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The Vicious Cycle:
Fundraising and Perceived Viability in US Presidential Primaries

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Abstract: Since at least Aldrich (1980a), a dynamic positive feedback loop between fundraising and electoral success has been hypothesized. Existing work on both directions of this feedback remains inconclusive and is often explicitly cross-sectional, ignoring the dynamic aspect of the hypothesis. Pairing high frequency FEC data on contributions and expenditures with Iowa Electronic Markets data on perceived probability of victory, we examine the bidirectional feedback between contributions and viability in a series of analyses. We find positive feedback in both directions during a successful insurgent-candidates' breakout from obscurity. This suggests the existence of multiple steady states. The implications for the efficiency of the primary process, and hence the system of public choice, are stark: if positive feedback exists, then high quality candidates might languish in obscurity while lesser, initially prominent candidates remain better known and better funded.

1 Which Came First: the money or the voters?

The conventional wisdom among campaign managers and the popular press is that money in politics is a vicious cycle. Candidates need to raise money to prove they are viable; and they need to be viable candidates to effectively raise money. In September 2007, Newsweek reported that former Arkansas Governor and Republican presidential candidate Mike Huckabee seemed to be a perfect fit for the GOP base. However, the article continued, "Huckabee is stuck in a familiar political trap: is he having trouble raising money because no one thinks he can win, or does no one think he can win because he's having trouble raising money?"[1]

Logically, this is the classic chicken-and-egg quandary. If such a positive-feedback loop exists, it carries at least two important implications for our system of representation and public choice. First, the positive question: how are the initial front-runners—who then become the nominees via the reinforcement process at work—selected? And second, the normative question: is the selection method desirable in the sense of selecting the "best" representative for the electorate? But before such questions can be tackled, it remains to be established that the conventional wisdom is correct; that positive-feedback between fundraising and popularity exists in both directions. As we will discuss in the next section, earlier work has not been conclusive. In this paper, we document the existence of this feedback loop and discuss its implications for the study of presidential primaries.

Our investigation consists of four complimentary empirical exercises. The first estimates an ARIMA model for campaign spending, including IEM prices as an independent variable to capture the possibility of feedback from perceived chance of victory to fundraising efforts. The results clearly show that many (though not all—a distinction we will characterize) candidates' receipts respond to changes in their electoral fortunes with magnitudes that are both economically and statistically significant. There appears to be a ternary classification of candidates: those stuck in an unfavorable steady state (long-shots), those enjoying a favorable steady state (frontrunners), and those transitioning between the two (insurgents on the way up or down). The second exercise is an interrupted time series analysis of the effect of a few key events on fundraising. These results lend weight to our ternary classification by showing that a frontrunner is vulnerable to a sufficiently large, negative shock. The third analysis is an investigation of candidate appearances showing that a candidate appearance increases local receipts, and, crucially, that this increase is larger when the candidate is doing well in the IEM markets. Finally, turning to the other direction of the feedback loop, we conduct a panel analysis of the effects of spending on vote share during the campaign. Building on Levitt (1994), we use fixed effects to control for omitted candidate-specific effects. Because we have panel data, we can do so without having to limit our sample of candidates and thus without fear of selection limiting out of sample prediction. We find that IEM share price responds strongly to changes in both one's own spending and the spending of one's opponents, but that there are decreasing returns to these effects, as expected.

The common thread is the dynamic nature of our study. We analyze both directions of the feedback loop with a consistent set of elections, a consistent source of data, and a dynamic framework thus enabling us to evaluate the proposed causal system in its entirety. We find strong evidence of a vicious cycle.

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[1] Holly Bailey, "Perfect Stranger," *Newsweek*, September 3, 2007.

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The paper is organized as follows: section 2 is a review of the literature; section 3 introduces the datasets; section 4 includes the analysis of the effects of popularity on fund-raising and robustness checks; section 5 presents the effects of campaign events on fund-raising; section 6 presents the effect of candidate appearances on fund-raising; section 7 presents the effects of campaign expenditures on popularity; and section 8 summarizes and concludes.

2 Unraveling the Causal Knot: past work on the connection between money and electoral success

2.1 Can Elections be Bought?

If money leads to popularity and popularity leads to money, then we have a difficult causal knot to untangle. While the simultaneity is widely recognized, in general each causal direction has been investigated separately. Springing from the seminal paper by Jacobsen (1978), one literature asks whether candidates who raise more money garner more votes. Rather than as a phenomenon of interest in itself, this literature has approached simultaneity as an econometric obstacle to correctly estimating the effect of spending on vote-share. In fact, the dynamics of the campaign are explicitly ignored. The baseline econometric method involves a cross-sectional regression of vote shares on the end-of-campaign spending totals of the challenger and the incumbent in US Congressional elections. Of course, fund-raising efforts, and thus spending, depend on the tightness of the race, implying simultaneity. Moreover, final vote shares depend not only on spending totals, but on the quality of each candidate and other omitted variables. Perhaps the best succinct expression of the omitted variables challenge comes from Green's (2004) review of the literature. "Because all else is rarely equal, and factors other than money influence how people vote, money matters more for some kinds of candidates than for others, and its effect varies with electoral circumstances."

The literature can be read as a series of refinements of Jacobsen's original measurement and estimation techniques to address such econometric concerns. Green and Krasno (1988) instrument for incumbent spending and control for challenger quality (wealth, previous office, etc.). Gerber (1998) goes further to instrument for challenger as well as incumbent spending. Erikson and Palfrey (1998) actually estimate a system of three equations for incumbent spending, challenger spending, and vote share. Taking a different approach, Levitt (1994) addresses all candidate-specific omitted factors (e.g. candidate quality) by considering only races with repeat challengers and taking the first difference between the first and second runs of the "same" race. Erikson and Palfrey (2000) argue that the simultaneity problem can be solved by looking only at close races. Other papers are dedicated to controlling for variation in the productivity of spending from other omitted variables such as differential effectiveness of spending. Ansolabehere, Gerber, and Snyder Jr. (2001) use a more precise measure of spending based on communication with voters rather than raw expenditures. Stratmann (2007) corrects for the difference in the price of purchasing advertising in different TV markets so as to

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achieve a measure of effective spending. Each econometric approach admits a slightly different sample and delivers a different estimate of coefficient magnitudes.[2]

Naturally, uncertainty over the proper econometric method translates into uncertainty over the magnitude of this cross-sectional effect. Which estimation method furnishes the correct coefficient estimates? As Stratmann (2005) notes in a recent review, "[t]o date, no consensus has been reached regarding the effectiveness of campaign spending on vote shares." Gerber (2004) compiles a list of estimates from four prominent studies of the marginal effect of $100,000 of spending (in 1998 dollars) on vote share in US House races.[3] For incumbents, they range from a low of 0.07 to a high of 1.80 percentage points. For challengers, the range is 0.24 to 2.17 percentage points.

Table 2.1: **Effect of $100,000 Spending Increase on Candidate Vote Share (House Elections)**

Author	Method	Incumbent	Challenger
Jacobsen (1978, 1985)	OLS linear model	+0.14	+2.17
Green & Krasno (1988)	TSLS, linear model	+1.80	+1.96
Levitt (1994)	Panel, linear model	+0.07	+0.24
Erikson & Palfrey (2000)	Table 1, column1	+0.57	+1.07

NOTE: 1998 dollars. The table reports the marginal effect of increasing spending by $100,000. This amounts to an increase in spending of $0.21 for each voting member of the voting age population (using 460,000 as the typical voting age population per district). The Erikson and Palfrey (2000) study did not report the effects of spending using a linear model, so the calculations require specification of a base level of spending. Base spending levels were mean incumbent and challenger spending in 1998, as reported in *Vital Statistics on Congress 2001-2002.* TSLS = two-stage least squares.

Reproduced from Gerber (2004) table 1.

There is considerable disagreement about how to read the pattern of results. Given his own results, Levitt (1994) understandably concludes that the marginal productivity of spending is trivial; previously estimated magnitudes are inflated due to omitted variables bias. Nonetheless, this is a troubling conclusion in that it implies that candidates—all of whom spend enormous effort to raise and spend money—grossly misunderstand campaign dynamics. Stratmann (2005) expresses the central paradox. "While incumbents and challengers spend much time on fund-raising and appear to believe that money is an important ingredient for winning elections, academic researchers for the most part have trouble establishing a causal and quantitatively important connection between spending and vote shares."

We feel that Jacobsen's (1978) original viewpoint fits the evidence quite well. Campaign spending serves primarily to familiarize voters with a candidate's brand. As such, it is subject to diminishing returns due to saturation. Thus, incumbents, who begin a campaign with an established brand, receive less bang-for-their-buck than challengers (Jacobsen 1978, Green and Krasno 1988, Gerber 1998) and senior incumbents receive

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[2] See Gerber 2004 for a swift summary of the development of econometric approaches in this literature.
[3] Each study is for US House elections but the set of elections varies according to the date of the study and the econometric technique.

less bang-for-their-buck than junior incumbents (Erickson and Palfrey 1998). Levitt's seemingly puzzling finding that both incumbent and challenger spending are extremely ineffective is simply a function of the sample that his econometric method selects. If candidates use spending to build a brand, it is likely in these cases of repeat challenges when spending matters least as both candidates have already built brand recognition. Put differently, most voters have already made up their minds about well-known candidates. This means that a given effort will find fewer undecided voters. Given that undecided voters are easier to convince than those who have already concluded unfavorably, well-known candidates require a greater effort and expenditure of money to attract each additional vote. We feel the range of estimates on display in table 1 may be most usefully interpreted as estimates of the declining marginal productivity of candidate spending as a candidate's name recognition improves.

Nonetheless, the econometric approach of this literature is static and thus unable to address the issue of positive feedback during a campaign. A positive correlation between money spent and votes garnered, even if it is causal, is consistent with, but does not necessarily imply, the kind of vicious cycle that constitutes Huckabee's "familiar political trap." Demonstration of the vicious cycle requires testing the dynamic feedback rather than simply looking at the end-of-campaign totals.

2.2 Who gives how much to whom? And why?

The literature on the determinants of campaign contributions is also well-developed, though the role of a candidate's electoral prospects—the crucial point for the issue at hand—is less consistently considered. Small individual contributions, rather than PAC money, are the average and the marginal contribution and constitute the bulk of money raised by candidates (Francia et al 1999, Ansolabehere et al 2003). When considering the motive of the giver, these contributions should be seen as consumption—a desire to participate in the campaign and associate with the others doing so—rather than investment—an attempt to influence future policy (Ansolabehere et al 2003 and Verba, Shlozman, and Brady 1995). Because of the existence of this pool of money, and because candidates face other considerations, PAC money seems to have little effect on representatives' votes, serving instead to elect politicians who are already like-minded (Broners and Lott 1997, Ansolabehere et al 2003).[4] While contributors do care about the policy position of the candidate, they are often motivated even more strongly by personal connections and the excitement of participating in the campaign (Brown Jr. et al 1995). In sum, candidates must work primarily to attract individual contributions and they must do so by offering an attractive package of associative benefits.

The central role of individuals and their motives raises a question of particular interest to our study. Do these contributors respond to electability, perhaps because they prefer to participate in a successful campaign? There are two prominent models of campaign fundraising in the presidential nomination contest, each emphasizing a distinct set of causes of fundraising success. The first is the organization-driven model. Under this framework, campaign fund-raising is not a function of electoral results and expectations, but rather a process that "relies heavily on organizational exploitation of candidates' political bases" (Hinkley and Green 1996). The base is a group of

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[4] For the alternate point of view stressing investment, see Stratmann (1991, 1998, 2002, 2005).

contributors who have given before, either to the candidate in his or her previous campaigns for other political office or to similar candidates in other campaigns. Bases tend to be geographic, ideological, ethnic, or some combination. Research suggests that contributors are unlikely to donate funds to a candidate unsolicited, even one they have financially supported in the past (Brown Jr. et al 1995). In light of this fact, campaigns have adopted a strategy to build an early organization and "systematically mine the initial base" (Hinkley and Green 1996). Given that the organizational strength and ideological, geographic, and ethnic base ought to be consistent throughout the campaign, it follows from the organization-driven model that fund-raising flows should be relatively stable, responding more to fund-raising effort by the campaign than to external events and electoral circumstances.

The second model of campaign fund-raising focuses on precisely those electoral circumstances and campaign events that the first discounts. The "momentum" view holds that candidates' success in primaries, caucuses, or other "election events" (major speeches, debates, straw polls, gaffes, drop outs by competitors, the slant of press coverage, etc.) can influence the willingness of donors to support a candidate and thus change the yield of fundraising efforts. As a result, campaign fundraising flows will be related to events and electoral success. Gurian (1990) and Gurian and Haynes (1993) suggest that long-shot candidates spend campaign funds in accordance with this momentum theory of donations. In their summary of fund-raising strategies in presidential primaries, Green and Bigelow (2004) explicitly describe a frontrunner's pre-emptive strategy of scaring off potential opponents by accumulating a large war-chest and a long-shot's momentum strategy of trying to raise enough to win the first few primaries and raise future funds off momentum. Both strategies are implicitly based on a belief in feedback from campaign circumstances to fundraising yield.

The opinion as to the efficacy of this strategy is split. Green and Bigelow (2000) point to the fund-raising windfall enjoyed by McCain after New Hampshire 2000. Green (2004) suggests that internet fundraising has made the outsider momentum strategy more attractive. Hagen and Mayer (2000) note that the process works in reverse: "[c]andidates who do poorly in the early primaries… are unable to raise enough money to conduct the kind of campaign that might reverse their downward fortunes." In their fascinating depiction of the process of fund-raising, Brown Jr., Powell, and Wilcox (1995) suggest two plausible reasons why receipts may respond to electoral conditions. Not only do visible, successful candidates offer more excitement and thus remain more attractive to potential contributors, they also, because of their increased success of winning office, find it easier to recruit and retain the best solicitors and other talented campaign personnel required to run a successful fundraising operation. Likewise, Hagen and Mayer (2000), Ansolabehere et al (2003) and Verba, Shlozman, and Brady (1995) all stress that widespread recognition, positive public image, and explicit campaign successes all increase willingness to contribute.

On the other hand, Goff (2004) rebuffs the concept of momentum finance in modern primaries: "[candidates] relying upon their success in these open contests to generate additional support for the ensuing contests inevitably will be disappointed as their campaigns are overwhelmed by competing candidates who have entered the formal nomination process financially prepared." He suggests this is due to the changes in the nomination process following the 1968 primaries, the advance of the primary calendar since the late 1980s, and the campaign finance reform which necessitates a broad base of

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many donors and enables those who are so successful as to be able to forgo matching funds to avoid spending limits.[5]

Two empirical studies of the fund-raising process stand out and merit particularly close attention. Unfortunately, they come to opposite conclusions. Damore (1997) finds evidence for the momentum model while Hinkley and Green (1996) explicitly reject the momentum model.

Damore (1997) finds that electoral success in primary contests has a huge impact on the fund-raising of long-shot candidates (though an insignificant effect on the finances of established candidates). Moreover, he finds that media coverage has a strongly positive interaction with this success—if a long-shot wins a primary but no one hears about it, the success does the candidate no financial benefit. These results echo previous work by Mutz (1995a,b) showing that a candidate's fundraising success depends on whether media coverage depicts his or her campaign as gaining or losing support.

While Damore's results are relevant and suggestive, there are reasons to question his methods. For one, his is a measure of relative contributions, scaled so as to be zero-sum. If contributions to each and every candidate were to double from one week to the next, Damore's measure would remain unchanged. However, in close races, all campaigns raise more money, even long-shots (see Stratmann 1991). This suggests that Damore's measure contains a misspecification of the effect of campaign conditions on fundraising success. Damore also chooses to restrict his time-series to the primary season, ignoring the so-called "money primary" of the year before the nomination campaign. In a footnote, he carefully defends this decision on the grounds that the majority of funds raised occur during the primary season. While this was strictly true for his sample (1984, 1988, 1992), Hinkley and Green contend it is not the case for 1988 alone and it is certainly no longer the case. During the 2000 and 2004 primaries, candidates raised on average 79% of their funds for the primary campaign before January 1st of the year of the general election.[6] To be sure, this is largely a result of the acceleration and compression of the primary schedule. As a result, most recent work places the emphasis on the money primary. Finally and most importantly, Damore does not consider that fund-raising may be an auto-regressive process and, as such, does not include lags of previous fundraising results. Our analysis of the fund-raising data shows this to be a mischaracterization (see section 3.4). Damore then pools data across candidates and races thus estimating a heterogeneous dynamic process in a pooled panel, which Pesaran and Smith (1995) show can lead to "inconsistent and highly misleading parameter estimates." Thus while we acknowledge Damore as a clear intellectual antecedent, we believe there are grounds for further study.

Studies of the fundraising process stress that, no matter how popular the candidate, contributions must be explicitly solicited. Hence believers in the organizational theory of campaign finance argue that momentum has negligible effects compared to the power of a strong fund-raising operation. Hinkley and Green (1996) fit an ARIMA process to each candidate's fundraising and find that "fund-raising series

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[5] This is a common theme in histories of campaign finance. See also Hagen and Mayer (2000) and Mayer and Busch (2004)

[6] This calculation includes the 25 candidates listed with the FEC from the 2000 Republican, 2000 Democratic, and 2004 Democratic presidential primaries. The calculation is a ratio of total funds raised by 12/31 of the year before the primary to total funds raised by the time the last competitor dropped out, effectively deciding the nomination.

have no slope or changes in intercept, either overall or in any particular portion—nothing that could be characterized as sustained, long-term momentum." Including measures of both campaign events and standing in the polls, they conclude that variation in fund-raising success during the 1988 presidential primary is due mainly to variation in fund-raising effort rather than the newsworthy campaign events one would expect to drive a momentum model.

While we like Hinkley and Green's approach sufficiently to have closely emulated it in general form, there are several causes to question some of the specific aspects and thus the results. First, their measure of fund-raising effort comes from quarterly campaign disbursement reports to the FEC. As we explain in section 3, there are strong reasons to believe this data is not an accurate measure of that portion of expenditures which are devoted to fundraising. Nor is it of the same weekly frequency as the rest of their data. Second, we worry that their direct inclusion of poll data introduces excessive measurement error in that poll data is rather uninformative in the early stages of a primary (Erikson and Wlezien 2008). Third, it is not clear whether they have dealt with the strong seasonal variation in contributions data (see section 3) which could easily lead to spurious inference if left unaddressed. Finally, we have some worry that their measure of campaign events, while admirably chosen to avoid ex-post selection bias, is swamped with trivial non-events, leading to premature rejection of the importance of any event.

Importantly, the authors themselves acknowledge that the receipts data commonly admit a pattern of "very stable levels of fund-raising along the series with a sharp peak lasting several weeks embedded within it" which "clearly *do* offer possibilities for a qualified version of momentum" and thus "need to be explained." They then note that the estimated coefficient on fund-raising effort is stronger than that on polls and take this as evidence that the former trumps the latter leading to their headline conclusion. In light of our doubts about the measure of fundraising effort, we remain unconvinced by this argument and instead see the significant positive coefficients on poll data as suggestive of the elusive feedback loop. It is also worth pointing out that while Hinkley and Green are explicitly testing an organizational model against a momentum model of fundraising, the two are not, in fact, mutually exclusive. Again, while we acknowledge Hinkley and Green as an important intellectual antecedent, we believe further study is merited.

2.3 Dynamic studies of Presidential Primaries

Most of the literature remains one-sided: addressing either the determinants of fund-raising or the effect of spending on election results. This is somewhat ironic as two of the most influential early contributions to the study of presidential primaries explicitly studied the possibility of positive feedback in Presidential primaries. Analyzing the 1980 and 1984 primaries, Bartels' classic *Presidential Primaries and the Dynamics of Public Choice* gives a wonderful analysis of the dynamics whereby a long-shot may emerge from the pack to become or challenge the established front-runner. His careful empirical analyses concentrate on the sequencing of the primaries and the role of media coverage. Initial name recognition is crucial to determining ex-ante front-runners. Momentum is driven by early victories—which come from fortuitous electoral circumstances, a candidate happens to match the preferences of states with early primaries—during which time the press, by emphasizing the horse-race rather than substance, contributes to

irrational exuberance. After the initial irrational exuberance, the candidate is evaluated on quality and succeeds or fades on his or her merits. If momentum dies out it is because, upon the sober reflection which sets in after a few weeks, the candidate fails to impress.

Bartels' work explains the role of media coverage in creating positive feedback; he does not address the role of fundraising in doing so. On the other hand, Aldrich explicitly and coherently argues for the existence of a vicious cycle between money and popularity. In his highly regarded book (Aldrich 1980a) and a subsequent paper (Aldrich 1980b), he details the workings of such a cycle during Jimmy Carter's campaign and specifies a theoretical model of how such dynamics might work. Nonetheless, formal empirical work convincingly validating his early insights across a variety of campaigns has yet to be conducted.

In sum, several previous studies have looked at pieces of the vicious cycle. Nevertheless, because of the methodological challenges and the resulting uncertainty over the magnitude of the effects involved, we feel there remains significant room for further work on both sides of the hypothesized feedback loop. Many of the results to date, because of their cross-sectional nature, address the dynamic phenomenon of interest only obliquely. Finally, because studies apply a variety of empirical methods to a variety of samples, we feel a unified study of the phenomenon in its entirety adds value by virtue of consistency.

The goal of this paper is to integrate these various strands of the literature and, by a rigorous comprehensive analysis, consider the existence of the vicious cycle in its entirety. We are explicitly interested in the *dynamic* relationship between campaign contributions, expenditures, and the probability of victory in U.S. presidential primaries. To investigate these feedbacks, we make use of two high-frequency datasets: Federal Election Commission (FEC) data measuring individual campaign contributions and Iowa Electronic Markets (IEM) data measuring the perceived likelihood of a candidate capturing the nomination. Our data are weekly, covering 24 candidates from the six most recent presidential primaries (R96, D00, R00, D04, D08, R08) for an average of 46 weeks each. In our study of the effects of expenditures on fund-raising, we make use of quarterly FEC data on campaign disbursements.

3 Data: sources and description

3.1 Campaign Contributions

We use data on campaign contributions from the Federal Elections Commission (FEC). [7] For each contribution made by any individual or PAC to a political campaign, the dataset records the date, donor's address and occupation, and the amount. The information is compiled by candidates and their campaigns and submitted to the FEC quarterly in the year before a general election and monthly in the year of the general election. We have aggregated the contributions by candidate and by week so that we have contribution schedules including the total number and amount of contributions for each candidate during each week of the campaign.

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[7] Data are available at http://www.fec.gov/finance/disclosure/ftpdet.shtml

The FEC requires candidates, parties, and PACs to document only donations from individuals or organizations who cumulatively give $200 or more. This means donations of less than $200 are not part of our dataset and constitute an important potential source of measurement error.[8] The most prominent feature of the data is a large spike on the final day of each quarter. The spike is less severe for earlier campaigns (D92, R96) and seems to affect only the contributions from individuals to campaigns, not the data for PACs. Discussions with political insiders have led us to a few theories about the nature of this spike and how to deal with it. To begin with, campaign staff do not specialize: the staffers making calls soliciting donations are also responsible for filing reports with the FEC. These reports, submitted quarterly, are due 10 days after the end of the reporting period. It seems that early in the quarter, staff workers both solicit and log donations. However, as the quarter comes to a close, resources are shifted to solicitation because there is a drive to report as large a quarterly number as possible. When the quarter ends, resources are moved back to logging donations and, as a result, campaigns may record most checks that have come in the past weeks as coming in on the final day of the quarter. It has also been suggested that staff workers, during solicitation calls, stress the last day of the quarter to potential donors, which may lead donors to date their checks for this day. In the estimation of the effect of electoral conditions on campaign fundraising, we will address these contribution spikes with end of quarter controls and by aggregation techniques to minimize this measurement error.

3.2 Campaign Expenditures

The FEC also collects budget statements from the candidates (and other political organizations) on a regular basis.[9] The statements, which are reported quarterly in the year before the general election and monthly in the year of, detail campaign expenses and receipts. Spending is nominally broken down into four broad categories: operating expenditures, fundraising disbursements, legal/accounting disbursements, and other expenses. The receipt information includes totals of contributions from individuals and PACs, as well as loans from the candidate, transfers from previous campaigns, and federal matching funds.

There are two main issues with this data. First, it is of much lower frequency. In order to obtain a consistent frequency, the monthly data from the year of the general election must be aggregated to the quarterly level and, because most primary contests in our sample are decided by late March or early April, there are at most five quarterly data points per candidate. Second, the reported composition of expenditures is clearly untrustworthy. According to data provided to the FEC in 2004, President George Bush's re-election campaign did not spend a single dollar on fundraising expenses, despite raising a record $258 million. Similarly, his Democratic challenger, Senator John Kerry reported spending only $1.6 million on fundraising, all before October 2003. Most campaigns in our sample report spending the vast majority of their funds on operating expenses. While it is not clear whether this is a deliberate obfuscation by campaigns

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[8] Though unrecorded by the FEC, campaigns keep track of these smaller donations so that they can report total fundraising numbers each quarter.
[9] Data are available at http://www.fec.gov/press/bkgnd/pres_cf/pres_cf.shtml

seeking to conceal their budget decisions or merely oversimplified accounting, it means that only the total expenditure figures are usable.

3.3 Likelihood of Victory

To measure the probability of victory, we use share prices on winner-take-all contracts traded on the Iowa Electronic Market (IEM). This market, which opened in 1988 trading shares on that year's presidential election, is a real-money futures market operated by the faculty of the University of Iowa Tippie College of Business. Traders invest $5 to $500 on various political contracts which liquidate at either a fixed sum (in winner-take-all markets) or a variable amount (for vote-share markets) following a political result. The traders are anonymous and all transactions are processed through the internet site for the IEM. Traders may either buy individual contracts at market prices from other traders or new unit portfolios from the IEM for $1. These unit portfolios contain one contract for each candidate to win a certain race. Each contract pays $1 if and only if the specified candidate wins and one "rest of field" contract is included thus, the expected value of a unit portfolio is exactly $1 as one and only one of these contracts will pay off. Traders then "unbundle" the contracts and can sell them at market prices (effectively allowing traders to short contracts.) In addition to protecting the IEM from losses (the bundle issuance ensures the markets are zero-sum), these unit portfolios ensure that prices of individual contracts are not affected by the volume of shares issued (Forsythe et. al. 1999). The directors of the IEM make an initial decision as to which candidates are included on the markets to start and which contracts are spun-off of the existing rest-of-field contract when a candidate not yet listed emerges as a plausible contender.[10] Berg et al. (2000) explain that the IEM operates "using a continuous double-auction trading mechanism." Transactions are made either as market orders (immediate trades at market prices) or as limit orders (decisions to buy or sell a certain quantity only if the price is at or better than a specified price limit.) Traders have access to historical data as well as the current best bid and ask prices and the last trade price.[11]

There are a number of reasons why prediction market data work better than polling data for our project. To begin with, the frequency is much greater. While some polls are taken daily close to election day, it is difficult to find such high frequency polls more than a year before the nominating convention, especially for earlier primaries. In addition, the question answered explicitly by those polled and the one answered implicitly by IEM participants are different. As Berg et al. (2000) note, the Iowa Markets (and other electronic markets) ask traders whom they think will win. Polls ask whom the subject personally supports. Wolfers and Zitzewitz (2007) argue that market prices on winner-take-all contracts on prediction markets represent probabilities of victory. Given this assumption, the prediction markets provide precisely the required data for this project whereas poll data would be an imperfect substitute requiring a difficult translation.[12] Finally, while prediction markets may be less accurate than the proper sophisticated

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[10] The IEM does not have a specific metric for when to introduce new contracts; it is left to the discretion of the IEM directors.

[11] For a more technical introduction to the IEM and its market mechanism, see Berg et al. (1996), berg et al. (1997) and Forsythe et al. (1992).

[12] See Erikson and Wliezen (forthcoming) or Nate Silver's website, www.fivethirtyeight.com, to see exactly how complex this translation can be.

reading of the polls (Erikson and Wliezen 2008), they are considerably more accurate than a naïve reading of the polls (Berg et al 2000).

The markets work by aggregating information, both private and public, into contract prices. However, political traders are subject to a number of biases including long-shot and wish-fulfillment bias (Wolfers and Zitzewitz 2004). Traders are also not a random sample of American voters: as a group they are highly educated, young, male, and tend to work in academia or research (Oliven and Rietz 2004). However, Oliven and Rietz argue that "marginal, not average traders set prices [on the IEM]." A few marginal traders, taking advantage of biases and irrational trading, can drive the market to efficient prices. This may be especially true because the IEM limits total investment and marginal traders can more easily be market makers (Forsythe et al. 1999).

Rhode and Strumpf (2007) provide excellent evidence of the market's efficiency and resistance to tampering. In the summer and fall of 2000, they "engaged in a series of controlled uninformative trades in the IEM presidential markets." They made eleven random investments, with each trade ten days apart. Given the investment limits in the IEM, the authors were able to make these trades (or series of trades) large relative to total trade volume.[13] As such, prices reacted to the initial trades. However, within two hours of the trades, half of the price effect was undone and the effect was no longer statistically significant. These results lead the authors to conclude that "the long-term market dynamics [of the IEM are] not influenced by uninformative trading."[14] In sum, IEM prices constitute a high quality, easily interpreted measure which is consistently available throughout our sample.[15]

We use data from the last six presidential nomination contests: The Republican primaries of 1996, 2000, and 2008 and the Democratic primaries of 2000, 2004, and 2008.[16] For these markets, we have data on the closing price of $1 winner-take-all shares for all candidates listed on the market as well as the "rest of the field" contract. In addition to closing price, the IEM also provides daily data on the share volume, dollar volume, high, low, and average price. We use the closing prices as a measure of the probability of victory. Contracts were also traded on a handful of candidates who never entered the race (e.g. Colin Powell in 1996 or Hilary Clinton in 2004). As these candidates never collected contributions, they do not enter our sample. In addition to the winner-take-all contracts, we make use of a number of complementary securities traded on the IEM. As we will explain later, we use these to control for party-level momentum.

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[13] Total investment was $3116, or 2% of the IEM total trade volume. (Rhode and Strumpf 2007).

[14] Rhode and Strumpf (2007) also note that TradeSports' 2004 presidential market also swiftly returned to previous levels after a similar attack.

[15] IEM is not the only political predictions market. The largest, and perhaps best known, is InTrade. While InTrade markets differ in some respects from the IEM (e.g. they are a private company and set initial prices rather than offering unit contracts), the basic concept and many of the features are the same. They offer contracts that liquidate at a fixed date based on the results of a political event and their prices are implicit measures of expectations about these events. However, InTrade did not cover presidential primaries until the 2008 election, so they do not yet have the volume of data necessary for this project.

[16] IEM data on the Democratic campaign of 1992 begins too late in the primary season for our purposes.

Table 3.1 **Iowa Electronic Markets Winner-Take-All Contracts**

Market	Start Date	Liquidation Date	Contracts
RNC '96	Jan 5, 1994	Aug 15, 1996	Alexander, B. Dole, Kemp, Gramm, Powell, Forbes, Quayle, and Buchanan
DNC '00	Jun 14, 1999	Aug 17, 2000	Bradley and Gore
RNC '00	Jun 14, 1999	Aug 3, 2000	Bush, McCain, Forbes, E. Dole, and Quayle
DNC '04	Feb 20, 2003	Jul 30, 2004	Kerry, Dean, Gephardt, H. Clinton, Edwards, Clark, and Lieberman
DNC '08	Mar 2, 2007	Aug 28, 2008	H. Clinton, Edwards, and Obama
RNC '08	Mar 2, 2007	Sep 10, 2008	Giuliani, Huckabee, McCain, Romney, and F Thompson

3.4 Time Series properties of the data

For the time-series estimations that follow, it will be important to understand the longitudinal properties of our data series. As discussed earlier, we aggregate the daily raw FEC data into weekly observations of the sum of contributions and the number of contributors. This aggregation serves two main purposes. First, there are strong day-of-the-week effects on contributions which are probably not relevant to our analysis. Second, while the FEC requires campaigns to date the contributions, the dating is not uniform. Campaigns may record the date the check was written, received, or processed. By aggregating to weekly data we hope to smooth and reduce measurement error.

Examining the relevant histograms, we find that the natural log of weekly contributions is distributed normally so we will use this transformation of the series whenever possible. The autocorrelation and partial autocorrelation functions of the transformed series indicate that ARIMA (1,0,0) models offer the best fit. This accords with the characterization by Hinkley and Green (1996).[17]

We also characterize the independent variables, including the IEM price data. At the daily level, there is evidence that probability of victory follows a random walk (ARIMA(0,1,0)). This is not surprising as IEM prices are asset prices and asset prices are often best modeled as near random walks. However, once the prices are aggregated to weekly, the series is best characterized by an AR(1). The series also exhibits non-

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[17] For some candidates there is evidence of quarterly seasonality. However, this is largely an artifact of the end-of-quarter reporting issues mentioned above. When the very last day of the series is dropped, the implied seasonality disappears.

stationary variance. In general, prices from the period before the Iowa Caucus display a much higher variance than prices during the voting season.[18] Luckily, Box-Cox estimation shows that a log-transformation of these prices stabilizes the variance for most candidates.[19]

The last variable of interest is the control for the two-party political climate: a measure of which party is fairing better nationally. These series, measured weekly, are drawn from various IEM contracts such as the probability that a Republican wins the White House (1996, 2008) or the probability that Republicans win control of the House of Representatives (2000). All political climate series appear to be AR(1) processes with a stationary variance.

3.5 Candidate Appearances

The final dataset of which we make use is a list of appearances for each candidate during the 2008 Republican and Democratic primaries. This data was collected by the Washington Post and displayed on their website during the campaign. An entry lists the candidate, location (city and state), and date, and frequently includes time of day and often the type of event (e.g. fundraiser, house party, speech, debate). Across both the primary and the general election, the dataset includes 7234 events for 17 candidates.

The Washington Post describes their data as follows:

> washingtonpost.com's Presidential Campaign Tracker uses information from campaigns, media reports and other sources to compile a listing of events involving presidential candidates and their spouses. The tracker covers events since January 2007. It does not include every event -- particularly fundraisers, which often are unannounced. Some events will be added retroactively as more details become available

As they are careful to point out, it is an incomplete list. Nonetheless, it represents a thorough compiling of available public information. In preparation for the analysis in section 6, we restrict to just the primary season and count multiple events on the same day only once, reducing the dataset to 2559 entries.[20]

4 The Battle for the Bucks

"I'm afraid that she's lost the battle for the bucks and not the battle of ideas. And that's unfortunate for the whole process."[21]
–John McCain, commenting on Elizabeth Dole's withdrawal from the Republican primary in 1999

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[18] This variance echoes the findings for poll data of Erikson and Wlezien (2008). Their results show that the variance in primary season polling data is much lower once voting begins and that variance declines in general as the election date approaches.
[19] Not all series were stabilized by the log transformation but in the interest of cross-estimation comparison we standardize this transformation.
[20] Two appearances by the same candidate on the same day in different states are treated as two appearances, one in each state.
[21] "Dole Dropout I: Who will take it to the Bank?" *The Hotline*, October 21, 1999.

4.1 Frontrunners, Insurgents, and Perpetual Long-shots

Our first goal is to analyze the determinants of campaign expenditures. Given our focus on a possible feedback loop, we are particularly interested in the effect of current electoral popularity on a candidate's ability to elicit contributions. At the same time, our review of the literature suggests two additional variables of interest. First, whether the general political climate is favorable to a candidate's party may enter the strategic calculus of a potential donor for many of the same reasons as those pertaining to the particular fortunes of the candidate in question. Namely, the likelihood of a candidate capturing the White House depends not only on his or her ability to capture the nomination but also to succeed in the general election. Furthermore, the psychological associative benefits likely depend on the broader popularity of the party. Second, because it takes time to develop the fund-raising networks and because voters and contributors increasingly tune in to the campaign as the convention approaches, there is a natural growth in funds raised, independent of the aforementioned factors. Hence we include a control for the number of days until the appropriate party convention.

The estimates are conducted separately for each candidate in each year's nomination process, but share a common specification:

$$(1 - \phi_1 B)C_t = \beta_1 V_{t-1} + \beta_2 P_{t-1} + \beta_3 D_{t-1} + \varepsilon_t \tag{4.1}$$

The models are estimated with an AR(1) term for the dependent variable (C, the natural log of weekly contributions from individuals) and the one-week lag of three independent variables: the natural log of the probability of victory (V), the control for party popularity (P), and days until the convention (D). For robustness, all models were also estimated with the natural log of the number of contributions (rather than the total dollar amount) as the dependent variable. The pattern of signs and significance were identical so we present only the specifications with total dollar amounts, which are more easily interpreted. For each candidate, the sample period begins with the opening of the nomination contract on the IEM (see table 3.1) and ends with either the formal announcement of withdrawal by the candidate or the beginning of the national convention (at which point the IEM contract is liquidated.)

In the face of the persistent simultaneity issues discussed in section 2, the identification of this model rests on an assumption about the timing of contributions. There are many steps that must take place before an unexpected increase in contributions can affect the candidate's perceived chance of victory. First, the check must be recorded and vetted before the funds are transferred to the campaign. Next the campaign manager must update budget decisions in response to the extra money. Once the money has been allocated to a particular expenditure, a contractor must be found and the money spent on additional mailings or advertisings. And finally, these activities must have their effect on the audience and this effect must be noted by the IEM participants. Our identification rests on the notion that this transmission process takes longer than a single week; thus innovations in campaign contributions do not cause contemporaneous (within the same week) changes in IEM price. Using the implied exclusion restriction, the ARIMA model of equation (4.1) is valid and the estimated relationships may be interpreted as causal. This identification strategy is one major advantage of using high-frequency longitudinal data.

Table 4.1 **ARIMA results by candidate**

RNC '96	Alexander	Buchanan	Dole	Gramm
	(1)	(2)	(3)	(4)
Probability of Victory	.604	.587	-.473	-.095
	(.336)*	(.172)***	(1.620)	(1.079)
Rep Price	.023	-.046	.072	.093
	(.115)	(.066)	(.052)	(.105)
Days to Convention	.002	-.0006	.0002	.001
	(.006)	(.003)	(.004)	(.004)
Constant	8.916	11.768	10.490	6.888
	(3.696)**	(2.375)***	(7.658)	(3.673)*
AR(1)	.488	.439	.556	.605
	(.133)***	(.100)***	(.097)***	(.136)***
N	54	50	81	57
χ^2 statistic	16.451	35.122	44.671	29.037

DNC '00	Bradley	Gore
	(1)	(2)
Probability of Victory	.834	2.409
	(.347)**	(1.705)
Rep Price	-.015	-.158
	(.035)	(.067)**
Days to Convention	.003	.014
	(.002)	(.003)***
Constant	9.772	5.074
	(1.734)***	(7.802)
AR(1)	.421	.392
	(.159)***	(.141)***
N	37	60
χ^2 statistic	20.508	59.417

RNC '00	Bush	Dole	Forbes	McCain	Quayle
	(1)	(2)	(3)	(4)	(5)
Probability of Victory	1.290	.964	-.360	1.430	.929
	(2.362)	(.698)	(.425)	(.452)***	(1.049)
Rep Price	-.014	-.117	.011	.004	.143
	(.041)	(.185)	(.052)	(.125)	(.296)
Days to Convention	.005	-.003	.013	-.014	-.0002
	(.003)*	(.008)	(.004)***	(.010)	(.022)
Constant	7.393	16.711	6.498	11.393	2.723
	(10.669)	(10.678)	(2.009)***	(6.352)*	(22.006)
AR(1)	.253	.093	.689	.514	-.311
	(.110)**	(.499)	(.208)***	(.304)*	(.278)
N	58	17	33	16	14
χ^2 statistic	18.771	4.425	50.461	18.284	2.675

Table 4.1 cont.

DNC '04	Clark	Dean	Gephardt	Kerry	Lieberman
	(1)	(2)	(3)	(4)	(5)
Probability of Victory	-.120	.582	.662	.627	-.387
	(.352)	(.183)***	(.662)	(.382)	(.664)
Days to Convention	.007	-.007	-.001	-.006	.007
	(.005)	(.003)***	(.002)	(.002)***	(.006)
Constant	11.800	12.543	10.815	12.757	10.160
	(.916)***	(.877)***	(1.474)***	(1.548)***	(1.168)***
AR(1)	-.070	-.112	-.055	.441	.154
	(.279)	(.198)	(.240)	(.132)***	(.164)
N	17	21	46	74	49
χ^2 statistic	2.411	19.717	2.078	21.008	3.781

DNC '08	Clinton	Edwards	Obama
	(1)	(2)	(3)
Probability of Victory	.591	1.179	.612
	(.377)	(.298)***	(.310)**
Dem Price	-.498	1.689	2.368
	(4.319)	(7.528)	(3.930)
Days to Convention	-.003	.001	-.002
	(.001)**	(.003)	(.001)**
Constant	13.177	8.138	11.314
	(2.425)***	(4.953)	(2.763)***
AR(1)	.171	.313	.332
	(.114)	(.142)**	(.105)***
N	64	50	76
χ^2 statistic	7.241	79.302	32.437

RNC '08	Giuliani	Huckabee	McCain	Romney	Thompson
	(1)	(2)	(3)	(4)	(5)
Probability of Victory	1.166	-.409	1.015	.959	1.879
	(.173)***	(.677)	(.122)***	(.161)***	(.303)***
Rep Price	-.661	-17.505	.784	2.419	-6.554
	(4.859)	(36.320)	(2.565)	(5.813)	(7.805)
Days to Convention	.002	.067	-.002	.004	-.024
	(.002)	(.038)*	(.0008)**	(.002)**	(.005)***
Constant	8.979	4.586	10.822	7.654	18.138
	(2.206)***	(20.144)	(1.050)***	(2.130)***	(3.531)***
AR(1)	.260	.659	.137	.187	-.118
	(.238)	(.478)	(.105)	(.168)	(.206)
N	54	16	77	52	32
χ^2 statistic	325.303	26.915	199.299	116.926	43.783

The results from the candidate-by-candidate estimations are presented in table 4.1.
The results suggest three types of campaigns. First, for front-runners—those who

dominate throughout the season both financially and politically such as Dole in '96 and Bush and Gore in '00—fluctuations in the current probability of winning the nomination have no significant effect on contributions. Second, there is a set of long-shot candidates who manage to turn electoral momentum into fund-raising gains. These candidates include many of the storied "insurgent" campaigns: Buchanan in '96; Bradley and McCain in '00; Dean in '04. Interestingly, this category also includes every candidate in '08 save early front-runner Clinton and curious exception Huckabee. It is worth noting that a positive coefficient can be generated either by a candidate on the way up enjoying increases in both perceived chance of victory and fundraising, or by a candidate on the way down, seeing his or her prospects diminish resulting in withered fundraising. Indeed, some candidates, such as Howard Dean in 2004, traverse the path in both directions. Finally, the remaining candidates are perpetual long-shots whose fund-raising totals are unresponsive to the waxing and waning of the candidate's (modest) political fortunes.[22]

Brown Jr. et al. (1995) note that "[c]ontributors and solicitors who are not strongly committed to a candidate may disappear if the candidacy falters and the prospects for election diminish." In general, the literature on contributors (and the solicitors who deliver them) suggests that a campaign possesses an island of strongly committed backers that will ride through thick and thin amidst a sea of strategic money that is attracted by the prospect of electoral success. Our results fit with this characterization. The viability of the front-runners has already been demonstrated; hence the variations in IEM price are generally swamped by other factors in the contributor's calculus. As a result, frontrunners' contributions are largely invariant to fluctuations in IEM price. Not so for the long-shots, who must demonstrate their viability to potential supporters. But what distinguishes between the second and third types of campaigns: between long-shots whose fundraising is responsive to electoral circumstances and those whose fund-raising is not? The longest of long-shots cannot generate sufficient prospects to begin to attract the tide of strategic money and thus, fluctuations in their slim perceived chance of victory mean little for their fundraising yields. Finally, those candidates in the middle zone, whose viability is clear to some but remains in doubt for others, can increase their fundraising take with increases in their perceived chance of victory, and vice versa. In sum, the results suggests a ternary typology, illustrated in figure 4.1.

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[22] In general, the coefficients are of the expected positive sign. There are a smattering of negative point-estimates, but only one of them is statistically significant; that of Edwards '04. This is a clear case of a small and unrepresentative sample. IEM did not spin off the Edwards contract from the Rest-of-Field contract until January 23, after the Iowa Caucuses and the first Democratic candidates' debate. Edwards dropped out five weeks later, leaving us with an extremely short time series derived entirely from the actual primary season rather than the money primary.
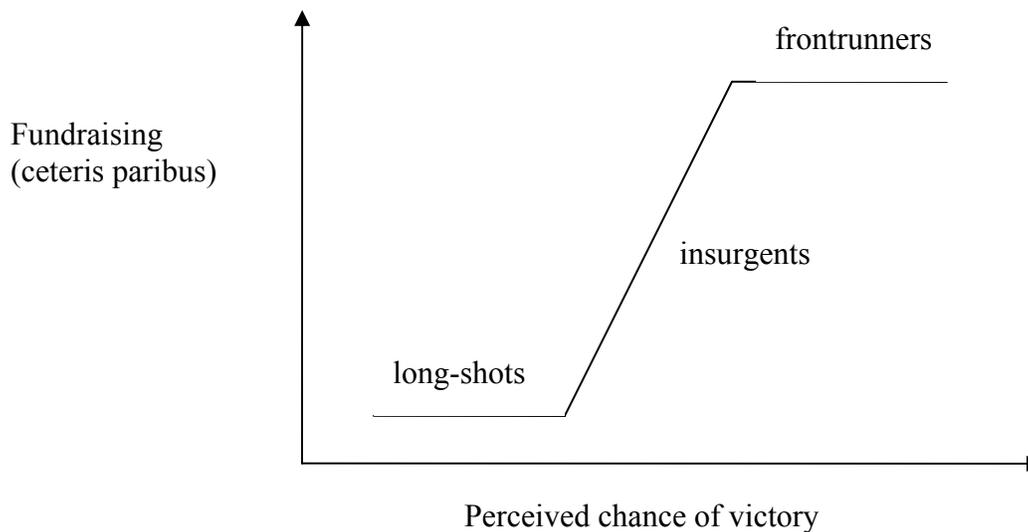
Figure 4.1: ARIMA results suggest a ternary typology of candidates. Persistent long-shots demonstrate little connection between fluctuations in their perceived chance of victory and their ability to raise money. Likewise for frontrunners whose viability is not in doubt. But the fundraising of candidates in a middle range, whose viability is neither assured nor impossible, respond very strongly to changes in perceived chance of victory as each political advance convinces new strategic donors of their viability. Likewise, each political setback translates into fundraising losses as marginal donors lose faith in the candidate's viability.

Surprisingly, there is no clear relationship between the overall political climate and contributions to any of the candidates; the signs are often of the "wrong" direction and only one of the coefficients is significant at the 10% level. Given the clear evidence that potential contributors are concerned with viability when considering long-shots, we find it surprising that contributors, especially those contributing to frontrunners, do not evaluate the chances of the frontrunner actually winning the general election. We see two main explanations for this result. It may be that contributors, being strongly partisan, are convinced that any nominee from their party has a good chance in the general election and thus view viability in the primary as the important hurdle. It may also be that the most important battle is for intra-party dominance. There is a great deal of jockeying for influence within a party. Perhaps contributors are focused on the primary because promoting their wing of the party as the representative of the whole is a sufficient prize in itself.[23] These are not mutually exclusive and other plausible explanations no doubt exist. Whatever the reason, contributors seem unmoved by changes in the overall fortune of their party.

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[23] We are indebted to Andrew Busch for this observation.

4.2 Robustness to "Seasonality"

As we mentioned in section 3, there is some quarterly "seasonality" in the contributions data; namely, there is a large spike in contributions on the last day of the quarter. To a lesser extent, there is a spike in the last week, likely from the same causes. The natural method of dealing with seasonality is seasonal adjustment. For quarterly and monthly data displaying annual seasonality, there exists an extensive literature and multiple well-established and diagnosed methods for seasonal adjustment. In our case, for weekly data displaying quarterly seasonality, there is no such literature at all.

There are several factors complicating an extraction of the seasonal component. First, a quarter usually consists of 13 weeks but occasionally spans 14. Second, quarters end on different days of the week and there are strong day-of-the-week effects. Third, a casual visual examination of the data suggests that the first three quarters of the year before the general election display a markedly different seasonality than the final quarter of that year or the first quarter of the year of the general. This coincides with accounts of the conduct of campaigns which stress a transition from organization-building and fund-raising toward vote-getting as the money primary becomes the actual voting-primary season.[24]

Luckily, time series characterization reveals that the bulk of the seasonality is contained in the spike on the final week of the quarter and the bulk of this is contained in the final day. Given the lack of a standardized approach to seasonality, for the baseline specification reported in table 4.1 we simply drop contributions made on the final day. For further robustness to the additional (less pronounced) surge in the final week, we have re-estimated specification 4.1 after dropping the final week of each quarter.[25] The results from this adjustment are included in the Appendix. We feel the analysis of the initial results holds up to these additional checks. In the first four primaries from 1996 – 2004, the magnitudes and significance of the estimates from the "last week dropped" specification are remarkably congruent with those of the original estimates. The estimates for both the 2008 primaries are significantly different. This is to be expected as the "last week spike" is much more pronounced in 2008 than in earlier FEC data. (Whether this is the result of a change in reporting practices or a change in campaign fundraising practices remains unclear.) As a result, the point-estimates from the robustness exercise are smaller

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[24] Green (2004) divides the primary into three segments: "the invisible primary", also known as the money primary, during which candidates raise funds and build their organization; "the primary" itself during which campaigns garner votes and delegates; and "the bridge" signifying the transition to the general election campaign after a single candidate has secured the nomination.

[25] A second approach would be to run specification 4.1 on data that has been seasonally adjusted in the following (crude) way. Unfortunately, as mentioned, there are many obstacles to productively seasonally adjusting weekly data with quarterly seasonality. One method might be to seasonally adjust the weekly contributions data by regressing the original series on a set of dummy variables indicating how many weeks are remaining until the end of the quarter. These dummies would capture the deviation from the average weekly contribution which is typical for "that time of the quarter". The seasonally adjusted series would then be the unadjusted series less this deviation: in essence the average contribution for the quarter in question plus any non-seasonal variation for that particular week. Unfortunately, the complications mentioned earlier torpedo this approach. This technique produces series which do not "look right". The biggest problem is that there is a serious change in the seasonality between the first three quarters of the year before the general election and the next two quarters. Pooling these together is clearly a mis-specification of the seasonal pattern. Estimating separately leaves insufficient data. As a result, we feel the best solution is simply dropping the last week which contains the bulk of the seasonality.

and the standard errors are larger (because much of the variation in the dependent variable has been dropped).

In light of these results, which estimates are to be believed for the 2008 primaries? It is unclear. If, as suggested, the end-of-quarter spike represents contributions which are correctly dated, then clearly the basic specification which includes most of these contributions is warranted. However, to the extent that these are mis-dated contributions whose successful solicitation is based on prior electoral conditions, then the original regressions suffer from measurement error and the results are biased to the extent that the end-of-quarter IEM price deviates from the prevailing IEM price at the time of contribution. Without further information, we are reluctant to take a stand on where the truth lies for the 2008 primaries. Nonetheless, we feel the broad patterns and attendant conclusions discussed in section 4.1 remain valid.

5 The Importance of Events

A fundamental tenet of the momentum strategy is that well-publicized campaign events revealing significant new information regarding candidates' viability may be important drivers of fund-raising. As Hinkley and Green (1996) suggest, rather than an ARIMA specification, we may want to isolate specific campaign events—straw polls, withdrawals by rivals, major caucuses, and primaries—and test to see if these events have an effect on a campaign's fundraising flow. One difficulty is that identification of events after the fact risks a bias towards selecting events which were later shown to have an effect on the campaign. However, we believe that it is most important to demonstrate the existence of events sufficiently momentous to have an effect on fundraising. Thus we deliberately select large events. This limits our ability to conclude on the general fund-raising implications of events in general. Rather, we are seeking to learn whether such fund-raising-important events exist at all.

To test the effect of specific events on the fund-raising flows, we follow the interrupted time-series techniques presented by McDowall et al. (1980) and Wei (2006). Perhaps the most interesting results would be tests of the effects of early voting events (Iowa Caucus, New Hampshire Primary, Super Tuesday) on fundraising. However, we are unable to test the effect of these events on fundraising for two reasons. First, because these events come in such rapid succession—Super Tuesday is no more than a month after the Iowa Caucus with the New Hampshire Primary in between—it is not possible to estimate distinct effects. Second, to properly estimate the effect of the event, an interrupted time-series analysis requires more than a few weeks data following the event. But most candidates drop out during this period or shortly thereafter ending their fundraising efforts. While the eventual winners do remain in the sample, more than a few weeks beyond Super Tuesday they are, in many cases, no longer actively competing in the primary but have re-geared their campaigns for the general election. Moreover, estimating on these candidates alone would introduce survivorship bias. Thus it would be hard to independently estimate effects of the primaries, rivals' withdrawals, and winning the nomination.

Rather than early primaries and caucuses, we use straw polls and events concerning the major candidates from the pre-election year. For Republicans, the media focuses on a number of straw poll events in the year before the nomination (Iowa,

Arizona, and others). Perhaps more importantly, campaigns who do well feed these poll results back to their potential donors as signals of their viability. We test the impact of these early signals of electoral quality. For a few contests in the sample, a major potential contender (Colin Powell in 1996 or Hillary Clinton in 2004) made an announcement that he or she was not seeking the nomination. Finally, in another contest, a potential major contender withdrew sufficiently early to be able to distinguish the effect from other campaign events (Elizabeth Dole and Dan Quayle in 2000).[26]

Each event is modeled as an initial pulse which decays exponentially. The onset parameter expresses the magnitude of the initial effect of the event on fundraising. The duration parameter measures the rate of decay and is expressed as the percentage of the current effect that remains one week later. A list of events and dates is included in the appendix.

We begin the event study with the 1996 Republican nomination race. There were six major straw polls in 1995 but two occurred in January, before the IEM opened or too soon after to be used in testing. Of the other four polls, only Arizona was a major surprise, with Pat Buchanan defeating Phil Gramm. Most other candidates, including front-runner Bob Dole, did not compete. The other notable poll was in Iowa, where Gramm tied Dole and the press anointed Gramm as Dole's most serious challenger (months after discounting him following his loss to Buchanan in Arizona).

The evidence from this interrupted time series analysis is noteworthy because most results are insignificant. Though the press (and many candidates) were very attentive to the straw polls, particularly the tie in Iowa in August and Buchanan's surprise win in Arizona in April, none of the events had significant effects on fundraising for any candidate in the 1996 Republican nomination race. While the events may have been politically important, as Steger (2007) argues, it is clear that they were not financially important.

The other major storyline for the Republicans in 1995 was whether or not General Colin Powell, the former chairman of the Joint Chiefs of Staff, would seek the nomination and, if he did, whether he would do so as a Republican, an Independent, or possibly even as a Democrat. Most polling in 1995 had Powell defeating President Bill Clinton both head-to-head and in a three-way race with Dole or any unnamed Republican. Powell first made news in September on CBS, when he revealed that if he were to run, he would do so as a Republican. Many Republican candidates believed Powell's possible candidacy limited their fund-raising. When announcing his own withdrawal from the nomination race, Senator Arlen Spector (R-PA) noted that the "intense publicity and speculation" about Powell's potential candidacy had put a damper on his own fundraising efforts.[27] Two months later, Powell announced that he would not seek the nomination and, as the press reported, most Republican candidates were relieved.

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[26] We use this very limited set of withdrawals rather than a broader set for two reasons. First, these are major contenders that were listed on the IEM; we would expect the withdrawal of minor candidates to have virtually no effect. However, we have not included the entire set of withdrawal dates because they are generally clustered between the Iowa Caucus and the week after Super Tuesday, in that crowded period of the early campaign which is swamped with potentially significant events. These are the withdrawals which we can isolate and which are likely to be significant.

[27] James O'Toole, "Specter plans to suspend presidential candidacy," *Pittsburgh Post-gazette*, November 22, 1995.

Despite complaints from several long-shots and also-rans that Powell's indecision in the fall of 1995 cost them donations or changed their spending strategy, only one candidate's fundraising was significantly affected by Powell's two announcements. The front-runner, Bob Dole, saw his fundraising flow fall by 93% when Powell announced he would run, if at all, as a Republican in September 1995. It took five weeks for Dole's fundraising to recover 90% of the way from this effect. Two months later, when Powell's announced his decision not to run, Dole's fundraising flow increased by 120%. The high duration parameter on the later estimate suggests that removal of this final obstacle provided long-lasting benefits to Dole (see table 5.1). We conclude that the possibility of losing frontrunner status can significantly impact the fundraising efforts of the frontrunner.

Table 5.1 **Powell's Effect on Dole's Fundraising**

Event	Onset	t-value	Duration	t-value
Powell a Republican	-0.934	-1.57	-0.585	-1.71
Powell withdraws	1.195	2.12	0.928	9.85

All estimates significant at 10% or better

Table 5.2 **Clinton's Effect on Lieberman's Fundraising**

Event	Onset	t-value	Duration	t-value
H. Clinton not running	1.282	1.79	0.978	10.64

All estimates significant at 10% or better

The 2000 Republican nomination race was less dramatic than the 1996 contest. There was no Powell, weighing whether or not to join the fray and polling better than candidates already competing; Bush jumped out to an early lead in both money and polls, and there aren't any straw polls available for interrupted time series analysis. However, the 2000 nomination does allow for the testing of the effects of major candidate withdrawals enabling us to follow up on the "Powell effect". Both Dan Quayle and Elizabeth Dole withdrew well in advance of the actual primary season. Estimating the effects of these withdrawals on the fundraising efforts of Bush and Forbes shows no significant effect. One reasonable interpretation is that neither of them were seen as a plausible challenger for the already dominant Bush.[28]

The 2004 Democratic primary allows for one final event as, like the 1996 Republican race, there was a well-known, undeclared, potential challenger. In fact, there were two such contenders: Al Gore and Hillary Clinton. Gore announced his decision not to run in December 2002, well before our sample period begins. Clinton did not make her intentions public until May 31, 2003. Given the effect of Powell's announcements on frontrunner Dole, we might expect her announcement to benefit either Kerry or Gephardt,

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[28] It should be noted that while John McCain eventually emerged as the strongest challenger to Bush, the IEM had not yet spun off his contract at this point. Hence the investigation is limited to Bush and Forbes as the continuing candidates.

the two front-runners at the time. However, it is *Lieberman* whose fundraising increased by 128% effectively permanently. No other candidate experienced significant effects either way. It is important to keep the context in mind; the Hillary Clinton who announced she was not running in 2004 was not the same candidate who ran for president in 2008 as the strong favorite. At the time, she had served only four years in the Senate and in head-to-head polls consistently lost to President George W. Bush by 2 to 1 margins. Moreover, polls showed only 8% of Democratic voters thought she would be the toughest opponent for Bush. So it is perhaps not so surprising that her removal from the field did not affect contributors to the frontrunners. Rather, the result suggests that Lieberman and Clinton were competing for the same donors, perhaps the stalwarts of the Clinton-Gore campaigns of the 1990s.

Taking liberties with a small sample, we might surmise that the elimination of rivals who have already been shown to be lesser (Clinton '04, Dole '00, Quayle '00) makes little difference to the fund-raising process of front-runners, but a legitimate challenge to their status as front-runners (Powell '96) can make a very large difference. This is consistent with the summary of figure 4.1. Frontrunners are vulnerable only to shocks which threaten their status as the frontrunner.

6. Candidate Appearances

For the third and final analysis of fundraising, we study the effects of candidate appearances on statewide fundraising. As ever, we ask whether perceived chance of victory increases the fund-raising productivity of candidate appearances. Looking at a cross-section of state-level data constitutes a new cut of the data which corroborates our longitudinal results.

In order to raise money, candidates must build a multi-level organization of chief and lesser solicitors. As Brown Jr. et al. put it,

"Candidates must assemble a set of benefits that will attract enough contributors to fund the campaign… [T]he candidate must build an organization to distribute these benefits and attract members."

One of the most important, and most limited, benefits to be distributed is access to the candidate him or herself. Brown Jr. et al explain:

"One major organizational technique designed to focus and structure fundraising efforts is the fundraising event… at which the candidate appears. Such events…assist in raising early money… because they provide immediate social returns in exchange for the contribution: small events usually provide direct access to the candidate; larger events provide the opportunity for solicitors to network with each other."

We have argued in the preceding sections that there exists a positive effect of viability on fund-raising and we have shown that, for many candidates, aggregate contributions increase with perceived chance of victory. The discussion of Brown Jr. et al. suggests another method of testing this hypothesis. If candidate appearances serve as a quid pro quo, providing immediate social returns in exchange for contributions, then it seems likely that the more popular the candidate, the greater the demand for his or her

presence and the greater the contributions such an appearance would solicit. This kind of exchange is a local one: the contributors involved are physically present at the candidate's event or connected via local news and personal networks. As a result, were we able to track a candidate's appearances, we would expect to see increased contributions in the vicinity.

With this test in mind, we return to the FEC dataset and generate the total contributions in a given week for a given candidate in a given state. We then use the Washington Post dataset on candidate appearances in the 2008 primaries, described in section 3.5, to create a dummy variable indicating whether a given candidate has made an appearance in a given state in a given week. Thus we have a panel dataset, with weekly data by candidate-state pair, describing total funds raised and whether a candidate appearance was made. To this we add the IEM market data measuring the candidate's perceived chance of victory during the week in question.

We perform a simple panel regression looking for the contemporaneous effect on state-wide fundraising of a candidate appearance within the same state. Our specification is

$$
\begin{aligned}
C_{c,s,w} = \sum_{j=1}^{13} C_{c,s,w-j} + \beta_1 V_{c,w} + \beta_2 A_{c,s,w} + \beta_3\left(V_{c,w} \times A_{c,s,w}\right) \\
+ \beta_4 P_{c,w} + \beta_5 D_{c,w} + F_c + \varepsilon_{c,s,w}
\end{aligned}
\tag{6.1}
$$

where $C_{c,s,w}$ is total contributions from individuals to candidate c in state s in week w, $V_{c,w}$ is the probability of victory, $P_{c,w}$ is the measure of the popularity of the candidate's party, D_w is the number of days until the candidate's convention, and F_c are candidate fixed effects. We also include a full quarter's worth of weekly lags of the dependent variable to control for the fact that candidates might choose the location of their appearances in response to previous fundraising successes and failures.[29] Total contributions for a candidate in a state are quite often zero, especially for lesser candidates, smaller states, and earlier in the campaign. This is analogous to left-censoring of the observed supply of contributions, thus we estimate the model via panel Tobit.[30] The coefficient of particular interest here is β_3, which indicates whether the candidate's current political fortunes ($V_{c,w}$) affect the fundraising productivity of candidate appearances ($A_{c,s,w}$). But we will also look at β_1, β_2, β_4, and β_5 to corroborate results from section 4.

This approach contains at least three important simplifications. First, we have chosen to aggregate contributions and events to the state level rather than county, zip code, or some other geographic partition. Making such a choice requires taking a stance on the geographic scope of the fund-raising benefits of an appearance. Both attendance—leading to priming and direct solicitation—and local media coverage—leading to priming for other forms of solicitation—likely reach a wider audience than the immediate zip

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[29] Adding additional lags all the way through 16 weeks improves the Akaike information criterion suggesting improved fit of the model. However, a close examination of the coefficients suggests that lags beyond one quarter are contaminated by seasonal patterns. As the gains to the AIC are marginal beyond the 13th lag, we choose to keep only 13.

[30] This also means we cannot use the log transformation so coefficients are no longer elasticities.

code. One also suspects that there are unannounced fund-raisers in the evenings after the events in the database. These need not be in the same zip code but are likely in the same state. Of course, while picking up a larger fraction of the "signal", aggregating at the state level rather than the zip code is also likely to pick up more "noise" in the form of unrelated fluctuations in contributions. We believe the state is the proper level of aggregation to maximize the signal to noise ratio.[31] We have also chosen to look only for same-week effects, rather than allowing events to affect local fundraising for several weeks in the future. In light of a complete lack of theoretical priors for what such a time-path should look like, we felt such an exercise would constitute little more than data mining. The current approach is thus likely an underestimate of the total local effect of candidate appearances. Iowa and New Hampshire, as the sites of the first Caucus and Primary, receive a disproportionate number of candidate appearances. Because visits are likely subject to diminishing returns and because candidates visiting these states likely conduct their business with a different set of goals (free press rather than fundraising), we drop these two states from the regression. Finally, with the results from section 4 in mind, we have split the sample into front-runners and the rest of the pack where a front-runner is defined as the candidate who currently enjoys the highest IEM price (for example, Hillary Clinton for all of '07, but Barrack Obama for most of '08.)

The results for both the pooled and the split sample are reported in table 6.1. Several of these estimates reiterate results from section 4: fundraising tends to increase as the campaign develops, fund-raising responds to perceived chance of victory for the pack more so than for the frontrunner, and the fortunes of the national party have no statistically significant effect on candidates' fundraising. To this we can now add that a candidate appearance raises more contributions when the candidate's perceived chance of victory is high. This holds for both the frontrunner and the rest of the pack. These results are further confirmation of the first direction of the feedback loop. Electoral success increases the productivity of the scarcest campaign resource: candidate time.

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[31] We have also tried aggregating by three-digit zip code. Zip codes follow a simple pattern. The first digit represents a group of states (for example, a leading 4 signals the state is either Michigan, Indiana, Ohio, or Kentucky). The next two digits are the region within that state group, usually centered on a major city (for example, 432xx is a zip code centered on the postal hub of Columbus, OH). These three-digit zip codes represent US Postal Service sectional center facilities. (The final two digits identify cities and towns individually.) Hence the three-digit zip code represents a sizable, contiguous, geographic area including several towns which is nonetheless significantly smaller than the state. However, densely populated metropolitan areas such as New York City often have several three-digit zip codes within close proximity. It is quite likely that an event listed in one zip3 would draw contributions from neighboring zip3s. Indeed, the empirical results do not display a strong pattern.

Table 6.1 Candidate Appearances and Fundraising

	Pooled	Frontrunners	Rest of the Pack
	(1)	(2)	(3)
Probability of Victory	521.747	285.093	548.263
	(52.529)***	(435.220)	(58.212)***
Dummy(Appearance)	7640.137	-4153.294	10151.270
	(4142.428)*	(50547.470)	(3979.852)**
Probability of Victory * Dummy(Appearance)	799.130	1244.524	504.578
	(112.334)***	(926.149)	(118.125)***
Own Party Probability of National Victory	959.796	78216.260	6013.312
	(21968.780)	(123926.800)	(21140.060)
Days to Convention	-176.784	-184.412	-169.989
	(8.399)***	(52.723)***	(8.438)***
Constant	33881.090	-18874.340	29388.390
	(9273.060)***	(57397.680)	(8964.877)***
Obs.	8423	697	7726
χ^2 statistic	7764.294	839.914	5288.825

Estimated using panel tobit. Specification includes one financial quarter's worth of lags of the dependent variable and candidate fixed effects.

7 Productivity of Campaign Expenditures

7.1 The Direct Effect

Sections 4-6 have documented the effects of electoral success on the ability of candidates to raise money. We have both confirmed the initial hypothesis that popularity helps raise money and established a few robust patterns of this relationship. There appears to be a ternary classification of candidates. The fundraising flows of *frontrunners*, candidates whose viability is not in question, do not respond to fluctuations in their perceived chance of victory. Persistent *long-shots*, candidates whose viability is doubted by all, also receive little return on fluctuations in their perceived chance of victory. But for *insurgents*, those candidates whose viability is legitimately in question, increases in perceived chance of victory will elicit money from strategic donors while declines in perceived chance of victory drive these strategic donors away.

It is time to turn to the other half of the positive feedback loop: the effects of campaign expenditures on electoral success, both perceived and actual. During the campaign, a candidate spends money to pay for campaigning trips—speeches and appearances that generate support both directly and indirectly via free media—and to pay for advertising in a variety of media outlets such as TV, internet, radio, and direct mail. In order for the feedback loop to present a true chicken-and-egg problem, it must be the case that this spending can raise a candidate's stature *during the campaign itself, sufficiently swiftly for this increased stature to then empower future fundraising*, as per the results of previous sections. Without a sufficiently swift reaction, the positive feedback would have insufficient time to develop and would not deliver as strong a barrier to the initial long-shots.

To test this, we build off the methodology from Levitt (1994). Rather than attempt to find a proxy for candidate quality or an instrument for spending, he uses repeat match-ups in House elections and estimates a first-differenced model. If candidate quality is fixed, then estimates of the effect of campaign spending on vote share will be unbiased, as the first differencing eliminates fixed variables (like candidate quality) from the specification. Even if candidate quality and other omitted variables are not fixed, so long as variation is small, then estimates are much less biased than other methods. Levitt's results have been questioned because the repeat races, while relatively common, are not a representative sub-sample. Specifically, it may be these races where both candidates are relatively widely known where money would have the smallest effect. (Jacobsen 2006, Lott Jr. 1991) But because we have panel data, we can use candidate fixed effects to remove the omitted variables while retaining the entire sample of candidates.

Consider a model in which the probability of victory for candidate c at time t, $V_{c,t}$, depends on the spending in that period by the candidate, $E_{c,t}$, spending by his or her opponents, $\hat{E}_{c,t}$, the quality of the candidate, Q_c, the quality of his or her opponents, $\hat{Q}_c$, and a preference for candidate c, a_c, which is a function of the set of candidates but is imperfectly observed, such as preference based on policy position.

$$V_{c,t} = \beta_1 E_{c,t} + \beta_2 \hat{E}_{c,t} + \gamma_1 E_{c,t}^2 + \gamma_2 \hat{E}_{c,t}^2 + \delta_1 Q_c + \delta_1 \hat{Q}_c + a_c + u_{c,t} \qquad (7.1)$$

The second order terms are included in response to the evidence that campaign spending exhibits diminishing returns (see section 2.1). By first differencing this specification, we arrive at a model which can be estimated:

$$\dot{V}_{c,t} = \beta_1 \dot{E}_{c,t} + \beta_2 \dot{\hat{E}}_{c,t} + \gamma_1 \dot{E}_{c,t}^2 + \gamma_2 \dot{\hat{E}}_{c,t}^2 + \dot{u}_{c,t} \qquad (7.2)$$

Dots represent the time-demeaned variables and the constant measures, like candidate quality and the time-consistent error, are eliminated via differencing. Alternately with panel data, one can simply roll the unobserved candidate-specific terms into candidate fixed effects.

$$V_{c,t} = \beta_1 E_{c,t} + \beta_2 \hat{E}_{c,t} + \gamma_1 E_{c,t}^2 + \gamma_2 \hat{E}_{c,t}^2 + v_c + u_{c,t} \qquad (7.3)$$

We estimate equation (7.3) using quarterly data for expenditures and the end-of-quarter IEM price to calculate $E_{c,t}$ and $V_{c,t}$. Average expenditures per candidate by quarter increase over the course of the campaign and then fall off in the final quarter because many campaigns end during the second quarter of the year of the general election. We also suspect that during the primary season itself (the first two quarters of the year of the general election) the relationship between expenditures and IEM price is affected by voting results and thus likely to be different than the relationship of the

preceding year. To avoid erroneously estimating one relationship for two distinct periods, we limit our sample to the year prior to the election.[32]

The results, presented in column 1 of table 7.1, show a strong and significant effect of campaign spending on market estimates of the probability of victory. Spending an additional $1 million (real 2000 dollars) increases the IEM probability of victory by as much as 1.75 percentage points. On the other hand, an additional $1 million in expenditures by one's opponents reduces one's probability of nomination by as much as 1 percentage point. As expected, spending by any candidate exhibits decreasing returns to scale. On the one hand, this confirms the other half of the feedback loop. On the other hand, it is worth noting that candidate fixed effects are estimated to explain 86% of the variation in the probability of victory measure (see the rho statistic). In other words, recent campaign spending is an important factor in determining candidate support, but other factors such as candidate quality or policy positions are likely even more important.

There is a strong belief among both campaign participants and observers that early expenditures are especially productive because they operate on a public which has fewer preconceived notions and is thus more impressionable. Campaign managers speak of using early expenditures to define one's opponent, forcing his or her efforts towards responding to weak points and misconceptions rather than transmitting a preferred message.[33] The implication is that a candidate's expenditures are less productive the more his or her opponents have spent early on. To test this, we have run two additional specifications including an interaction between one's own expenditures and a measure of early spending by one's opponents (columns (2) and (3) of table 7.1). We have two such measures. The first is total spending by all opponents in the first quarter of the year before the primary. The second is the cumulative total of spending by all opponents in all prior quarters. The null hypothesis is that such a term ought to have a negative coefficient if early or prior spending by a candidate's opponents prepares an unfavorable ground for the candidate's current spending. As it turns out, we see no significant effect of early or prior spending by opponents on the productivity of a candidate's current spending.

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[32] As it turns out, adding the primary season itself does not change the sign and significance of the coefficients. Nonetheless, given the complexities of the actual primary and the commensurate likelihood of a change in specification, we feel this is the proper approach.

[33] We are indebted to Clifford Brown Jr. for bringing this point to our attention.

Table 7.1 Quarterly Expenditures and IEM Price

	IEM Price ($\dot{V}$)		
	(1)	(2)	(3)
Own Total Exp, $\dot{E}$	1.752**	1.664**	1.767*
	(.746)	(.834)	(.982)
Own Total Exp^2, $\dot{E}^2$	-.024*	-.027*	-.024*
	(.014)	(.016)	(.014)
Opponents' Total Exp, $\dot{\hat{E}}$	-1.030***	-.997***	-1.031***
	(.307)	(.307)	(.301)
Opponents' Total Exp^2, $\dot{\hat{E}}^2$	.011**	.010**	.011**
	(.005)	(.004)	(.004)
Opponents' Total Expenditures in Q1 * Own Total Exp			-.002
			(.058)
Opponents' Cumulative Prior Expenditures * Own Total Exp		.004	
		(.009)	
N	73	73	73
Candidates	23	23	23
ρ	.863	.861	.860
R^2(within)	.255	.258	.255
R^2(overall)	.378	.381	.38
R^2(between)	.41	.415	.413

Given the pervasive simultaneity in the relationship between money and fundraising, one may ask whether this estimate can be interpreted causally. It may be that campaigns spend in reaction to their probability of victory: perhaps as electoral conditions change, campaigns revise their inter-temporal spending profile. The most likely story would be a campaign in danger of becoming irrelevant accelerates spending, risking burning through existing cash too quickly in hopes that productive spending now will produce more contributions later. But endogeneity of this sort would actually bias our coefficients toward zero and thus cannot explain away a significant result. Perhaps more importantly, the fundraising totals for a given quarter are aggregated from the entire three month period while the associated probability of victory is taken to be the IEM closing price on the final day of the quarter. Thus our aggregation to monthly data has provided a natural temporal lag which reduces the plausibility of reverse causality. We submit that these estimates can be interpreted causally.

7.2 Voting with Money: signaling via fundraising news

There is an alternate view of the role of money which deserves mention. In accord with Pratt (2002), many believe campaign contributions are signals of the candidate's quality. Essentially, each voter possesses noisy private information about candidate

quality and gives money to the candidate her private information suggests is the best. Thus there is a positive relationship between the true quality of the candidate and the amount of contributions he is able to rake in, allowing a voter to improve her private signal of a candidate's quality simply by noting how much money he has raised, thereby internalizing the private information of others. In this view, campaign expenditures may or may not also directly influence voters via paid advertising and candidate appearances. Fundraising is thus a sort of continuous straw poll in which monetary votes are publicly counted and may influence the views of other voters going forward.

Given the level of press coverage devoted to quarterly FEC fundraising totals, and the success of signaling models and the informational properties of voting in other contexts, this is an intuitively plausible and appealing model that deserves attention. To test it, we have run an interrupted event study using the FEC reports in which candidates' quarterly or monthly fundraising totals are released. Mirroring section 5, we begin by building an ARIMA model for the IEM markets for each candidate. Then we use intervention analysis to estimate the magnitude of the initial impact and the rate of exponential decay of the FEC reports. To limit to the period of most intense media scrutiny, we use the releases for the third and fourth quarter of the year before and the first monthly release for the year of the general election.[34]

The overwhelming pattern in the data is the insignificance of fundraising news releases on the IEM probability of nomination for all candidates in the sample. Of the 45 candidate-release pairs in our sample, only 5 are significant at the 10% level. This is no different from the results of a random sample. Moreover, the pattern of signs among these significant coefficients does not seem to match the tenor of the press coverage following the release. For example, in December of 2003, Dean reported $16 million in fourth quarter contributions bringing his total to $40.9 million. While both of these marks led the field, the estimated impact of this FEC report was a 5 point decline in his probability of victory.[35] We submit that the results are simply random noise with no evidence of a systematically significant effect.

Unfortunately, it is difficult to conclude definitively against the money-as-signal theory. Quarterly reports are due exactly ten days after the end of the quarter and the information is released exactly five days after that. Nonetheless, it is quite plausible that the official FEC release date is not, in fact, the actual date at which the information is released to the public or the IEM participants. Many campaigns release their numbers (or hint at them) to the media before the FEC announcements. In an attempt to address early information leaks, we have done media searches to identify the date of first mention and have used this instead of the official release date. The results remain insignificant. Admittedly, we have no guarantees that we have successfully identified the actual date the information first became public. It is possible that insiders leak the knowledge before mention in the press, or that IEM participants are slow in noting the release of such information. Nonetheless, while not completely disproving the money-as-signal theory, our evidence suggests that at the very least, the diffusion of that information is very gradual.

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[34] Recall that FEC reports are filed quarterly the year before and monthly the year of the general election.
[35] Dean's later failure in the Iowa caucus is not driving this result.

8. Summary and Implications

8.1 The Results

Using longitudinal and panel methods on a consistent set of US presidential primaries, we have shown that both sides of the vicious cycle are statistically significant and strong. The typology that emerged in section 4 confirms that the primary process contains multiple steady states. Fund-raising flows are stable for long-shots who remain in obscurity. Flows are likewise stable for front-runners who have already demonstrated their viability. But there exists a third set of insurgent candidates who are "climbing the hill" to transition from confirmed obscurity to confirmed viability. These candidates are traversing the range of viability over which fund-raising responds positively to increases in IEM price as changes in political news either attract or repulse strategic donors. The results of section 5 then confirm this view by showing that the fund-raising of a front-runner is vulnerable to the entry of a candidate which would jeopardize his front-runner status. By showing that candidate appearances are more productive when the candidate is popular, section 6 gives the first evidence in favor of the specific mechanism at work: that increases in perceived electoral viability mean increased associative benefits stimulating increased contributions. These results also serve to confirm the results of the dynamic analysis with a cross-sectional approach. Finally, in section 7, we take the first look at the dynamic feedback from expenditures to viability *during the campaign* and find strong and significant evidence that money increases the perceived chance of victory of those that spend it, to the detriment of rivals. As a result, there exists a strong vicious cycle with multiple steady states. Initial front-runners reap enormous advantages during the primary season as their public perception as viable candidates helps them raise money the spending of which, in turn, reinforces the perception of their viability. Meanwhile, the viability of long-shots is in doubt, hampering their ability to attract money, the lack of which prevents them from projecting their image and attracting support. Candidates who start as dark horses must find a way to demonstrate their bona-fides and get over the hump between obscurity and viability. While we do see attempts to climb the hill from obscurity to viability, it is also clear from the data that most of these attempts fall short of achieving the plateau.

8.2 The Implications for Efficiency of Public Choice

The essential question raised by the dynamic feedback between fundraising success and electoral prominence is whether the electoral process is inefficient. Might the "best" candidate—by whatever metric—languish in obscurity, unable to generate the initial momentum necessary for the positive feedback to begin while a lesser candidate rides their initially favorable position to the nomination?

In an electoral general equilibrium, voters evaluate candidates on two axes: policy and valence. Policy is the collection of political positions and ideological beliefs held by a candidate. Valence is the non-ideological quality of a candidate encompassing managerial skill, political creativity, charisma, reputation, or even physical attractiveness (Coate 2004a). In theory, all voters would prefer a candidate with high valence, as these qualities make for good elected officials regardless of political orientation. *Ceteris paribus*, voters would like to elect highly competent candidates who share their

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ideological positions. However, candidates can only observe a noisy signal of valance and policy. Thus candidates can spend money—on direct and media advertising, travel for speeches and debates, and the managers and expert studies that direct the first two categories—in an effort to influence voters' inferences of their policy and valence. Informative campaigning signals to voters about the policy positions of the candidate (Coate 2004a) while persuasive campaigning may serve to convince voters about valence.[36]

However, the very effectiveness of such advertising admits a potential source of representative inefficiency. First of all, it is not clear that voter learning inevitably converges on the truth: through a variety of mechanisms such as selective release of information, candidate spending may persuade the voter to see the candidate more favorably than they would under full disclosure. As a result, if a minority interest group with non-representative policy preferences heavily finances a candidate who shares their views, and if such financing effectively persuades a wide swath of voters, it is conceivable for the process to produce an officeholder who is not representative of the broader public's preferences, but rather skewed toward whichever group raised the most money for their candidate. From a public choice perspective, the benefits of campaign spending, namely the increase in voters' knowledge of the candidates, must be weighed against this potential policy bias.

One natural solution would be mandating equal funds across all campaigns. Ignoring legal issues, the clear problem is that such a system would invite an overload of candidates; voters may receive a clutter of signals with commensurately reduced learning. Elimination of all spending would simply eliminate learning altogether. Clearly there is a role for campaign spending and for a market place of contributions. The former enables learning about the candidates while the latter winnows the field. But the design of campaign finance regulation must acknowledge the demonstrated strength of the vicious cycle and the historical record of initial frontrunners.

8.3 Questions for Future Research

We have shown that a dynamic campaign exacerbates this potential source of inefficiency as early contributions can, via a process of cumulative causation, lead to insurmountable differences in campaign fundraising and campaign expenditures do effectively increase chances of electoral success. Aldrich's vicious cycle has been confirmed. Our results, in turn, raise more questions. What distinguishes the successful insurgents, those candidates who manage to initiate the positive feedback loop between popularity and money, from the also-rans who remain obscure? Perhaps more importantly, the vicious cycle implies that the selection of presidential nominees is not confined to the primary season or even the money primary. Rather, it implies an important role for the initial characteristics that distinguish the candidate who is anointed the initial frontrunner at the start of the money primary. How are these initial front-runners identified? What are the roles of fund-raising capacity, name recognition, and prior experience in public service? Answering these questions will shed light on whether

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[36] See Gurian and Haynes (2003) and Dutwin (2000) concerning voters' knowledge of candidates during a campaign.

the vicious cycle is a worrisome source of inefficiency, or simply complexity that ought to be detailed in the interest of transparency in public choice.

Appendix A: ARIMA results by candidate, dropping last week of quarter

RNC '96	Alexander	Buchanan	Dole	Gramm
	(1)	(2)	(3)	(4)
Probability of Victory	.548	.237	-.244	-.247
	(.259)**	(.356)	(1.190)	(.817)
Rep Price	.028	-.101	.046	.107
	(.099)	(.085)	(.050)	(.095)
Days to Convention	.0008	-.005	-.0006	.002
	(.005)	(.002)**	(.002)	(.003)
Constant	9.081	16.050	11.280	6.175
	(3.246)***	(3.708)***	(5.675)**	(3.491)*
AR(1)	.626	.051	.445	.594
	(.126)***	(.196)	(.126)***	(.129)***
N	50	28	56	52
χ^2 statistic	38.458	17.06	16.568	28.216

DNC '00		Bradley		Gore
		(1)		(2)
Probability of Victory		.810		1.708
		(.236)***		(1.232)
Rep Price		.054		.076
		(.030)*		(.084)
Days to Convention		.0004		.003
		(.002)		(.004)
Constant		7.350		.307
		(1.457)***		(5.894)
AR(1)		.545		.057
		(.164)***		(.204)
N		34		35
χ^2 statistic		28.953		6.791

RNC '00	Bush	Dole	Forbes	McCain	Quayle
	(1)	(2)	(3)	(4)	(5)
Probability of Victory	-1.285	.457	-.148	1.396	1.698
	(1.954)	(.383)	(.265)	(.474)***	(.609)***
Rep Price	-.004	.055	-.022	.034	.176
	(.063)	(.198)	(.049)	(.199)	(.113)
Days to Convention	.007	.001	.012	-.015	-.019
	(.003)**	(.012)	(.003)***	(.010)	(.015)
Constant	17.258	7.072	8.171	10.428	7.639
	(8.887)*	(13.459)	(2.027)***	(9.291)	(9.954)
AR(1)	.171	-.329	.659	.509	-.317
	(.301)	(.407)	(.185)***	(.316)	(.432)
N	35	15	30	15	13
χ^2 statistic	21.249	4.703	74.212	15.171	11.985

Appendix A cont.

DNC '04	Clark	Dean	Gephardt	Kerry	Lieberman
	(1)	(2)	(3)	(4)	(5)
Probability of Victory	-.127	.559	.572	.384	-.395
	(.316)	(.193)***	(.578)	(.512)	(.618)
Days to Convention	.008	-.007	-.002	-.002	.007
	(.005)*	(.003)**	(.002)	(.003)	(.006)
Constant	11.553	12.472	11.164	11.956	10.104
	(.903)***	(.869)***	(1.362)***	(1.694)***	(1.061)***
AR(1)	.018	-.082	-.256	.384	.070
	(.497)	(.210)	(.181)	(.194)**	(.161)
N	16	20	43	50	46
χ^2 statistic	3.437	14.017	6.08	5.85	3.551

DNC '08	Clinton	Edwards	Obama
	(1)	(2)	(3)
Probability of Victory	.626	.777	-.078
	(.397)	(.814)	(.378)
Dem Price	-.085	2.675	.529
	(3.810)	(6.983)	(4.902)
Days to Convention	-.004	.0004	-.003
	(.001)***	(.003)	(.002)*
Constant	12.905	8.585	15.091
	(2.320)***	(4.530)*	(2.965)***
AR(1)	.457	.479	.719
	(.124)***	(.161)***	(.167)***
N	59	41	59
χ^2 statistic	27.455	12.271	32.228

RNC '08	Giuliani	Huckabee	McCain	Romney	Thompson
	(1)	(2)	(3)	(4)	(5)
Probability of Victory	.885	-.223	.847	-.129	1.191
	(.954)	(.198)	(.184)***	(1.052)	(.829)
Rep Price	.406	7.386	.996	-1.459	-4.779
	(5.002)	(21.754)	(2.316)	(4.291)	(8.519)
Days to Convention	.0008	.035	-.001	.0003	-.017
	(.002)	(.012)***	(.001)	(.002)	(.011)
Constant	9.847	2.044	10.738	13.955	16.832
	(3.214)***	(8.297)	(1.039)***	(4.211)***	(4.374)***
AR(1)	.425	.600	.340	.444	.054
	(.242)*	(.654)	(.183)*	(.189)**	(.293)
N	42	11	47	43	27
χ^2 statistic	3.872	10.018	35.372	5.7	2.545

Appendix B: **Events used in section 5**

Date	Event	Description
Apr 9, 1995	Oklahoma Straw Poll	Gramm wins
Apr 24, 1995	Arizona Straw Poll	Buchanan wins in a surprise
Aug 19, 1995	Iowa Straw Poll	B. Dole and Gramm tie
Sep 17, 1995	Powell Announces	General Powell announces he would run as a Republican if running
Nov 8, 1995	Powell Withdraws	General Powell announces he will not run
Nov 18, 1995	Florida Straw Poll	B. Dole wins in close contest with Gramm and Alexander
Aug 14, 1999	Iowa Straw Poll	Bush wins
Sep 27, 1999	Quayle Quits	Quayle with little support and less money
Oct 20, 1999	E. Dole Quits	E. Dole notes Bush and Forbes able to outspend her eighty to one.
May 31, 2003	H. Clinton Quits	

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