality, significantly affect incumbent vote totals (Jacobson 1980; Green and Krasno 1988), we believe that restrictions on π^s that predict differences in the equilibrium probability of reelection according to challenger quality and other conditions are in order.

To generate predictions about the occurrence of period 1 contributions, it is now convenient to rewrite condition ii of the proposition. Then, substituting $\Delta_1(\omega)$ and $\Delta_2(\omega)$ into ii, we obtain $\mu_G'(r_1)(\Delta_1(\omega)\omega + \Delta_2(\omega)) = 1$, where $\Delta_1(\omega)\omega + \Delta_2(\omega)$ is the net joint utility of the group and incumbent for the good electoral state over the bad electoral state. Since Δ_1 and Δ_2 are assumed to be positive, we can see that the group will contribute early money, r_1, as long as its marginal impact on future electoral conditions is positive, $\mu_G' > 0$. Further, as μ_G is subject to diminishing returns, early money will be more effective when electoral conditions have the greatest impact on the returns to the group and the incumbent.[14]

---

[13] To see this, note that $\pi_G(r^{G^*}) - \pi_B(r^{B^*}) = [\pi_G(0) - \pi_B(0)] + [\int_0^{r^{G^*}} (\pi_G'(\rho) - \pi_B'(\rho))d\rho] + \int_{r^{G^*}}^{r^{B^*}} -\pi_B'(\rho)d\rho$. From A1, the first bracketed term is positive, and from A2 the second and thirds terms are negative.

[14] While we do not test this hypothesis directly in the empirical work that follows, it proves useful in interpreting our findings about the relative lack of early money.

Hypothesis 3. Early contributions are greater when the effect of early spending on future electoral conditions is large.

We can also relate early contributions to the variables W, θ, and $\hat{g}$. These variables have a positive impact on early contributions if and only if $\Delta_1(\omega)\omega + \Delta_2(\omega)$ is increasing in ω. Since this net benefits function is determined by maximization with respect to ω, a straightforward application of the envelope theorem establishes that its first derivative is $\Delta_1(\omega) > 0$. Therefore, our model suggests that W, θ, and $\hat{g}$ are positively related to early contributions.

Hypothesis 4. Early contributions should be higher, *ceteris paribus*, the greater the utility to the incumbent, the more the group cares about access relative to policy, and the better the ideological match between the incumbent and the legislator.

4.3 *Intertemporal Substitution and Contribution Timing*

An intuitive view regarding contribution timing is that there might be intertemporal substitution, by which certain types of groups give early but not late, while others adopt a diametrically opposite strategy. Put another way, a group has a bundle of money and decides at what time it is most advantageous to provide these funds. Statistically, such substitution implies that a negative correlation should exist between early and late contributions from a given group.

Interestingly, at least for the first two periods, our dynamic contribution model generates the opposite prediction. Given that contributions in both stages should be positively correlated with the group's utility, θ, and $\hat{g}$, as well as with W, funding across periods 1 and 2 should also be positively correlated. This provides a very clear empirical test of whether our perspective on contribution timing is sensible. Although we expect that the variables specified in our model will significantly predict contributions across the cycle, our theoretical results suggest that, to the extent that they are misspecified and measured with error, errors associated with each group's contributions over the cycle should be, if anything, positively correlated. In contrast, if the intuitive model is right, we should see a negative correlation.

Hypothesis 5. Contribution levels in the two preelection periods should be positively correlated.

Certainly, evidence that PACs primarily contribute in single installments would provide *prima facie* refutation of Hypothesis 5. Happily, although only suggestively, the descriptive data suggest that a significant portion of PACs split their contributions to an incumbent even more than required by the accounting requirements of campaign finance regulation that separate funds for general elections and primaries. For instance, in the 1995–1996 electoral cycle, while there is significant variation between PAC types, labor, corporate, and trade PACs give more than one donation to reelection-seeking members of Congress anywhere from 40 to 60% of the time.[15]

[15] Since the FEC regulations allow either primary or general campaign contributions to be given at any point in the electoral cycle, reporting restrictions can induce multiple contributions only if PACs seek to give a total exceeding $5000 (the single election limit). Since only 4% of itemized contributions exceed even $2500 (using 1995–1996 data), these restrictions are rarely binding.

5 Testing the Model

While Hypothesis 3 is not directly amenable to testing, we can investigate our remaining hypotheses empirically. The results should provide a direct test of the dynamic contribution model. However, several related econometric issues complicate developing the estimator required for testing these hypotheses. Since Hypotheses 1, 2, and 4 all pertain to the relationship between observable variables and the level of contributions in each period, our estimator must allow us to assess the effects of various access and electoral variables on the level of contributions in each electoral period. But, unfortunately, since Hypothesis 5 suggests that errors are likely correlated over the electoral cycle, estimating one equation per period using ordinary least squares (OLS) or Tobit and comparing the effects of the same independent variables for different periods on contribution levels is unsatisfactory. Further, given that our dependent variable is censored at zero, the typical approach to dealing with correlated errors given multiple periods—running a pooled time-series cross section where coefficients are specified to deal with the possibility that variables might have different effects at various points—is inappropriate, as it would result in inconsistent estimates (Madalla 1983). In fact, as $0 is the median per-period contribution in all of our samples, transformations such as log–log are inappropriate solutions for our censoring problem.

Unfortunately, many econometric techniques which have been used to look at PAC timing do not allow us to test our model with confidence either. For instance, duration analysis provides an intuitive means of modeling the temporal process of campaign contributions empirically. As such, Box-Steffensmeir and Radcliffe (1997) develop a split-population survival model of the date of the first contribution from a PAC to an incumbent. Unfortunately, the microfoundations of this approach are inconsistent with our theoretical model. While our model assumes that timing is determined from backward induction from a known election date, the split population model assumes that the election is a random, exogenous, censoring event.[16] Alternative models pose other problems. For instance, Mebane and Wand (1999) develop a Poisson model of the numbers of contributions of various sizes received by open seat candidates over the 1994 electoral cycle, but their model does not allow for studying the relationship between a particular group and candidate over time.

Thankfully, the Tobit model can be generalized, with the standard specification being a special case, to estimate the correlation of contributions over time. Although presenting problems of tractability, which fortunately are not insurmountable, we can estimate the intertemporal correlation of contributions.

To do so, we represent our multiperiod generalization of the Tobit model by

$$y^* = \boldsymbol{X}\beta + \varepsilon \tag{4}$$

where y^* is an $NT \times 1$ vector of latent variables corresponding to the N incumbent/PAC pairs and T time periods. The data matrix $\boldsymbol{X}$ is a block diagonal matrix with the $N \times k_j$ matrices $\boldsymbol{X_j}$ corresponding to data at time j forming the diagonal. To allow the coefficients to vary with respect to time, we construct the coefficient vector so that $\beta' = (\beta_1', \ldots, \beta_T')$, β_j is a coefficient vector of length k_j, and ε is an $NT \times 1$ disturbance vector. We assume

[16] An additional complication of the split-population approach is that it cannot be used to model the size of contributions—a variable for which our theoretical model generates predictions.

that the observed contribution y_{it} is given as follows:

$$y_{it} = \begin{cases} y_{it}^* & \text{if} \quad y_{it}^* \geq 0 \\ 0 & \text{otherwise} \end{cases} \tag{5}$$

Also, we let d_{it} be an indicator function equal to 1 if $y_{it}^* \geq 0$. We assume that ε is distributed independently and identically across incumbent-group pairs but that it covaries across time within the pairs with covariance Σ. Formally, we assume that ε is multivariate normal, with mean 0 and covariance $\Sigma \otimes I_N$. Further, even given censoring, the system could be estimated via the standard Tobit model if Σ were a diagonal matrix. However, since our theoretical model implies that contribution behavior should persist across the cycle, and any unmeasured heterogeneity across group-incumbent pairs would violate the assumption of zero autocovariances, standard Tobit is inappropriate.

Before proceeding to the likelihood function, it is useful to employ some properties of the multivariate normal distribution to reparameterize the covariance matrix. Let A be the Cholesky decomposition of Σ such that $AA' = \Sigma$ and A is a lower triangular matrix. A well-known result is that ε_i can be written $A\eta_i$, where $\eta_i' = (\eta_{i1}, \eta_{i2}, \ldots, \eta_{iT})$ are standard normal variables. Using these results, we can establish that ε_{it} can be written as a univariate normal random variable whose mean is $\sum_{j=0}^{t-1} a_{tj}\eta_{ij}$ and whose variance is a_{tt}^2, where a_{ij} are the corresponding elements of A. Thus, Eq. (3) can be rewritten $y_{it}^* = x_{it}'\beta_t + \sum_{j=1}^{t-1} a_{tj}\eta_{ij}$. Hence, conditional on observations of $\eta_{i1}, \ldots, \eta_{i,t-1}$, we can estimate this equation via the standard Tobit model recursively from period 1 to period t. The difficulty, of course, is that, as censoring precludes observing η, η_{it} is unobserved for observations in which $d_{it} = 0$. The likelihood function of observations for period t is

$$\int_{\eta_i} \left[d_{it}\phi\left(a_{tt}^{-1}\left(y_{it} - x_{it}'\beta_t - \sum_{j=1}^{t-1} a_{tj}\eta_{ij}\right)\right) + (1 - d_{it})\Phi\left(a_{tt}^{-1}\left(-x_{it}'\beta_t - \sum_{j=1}^{t-1} a_{tj}\eta_{ij}\right)\right)\right]$$
$$\times f(\eta_{i,t-1}|y_{i,t-1}, \eta_{i1}, \ldots, \eta_{i,t-2}) \ldots f(\eta_{i1}|y_{i1}) d\eta_{i1} \ldots d\eta_{i,t-1} \tag{6}$$

Recently developed simulation techniques help make estimation of this model tractable. We adopt the GHK simulator, which facilitates estimation by allowing us to replace (η_{i1}, $\eta_{i2}, \ldots, \eta_{i,T-1}$) and their associated conditional probabilities with simulated draws ($\tilde{\eta}_{i1}$, $\tilde{\eta}_{i2}, \ldots, \tilde{\eta}_{i,T-1}$) for this purpose.[17] By design, these simulated error terms are consistent with the observed behavior.

Under the GHK simulator, the draws are simulated recursively as follows. First, consider d_{it}. If $d_{i1} = 1$, then $\tilde{\eta}_{i1} = y_{i1} - x_{i1}'\beta_1$. However, if $d_{i1} = 0$, $\tilde{\eta}_{i1}$ is drawn randomly from the density $\phi(\eta_{i1})/\Phi(-x_{i1}'\beta_1/a_{11})$, which is that of the standard normal distribution truncated from above at $-x_{i1}'\beta_1$. This ensures that $\tilde{\eta}_{i1}$ is consistent with the observation that $d_{i1} = 0$. Now consider $\tilde{\eta}_{it}$. If $d_{it} = 1$, then $\tilde{\eta}_{it} = y_{it} - x_{it}'\beta_t - \sum_{j=1}^{t-1} a_{tj}\tilde{\eta}_{ij}$. If $d_{it} = 0$, $\tilde{\eta}_{it}$ is drawn randomly from density $\phi(\eta_{it})\Phi(-x_{it}'\beta_t - \sum_{j=1}^{t-1} a_{tj}\tilde{\eta}_{ij}/a_{tt})^{-1}$.[18]

Although a single draw provides consistent estimates, we can improve efficiency by averaging the log-likelihood function over a number of draws. However, there is little to be gained from large numbers of draws in our Tobit case, since we use simulation only for

[17] See Hajivassiliou et al. (1996) for a review and a Monte Carlo analysis of the GHK and other probability simulators; see Lawrence (1996) for a political science application.

[18] In practice, $\tilde{\eta}_{it} = \Phi^{-1}[u_{it}\Phi(-z_{it})]$, where u_{i1} is a draw from $u[0, 1]$ and $z_{it} = x_{it}'\beta_t + \sum_{j=1}^{t-1} a_{tj}\tilde{\eta}_{ij}/a_{tt}$.

censored observations rather than for every observation as in the typical multinomial probit application.[19]

6 Data and Measurement

Testing our predictions about the timing of contributions requires (1) enumerating the variables that ought to determine PAC giving and its timing across the electoral cycle (i.e., access demand, ideological compatibility, and electoral vulnerability) and (2) specifying the appropriate structural model and contrasting its performance with the alternatives. To reiterate, we seek to test whether temporal contributions patterns are consistent with Hypotheses 1, 2, 4, and 5. Together, Hypotheses 2, 4, and 5 suggest that the incumbent's ability to generate access and the ideological compatibility between the incumbent and the group should generate roughly uniformly higher contributions across the cycle; Hypothesis 1 indicates that late contributions will be very sensitive to electoral conditions.

With just a few exceptions, measuring contribution behavior is straightforward. We investigate the timing of labor, corporate, and trade PAC contributions over the three electoral cycles from 1991 to 1996. Using Federal Election Commission data, we can discern contribution amounts to House incumbents as well as the contribution date and source. To narrow our analysis, we focus mostly on the universe of large PACs—for the 1994 and 1996 cycles, defined as those giving more than $300,000 in the previous electoral cycle and, for the 1992 cycle, defined as those giving more than $200,000 (reflecting lower levels of giving in these years).[20]

Measuring our dependent variable requires defining the intraelection periods. While we attempted various periodizations of the electoral cycle, for reasons of theory and parsimony we adopt a three-period model.[21] The *off-year* period incorporates contributions given in the calendar year without elections, the *preprimary* period includes contributions made from the beginning of the election year through the primary, and the *general election* period involves contributions given between the primary and the general election.[22] We use the primary date in our periodization scheme because it provides the best objective measure about when uncertainty about challenger quality and other electoral conditions is resolved. Our dependent variable, therefore, is the level of contribution (in thousands of dollars) for all possible PAC-incumbent pairs given our sample of PACs, including those pairs for which there is never a contribution.

As for independent variables, we borrow extensively from the existing literature in attempting to measure electoral conditions, ideology, and relative access values (e.g., Gopoian

[19] The estimates we present below are based on 10 draws. Experimentation reveals that more draws have a negligible effect on the estimates.

[20] To check the robustness of our sample exclusions, we also employ a random sample of smaller PACs that give at least $100,000 (for the 1994 and 1996 cycles) or $50,000 (for the 1992 cycle). However, we present only the results for large PACs. Our substantively comparable findings for smaller PACs are available at the *Political Analysis* website. We do not wish to suggest, however, that our results generalize to those groups giving less than these thresholds. First, the logic of our theoretical model seems less compelling for small PACs who tend to pursue more idiosyncratic goals. Second, Box-Steffensmeier and Radcliffe (1997) find very different patterns in the timing of contributions of small PACs relative to large PACs.

[21] Finer partitions of the electoral cycle proved to have little substantive effect on the analysis. Given that we use only three periods, other methods such as quadrature could have been used to evaluate integrals in Eq. (5). However, given our large sample sizes and the number of elections we analyze, GHK provides substantial economies over these other methods.

[22] As it is difficult to distinguish monies given for future access from those given for immediate access empirically, we must implicitly assume that the spot transactions occur uniformly over time and do not have a systematic effect on the timing of contributions relative to the electoral cycle. To the extent to which this assumption is invalid, it biases against empirical findings supportive of our model.

1984; Grenzke 1989; Grier and Munger 1986, 1991; Hall and Wayman 1990). Like previous research, we identify three types of potential determinants of PAC contributions—electoral, programmatic, and structural—which are used to operationalize electoral, ideological, and access motivations. We measure them as follows.

6.1 *Electoral Characteristics*

Since the model suggests that electoral conditions and their changes determine the timing of contributions, we hope to specify appropriate measures of electoral circumstances for each period in our model. To capture both the incumbent's long-term electoral vulnerability and expectations about future primary and general election challenges, we utilize the incumbent's two-party vote percentage from the previous election for all three periods. In the preprimary period, we also add data about primary opposition: To measure contemporaneous vulnerability as well as expectations about future quality challengers, we include the number of candidates both in the incumbent's primary and in the challenger's primary. In the general election period, we further measure vulnerability by including the incumbent's vote percentage in the primary, challenger quality, lack of opposition, and, as a measure of elite expectations about the closeness of the general election, a 4-point scale ranging from 0 (toss-up) to 3 (safe incumbent) devised from *Congressional Quarterly's* October predictions of House election outcomes.[23]

6.2 *Programmatic Characteristics*

We also employ a number of measures to capture programmatic characteristics that could affect a group's compatibility with the incumbent on general policy matters. To measure ideological or party differences between the group and the incumbent, we employ Poole and Rosenthal's (1997) DW-NOMINATE scores; we use a quadratic specification to capture any nonlinearities caused by PACs with ideal points that are interior to the positions of members of Congress.[24] We also measure party affiliation with a dummy variable for Republicans and any socioeconomic effects with median district income (in $10,000s). Given our theoretical model, we expect that the effects of these variables are consistent across the electoral cycle.

6.3 *Structural Characteristics*

To capture variations in access demand, we measure each member's organizational position in the House as a proxy for the value of access to the incumbent. We include dummy variables for membership on exclusive committees and in the leadership and a measure of each member's seniority in the chamber (in years, divided by 10 to facilitate estimation).[25] Our model predicts that these variables will also be important predictors of campaign contributions across the electoral cycle.

Beyond these independent variables culled from the literature, we employ several additional controls. To capture any heterogeneity in contribution patterns related to a PAC's resources, we include PAC size, measured as the total amount of money given to House candidates in the previous election. Also, to control for any distortion created by our use of primary dates for periodization, we incorporate the number of days in each period. We

[23] While it is plausible that these predictions may be endogenous to fundraising, in previous work we find that using instrumental variables for these elite expectations alters the results very little (see McCarty and Rothenberg 1996a).

[24] For more on the rationale and interpretation of this specification, see McCarty and Rothenberg (1996b).

[25] We define exclusive committees as Appropriations, Commerce (a.k.a. Energy and Commerce), Ways and Means, and Rules and leaders as party leaders, committee chairs, and ranking members.

prefer this approach to using "dollars per day" as a dependent variable, since the latter would certainly produce estimates suggesting that incumbents in late primary states receive less money.

7 Results

Table 1 presents our empirical results for large corporate, trade, and labor PACs in the 1996 election.[26] Our results support many of the hypotheses that follow from our contribution model. Also, as mentioned, results for both sizes of PACs are remarkably similar, demonstrating our model's robustness.

As our coefficients are hard to interpret substantively—not only are Tobit coefficients inherently difficult to interpret, but our hypotheses about the relative impact of factors such as committee assignments and leadership across the cycle are impossible to evaluate from raw coefficients—in the following discussion we compare the expected contribution for each period for a typical majority party incumbent, setting all continuous variables (except that of interest) to their sample means and all categorical variables to zero.

7.1 *Electoral Conditions*

The expectations generated by our model regarding the importance of electoral conditions for the timing of campaign contributions receive strong empirical support. Particularly important is the extreme sensitivity of late contributions to electoral conditions. Rather than linking up with sure winners, PACs scramble late in the electoral cycle to get money into the hands of those incumbents who can best use it.

Figure 2 illustrates this pattern by displaying the effect of incumbent vulnerability on late contributions. This figure plots the ratios of expected contributions for incumbents in races that *Congressional Quarterly* (*CQ*) defines as "leaning" in their direction, as "expected" to win, or as "safe" to the expected contributions of incumbents in "close races." It shows a strong relationship between contributions and electoral security. Incumbents in leaning races receive from 70 to 85% of what the most vulnerable members get, those expected to win get about 30 to 75%, and safe incumbents take in 15 to 65% (all differences are significant at the .01 level). If anything, given our controls for challenger quality and lack of opposition, the ratios presented in Fig. 2 are probably conservative.

Perhaps because the *CQ* predictions do capture the effects of electoral conditions well, our estimates for other electoral variables are a bit more inconsistent. For the general election period, challenger quality, although insignificant in a few cases and in the wrong direction in one instance, typically exhibits the predicted positive sign. Lack of opposition is significant, with a predicted negative sign, in all cases in 1992 and 1994,[27] but it is insignificant for corporate and labor PACs in 1996. Incumbent primary results are insignificant in most cases.

Turning to electoral conditions in the two earlier periods, we find that the previous electoral performance of the incumbent has a statistically significant effect on contributions in each period. As one might expect, with just a few exceptions, the effects are larger and more consistent for labor unions than for other PAC types, but they are statistically significant across all groups. For instance, in 1996 large corporate PACs typically gave upwards of $150 more in each period to Republican incumbents who are the most marginal

[26] The table of coefficients for 1992, 1994, and the sample of smaller PACs is available at the *Political Analysis* website.

[27] See the *Political Analysis* website for these results.

Table 1 Estimates of a dynamic contribution model (standard errors in parentheses)

	Off-year contributions			*Preprimary contributions*			*General election contributions*		
	Corporate	*Labor union*	*Trade assoc.*	*Corporate*	*Labor union*	*Trade assoc.*	*Corporate*	*Labor union*	*Trade assoc.*
Constant	−30.832	−23.195	−14.940	−47.197	−60.572	−87.393	−55.812	−55.873	−72.009
	(1.530)	(1.972)	(1.162)	(3.652)	(5.299)	(3.575)	(4.523)	(6.145)	(3.574)
PAC size	5.183	3.622	2.601	6.282	9.782	12.290	9.166	11.159	11.532
	(0.190)	(0.260)	(0.143)	(0.420)	(0.673)	(0.419)	(0.518)	(0.695)	(0.388)
Ideology	6.862	−17.404	5.274	9.786	−28.662	13.007	18.017	−27.108	14.623
	(0.899)	(1.125)	(0.709)	(2.228)	(2.753)	(2.079)	(2.675)	(3.177)	(1.873)
Ideology^2	−1.233	−23.265	−3.372	−7.292	−38.091	−11.843	−9.823	−61.413	−22.184
	(1.672)	(2.069)	(1.300)	(3.905)	(5.143)	(3.688)	(4.754)	(5.747)	(3.393)
Party	−1.196	−1.139	−1.712	−3.375	−13.216	−4.848	−7.299	−16.837	−5.893
	(0.569)	(0.635)	(0.448)	(1.396)	(1.734)	(1.301)	(1.624)	(1.768)	(1.155)
Seniority	−0.122	0.127	−0.724	0.532	−0.512	−0.772	−0.676	−0.131	−0.558
	(0.180)	(0.178)	(0.147)	(0.402)	(0.488)	(0.416)	(0.529)	(0.492)	(0.371)
Previous general election	−2.988	−6.173	−4.351	−5.638	−14.623	−2.568			
	(0.782)	(0.873)	(0.605)	(1.823)	(2.797)	(1.794)			
Major committee	1.858	0.648	1.913	3.961	1.480	3.841	3.126	−0.833	3.267
	(0.222)	(0.234)	(0.170)	(0.511)	(0.685)	(0.488)	(0.602)	(0.691)	(0.449)
Leadership	1.285	0.830	0.893	1.624	2.594	0.951	2.494	−0.219	1.848
	(0.460)	(0.430)	(0.378)	(0.965)	(1.312)	(1.057)	(1.334)	(1.268)	(0.983)
Median district income	−0.184	0.602	0.384	−0.333	1.355	−0.335	−0.638	1.262	0.288
	(0.126)	(0.138)	(0.097)	(0.289)	(0.403)	(0.280)	(0.354)	(0.384)	(0.258)
No. days in cycle				29.776	26.949	28.653	16.267	9.750	1.146
				(4.100)	(5.409)	(3.817)	(5.270)	(5.683)	(3.423)
Incumbent primary opposition				0.481	1.576	1.383			
				(0.358)	(0.393)	(0.343)			

(Continued on next page)

Table 1 Estimates of a dynamic contribution model (standard errors in parentheses) *(Contiuned)*

	Off-year contributions			*Preprimary contributions*			*General election contributions*		
	Corporate	*Labor union*	*Trade assoc.*	*Corporate*	*Labor union*	*Trade assoc.*	*Corporate*	*Labor union*	*Trade assoc.*
Challenger primary opposition				0.188 (0.251)	−0.366 (0.262)	−0.230 (0.261)			
Unopposed							1.611 (1.624)	−1.715 (1.916)	−3.467 (1.252)
Primary margin							0.791 (1.830)	−1.970 (1.980)	1.984 (1.484)
Challenger quality							0.346 (0.663)	−3.015 (0.771)	0.496 (0.529)
CQ prediction							−2.207 (0.304)	−4.450 (0.360)	−2.080 (0.236)
N	4,272	9,256	8,900						
Log-likelihood	−16,618	−34,327	−42,097						
Initial log-likelihood	−19,608	−42,762	−46,102						
Avg. contribution	$525	$539	$644	$265	$539	$712	$372	$668	$879
Daily contribution	$1.44	$1.47	$1.76	$1.44	$3.01	$3.98	$2.05	$3.76	$5.02

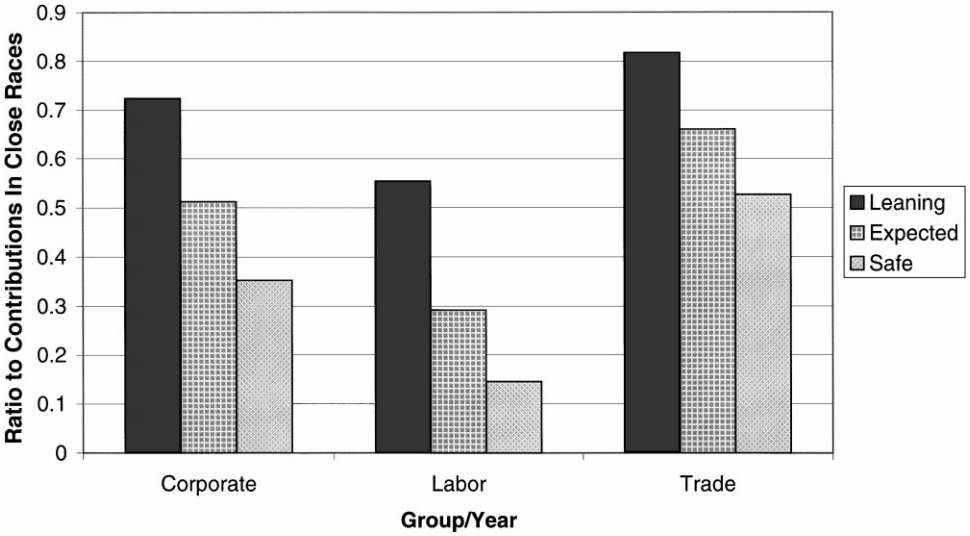

Fig 2 Effect of electoral conditions on late contributions (corporate, labor, and trade PACs).

(receiving 50 rather than 69% of the vote in the previous election). As average contributions in the off-year and primary periods are $1358 and $671, the most vulnerable are afforded premiums of 14 and 21% (corresponding premiums are 19 and 5% for trade PACs and 19 and 22% for labor PACs).[28] While these effects are substantial compared to the results illustrated in Fig. 2, we can see that vulnerability's effect is much greater on later than on earlier contributions.

7.2 *Timing and Intertemporal Substitution*

Our results also support the dynamic contribution model's predictions about timing. In particular, the effects of ideological and access variables are rather consistent across the electoral cycle. Also, little in the way of intertemporal substitution appears to be taking place.

For instance, our findings indicate that members are either not able or not willing to use their institutional position, whether it be leadership, committee memberships, or status in the majority, to receive funds earlier. Those advantageously positioned tend to receive more contributions in every period, but funds roll in at the same percentage rate as they do for those less blessed.

Figure 3 illustrates such patterns. For instance, in plotting the ratio of contributions to a typical Republican to that of a typical Democrat in each period, it shows the absence of marked swings from one party to another across the cycle.[29] The figure does suggest that corporate and trade PACs slightly emphasized contributions to Republicans late in the electoral season. However, as this effect is present for both the 1994 and the 1996 elections, it is doubtful that majority party status has anything to do with these results.

In a similar vein, Fig. 3 plots the ratio of contributions both to exclusive committee members and to leaders to those of the rank and file. These results show that the observed

[28] As labor's contribution to any Republican incumbent is small, our comparison for labor groups is for Democratic incumbents only.

[29] In Fig. 3, we set the ideology variable equal to the respective party mean rather than to the sample mean. Labor PACs are excluded from the party comparison, as their contributions to Republicans are trivial.

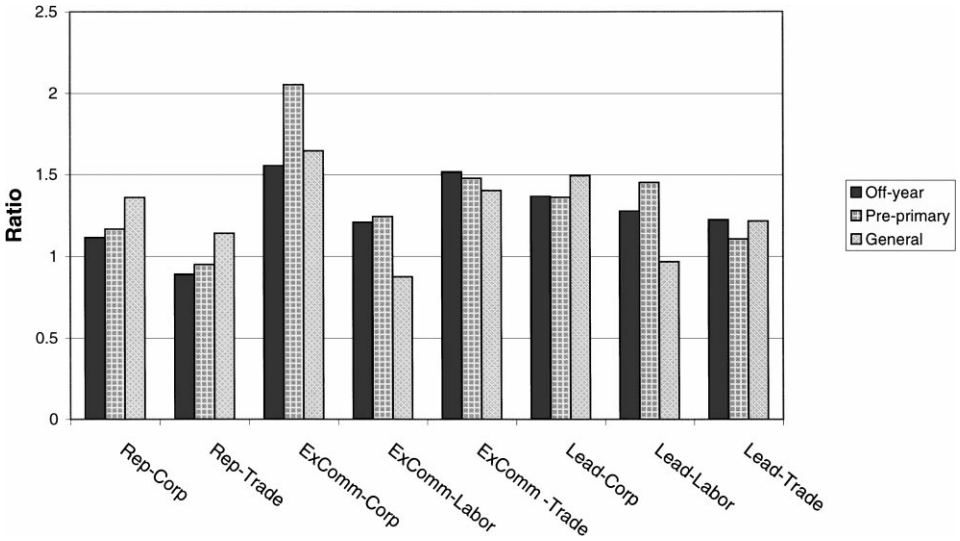

Fig 3 Effect of party, committee assignment, and leadership (corporate, labor, and trade PACs). Rep, ratio of the contribution to a Republican to that of a Democrat; ExComm, ratio of the contribution to an exclusive committee member to that of a rank-and-file member; Lead, ratio of the contribution to a party leader to that of a rank-and-file member.

temporal pattern of contributions is also not conditioned greatly by where members are situated in the legislative hierarchy. Except for a tendency of corporate PACs to emphasize major committee membership in the primary period, no systematic variation is observed.

Results for intertemporal substitution reinforce our beliefs about the effects of timing by showing that the relationship between giving at one point and another is weak. Recall that our panel Tobit estimator allows us to produce an intertemporal correlation matrix for our error terms. These correlations are positive and significant but uniformly small, refuting the naïve "gave at the office" theory that implies that PACs will choose to give early or late but not both (see Table 2). Consistent with the dynamic contribution model, after controlling for relevant factors, contribution behavior is fairly independent across time.

Table 2 Intertemporal substitution of contribution activity (temporal error correlations by PAC type)

	Off-year	*Preprimary*	*General*
	Corporate PACs		
Off-year	1.000	0.183	0.163
Preprimary	0.183	1.000	0.022
General	0.163	0.022	1.000
	Labor PACs		
Off-year	1.000	0.076	0.079
Preprimary	0.076	1.000	0.016
General	0.079	0.016	1.000
	Trade PACs		
Off-year	1.000	0.159	0.127
Preprimary	0.159	1.000	0.015
General	0.127	0.015	1.000

8 Discussion and Conclusions

Given the generally encouraging results for our testable hypotheses, we feel that it is appropriate to speculate about other implications of the theoretical model for the role of organized groups in both the electoral and the policy processes. At least three such implications stand out. First, the model suggests that the empirical regularity of little early money may be accounted for by the unwillingness of a strategic incumbent to pay the price of lower total fundraising and greater provision of access. Drawing upon the untested Hypothesis 3, we might think of contribution timing as reflecting the value of money, as our model implies that bargaining concessions are made to equate the marginal value of campaign spending in each period. For example, as we find that money flows to candidates two to three times faster during the general election period than earlier, we think it is reasonable to infer that early money has a smaller value relative to late money than is commonly believed. Consistent with earlier empirical findings that question early money's instrumental value, our interpretation is that candidates do not consider cash on hand at the beginning of the electoral cycle important enough to justify the necessary bargaining concessions.

Additionally, our results reaffirm findings of McCarty and Rothenberg (1996b) that organized interests are very responsive to electoral conditions. Rather than attempt to cast their support to sure winners in an effort to guarantee access, potential contributors save most of their money until right before the general election and put it disproportionately in the hands of the most vulnerable. This is true even for the quintessentially access-driven corporate PACs.

Finally, consistent with McCarty and Rothenberg (1996a), our results provide little evidence for routinized patterns of group support for incumbents. Behavior seems to be determined substantially by the short-term incentives induced by the next general election. PACs' emphases on investing when returns are most uncertain are not consistent with the implicit agreements necessary for long-term investment in politicians.

Appendix: Proof of Lemma 1

Using backward induction from the last period, the incumbent will offer $a_3^{s^*}$ to equate marginal revenue and marginal cost so that $\theta u'(a_1^* + a_2^{s^*} + a_3^{s^*}) = k'(a_1^* + a_2^{s^*} + a_3^{s^*})$. Define $\bar{a}$ such that $\theta u'(\bar{a}) = k'(\bar{a})$. Therefore, $r_3^s(a_1^*, a_2^{s^*}) = \max\{0, \theta(u(\bar{a}) - u(a_1^* + a_2^{s^*}))\}$. We assume an interior solution such that $r_3^s > 0$.

In the second period, the group's willingness to contribute is given by the expected utility of accepting the contract offered by the incumbent minus the utility if it does not contribute so that

$$\begin{aligned} r_2^s(a_1^*, a_2^s) \;=\; & \pi_s(r_2^s)\left[\theta u\left(a_1^* + a_2^s + a_3^s\right) + g_I - r_3^s\left(a_1^* + a_2^s\right)\right] + \left(1 - \pi_s\left(r_2^s\right)\right) g_C \\ & - \pi_s(0)\left[\theta u\left(a_1^* + a_3^s\right) + g_I - r_3(a_1^*, 0)\right] - (1 - \pi_s(0)) g_C \end{aligned}$$

Substituting the solution for r_3^s and rearranging, we find

$$\theta u\left(a_1^* + a_2^s\right) = \frac{r_2^s\left(a_1^*, a_2^s\right) + \pi_s(0)[\theta u(a_1^*) + \hat{g}]}{\pi_s\left(r_2^s\right)} - \hat{g} \tag{L1}$$

where $\hat{g} = g_I - g_C$.

In the first period, the group's willingness to provide access is

$$r_1(a_1) = \sum_{s\in\{G,B\}} \mu_s(r_1)\big(\pi_s\big(r_2^s\big)\big[\theta u\big(a_1 + a_2^s + a_3^s\big) + \hat{g} - r_3^s(a_1)\big] - r_2^s(a_1)\big) - \mu_s(0)\big(\pi_s\big(r_2^s\big)\big[\theta u\big(a_2^s + a_3^s\big) + \hat{g} - r_3^s(0)\big] - r_2^s(0)\big)$$

Substituting for r_2^s, r_3^s and rearranging,

$$\theta u(a_1) + \hat{g} = \frac{r_1(a_1) + \sum \mu_s(0)\pi_s(0)\hat{g}}{\sum \mu_s(r_1)\pi_s(0)} \tag{L2}$$

Substituting (L1) and (L2) into r_3^s, we find that

$$r_3^s\big(r_1, r_2^s\big) = \theta u(\overline{a}) + \hat{g} - \frac{r_2^s}{\pi_s\big(r_2^s\big)} - \frac{\pi_s(0)}{\pi_s\big(r_2^s\big)}\left(\frac{r_1 + \sum \mu_s(0)\pi_s(0)\hat{g}}{\sum \mu_s(r_1)\pi_s(0)}\right)$$

References

Austen-Smith, David. 1995. "Campaign Contributions and Access." *American Political Science Review* 89:566–581.

Baron, David P. 1989. "Service-Related Campaign Contributions and the Political Equilibrium." *Quarterly Journal of Economics* 104:45–72.

Baron, David P., and Jongryn Mo. 1992. "Campaign Contributions and Party-Candidate Competition in Services and Policies." In *Political Economy: Institutions, Information, Competition, and Representation*, eds. William Barnett, Melvin Hinich, Howard Rosenthal, and Norman Schofield. New York: Cambridge University Press.

Biersack, Robert, Paul S. Herrnson, and Clyde Wilcox. 1993. "Seeds for Success: Early Money in Congressional Elections." *Legislative Studies Quarterly* 23:535–551.

Box-Steffensmeier, Janet M. 1993. "A Dynamic Analysis of the Role of War Chests in Campaign Strategy." *American Journal of Political Science* 40:352–371.

Box-Steffensmeier, Janet M., and Peter M. Radcliffe. 1997. "Theories of Access and the Timing of PAC Contributions: A Split-Population Survival Model." Paper presented at the 1997 Southern Political Science Association.

Epstein, David, and Peter Zemsky. 1995. "Money Talks: Deterring Quality Challengers in Congressional Elections." *American Political Science Review* 89:295–308.

Erikson, Robert S., and Thomas Palfrey. 1998. "Candidate Spending and Incumbency: An Alternative Simultaneous Equations Approach." *Journal of Politics* 60:355–373.

Goldenberg, Edie N., Michael W. Traugott, and Frank R. Baumgartner. 1986. "Preemptive and Reactive Spending in U.S. House Races." *Political Behavior* 8:3–20.

Grier, Kevin B., and Michael C. Munger. 1986. "The Impact of Legislator Attributes on Interest Group Campaign Contributions." *Journal of Labor Research* 7:349–361.

Grier, Kevin B., and Michael C. Munger. 1991. "Committee Assignments, Constituency Interests, and Campaign Contributions." *Economic Inquiry* 29:24–43.

Hajivassiliou, Vassilis, Daniel McFadden, and Paul Ruud. 1996. "Simulation of Multivariate Normal Rectangle Probabilities and their Derivatives: Theoretical and Computational Results." *Journal of Econometrics* 72:85–134.

Hersch, Philip L., and Gerald S. McDougall. 1994. "Campaign War Chests as a Barrier to Entry in Congressional Races." *Economic Inquiry* 32:630–641.

Himmelberg, Charles P., and Gregory J. Wawro. 1998. "A Dynamic Panel Analysis of Campaign Contributions in Elections for the U.S. House of Representatives." Paper presented at the 1998 American Political Science Association, Boston.

Gopoian, J. David. 1984. "What Makes PACs Tick? An Analysis of the Allocation Patterns of Economic Interest Groups." *American Journal of Political Science* 28:259–281.

Grenzke, Janet M. 1989. "PACs and the Congressional Supermarket: The Currency is Complex." *American Journal of Political Science* 33:1–24.

Hall, Richard, and Frank Wayman. 1990. "Buying Time: Moneyed Interest and the Mobilization of Bias in Congressional Committees." *American Political Science Review* 88:911–926.

Jacobson, Gary C. 1980. *Money in Congressional Elections*. New Haven, CT: Yale University Press.

Krasno, Jonathan S., and Donald Philip Green. 1988. "Preempting Quality Challengers in House Elections." *Journal of Politics* 50:920–936.

Krasno, Jonathan S., Donald Philip Green, and Jonathan A. Cowden. 1994. "The Dynamics of Campaign Fundraising in House Elections." *Journal of Politics* 56:459–474.

Lawrence, Eric. 1996. "Simulated Maximum Likelihood via the GHK Simulator: An Application to the 1988 Democratic Super Tuesday Primary." Paper presented at the 1996 Midwest Political Science Association.

Madalla, G. S. 1983. *Limited-Dependent and Qualitative Variables in Econometrics*. New York: Cambridge University Press.

Mayhew, David. 1974. *Congress: The Electoral Connection*. New Haven, CT: Yale University Press.

McCarty, Nolan, and Keith T. Poole. 1998. "An Empirical Spatial Model of Congressional Campaigns." *Political Analysis* 7:1–30.

McCarty, Nolan, and Lawrence S. Rothenberg. 1996a. "Commitment and the Campaign Contribution Contract." *American Journal of Political Science* 40:872–904.

McCarty, Nolan, and Lawrence S. Rothenberg. 1996b. "Candidates, Contributors, and the Nature of Electoral Support." Paper presented at the 1996 Wallis Conference on Political Economy.

Mebane, Walter R., Jr., and Jonathon Wand. 1999. "Poisson-Normal Dynamic Generalized Linear Mixed Models of U.S. House Contributions." Paper presented at the 1999 Summer Political Methodology Meetings, Texas A&M University.

Poole, Keith T., and Thomas Romer. 1985. "Patterns of Political Action Committee Contributions to the 1980 Campaigns for the United States House of Representatives." *Public Choice* 47:63–111.

Poole, Keith T., Thomas Romer, and Howard R. Rosenthal. 1987. "The Revealed Preferences of Political Action Committees." *American Economic Review* 77:298–302.

Poole, Keith T., and Howard R. Rosenthal. 1997. *Congress: A Political-Economic History of Roll Call Voting*. Oxford: Oxford University Press.

Snyder, James M. 1990. "Campaign Contributions as Investments: The U.S. House of Representatives 1980–1986." *Journal of Political Economy* 98:1195–1227.

Squire, Peverill. 1991. "Preemptive Fund-Raising and Challenger Profile in Senate Elections." *Journal of Politics* 53:1150–1164.