A Dynamic Analysis of The Role of War Chests in Campaign Strategy

Janet M. Box-Steffensmeier

American Journal of Political Science, Vol. 40, No. 2. (May, 1996), pp. 352-371.

Stable URL:
http://links.jstor.org/sici?sici=0092-5853%28199605%2940%3A2%3C352%3AADAOTR%3E2.0.CO%3B2-Z

American Journal of Political Science is currently published by Midwest Political Science Association.

*A Dynamic Analysis of The Role of War Chests in Campaign Strategy**

Janet M. Box-Steffensmeier, *Ohio State University*

Theory: War chest dynamics affect challenger entry.
Hypotheses: Large war chests deter challengers from entering. High quality challengers should be particularly influenced.
Methods: Repeated measures analysis of variance and duration analysis with time varying covariates and temporally disaggregated war chest data are employed.
Results: The primary contribution of this paper is the empirical evidence that war chests affect entry decisions of high quality challengers.

A Texas state legislator was indicted this year on charges that she falsified her campaign reports to show that she had raised more money than she had actually received. Why? She wanted to scare off any possible opposition by showing that she was so well-funded that it would be foolhardy to challenge her. (Legislative Studies Section Newsletter 1993).

Members of Congress are spending more time raising campaign funds as the average expenditure per election increases. In 1974, the average House incumbent spent $56,537 and the average House challenger spent $40,015, with a spending gap of $16,523 (Makinson 1992, 3). In 1990, the spending gap increased to an astonishing $308,214 with the average incumbent spending $413,231 and the average challenger spending $105,017 (Makinson 1992, 3).

The increasing costs of winning office and the fact that House members never stop campaigning due to the two-year election cycle (Fenno 1982, 27) have contributed to the growth of war chests. Since House incumbents no sooner finish one campaign and have to begin another, there is an incentive to build large war chests. Presumably a large war chest will not only provide security by allowing the incumbent to react quickly to a challenger

*Paper prepared for presentation at the 1994 annual meeting of the American Political Science Association, September 1–4, 1994, New York, NY. I would like to thank Larry Baum, Walter Dean Burnham, Melissa Collie, Robert Erikson, Victoria Farrar-Myers, Charles Franklin, Jay Goodliffe, Paul Herrnson, Gary Jacobson, Bradford Jones, Jonathan Katz, John Kessel, David Kimball, Eric Lawrence, Krishnan Namboodiri, Brian Roberts and Nicholas van de Walle for helpful comments, Gary Jacobson for the challenger quality data used, and Peter Radcliffe and Christopher Zorn for research assistance. This research was supported, in part, by the Ohio State Research Foundation, Mortar Board Foundation, and the University of Texas. The data, STATA programs, and documentation may be obtained by anonymous ftp from ICPSR's Publication-Related Archive under the author's name or title of the article.

American Journal of Political Science, Vol. 40, No. 2, May 1996, Pp. 352–371

but perhaps even more important, deter challengers from entering. This paper empirically tests the temporal relationship between war chests and challenger entry.

Whether war chests deter challengers from entering is an important question because a necessary component of a democracy is competitive elections. Competitive elections are the primary means to ensure responsiveness by the elected to their geographic constituency, or at least their voting constituency.[1] Competitive elections presume the existence of alternatives among which to choose. If such alternatives do not exist, the constituent-representative relationship is altered and the process of democratic representation may break down.

Whether a challenger enters is obviously a major determinant of electoral outcomes. If the incumbent is running for reelection, he or she would prefer to have no challenger, which would guarantee reelection. If there is a challenger, the incumbent would prefer a low quality candidate to a high quality one. Finally, the incumbent should prefer a challenger to enter later since the longer the challenger is in the race, the more media exposure the challenger receives. Since incumbents typically have better name recognition than challengers, it is reasonable to expect incumbents to try to preserve this advantage. Empirically, the impact of challenger entry on electoral outcomes is not disputed (Mann and Wolfinger 1980; Jacobson and Kernell 1983; Bond, Covington, and Fleisher 1985; Green and Krasno 1988).

Due to the strong effect of challenger entry on electoral outcomes, investigating what determines whether the incumbent faces a challenger is important. This information is needed to understand more fully incumbents' stragegic behavior. Many scholars have investigated the important issue of challenger entry and the strategic implications (by Hinckley 1980a, 1980b; Jacobson and Kernell 1983; Krasno and Green 1988; Bauer and Hibbing 1989; Jacobson 1990; Jones 1995). The purpose of this paper is to empirically test whether war chests affect challenger entry by incorporating timing information.

War Chest Dynamics Over the Electoral Cycle

The size of the incumbent's war chest is the main factor posited to affect challenger entry that is under an incumbent's control. Thus, war chests are a critical part of an incumbent's electoral strategy. The common

[1]Noncompetitive elections could signal perfect satisfaction with incumbent responsiveness. If elections are noncompetitive for other reasons, however, such as a large incumbent war chest scaring off challengers, then the implications for democracy need to be considered.

factors considered in models of challenger entry are: incumbent vote share in the previous election, district partisanship, and national tides. The relationship, however, between the incumbent's effort and these factors is not as strong as the relationship between the incumbent's effort and the size of his or her war chest.[2] That is, the incumbent cannot as effectively influence the other factors compared to influencing the size of his or her war chest. For example, national tides are typically measured as party affiliation and are generally uncontrollable by most, if not all, individual incumbents.

Anecdotal evidence strongly suggests that incumbent war chests affect challenger entry. Fritz and Morris (1992) discuss the widely held perception that incumbents amass huge war chests to scare away potential challengers. In practical politics, this is known as "killing the money." Candidates, would-be candidates, and campaign strategists also pay attention to the timing of money (Guzzetta 1981; FaithAmerica Foundation 1982; Beaudry and Schaeffer 1986; Biersack and Wilcox 1990; Goldstein 1991; Epstein and Zemsky 1995). *The Campaign Manual,* written by the president of a campaign consulting firm for challengers, specifically discusses the steps for obtaining the incumbent's Federal Election Commission (FEC) reports to assess financial and political strength throughout the course of the campaign (Guzzetta 1981, 17).

Political folk wisdom has long told us that large war chests may be built to deter challengers, however, Goldenberg, Traugott, and Baumgartner (1986) are the first to introduce the idea that war chests should be studied for their effect on challenger strength. Their important research suggests that an incumbent's monetary resources could be used strategically to influence challenger entry. They state that such motives and behavior require further study and that a definitive demonstration of these effects awaits systematic study of the preprimary period (1986, 10). They do not attempt, however, to empirically investigate their thesis.

Krasno and Green (1988) investigate the effects of money on the entry of strong and weak challengers in the 1978 election.[3] They do not find evidence supporting Goldenberg, Traugott and Baumgartner's (1986) hypothesis of a monetary deterrence effect or Jacobson and Kernell's (1983)

[2]The argument that any challenger should assume as a matter of course that the incumbent will be able to raise and spend whatever it takes to conduct a full-scale campaign if the need arises is inconsistent with the data (Herrnson 1995).

[3]Krasno and Green (1988) state, "Unfortunately, disaggregating the spending data by time is an extremely painstaking process. As a result, we chose to examine only the case investigated by Goldenberg et al., the 1978 election cycle" (1988, 931). However, this data set, "The 1978 Congressional Campaign," is inadequate for testing the idea that challenger quality is affected in the preprimary period because the data only cover from July 1978 to November 1978.

theory of national forces. Their research does support Bond, Covington, and Fleisher's (1985) conclusions that district level (local) forces exert the strongest effect on challenger entry. Krasno and Green draw upon Ragsdale and Cook's (1987) qualitative findings to conclude, "Incumbents often raise and spend money in the year before the election, but the preemptive effect of these activities on challenger quality has managed to elude both quantitative and qualitative analyses" (1988, 932). Ragsdale and Cook (1987) report that challengers place emphasis on the incumbent's previous election margin, but not their bankroll before the election year, and that the incumbent's actions between elections are virtually meaningless.

Squire (1989) has also tested for the deterrence effect by examining contested and uncontested races. He uses cash-on-hand at the beginning of an election cycle, January 1983, and looks for an effect on the 1984 election outcome. Squire concludes that cash-on-hand does not affect whether a challenger enters a race. Instead the determinants are reflections of national tides (party), local district forces (previous election outcome), and regional effects (southern states). The strongest effect is attributed to the incumbent's share of the previous vote, consistent with Krasno and Green's (1988) empirical results. This is also consistent with Jacobson (1987), Bianco (1984), and Bond, Covington, and Fleisher (1985), all of whom show that the size of the previous election margin affects the challenger's quality. None of these studies, however, incorporate war chest information. Studies that do not include war chests may be open to criticism of specification bias if it is shown that war chests do affect challenger entry decisions. Important work by Erikson and Palfrey (1994) and Epstein and Zemsky (1995) use game theory to gain insight into the study of war chests and challenger entry dynamics. Finally, Herrnson (1995) provides an excellent account of the buildup of war chests.

War chest dynamics are expected to be important because challenger entry decisions occur over time. Wilcox (1987) shows that over 20% of challengers filed statements of candidacy during the first year of the 1984 and 1986 election cycles. Approximately 15% filed during the first two months of the election year, a third filed during March and April, and a quarter filed June or later. Challengers can decide whether to run until the primary occurs and will use all available information, including war chest size, until the entry decision is made. It is unrealistic to expect that challengers decide whether to enter a race on January 1, following an incumbent's successful reelection bid (Squire's measure, 1989), or that they decide between July and November of the election year (Krasno and Green's measure, 1988).

Although scholars have recognized the element of time and its potential impact on candidates, contributors, and campaign strategy, the temporal

effect has not been empirically tested. This paper builds upon and challenges previous findings while increasing the power for description and inference. Important information that was not included in earlier studies is added by measuring war chests and challenger entry over the course of the electoral cycle.

The information gathered about the history of the incumbent's war chest is useful to potential challengers and may more accurately capture the effect of war chests on challenger entry, which was deemed elusive by Krasno and Green (1988). This paper is specifically aimed at mounting more appropriate data and statistical tests to determine whether an incumbent's strategy of deterring challengers by amassing large war chests is likely to be effective. A duration model with time varying covariates allows us to adequately test this hypothesis and to focus on the war chest data that are part of the incumbent's deterrence strategy.

Data and Analyses

The data consist of 397 House races in which an incumbent ran for reelection in 1990.[4] Monetary data for 1989–90 are divided into the five FEC reporting periods that cover from the beginning of the election cycle until all primaries have occurred.[5]

The amount of the incumbent's cash-on-hand is a more precise empirical measure of a war chest than contributions or expenditures based on descriptions in the literature and popular press (Fritz and Morris 1992). Cash-on-hand is defined by the Federal Election Commission to include petty cash, funds held in checking and savings accounts, traveler's checks, certificates of deposit, treasury bills and other investments valued at cost (Federal Election Commission 1988). Defining war chests other than by cash-on-hand is problematic. Expenditures may reflect trouble that the incumbent is trying to repair, and preemptive or reactive expenditure components are intertwined. Using contributions as a measure of an incumbent's war chest is also problematic since the incumbent may need to raise large

[4]The monetary data were obtained from the Federal Election Commission (1990) tape, Campaign Expenditures in the United States, 1989–1990: Freedom of Information Act (FOIA) Data. The races of interest were selected from part 1 of the data tape, which is the Candidate Master File. The data were then merged with part 2, the Committee Master File, which contains the needed committee identification numbers. These identification numbers are matched with the reports in part 4, the Detailed Report File, in order to obtain the monetary data broken down by period. Louisiana races were excluded due to the open primary system. Vermont was excluded due to the odd result that the winning challenger was from a third party.

[5]The data from the Federal Election Commission (1990) preprimary report has been aggregated into the relevant quarterly report.

Table 1. Disaggregation of Incumbent War Chests by Reporting Period (Dollars)

Periods	Mean	Median	*N*
CONTESTED RACES:			
Period 1: January 1, 1989, to June 30, 1989	$152,126	$103,055	320
Period 2: July 1, 1989, to December 31, 1989	185,085	129,303	320
Period 3: January 1, 1990, to March 31, 1990	201,405	147,429	320
Period 4: April 1, 1990, to June 30, 1990	242,794	178,227	291
Period 5: July 1, 1990, to September 30, 1990	243,620	200,761	137
UNCONTESTED RACES:			
Period 1: January 1, 1989, to June 30, 1989	194,725	134,853	77
Period 2: July 1, 1989, to December 31, 1989	226,382	169,358	77
Period 3: January 1, 1990, to March 31, 1990	236,077	188,801	77
Period 4: April 1, 1990, to June 30, 1990	254,766	203,837	59
Period 5: July 1, 1990, to September 30, 1990	309,897	215,066	25

Note: War chests are measured at the end of each period.

sums of money as a result of political trouble, such as a scandal. This is not the deterrence effect we are interested in for the typical incumbent. If an incumbent is in trouble, the savings rate is low, although the rate of contributions and expenditures is high. Ideally, we want to look only at preemptive monetary actions, i.e., those that occur before a challenger enters, not reactive, to ensure the best test of the deterrence hypothesis.[6] The reactive situation interferes least when measuring war chests as cash-on-hand, which is essentially savings (Box-Steffensmeier and Franklin 1995).

War chest data for contested and uncontested races are shown in Table 1. The data provide a snapshot of the growth and decline of war chests through the primary season. Incumbents in uncontested races had an average of $42,000 more in their war chest than incumbents in contested races in June 1989. Incumbents in uncontested races consistently maintained a larger war chest than their counterparts in contested races. Incumbents' war chests ranged from $0 to $1.7 million.

Challengers have virtually no cash-on-hand, which emphasizes the potential power of war chests to be a factor in challenger entry decisions. This is particularly true when considered in light of previous results that show incumbent expenditures, especially early expenditures, have a strong

[6]War chests may also preempt a challenger from making certain moves, however, this thesis is not tested.

positive effect on the vote (Box-Steffensmeier and Lin 1995) and on later fundraising success (Biersack, Herrnson, and Wilcox 1993).

Repeated Measures ANOVA

Repeated Measures Analysis of Variance (ANOVA) helps to identify timing patterns in the data, which may lead to further insight about congressional campaign strategies. Specifically, repeated measures ANOVA can be used to test whether the observed differences shown in Table 1 can be attributed to chance, or whether they reflect a distinct temporal pattern. The measurements, cash-on-hand, can be thought of as responses to levels of a factor of interest, time. The data are on the same member of Congress over time, i.e., the size of incumbent A's war chest at time t_1, t_2, t_3, t_4, and t_5, and therefore tend to be correlated with each other. Repeated measures ANOVA takes into account the correlation (Winer 1971; Girden 1992). That is, variability among the subjects due to individual differences is removed from the error term. Since individual differences are the major source of error variance, the repeated measures design is much more powerful than completely randomized designs where different subjects are randomly assigned to different treatments. Thus a major advantage of the repeated measures design is the resulting increased precision (Stevens 1986).[7]

The first repeated measures ANOVA finding is that there are no differences by between-subjects according to whether the race was contested. In other words, war chests for incumbents who faced a challenger were not significantly different at any one time point from those who did not face a challenger. This confirms Squire's (1989) conclusions since he measures war chests at the beginning of the two-year election cycle. So if war chests are measured in January 1995, they are not expected to predict which incumbents will face a challenger in the November 1996 elections.

More interestingly, repeated measures ANOVA determines whether there are differences among groups *over time.*[8] The data are divided according to 1) whether a challenger entered, and 2) whether a *high quality* challenger entered, to determine if the change in war chests over the elec-

[7]Stevens (1986) recommends that both the modified univariate and multivariate approach be used with repeated measures ANOVA since they may differ in the effects they will discern. The multivariate and modified univariate tests both lead to the same conclusions throughout this analysis.

[8]The deterrence effect should not occur after the fifth period because at the end of the fifth period all primaries have occurred and therefore all entry decisions have been made. So empirically, the deterrence effect is expected to occur at most up to the sixth period. Some states do allow parties to nominate after the primary, but this is rare. This time frame is consistent with the existing literature that examines when a challenger decides whether to enter a race (Maisel 1986; Wilcox 1987).

toral cycle can be used to distinguish between incumbents who face a challenger and those that do not.[9] The second scenario is tested because Mann and Wolfinger (1980) conclude that the incumbent's probability of electoral success remains the same whether the incumbent faces a weak challenger or no challenger. Herrnson (1992, 1995), Krasno (1994), and Epstein and Zemsky's (1995) important work also suggests that the distinction between high and low quality challengers will be very important in the war chest context. Low quality challengers may realize their prospect of winning is dismal but enter for other reasons, such as to increase name recognition or to advance within their party. Differences between whether a challenger entered are significant at the 0.01 level when the war chest data are examined over the course of the primary season for cases one and two. Thus, the dynamics in incumbents' war chests indicate whether a challenger is expected to enter.

The existence of time dependent patterns shows that war chests are dynamic and suggests that the current literature's static model should be rejected in favor of one that incorporates the change in war chests over the course of the electoral cycle. After all, some war chests steadily increase between the start of the election cycle and the primary, others steadily decrease and still others oscillate. While repeated measures ANOVA confirms the expected dynamics, it does not allow us to make causal statements about the effect of war chests on challenger entry. A model that incorporates both the change of war chests over time and entry timing decisions is needed to test the theory and to avoid confounding deterrence and reaction strategies. Before exploring such a model, replication and extension of a sophisticated static analysis was conducted to buttress the argument that dynamic analyses are needed and to show that 1990 is not a unique case.

Examination of a Sophisticated Static Analysis

The purpose of this section is to show that Squire's (1989) conclusions, which were based on data from 1978–84, continue to hold for 1990. In addition, regardless of the different operationalizations used in the static

[9]While there is general agreement that challenger quality is important in studies of congressional elections, disagreement exists about how to measure it. Jacobson (1989, 1990) uses a dichotomy that indicates whether the challenger has held any prior political office. Bond, Covington, and Fleisher (1985) propose a trichotomy that differentiates among the type of political office held and incorporates information about past political experience that does not include holding office. Krasno and Green (1988) use a seven-point scale that makes even finer distinctions and incorporates information about past experience that is not political. Bond and Fleisher (1992) point out that the simple dichotomy picks up the most important component of candidates quality. Therefore, the dichotomy is used in this paper.

model, the conclusions remain the same. The variables used in the replication and all subsequent analyses are defined below.

Challenger Entry is the dependent variable. Squire (1989) measured challenger entry as a dichotomous variable indicating whether the incumbent faced a challenger. This definition was changed in variations of his model to incorporate challenger quality.

Party is a dummy variable equal to zero if the incumbent is a Republican and one if the incumbent is a Democrat. Party captures the short-term national trend posited to affect the parties' prospects of fielding challengers.

South is also a dummy variable that is equal to one if the district is located in the South.[10] Races in the South are posited as more likely to be uncontested or have low quality challengers because of one party dominance and "traditionalistic" political culture (McKitrick 1975; Elazar 1984; Keefe and Ogul 1985; Squire 1989).

Prior Vote is the incumbent's proportion of the major party vote in the previous election. It controls for long-term district forces such as the district's party composition and the enduring popularity of the incumbent. The expectation is that the smaller the previous election margin, the more likely a high quality challenger will enter.

War chest is the amount of money the incumbent has in reserve to use at his or her discretion. War chests are measured at the end of each period and in millions of dollars to keep the measurement of all variables on the same scale. The expectation is that the larger the war chest, the less likely the incumbent will face a challenger.

The first set of results using the 1990 election data were consistent with Squire's (1989) results for the 1978 to 1984 elections; war chests did not affect whether an incumbent faced a challenger. Neither war chests nor the interaction term obtained significance. All other variables were significant. Subsequent models changed how challenger entry and war chests were measured, however, the conclusion remained the same.[11] Thus, the findings are not artifacts of the operationalization of the static model.

Given open disclosure, accessibility of the FEC reports, and the importance of financial information, it is likely that a challenger possesses information about the incumbent's finances for *all* periods prior to his or her entry decision. Thus, the dynamics of the incumbent's war chest over time

[10]Southern states are defined as Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Texas, Virginia. This categorization follows Squire (1989, 283).

[11]The variations included splitting the dependent variable differently (high quality vs. low quality or no challenger) and treating it as a trichotomous variable. War chests were also measured at different time points, i.e., for each time period.

are expected to affect challenger entry decisions. The rest of the paper incorporates data on when challengers enter and tests whether the dynamics of war chests affects challenger entry.

A Duration Analysis of War Chests

This section continues to use the data previously described, with one exception, the dependent variable is measured differently. Instead of simply measuring whether a challenger entered, *when* the challenger entered is recorded as well. The new information can be incorporated into the model by using duration analysis. Duration analysis is relatively new in political science, appearing within the last decade, and is considered a very promising direction for methodological and substantive research in political science (Bartels and Brady 1993; Box-Steffensmeier and Jones 1995).[12] Duration analysis is particularly well-suited to handle two features of the data, censoring[13] and time varying explanatory variables, which cause major problems for standard statistical methods, i.e., typically severe bias or loss of information (Yamaguchi 1991). Time varying variables are critical for measuring war chests over time.[14]

In the simplest form, duration data are longitudinal records of when events happened (Allison 1984) and duration models analyze the length of time until an event occurs.[15] Models in this paper are focused on explaining the length of time between the beginning of an election cycle and the entry of a challenger using the 1990 incumbent races in the House. The dependent variable, incumbent "survival" time, is the *time* until a challenger enters. Alternative definitions of a challenger are examined, as was done previously in the paper. Specifically, challenger entry is defined as 1) any chal-

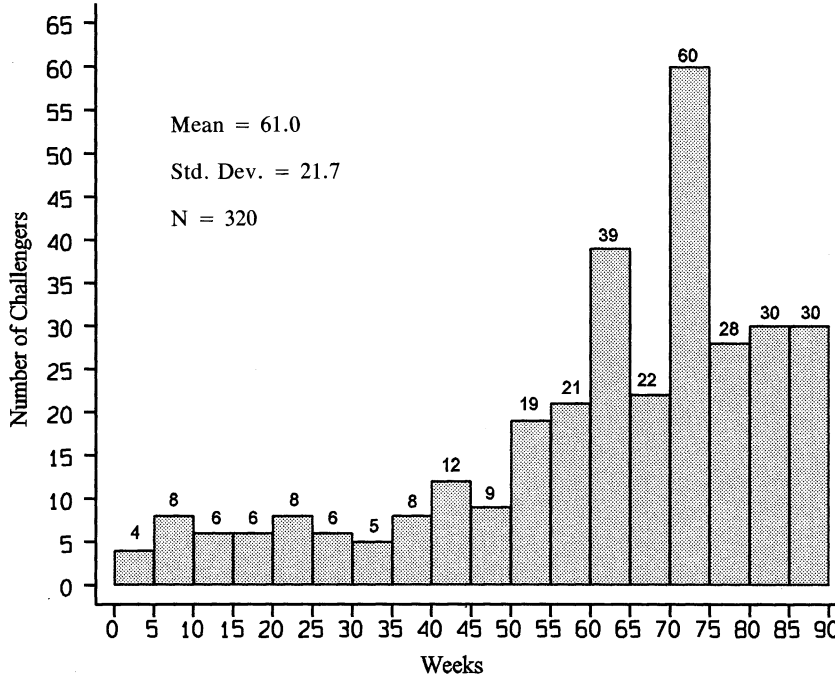
[12]Early work in this area by Browne, Frendreis and Gleiber (1984, 1986) and Cioffi-Revilla (1984) on cabinet dissolution was deemed "disappointing and inadequate" by Strom et al. (1988) due largely to their simplistic model. King et al. (1990) curtailed much of the criticism by developing a stochastic model in which the probability of cabinet dissolution varies with explanatory variables. Diermeier and Stevenson (1994) are also making important methodological advances in pursuit of this substantive question by utilizing a competing risks model with *dependent* risks. Other innovative applications include: leadership duration (Bienen and van de Walle 1989, 1992), decolonization (Strang 1991), state lottery adoption (Berry and Berry 1990), ballot reform (Katz and Sala 1996), interstate rivalries (Goertz and Diehl 1995), congressional careers (Jones 1994), and legislative position taking (Box-Steffensmeier, Arnold, and Zorn 1995).

[13]Censoring occurs when incomplete information is available about the duration of the risk because of a limited observation period (Yamaguchi 1991, 3).

[14]Time varying independent variable are sometimes referred to as "time dependent."

[15]The roots of this method lie in demography. Event history analysis is the term typically preferred by sociologists. Biostatistics and engineering have also developed similar techniques and refer to these methods as survival analysis and reliability analysis, respectively.

Figure 1. Timing of Challenger Entry



lenger entering, regardless of quality, and 2) a high quality challenger entering. Weeks are counted from January 1 of the odd numbered year. Thus the distinction between the dependent variable previously used and the dependent variable used for the duration analysis is the additional information about *when* the challenger entered.

Figure 1 presents the challenger entry data. The median entry time is the 66th week of the campaign. Challenger entry is recorded when the challenger raises or spends over $5,000. The FEC defines challenger entry as the earliest of the following three possibilities: when a candidate raises over $5,000, spends over $5,000, or declares himself or herself as a candidate (Federal Election Commission 1988). Empirical differences between possibilities one and two are minuscule.[16] There were 77 uncontested races

[16]If the major party challenger did not raise $5,000 prior to the primary, the date when the candidate declared himself or herself a candidate by filing a candidacy statement with the FEC is used as the date of entry.

in 1990, 55 "contested" races where the challenger did not raise or spend at least $5,000, and 265 races where the challenger raised or spent at least $5,000; the total number of observations is 397.[17] An incumbent knows whether he or she will face a challenger by the primary filing date. Observations are censored by the week in which the 1990 primary occurred if no challenger entered. Censored observations range from March 13, 1990, which was when primaries were held in Texas, to September 22, 1990, which was when primaries were held in Hawaii.

Duration models test the effect of war chests on challenger entry while explicitly considering the element of time. From a statistical point of view, the timing of challenger entry may contain valuable information, and it is statistically inefficient to ignore this information. Logit or probit does not cause bias or inconsistency, but does give estimates that are inefficient compared with maximum likelihood estimation, which is used in duration analysis; the estimates from probit or logit will have larger variance.

A Duration Model with Time Varying Covariates

Time varying covariates are important because they allow the dynamics of war chests over the course of the electoral cycle to be incorporated into the model. Of course, some explanatory variables do not change over time (the previous election outcome or whether the district is in a southern state) and so there is no need to worry about temporal variation. A duration model with time varying covariates allows us to test whether the change in war chests over the course of the electoral cycle affects challenger entry and to focus on the war chest data that are part of the incumbent's deterrence strategy, i.e., to exclude war chest information once a challenger entered since the incumbent can no longer be deterring that challenger and is instead reacting to the challenger.

Incorporation of time varying covariates is relatively straightforward in hazard based models (Kalbfleisch and Prentice 1980; Greene 1993). At each point in time, the hazard rate is determined by the values of the explanatory variables at that time. After a challenger enters, the observation "exits" from the data set and from the calculation of the hazard rate. The hazard is modeled as a step function, with different values of the covariates through intervals between $t = 0$ and $t = T$. T is the terminal value for the

[17]Based on the rationale that a challenger who raises or spends less than $5,000 is equivalent, in terms of the incumbent's reaction, to no challenger entering, the analysis was rerun censoring all the poorly funded challengers at the primary date, i.e., essentially treating these cases as no challenger entered. The results were very similar to those reported in Table 2.

observation; the point at which either a challenger enters or censoring occurs, i.e., the primary occurs, which precludes entry.[18]

The model with time varying covariates, referred to as a Cox regression model, is an extension of the proportional hazards model developed by Cox (1972, 1975).[19] A simplified model with two explanatory variables, one constant and one varying over time, may be written:

$$h(t) = h_o(t)e^{\beta_1 x_1 + \beta_2 x_2(t)}$$

In this model, the hazard at time t, $h(t)$, depends on the value of x_2 at the same time t.[20] Signs of the coefficients from a hazard rate model indicate whether a particular variable increases or decreases the hazard rate. The standard errors can be used to determine statistical significance, i.e., the coefficient divided by the standard error, as in the more familiar ordinary least squares context. To understand the magnitude of the effect, the percentage change in the risk of experiencing the event is useful. See Appendix A for further discussion about calculating the percentage change in the hazard rate.

Table 2 shows the estimation results of a Cox's regression model with time varying covariates in which an event is defined as the entry of a high quality challenger. Modeling decisions are also discussed in Appendix A. The overall fit of the model is good; we may reject the null hypothesis that the coefficients are jointly zero at the 0.001 level. The signs of the coefficients tell us that incumbents from the South are more likely to enjoy a race without a high quality challenger. Republican incumbents are also more likely to not face a high quality challenger. Finally, having a large war chest and prior vote margin helps deter high quality challengers. Only the war chest and prior vote variables are statistically significant, however, thus the subsequent discussion focuses on these two variables.

The third column of Table 2 shows the percent change in the hazard rate. The results tell us that for a 1% increase in the prior vote, the hazard rate decreases by almost 7%. That is, the percentage change in the haz-

[18]This requires one or more lines of data per observation since the covariates must be provided for each interval observed. The number of lines varies by observation (congressional district) depending upon when the challenger entered or the primary occurred. See documentation included with the data file for details.

[19]Since the values of the variables, $x(t)$, vary over time t, so does the relative hazard, $h(t)/h_o(t)$. This means that the assumption of proportional hazards no longer holds (Collett 1994, 224).

[20]Cox regression models do not have constant terms. Instead the constant is absorbed into the baseline hazard.

Table 2. Factors Influencing the Timing of Entry by High Quality Challengers

Variable	Coefficient	*P*-value	Percent Change in the Hazard Rate
South	−0.44	0.30	−35.5
	(0.42)		
Party	0.23	0.47	26.4
	(0.32)		
Prior Vote	−6.97	0.00	−6.7
	(1.66)		
War Chest	−3.01	0.03	−26.0
	(1.39)		

Note: Units for the war chest variable in the third column is $100,000 and for prior vote, 1%.
Log-likelihood = −197.39
Chi-Square (4) = 34.11
($p < 0.001$)
$N = 397$

ard of challenger entry at any time t for two incumbents who differ by 1% in prior vote and who have the same values for the other independent variables is approximately 7%. A one standard deviation increase in the prior vote, which is 14.2%, decreases the hazard rate by 62.9%. A 5 and 10% increase results in a 29.4 and 50.2% decrease, respectively.

Each $100,000 increase in an incumbent's war chest decreases the hazard of a high quality challenger entering by 16%. That is, the percentage change in the hazard of challenger entry at any time t for two incumbents whose war chests differ by $100,000 and who have the same values for the other independent variables is 16%.[21] A one standard deviation increase in an incumbent's war chest, which is $239,000, results in a 51.3% decrease in the hazard rate. The effect of the increase in the war chest is nonlinear. For example, if the increase is $100,000, the hazard rate decreases 26%; if the increase is $200,000, the hazard rate decreases by 45%. So this $100,000 differential increase ($200,000–$100,000) results in a decrease of 19% (−45.0%–(−26.0%)). In contrast, a $100,000 differential increase

[21]The effect of a time varying covariate, $x_k(t)$, on the overall *survival function,* in contrast to the hazard rate, depends on when the change with respect to the status of x_k occurs. The intuition is straightforward; the earlier the increase in the incumbent's war chest occurs, the larger the effect is on the overall probability of not having a high quality challenger enter.

between $900,000 and $1,000,000 results in a decrease of only 1.8% (−95.1%–(−93.3%)). Thus, there are diminishing returns.

Teachman and Hayward (1993) point out that the perspective gained from looking at time varying covariates is likely to be particularly important when the timing of change on the time varying covariates can be manipulated or when change corresponds to important junctures for the cases under study, which is true in the war chest context. Taking into account the dynamics of war chests allowed us to empirically measure a previously elusive effect. It is important to look at the effect of incumbents' war chests on the entry of high quality challengers because the size of an incumbent's war chest is controllable to the extent that additional effort results in a larger war chest and because this variable is controllable to a much greater degree than the other covariates in the model.

Discussion and Conclusions

The primary contribution of this paper is the empirical evidence that war chests, which are candidate-controllable, affect challenger entry. Specifically, large incumbent war chests deter high quality challengers from entering. The simple proposition that incumbents' war chests deter challengers was supported by not so simple duration analysis methods. Findings that war chests affect challenger entry supports Blumenthal's (1982) understanding of the "permanent campaign era," which is candidate centered, by providing evidence of how incumbents can attempt to insulate themselves from competitive races.

Accurate assessment of the monetary effect on challenger entry also has important policy implications. For example, if war chests have an effect on challenger entry, then campaign finance reform that limits not just the amount, but the *timing* of money, would enhance competition. The suspected importance of early money has been previously pointed out in discussions of campaign finance reform (Magleby and Nelson 1990).

Revision of past research conclusions about the effect of war chests also demonstrates the potential of duration analysis methods. Duration analysis is relatively new in the social sciences and is a rapidly growing area in econometrics. The potential applications in political science are extensive and exciting because duration analysis methods allow new questions to be asked and reveal new answers to old questions, as in this paper.

Manuscript submitted 6 March 1995.
Final manuscript received 19 June 1995.

APPENDIX

The Percentage Change in the Hazard Rate

A useful way to interpret the coefficients in a duration model is to calculate the percentage change in the hazard rate. For a dichotomous independent variable, the percentage change in the risk of experiencing the event is:

$$100[e^{(\beta_k * 1)} - e^{(\beta_k * 0)}]/e^{(\beta_k * 0)}$$

Negative coefficients produce values of $e^{(\beta_k * 1)}$ that are less than one, and therefore produce negative percentage changes. The interpretation for a continuous independent variable is similar:

$$100[e^{(\beta_k * (x+\delta))} - e^{(\beta_k * x)}]/e^{(\beta_k * x)}$$

This gives the percentage change in the hazard rate for a δ unit change in the independent variable, x. See Namboodiri and Suchindran (1987) and Teachman and Hayward (1993) for further elaboration.

Modeling Decisions

There are two modeling issues that need to be discussed: 1) the model choice, i.e., Cox regression, Weibull, logistic, or exponential,[22] and 2) the definition of an event, i.e., the entry of a challenger or the entry of a high quality challenger only.

The advantages of parametric models include predicting what will happen beyond the "follow-up" period of the data. For example, in studies of criminal recidivism, it is useful to be able to predict who will return to prison beyond the time frame of the observation (parole) period. In the context of challenger entry, this advantage of parametric models is not as useful because we observe the entire duration of the event due to the imposition of mandatory primary and general election dates. Another advantage of the parametric models is that it smooths the data; the disadvantage is that it can be the wrong model. The best parametric model was fit and then compared to the nonparametric model.

To help choose among the parametric models, it is useful to fit the Cox model and examine the shape of the baseline hazard function. If a specific shape is suggested, a parametric model may be suitable because the estimated parameters would be more precisely estimated (Collett 1994). The exponential model is simply a special case of the Weibull with the parameter sigma, which indicates the shape of the failure time distribution, set to one. Therefore, a test of the exponential model versus the Weibull model is to fit a Weibull model and see if the value of the parameter is statistically distinguishable from one. In the examination of war chests, sigma is distinguishable from one with great confidence. Choosing between the Weibull and logistic models is not as simple. Fit for each of these models is comparable, and the coefficients are largely similar. While this makes selection difficult, it also minimizes the errors made when choosing one model or the other. They

[22] See Goodliffe (1995) for further modelling elaborations, including a discussion of the competing risks model in the challenger entry context.

are distinguishable, however, because the Weibull model allows for modeling unobserved heterogeneity in the sample. Since the vulnerability of incumbents could differ due to variables not included in the model, such as scandals or the incumbent's position on his or her career path (see Jones 1994), accounting for unobserved heterogeneity may be important and therefore the Weibull model is chosen for comparison with the Cox regression model. Subsequent estimation revealed that heterogeneity was not a concern.

Among the models that use time varying covariates, the Cox regression is usually the preferred model. Collett (1994) points out that discrimination between a Cox and Weibull model is difficult. If the standard errors for the Weibull are substantially smaller than those for the Cox model, the Weibull model would be preferred because of efficiency. If the standard errors are similar, the Cox model is preferred because of its less restrictive assumptions. We chose the Cox model.

While a split population model is appealing because it allows one to *separate* the effect of the variable on whether a challenger enters and when the challenger enters, such models are currently not estimable with time varying covariates. Time varying covariates are critical based on the evidence from the repeated measures ANOVA and the variations of the static model explored in the previous section.

The second modeling choice is the definition of the event. Squire's (1989) work suggests that any challenger entering should be considered an event. In contrast, Mann and Wolfinger (1980), Krasno and Green (1988), Krasno (1994), Herrnson (1992, 1995), and Epstein and Zemsky (1995) all suggest that an event occurs only when a high quality challenger enters. Both definitions were tested.

When a Weibull or Cox regression model is estimated for all challengers, the conclusions are the same, war chests just fail to reach conventional levels of significance. When defining entry according to when a *high quality* challenger enters, however, the war chest deterrence results are very strong for both the Weibull and Cox models. Only results for the Cox model with high quality challenger entry results are presented based on the previous discussion and since the conclusions are the same. The Cox regression results are slightly stronger in terms of significance and more straightforward to interpret than the Weibull model results.

REFERENCES

Allison, Paul D. 1984. *Event History Analysis: Regression for Longitudinal Event Data.* Newbury Park, CA: Sage Publications, Inc.

Bartels, Larry M., and Henry E. Brady. 1993. "The State of Quantitative Political Methodology." In *Political Science: The State of the Discipline II,* ed. Ada W. Finifter. Washington: The American Political Science Association.

Bauer, Monica, and John R. Hibbing. 1989. "Which Incumbents Lose in House Elections: A Response to Jacobson's 'The Marginals Never Vanished.'" *American Journal of Political Science* 33:262–71.

Beaudry, Ann, and Bob Schaeffer. 1986. *Wrong Local and State Elections: The Guide to Organizing Your Campaign.* New York: The Free Press.

Berry, Francis S., and William D. Berry. 1990. "State Lottery Adoptions as Policy Innovations: An Event History Analysis." *American Political Science Review* 84:395–415.

Bianco, William T. 1984. "Strategic Decisions on Candidacy in U.S. Congressional Districts." *Legislative Studies Quarterly* 2:351–64.

Bienen, H., and N. van de Walle. 1989. "Time and Power in Africa." *American Political Science Review* 83:20–34.

Bienen, H., and N. van de Walle. 1992. "A Proportionate Hazard Model of Leadership Duration." *Journal of Politics* 54(3):685–98.

Biersack, Robert, Paul S. Herrnson, and Clyde Wilcox. 1993. "Seeds for Success: Early Money in Congressional Elections." *Legislative Studies Quarterly* 18:535–52.

Biersack, Robert, and Clyde Wilcox. 1990. "Financing National Campaigns: A Research Agenda." *American Politics Quarterly* 18:215–41.

Blumenthal, Sidney. 1982. *The Permanent Campaign.* New York: Simon and Schuster.

Bond, Jon, Cary Covington, and Richard Fleisher. 1985. "Explaining Challenger Quality in Congressional Elections." *Journal of Politics* 47:510–29.

Bond, Jon, and Richard Fleisher. 1992. "Explaining Candidate Quality in Open Seat House Races, 1976–1988." Presented at the annual meeting of the Southern Political Science Association, Tampa, Florida.

Box-Steffensmeier, Janet M., Laura Arnold, and Christopher Zorn. 1995. "Strategic Position Taking and the Timing of Voting Decisions in Congress: A Study of the North American Free Trade Agreement." Presented at the annual meeting of the Midwest Political Science Association, Chicago.

Box-Steffensmeier, Janet M., and Charles Franklin. 1995. "The Long Campaign: Senate Elections in 1992." In *Democracy's Feast: Elections in America,* ed. Herbert Weisberg. Chatham, NJ: Chatham House Press.

Box-Steffensmeier, Janet M., and Bradford Jones. 1995. "Duration Models and Their Applications in Political Science." University of Arizona Typescript.

Box-Steffensmeier, Janet M., and Tse-Min Lin. 1995. "A Dynamic Model of Campaign Spending in Congressional Elections." *Political Analysis* 6.

Browne, Eric C., John P. Frendreis, and Dennis W. Gleiber. 1984. "An Events' Approach to the Problem of Cabinet Stability." *Comparative Political Studies* 17:167–97.

Browne, Eric C., John P. Frendreis, and Dennis W. Gleiber. 1986. "The Process of Cabinet Dissolution: An Exponential Model of Duration and Stability in Western Democracies." *American Journal of Political Science* 30:628–50.

Cioffi-Revilla, Claudio. 1984. "The Political Reliability of Italian Governments: An Exponential Survival Model." *American Political Science Review* 78:318–37.

Collett, D. 1994. *Modelling Survival Data in Medical Research.* New York: Chapman and Hall.

Cox, D. 1972. "Regression Models and Life Tables." *Journal of Royal Statistical Society, Serial B* 34:187–220.

Cox, D. 1975. "Partial Likelihood." *Biometrika* 62:269–76.

Diermeier, Daniel, and Randall Stevenson. 1994. "A Competing Risk Analysis of Cabinet Duration." Presented at the annual meeting of the Midwest Political Science Association, Chicago.

Elazar, Daniel J. 1984. *American Federalism: A View from the States.* New York: Harper & Row.

Epstein, David, and Peter Zemsky. 1995. "Money Talks: A Signaling Approach to Campaign Finance." *American Political Science Review* 89:295–308.

Erikson, Robert S., and Thomas R. Palfrey. 1994. "Strategic Issues in Campaign Spending: Theory and Evidence." Paper presented at the 1994 Annual Meeting of the Midwest Political Science Association, Chicago.

FaithAmerica Foundation. 1982. *The Citizens Guide to Winning Elections.* Scottsdale, AZ: FaithAmerica Press, Inc.

Federal Election Commission. 1988. *Campaign Guide for Congressional Candidates and Committees.* Washington: Federal Election Commission.

Federal Election Commission. 1990. *Campaign Expenditures in the United States, 1989–1990: Freedom of Information Act (FOIA) Data* [Computer file]. 2d release. Washington, D.C.: Federal Election Commission [producer], 1986. Ann Arbor, MI: Inter-university Consortium for Political and Social Research [distributor].

Fenno, Richard. 1982. *The United States Senate: A Bicameral Perspective.* Washington, D.C.: American Enterprise Institute.

Fritz, Sara, and Dwight Morris. 1992. *Handbook of Campaign Spending.* Washington: Congressional Quarterly Press.

Girden, Ellen R. 1992. *ANOVA Repeated Measures.* Newbury Park, CA: Sage Publications.

Goertz, Gary, and Paul F. Diehl. 1995. "The Invitation and Termination of Enduring Rivalries: The Impact of Political Shocks." *American Journal of Political Science* 39:30–52.

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

Goldstein, Joshua. 1991. *The $43 Million Loophole.* Washington, D.C.: The Center for Responsive Politics.

Goodliffe, Jay. 1995. "War Chests and Challenger Quality." Presented at the annual meeting of the Midwest Political Science Association, Chicago.

Green, Donald P., and Jonathan S. Krasno. 1988. "Salvation for the Spendthrift Incumbent: Reestimating the Effects of Campaign Spending in House Elections." *American Journal of Political Science* 32:884–907.

Greene, William. 1993. *Econometric Analysis.* New York: Macmillan.

Guzzetta, S. J. 1981. *The Campaign Manual: A Definitive Study of the Modern Political Campaign Process.* Alexandria, VA: Campaign Publishing Co.

Herrnson, Paul S. 1992. "Campaign Professionalism and Fundraising in Congressional Elections." *Journal of Politics* 54:859–70.

Herrnson, Paul S. 1995. *Congressional Elections: Campaigning at Home and in Washington.* Washington, D.C.: Congressional Quarterly Press.

Hinckley, Barbara. 1980a. "The American Voter in Congressional Elections." *American Political Science Review* 74:641–50.

Hinckley, Barbara. 1980b. "House Reelections and Senate Defeats: The Role of the Challenger." *British Journal of Political Science* 10:441–60.

Jacobson, Gary C. 1987. "The Marginals Never Vanished: Incumbency and Competition in Elections to the U.S. House of Representatives, 1952–82." *American Journal of Political Science* 31:126–41.

Jacobson, Gary C. 1989. "Strategic Politicians and the Dynamics of U.S. House Elections, 1946–86." *American Political Science Review* 83:733–93.

Jacobson, Gary C. 1990. "The Effects of Campaign Spending in House Elections: New Evidence for Old Arguments." *American Journal of Political Science* 34:334–62.

Jacobson, Gary C., and Samuel Kernell. 1983. *Strategy and Choice in Congressional Elections.* 2nd. ed. New Haven: Yale University Press.

Jones, Bradford S. 1994. "The Incumbent's Niche: A Longitudinal Perspective on Congressional Careers." Ph.D. diss. State University of New York at Stony Brook.

Jones, Bradford S. 1995. "Strategy & Choice Across Congressional Careers." University of Arizona Typescript.

Kalbfleisch, John D., and Ross L. Prentice. 1980. *The Statistical Analysis of Failure Time Data.* New York: John Wiley & Sons, Inc.

Katz, Jonathan, and Brian Sala. 1996. "Careerism, Committee Assignments & the Electoral Connection." *American Political Science Review* forthcoming.

Keefe, William J., and Morris S. Ogul. 1985. *The American Legislative Process.* 6th ed. Englewood Cliffs, NJ: Prentice-Hall.

King, Gary, James E. Alt, Nancy E. Burns, and Michael Laver. 1990. "A Unified Model of Cabinet Dissolution in Parliamentary Democracies." *American Journal of Political Science* 34:846–71.

Krasno, Jonathan K. 1994. *Challengers, Competition, and Reelection.* New Haven: Yale University Press.

Krasno, Jonathan S., and Donald P. Green. 1988. "Preempting Quality Challengers in House Elections." *Journal of Politics* 50:920–36.

Legislative Studies, Section Newsletter. 1993. "Legislator Indicted for Overreporting Contributions," 16(2):26.

Magleby, David B., and Candice J. Nelson. 1990. *The Money Chase: Congressional Campaign Finance Reform.* Washington: The Brookings Institution.

Makinson, Larry. 1992. *Open Secrets: The Cash Constituents of Congress.* Washington: Congressional Quarterly Press.

Maisel, Louis S. 1986. *From Obscurity to Oblivion: Running in the Congressional Primary.* 2nd ed. Knoxville: University of Tennessee Press.

Mann, Thomas E., and Raymond E. Wolfinger. 1980. "Candidates and Parties in Congressional Elections." *American Political Science Review* 74:617–32.

McKitrick, Eric. 1975. "Party Politics and the Union and Confederate War Efforts." In *American Party Systems,* ed. William N. Chambers and Walter Dean Burnham. New York: Oxford University Press.

Namboodiri, Krishnan, and C. M. Suchindran. 1987. *Life Table Techniques and Their Applications.* New York: Academic Press.

Ragsdale, Lyn, and T. E. Cook. 1987. "Representatives' Actions and Challengers' Reactions: Limits to Candidate Connections in the House." *American Journal of Political Science* 31:45–81.

Squire, Peverill. 1989. "Competition and Uncontested Seats in U.S. House Elections." *Legislative Studies Quarterly* 14:281–95.

Stevens, J. 1986. *Applied Multivariate Statistics for the Social Sciences.* Hillsdale, NJ: Lawrence Erlbaum.

Strang, David. 1991. "Global Patterns of Decolonization, 1500–1987." *International Studies Quarterly* 35:429–54.

Strom, Kaare, Eric C. Browne, John P. Frendreis, and Dennis W. Gleiber. 1988. "Contending Models of Cabinet Stability." *American Political Science Review* 82:923–41.

Teachman, Jay D., and Mark D. Hayward. 1993. "Interpreting Hazard Rate Models." *Sociological Methods and Research* 21:340–71.

Wilcox, Clyde. 1987. "The Timing of Strategic Decisions: Candidacy Decisions in 1982 and 1984." *Legislative Studies Quarterly* 12:565–72.

Winer, B. J. 1971. *Statistical Principles in Experimental Design,* 2d ed. New York: McGraw-Hill Book Co.

Yamaguchi, Kazuo. 1991. *Event History Analysis.* Newbury Park, CA: Sage Publications, Inc.