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A MODEL OF THE POLITICAL ECONOMY OF THE UNITED STATES

Alberto Alesina

John Londregan

Howard Rosenthal

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ABSTRACT

We develop and test a model of joint determination of the rate of economic growth and the results of presidential and Congressional elections in the United States. In our model, economic agents and voters have rational expectations. Economic policy varies as a function of control of the White House and the two-party shares in Congress. Politics affects growth through unanticipated policy shifts following the outcome of presidential elections. The economy influences elections as voters use past realizations of growth to make rational inferences about the "competency" level of the incumbent administration. Elections are also influenced by voters using their midterm Congressional votes to moderate the policies of the incumbent administration. The theoretical model is used to generate a recursive system of equations in which the dependent variables are the growth rate and the vote shares in presidential and Congressional elections. The theory implies several restrictions on the equations. Tests of the restrictions generally support the model; however, the results support the traditional view of naive retrospective voting as well as the "rational" retrospective voting posited in the model.

Alberto Alesina
Harvard University,
and NBER

John Londregan
Carnegie Mellon
University

Howard Rosenthal
Carnegie Mellon
University

1. Introduction

The literature on macroeconomic fluctuations and elections is divided in three branches. The first one studies the effects of economic conditions on voting behavior: economic fluctuations are viewed as exogenous or predetermined, while electoral results are the endogenous variables.[1] A second strand emphasizes the "partisan effects" on the economy of differences in the policies followed by different parties.[2] A third line of research emphasizes the "opportunistic" behavior of politicians who try to manipulate the economy in order to increase their chances of remaining in office.[3]

For the United States in the twentieth century, this literature discloses several regularities:

(i) The president's performance at the polls rises and falls with the economic tides. The share of the two party vote cast for the incumbent president's party's presidential candidate increases with the rate of growth of output in the election year; other economic variables such as unemployment or inflation are much less significant in explaining presidential results.

(ii) Congressional vote shares are less sensitive to the ebb and flow of economic conditions.[4]

(iii) The party holding the White House always loses plurality in mid-term Congressional elections, relative to its vote share in the preceding election; this is the well known "mid-term electoral cycle.[5]

(iv) Since World War II, in the first half of Republican administrations, economic growth decelerates, reaching its nadir during the second year of each four year term, when the rate of growth of GNP is significantly below average, while the economy grows more rapidly during the first half of Democratic administrations. In the last two years of each four year term, there are no significant differences between the growth rates of GNP for Democratic and Republican administrations.[6]

To account for these regularities, this paper constructs and empirically tests a model with jointly endogenous economic and electoral outcomes. This requires rational economic agents who are nonetheless "surprised" by the outcomes of uncertain elections (Alesina 1987), rational voters who use the institutional structure of the political system to moderate polarized parties (Fiorina, 1988, Alesina and Rosenthal 1989a,b), and rationally retrospective voters (Cuikerman and Meltzer, 1986, Rogoff and Sibert, 1988) who use past economic performance to update their assessment of the incumbent administration's economic policy competence.

In Section 2, we develop a model which integrates the theoretical literature just cited. The model gives rise to a set of simultaneous equations in which the endogenous variables are GNP growth and the vote shares in presidential and House elections. An econometric specification and estimation results are presented in Section 3. This empirical framework permits us to test several implications of our model. The evidence supports the basic theory with respect to (a) the midterm electoral cycle, (b) the economy having greater impact on presidential elections than on Congressional elections (in fact, we find the economy has little effect on midterm elections and influences on year House elections mainly through presidential coattails), and (c) a shift in the behavior of the growth rate in the wake of presidential elections. On the other hand, our results cannot reject the presence of "naive" retrospective voting rather than "rational" retrospective voting. A reconciliation of these results is the focus of the conclusion.

2. The Model

The Basic Economy

Consider a model (Fischer, 1977) in which noncontingent nominal wage contracts are signed at the end of period t and cannot be revised until the end of period t+1. In such a model the rate of nominal wage growth is equal to ex ante expected inflation plus the ex ante expected rate of productivity growth. In what follows we assume that expected productivity growth is constant. Disregarding capital, a supply function for this economy can be written as follows:

$$g_t = \bar{g} + \alpha g_{t-1} + \gamma(\pi_t - \pi_t^e) + \varepsilon_t \tag{1}$$

where g_t is the output growth rate, $\bar{g}$ is the "natural" rate of growth; π_t is the inflation rate, $\pi_t^e = E(\pi_t | I_{t-1})$ is the rational expectation of inflation based upon the information available in period t-1, and $\alpha \in [0,1)$ allows for persistence in the growth rate.

Allowing for persistence in output growth ($\alpha>0$) does not change our qualitative conclusions, at least for the functional forms used in our model. Therefore, to facilitate presentation we work with:

$$g_t = \bar{g} + \gamma(\pi_t - \pi_t^e) + \varepsilon_t \tag{2}$$

The error ε_t consists of two components, which cannot be separately observed by the voters (nor by econometricians):

$$\varepsilon_t = \zeta_t + \eta_t \tag{3}$$

The transitory shock ζ_t represents unanticipated economic events beyond the scope of government control (e.g. oil price shocks, technological innovation). The η_t term corresponds to the "competence" of the government. Within administrations, the competency level exhibits some inertia, evolving over time according to an MA(1) process. However, in the aftermath of an electoral defeat of the incumbent party, the slate is wiped clean[7]:

$$\eta_t = \mu_t + \rho i_t \mu_{t-1} \quad (4)$$

$0 < \rho \le 1$; μ_t is i.i.d.; $E(\mu_t) = 0$

$i_t = 1$ if the party of the president at t and t-1 is the same

$= 0$ otherwise (change of control of the presidency).

Thus, the government influences growth through two mechanisms. First, by creating unexpected inflation through the use of monetary policy or other instruments. Second, by being competent. The role of competency might be seen as arising in avoiding large scale inefficiencies, as in the savings and loan debacle or, allegedly, defense contracting or in successfully promoting the introduction of new technologies. The model does not require that the government "knows" its competency level.

The competency shock depends on the productivity of the administration's management team. In our model, when a president is replaced in office by a member of his own party, the successor's administration inherits the competency shock, μ_{t-1}.[8] Although there is considerable turnover among key policy makers (so that outcomes in the distant past are uninformative about the current level of competence) from one period to the next an administration retains many of its personnel. Accordingly, the current composite shock to the growth rate, ε_t, provides information about the following period's growth rate if the current administration remains in office.

We have modeled the competency shock as persisting for one period only. This is sufficient to induce "rational retrospective voting", but it may not be realistic. Higher-order MA processes could be introduced (see the Appendix) without changing our qualitative results as long as the shocks that precede a presidential election do not influence the competency level of the incumbent's party beyond a single presidential term. We must rule out shocks which persist for more than one term for reasons of tractability.[9] Similarly, we rule out any AR representation of competency shocks.

Finally, note that if we relaxed (4) to allow the challenger to inherit a non-zero competency shock (μ_{t-1}), our analysis carries through given that voters have risk neutral preferences over output, as in (8) below. In contrast, if voters were risk averse, a lagged but unknown competency shock for the challenger could create a bias in favor of the party holding the White House. Such a bias would have important effects on the dynamics of our model.

<u>The Two Political Parties</u>

In this economy parties D and R compete for office. Parties are internally undifferentiated; all presidential and legislative candidates of a party have identical preferences. As in Alesina (1987), these preferences are represented by utility functions which are, for tractability, quadratic in the inflation rate and linear in output growth:

$$W^D = \sum_{t=0}^{\infty} \beta^t \left[-\frac{1}{2} (\pi_t - \bar{\pi}^D)^2 + b^D g_t \right] \tag{5}$$

$$W^R = \sum_{t=0}^{\infty} \beta^t \left[-\frac{1}{2} (\pi_t - \bar{\pi}^R)^2 + b^R g_t \right] \tag{6}$$

$$\text{where } \bar{\pi}^D > \bar{\pi}^R \geq 0; \quad b^D > b^R > 0 \tag{7}$$

While the parties agree that output growth is desirable, they differ both in terms of their most preferred inflation rates, $\bar{\pi}^D > \bar{\pi}^R$, and in their marginal rates of substitution between output and deviations of inflation from its most preferred level, as implied by $b^D > b^R$. The parties have a common discount factor $\beta \in (0,1)$. Inflation is directly controlled by the policy makers.

Each party's objective function gives rise to a time consistency problem (Kydland and Prescott, 1977; Barro and Gordon, 1983). Each party would prefer to commit to a lower rate of inflation than it actually implements. That is, each party would be better off if whenever it had control over policy, it implemented its inflation bliss point ($\bar{\pi}^D$ or $\bar{\pi}^R$) and if the agents in the economy believed that these policies would be carried out. But once in office, a party is unable to resist the temptation to stimulate shortrun growth through an inflation surprise. If $b > 0$, a party will inflate to the point at which the disutility of a surprise increment of inflation just offsets the perceived benefits of the resulting output stimulation. In equilibrium, agents in the economy anticipate the inflation rates at which this indifference occurs.

This specification of parties' preferences is consistent with the literature on "partisan" effects. The basic motivation of this approach is that for distributional reasons the "left" cares more about unemployment and growth, while the "right" is more concerned with controlling inflation. We assume no entry of third parties.

<u>The Timing of the Model</u>

Schematically, the timing of events in our model is:

Periods t = 0, 2, 4, . . .

- Inflation (π_t) determined by government; shocks ζ_t, η_t assigned by "nature".
- Output growth (g_t) realized.
- Binding economic plans (wage contracts) for period t+1 made by uncoordinated private agents.
- The president (who serves in t+1 and t+2) and Congress (serves in t+1) elected ("on year" election).

Periods t = 1, 3, 5 . . .

o Identical to above except president remains in office and only Congress (serves in t+1) elected ("off year" or "midterm" elections).

Obviously, the scenario above indicates that a period in our model may be thought of as representing two calendar years.

The Institutional Structure of Elections

As in the timing schematic, every two periods a president is elected by majority rule. One Congressional election is contemporaneous with the presidential election while another takes place in the middle of the presidential term of office. Congress is elected by strict proportionality.[10]

Voting as a Two Move Game

Election of the entire legislature every period is a critical feature of the model. Also critical is the assumption that competency shocks vanish within a single presidential term. A possible extension of this model would allow for competency shocks originating in the legislature. However, as the legislative process involves a large number of decision makers, individual variations in competence are likely to cancel out, leaving the overall competence of Congress nearly constant over time. Thus, it is reasonable to assume that variations of competence affect the president but not Congress.

These assumptions imply that the electoral outcomes of the presidential election and the following midterm election have no implications for the ensuing presidential elections and later elections. On the other hand, expectations about the results of midterm elections are relevant to decisions in the on year, since presidents are elected for two periods. Thus, the voting equilibrium can be characterized in terms of a game with two moves, the simultaneous election of a president and Congress in on years and the election of Congress at midterm.

At each move, all voters must vote. Split tickets are permitted on the first move. In equilibrium, no measurable set of voters uses randomized strategies (Alesina and Rosenthal, 1989b).

While actual realizations of the economy and elections will vary as a consequence of the random variables in the model, the equilibrium voting strategies used in each two move game will be repeated indefinitely. Consequently, where the meaning is clear, we use the subscripts "0", "1", and "2" to refer to the model with elections occurring in periods 0 and 1 and economic outcomes occurring in periods 1 and 2.

Voter Preferences

The voters in our model also all maximize discounted quadratic preferences of the same form as (5) and (6). However, voters differ in their preferred inflation rates, and in their willingness to sacrifice growth to reduce inflation. The preferred inflation rate for voter i is, $\bar{\pi}^i$ and her marginal rate of substitution between output and inflation by b^i. The discounted utility for voter i is:

$$W^i = \sum_{t=0}^{\infty} \beta^t \left[-\frac{1}{2} (\pi_t - \bar{\pi}^i)^2 + b^i g_t \right] \tag{8}$$

There is a continuum of voters whose preferences are parameterized by $(\bar{\pi}^i, b^i)$.[11] The inflation ideal points $\bar{\pi}^i$ are uniformly distributed on, without loss of generality, an interval of length one.

$$\bar{\pi}^i \sim U[\mathbf{a}, 1+\mathbf{a}] \tag{9}$$

where **a** is a random variable. In every period an independent realization[12] of the random variable **a** is drawn from a uniform distribution on the interval [-w, w], where w is a constant:

$$a \sim U[-w, w] \qquad (10)$$

The distribution of the output weights b^i must be in a bounded interval $[b_L, b_U]$. In the Appendix, we show that there are two special cases where our results are unaffected by replacing this distribution with the assumption that every voter has an identical preference b. One case includes b^i being a strictly monotonically increasing function of $\bar{\pi}^i$. The other includes statistical independence of the π's and b's. Given that our results hold for these two extreme opposite cases, we conjecture that our qualitative results are relatively robust to the form of the joint distribution of $(\bar{\pi}^i, b^i)$. In the remainder of the main text, we assume (8) with $b^i = b \ \forall \ i$.

The Role of Uncertainty

The objective functions of parties and voters and the distributions of $\bar{\pi}^i$ and of the random variable a are "common knowledge." Uncertainty about the realization of a implies that the electoral results are uncertain, even with certainty about the policies which are followed by the two parties, if elected. This uncertainty about voter preferences is critical if the model is to explain the presence of mid-term electoral cycles (Alesina and Rosenthal, 1989a, b).

Before the elections held at the end of time t, voters observe g_t and π_t and know π_t^e, but cannot directly observe the current innovation to the incumbent administration's competence, μ_t. However, they can use the past history and knowledge of the parameters of the model to infer the exact value of $\mu_t^* \equiv \mu_t + \zeta_t$. Before a presidential election is held, this inference is useful only in forecasting growth in the next period since the competency shocks are MA(1).

In the next period, conditional on the incumbent being reelected, standard results from signal extraction theory show that the optimal forecast of ε is $\rho^* \mu^*$, where

$$\rho^{*} \equiv \rho \frac{\sigma_{\mu}^{2}}{\sigma_{\zeta}^{2} + \sigma_{\mu}^{2}}$$

In contrast, conditional on the incumbent losing, the optimal forecast is 0, since voters have no information about the competence of the opposition by (4).

The growth wedge of $\rho^{*}\mu_t^{*}$ between reelection and defeat of the current administration is what generates rational retrospective voting. Positive innovations to growth, regardless of whether they arise serendipitously via ζ_t, or from adroit policy implementation via μ_t, lead rational voters to expect higher growth if the incumbent administration is reelected. Notice that this framework precludes signaling by the administration: voters' forecasts of post reelection growth depend on ε_t. In turn, rational voters know that ε_t does not depend on the government's inflation policy.[13]

The Time Consistent Inflation Policies of the Two Parties

Suppose now that party J (J = D,R) holds the presidency in period t and has full control over policy. Party J's time consistent policy is:

$$\pi_t^{J*} = \bar{\pi}^{J} + \gamma b^{J} \qquad J = D,R \quad \forall t \tag{11}$$

Similarly, if voter i were dictator, the voter's time consistent policy would be the indirect bliss point:

$$\pi_t^{i*} = \bar{\pi}^{i} + \gamma b \qquad \forall t \tag{12}$$

Equations (11) and (12) are obtained by substituting (2) into (5), (6), and (8) and taking first order conditions. Note that $\pi^{D*} > \pi^{R*}$.

It is also direct to demonstrate that "extreme" voter types with indirect bliss points less than π^{R*} (greater than π^{D*}) have a weakly dominant strategy of always voting for party R (D). To guarantee that the pivotal voter's own ideal point is uninformative about the realization of the random variable a, we further assume that[14]:

$$0 < w < \min\{\bar{\pi}^{R*} - \gamma b,\ 1 - \bar{\pi}^{D*} + \gamma b\} \tag{13}$$

The Executive-Legislative Policy Interaction

Post-electoral inflation is a function of which party holds the presidency and of the composition of Congress. The nature of the policy interaction between the legislature and the executive in practice is, of course, a complex question. We capture this interaction by the following expression for the actual inflation rate when party R and D hold the presidency respectively:

$$\pi_t^R = \pi^{R*} + \frac{K}{1+K}\left(\pi^{D*} - \pi^{R*}\right) V_{t-1}^D \tag{14}$$

$$\pi_t^D = \pi^{D*} - \frac{K}{1+K}\left(\pi^{D*} - \pi^{R*}\right) V_{t-1}^R \tag{15}$$

where $K > 0$ and V_{t-1}^J is the vote share of party J in the Congressional election at the end of period t-1. Equations (14) and (15) imply that regardless of which party controls the presidency, if the opposition party receives a positive share of the Congressional vote, the realized rate of inflation will exceed the time consistent policy of party R, π^{R*}, and fall short of that of party D, π^{D*}. However, in sharing control over inflation with Congress, the president always retains some influence: for any given share of the Congressional vote for party R, inflation is higher with a party D president than with a R president[15]:

$$\pi_t^D > \pi_t^R \tag{16}$$

Notice that Congressional influence on policy increases with K.

Analysis of the Electoral Model

In standard two candidate voting models, characterizing voter equilibrium is trivial. Since voters have only a binary choice, there is a unique equilibrium once weakly dominated strategies have been cast aside. In our model, except for "extremists", voters do not have weakly dominant strategies. How one would vote in either presidential or Congressional elections will depend upon one's conjectures about the behavior of other voters. Thus, there is a fundamental problem of coordination of voter strategies. In addition, the standard notion of Nash equilibrium is inappropriate in that we have a continuum of voters, each with no individual influence on the outcome.

Alesina and Rosenthal (1989b) show that plausible equilibria can be characterized, however, by appealing to Greenberg's (1989) recent development of abstract stable sets. [Termed "consistent partitions" by Kahn and Mookherjee (1990), stable sets generalize the concept of Coalition Proof Nash Equilibria (Bernheim, Peleg, and Whinston, 1987).] The basic idea is that equilibrium strategies should be robust to "credible" defections of coalitions as well as individuals. That is, no "credible" coalition of voters would want to modify the electoral outcome by changing their votes.

<u>Midterm Elections</u>

The equilibrium strategies that apply to the midterm elections can readily be characterized intuitively. Without loss of generality, we assume party R is in office, the case of party D in office being symmetric.

With party R in office, there is a unique pivotal voter ideal point, $\bar{\pi}^{CR}$, such that all voters with lower inflation ideal points vote R and all those with higher ideal points vote D. The expected Congressional vote for D is:

$$E(V_1^D) = 1-\bar{\pi}^{CR} \tag{17}$$

Moreover, the pivotal voter must, from the Pivotal Voter Theorem (Alesina and Rosenthal, 1989b), obtain, in expectation, her indirect bliss point:

$$E(\pi_2^R) = \bar{\pi}^{CR} + \gamma b \tag{18}$$

The intuition is straightforward. Suppose that expected inflation did not match the ideal point of the pivotal voter but, say, was lower. By continuity, voters with ideal points slightly less than $\bar{\pi}^{CR}$ would also find that inflation was too low. So this group of voters would all want to switch their votes to party D in order to increase inflation, implying that $\bar{\pi}^{CR}$ did not define equilibrium strategies. (See the Appendix for more details.)

Using (17), (18), and (14), we find:

$$\bar{\pi}^{CR} = \frac{\left(\pi^{R*} - b\gamma\right)(1+K) + K\left(\pi^{D*} - \pi^{R*}\right)}{1 + K + K\left(\pi^{D*} - \pi^{R*}\right)} \tag{19}$$

Analogous arguments show that when there is a D president at t+1, there exists another cutpoint, $\bar{\pi}^{CD}$ such that all voters with $\bar{\pi}^{i} > \bar{\pi}^{CD}$ prefer to vote for party D, while those with $\bar{\pi}^{i} < \bar{\pi}^{CD}$ vote for the R party Congressional delegation:

$$\bar{\pi}^{CD} = \frac{\left(\pi^{D*} - b\gamma\right)(1 + K)}{1 + K + K\left(\pi^{D*} - \pi^{R*}\right)} \tag{20}$$

From (19) and (20), it follows that, regardless of which party occupies the White House, an increase in b, the weight placed on growth, favors party D in the midterm election. Economic agents rationally anticipate the increased vote for D's Congressional delegation and the correspondingly accelerated inflation. The net effect is that both the vote for party D and the rate of inflation are higher, while the expected rate of growth is unaffected.

Also, note that

$$\frac{d\bar{\pi}^{CD}}{dK} < 0 \text{ [16]}, \qquad \frac{d\bar{\pi}^{CR}}{dK} > 0 \tag{21}$$

An increase in K implies that Congress is more powerful in influencing policy. Thus, to achieve a given level of "moderation", the vote for the party not holding the presidency can be decreased as K is increased.

The Two Period Model: President Unconstrained in Period 1

In treating the full two period model, we must recognize that each voter simultaneously make two choices in the on year election. Insight into the analysis is provided by decoupling these two choices and assuming that a president unconstrained by Congress is elected in the first period. This immediately tells us:

$$\text{Unconstrained D elected} \Rightarrow \pi_1 = \pi_1^D = \pi^{D*} \tag{22}$$

$$\text{Unconstrained R elected} \Rightarrow \pi_1 = \pi_1^R = \pi^{R*} \tag{23}$$

We have already shown that in period 2 the equilibrium strategies imply:

$$\text{D president} \Rightarrow E(\pi_2) = E(\pi_2^D) = \bar{\pi}^{CD} + \gamma b \tag{24}$$

$$\text{R president} \Rightarrow E(\pi_2) = E(\pi_2^R) = \bar{\pi}^{CR} + \gamma b \tag{25}$$

Again, intuitively, the equilibrium will be described by a set of cutpoints $\bar{\pi}^{CD}$, $\bar{\pi}^{CR}$, and $\bar{\pi}^{P}$, where the last one is for the presidential election. Individuals with indirect bliss points lower than $\bar{\pi}^{P}$ will vote R for president, while those with higher bliss points vote D. Thus, the expected vote for the Democratic presidential candidate will be:

$$E(V_0^{DP}) = 1 - \bar{\pi}^{P} \tag{26}$$

For an equilibrium to hold, a voter with ideal point $\bar{\pi}^{P}$ type must obtain the same expected utility from a R victory as from a D victory. This condition is given by:

$$E\left\{ \sum_{t=1}^{2} \beta^t \left[-\frac{1}{2} (\pi_t - \bar{\pi}^P)^2 + bg_t \right] \middle| \text{Party D wins} \right\} =$$

$$E\left\{ \sum_{t=1}^{2} \beta^t \left[-\frac{1}{2} (\pi_t - \bar{\pi}^P)^2 + bg_t \right] \middle| \text{Party R wins} \right\} \tag{27}$$

After substitution of (22) - (25), we obtain:

$$- \frac{1}{2}\cdot\left(\pi^{D*}-\bar{\pi}^{P}\right)^2 + \gamma b\cdot E(g_1^D) - \frac{\beta}{2}\cdot\left[Var(\pi_2^D)+\left(\bar{\pi}^{CD}+\gamma b-\bar{\pi}^{P}\right)^2\right]+ \beta\gamma b\cdot E(g_2^D) =$$

$$- \frac{1}{2}\left(\pi^{R*}-\bar{\pi}^{P}\right)^2 + \gamma b E(g_1^R) - \frac{\beta}{2}\cdot[Var(\pi_2^R)+\left(\pi^{CR}+\gamma b-\bar{\pi}^{P}\right)^2] + \beta\gamma b\cdot E(g_2^R) \quad (28)$$

where $E(g_t^J)$ is the expectation, before the presidential election, of growth in period t, given that party J wins the presidency.

When wage contracts are signed in period 0, there is uncertainty about the outcome of the presidential election. The probability of a D victory, Q, and consequently expected inflation, π_t^e, are determined endogenously in the model:[17]

$$Q(\bar{\pi}^P) = \frac{w - \bar{\pi}^P - \frac{1}{2}}{2w} \quad (29)$$

$$\pi_1^e = Q\pi^{D*} + (1-Q)\pi^{R*} \quad (30)$$

On the other hand, even before the presidential election takes place, voters know that a new wage contract will be negotiated in period 1 with full knowledge of who will be president in period 2. As a result, voters know there will be no inflationary surprise in period 2, except that associated with the random variable **a**, and that:

$$\pi_2^{eJ} = \bar{\pi}^{CJ} + \gamma b \quad (31)$$

Without loss of generality, we assume D president in period 0, the case of R president being symmetric. We then use (30), (31), and (4) to calculate the growth expectations[18]:

$$E(g_2^J) = \bar{g} \text{ for } J \in \{D,R\} \quad (32)$$

$$E(g_1^D) = \bar{g} + (1-Q)(\bar{\pi}^{D*} - \bar{\pi}^{R*}) + \rho^* \mu_o^* \quad (33)$$

$$E(g_1^R) = \bar{g} - Q(\bar{\pi}^{D*} - \bar{\pi}^{R*}) \quad (34)$$

The analysis of the midterm case in the Appendix readily establishes:

$$Var(\pi_2^D) = Var(\pi_2^R) \quad (35)$$

Substituting equations (32) -(35) into (28) we find:

$$\bar{\pi}^{P} = \frac{\frac{1}{2}\left((\pi^{D*})^2 - (\pi^{R*})^2\right) + \frac{\beta}{2}\left((\bar{\pi}^{CD}+\gamma b)^2 - (\bar{\pi}^{CR}+\gamma b)^2\right) - \gamma b\left(\pi^{D*} - \pi^{R*} + \rho^{*}\mu_0^{*}\right)}{\left(\pi^{D*}-\pi^{R*}\right) + \beta\left(\bar{\pi}^{CD}-\bar{\pi}^{CR}\right)} \tag{36}$$

Equations (26) and (36) imply that the plurality for the incumbent depends upon economic performance. However, this sensitivity is focused entirely on the component of growth that is informative about post election performance, μ_0^*. Voters in this model are rationally retrospective. The higher their growth forecast for the next period, $\rho^*\mu_0^*$, the greater the vote for the incumbent. And since one can readily show that μ_0^* is increasing in the period 0 growth rate, one finds that the incumbent's vote is increasing in the growth rate for the election year. Notice also that the sensitivity of the plurality to μ_0^* is greater the *smaller* the gap between the expected discounted inflation rates expected under the two contending candidates: $\left(\pi^{D*}-\pi^{R*}\right)+\beta\cdot\left(\bar{\pi}^{CD}-\bar{\pi}^{CR}\right)$. Voters are less ideological when the platforms of the two parties are close to each other. The response to μ_0^* is also influenced by the value of b: the more the average voter cares about output relative to inflation, the more sensitive she will be to information about the current administration's economic competence. The sensitivity of voters to economic performance is also increasing in the degree of persistence in the competence shock, ρ, and the signal to noise ratio $(\sigma_{\mu}^2/\sigma_{\zeta}^2)$, both of which correspond to higher values of ρ^*.

<u>The Two Period Model With Congress Elected in Both Periods</u>

We now turn our attention to the case in which Congressional elections are held in every period, so that in even periods voters both elect a president and a new legislature simultaneously. Here we must find one more cutpoint $\bar{\pi}^{C}$, which applies to the on year Congressional elections. Again voters with indirect bliss points below the cutpoint will vote for R and those above will vote for D. As in the midterm case, the cutpoint results in first period inflation policy equaling, in expectation, the bliss point of the pivotal voter. Applying results from Alesina and Rosenthal (1989b), we have:

$$\bar{\pi}^{C} = Q(\bar{\pi}^{P})\bar{\pi}^{CD} + (1-Q(\bar{\pi}^{P}))\bar{\pi}^{CR} \tag{37}$$

The first period Congressional cutpoint is a weighted average of the second period cutpoints, with the weights given by the probability of the presidential election outcome. As the presidential outcome becomes more certain, there is less variation in the Congressional outcome between the two periods. For example, the closer Q is to 1, i.e. the more likely it is that D will win the presidency, the closer $\bar{\pi}^{C}$ is to $\bar{\pi}^{CD}$. A symmetric result holds when Q is close to zero.

Using (17) and (18) we can rewrite (37) as follows:

$$\bar{\pi}^{C} = \frac{Q(\bar{\pi}^{P})(\pi^{D*}-b\gamma)(1+K) + (1-Q(\bar{\pi}^{P}))[(\pi^{R*}-b\gamma)(1+K) + K(\pi^{D*}-\pi^{R*})]}{1+K+K(\pi^{D*}-\pi^{R*})} \tag{38}$$

A "midterm cycle" occurs if and only if:

$$\bar{\pi}^{CR} < \bar{\pi}^{C} < \bar{\pi}^{CD} \tag{39}$$

Inspection of (37) shows that this requires:

$$0 < Q(\bar{\pi}^{P}) < 1 \tag{40}$$

That is, we get a midterm cycle only when there is uncertainty about the outcome of the presidential election. Uncertainty leads voters to hedge their bets in on years. They must await the ensuing midterm elections in order to "fully" moderate the presidential winner. Equation (37) implies that the less unexpected is the outcome of presidential elections, the smaller the size of the mid-term effect.

The amount of uncertainty depends upon $\bar{\pi}^{P}$ which in turn is a function of the parameters of the model. The value of this cutpoint can be obtained from an expression identical to (28), with modification of the first period terms. In the first period, in fact, we have:

$$E(\pi_1^D) = \pi^{D*} - \frac{K}{1+K}\cdot\left(\pi^{D*} - \pi^{R*}\right)\cdot\bar{\pi}^C \tag{41}$$

$$E(\pi_1^R) = \pi^{R*} + \frac{K}{1+K}\cdot\left(\pi^{D*} - \pi^{R*}\right)\cdot(1-\bar{\pi}^C) \tag{42}$$

$$\pi_1^e = Q\pi^{D*} + (1-Q)\pi^{R*} - \frac{K}{1+K}\cdot\left(\pi^{D*} - \pi^{R*}\right)\left[\bar{\pi}^C+1-Q\right] \tag{30'}$$

These expressions permit one to compute expectations over growth and, after substitution, the presidential cutpoint. The expressions for the presidential and Congressional cutpoints generate two equations in two unknowns that are otherwise functions only of the parameters of the model (π^{D*}, π^{R*}, γ, β, ρ^*, b, and w).

Alesina and Rosenthal (1989b) analyze (in a different parameterization) the solution to these equations and demonstrate that, depending on the parameter values, the equilibrium is one of three types. In the first two types, one of the presidential candidates is elected with certainty, and the Congressional election results are identical to those for the corresponding midterm election. In the third, the presidential cutpoint leaves the outcome of the presidential election in doubt, and the on year Congressional election cutpoint lies between the two midterm cutpoints. Note that if party R is closer to the median than party D, then in this third type of equilibrium the R party will be expected to win the presidential election, inducing further moderation by voters at midterm. However, if Congress were not elected by strict proportionality, and instead there were a bias toward party D in Congressional elections, it would be possible for party R to be farther from the median and still on average prevail in Presidential elections.

An important characteristic of the two period model is that the state of the economy does not directly affect Congressional voting since the competency shock is purely a characteristic of the executive. In contrast, an incumbent president is evaluated on two dimensions. Voters consider both ideology and their perception of the incumbent's competence when deciding how to cast their presidential ballots.

3. Estimation

Time Span and Time Intervals

Our analysis of the joint determination of economic growth and the results of national elections in the United States covers 1915-88. Starting at 1915 was motivated by the beginning of a new financial regime in 1914, with the simultaneous inception of the Federal Reserve System and the collapse of the gold standard.[19]

In the theoretical model, each period represents two calendar years, mimicking the intervals between national elections. On the other hand, macroeconomic empirical analysis employs annual or even quarterly data. Recent historical research by Romer (1989) and Balke and Gordon (1987) has provided very similar estimates of the annual time series for real GNP. The high degree of concurrence between these estimates leads us to work with annual data. In the Appendix, we show that our theoretical structure can easily be extended to the case in which a "period" is one year.

The Growth Equation

The economic model, (1) -(4), leads to a growth equation that is MA(1) with an added, systematic effect from surprise inflation in the wake of every presidential election. To capture this source of surprise inflation we construct a "partisan effect" variable: pe_t, which takes the value of "1" during the second year of a Republican administration, "-1" during the second year of a Democratic administration, and "0", otherwise. The theory implies that the coefficient on this variable in the growth equation should be negative.

The existence of lags between changes of macroeconomic policy and their effects on real economic activity explains why the variable pe is non-zero only in the <u>second</u> year of each presidential term. Those macroeconomists who believe that monetary policy has real effects would agree that policy changes do not effect output in less than two to four quarters.[20] In a study using quarterly data, Alesina (1988b) shows that the post-electoral effects on the economy appear no sooner than two quarters after the elections, reach maximum strength in about five to six quarters, and disappear by 10 quarters. Analogous results for several other countries are reported in Alesina and Roubini (1990). This evidence on "time lags" suggests our specification of the pe dummy as the most appropriate. With reference to equation (2):[21]

$$(\pi_t - \pi_t^e) \sim pe_t \tag{43}$$

In our theoretical model, the size of the inflation surprise is a function of Q which, in turn, is a function of all the parameters of the model. In particular, except for the symmetric case in which $Q = \frac{1}{2}$, the size of the inflation surprise varies across parties. Given the relatively few observations available, it is impractical to estimate directly all the parameters which affect the value of the inflation surprise[22]. Thus, we adopt the simple symmetric specification implied by the dummy pe_t. In addition to the presidential inflation surprise captured by pe_t, our theoretical model also allows for surprise inflation from the outcome of Congressional elections. However, whereas the presidential outcome is discrete, the impact of Congressional elections depends on "unexpected" realizations of V^D. These unexpected realizations should be roughly of the magnitude of the small forecast errors from our House equations, below. In addition, presidential influence on policy is likely to exceed that of Congress; that is K is small. (See Hibbs, 1987.) Consequently, the impact of Congressional surprises is likely to be sufficiently small that we can simplify the empirical model by excluding Congressional surprises from (43).

With the term ζ_t in equation (3), we modeled transitory effects on growth as random events. But military activities, especially wars, represent an obvious source of transitory effects that can be included in the analysis.[23] Define m_t to be the number of individuals in military service as of June 30th of year t and POP_t to be the population of the United States for the same year. Then the rate of military mobilization is given by:

$$mm_t = (m_t - m_{t-1})/POP_t.$$

This variable highlights the beginnings and endings of wars and scales conflicts relative to one another. Including mm_t and substituting from (43) and (4) and using the definitions of ρ^* and μ^*_t, our model of growth is:[24]

$$g_t = \gamma_0 + \gamma_1 pe_t + \gamma_2 mm_t + \mu^*_t + \rho^* 1_t \mu^*_{t-1} \qquad (44)$$

Although equation (44) could not be rejected against more general specifications of the growth equation that include higher order autoregressive and moving average terms, the GNP growth series can be well described by either an MA(1) or an AR(1) process.[25] Our choice of the MA(1) representation was driven by the tractability of the theoretical model in this case. To facilitate estimation of the full model and to capture systematic changes of the volatility of the growth rate over the electoral cycle, we allow for heteroskedasticity with separate variances for non-election years, midterm election years, and years in which there is a presidential election: $\sigma^2_{\mu n}$, $\sigma^2_{\mu m}$, and $\sigma^2_{\mu p}$ respectively.[26] We impose the simplifying assumption that the value of $\mu^*_{1914} = 0$, and that each new administration takes office with a presample value of $\mu^*_{t-1} = 0$.[27]

<u>Elections</u>

For convenience in estimation, we specify for both presidential and Congressional elections, the dependent variables as <u>shares of two party vote for the party of the incumbent President.</u>

Presidential Elections

Our theoretical model of presidential voting maintains that voters care about two dimensions of performance: ideology and competence. We include two variables in our presidential voting equation to account for the effects of ideology: r_t, the incumbent president's party affiliation which takes on a value of "1" if the incumbent is a Republican, and "0" otherwise; and v^{hm}_{t-2}, the share of the popular vote cast for the incumbent president's House delegation during the preceding midterm Congressional election. The first of these variables allows for the possibility that the presidential cutpoint $\bar{\pi}^P$ is not at the expected median, so that on average one party may have a vote share greater than one-half. The second variable allows for the fact that the locations of the parties relative to the distribution of the voters may adjust slowly in time. We use the lagged House vote as a predetermined variable that may capture a portion of shifts in positions or preferences[28].

As to performance, our model holds that only the current innovation to GNP growth, μ^*_t but not μ^*_{t-1} is informative about the incumbent party's future performance in the presidency. Since current GNP growth, g_t, depends on μ^*_{t-1}, this specification differs from standard retrospective voting models in which voters use g_t to evaluate the economic performance of the incumbent administration.[29]

To test the prediction that voters only respond to the μ^*_t component of the current growth rate, we add μ^*_{t-1} to our specification of the presidential voting equation. The theory implies that the coefficient of this variable is zero.[30] We also enter mm_t in this equation. A positive coefficient for mm_t could be interpreted as a "rally 'round the flag" effect. The equation also contains an additional disturbance φ^P_t that is orthogonal to the growth shocks. The equation to be estimated is:

$$v^P_t = \psi_0 + \psi_1 r_t + \psi_2 v^{hm}_{t-2} + \psi_3 mm_t + \psi_4 \mu^*_{t-1} + \psi_5 \mu^*_t + \varphi^P_t \qquad (45)$$

Note that φ_t^p does not appear in (41). Consequently, the two equations represent a recursive system. The recursive structure is preserved when we add Congressional voting.

Many analysts (see Erikson, 1988) include a direct measure of the incumbent president's popularity on "non-economic" dimensions. This is typically constructed from opinion poll data collected a few months prior to the election or immediately after the election. In our model "personality" effects are incorporated in the error term φ_t^p, while the lagged House vote tracks evolving differences between the parties' ideal points and those of the voters. While measures of individual candidate effects would be desirable, the standard measures (questions of data availability prior to 1948 apart) are subject, as Fair (1978) pointed out, to simultaneity bias. Consequently, we do not include survey based measures in our specification.

A second presidential voting specification permits a straightforward test of the naive retrospective voting hypothesis:

$$v_t^p = \psi_0 + \psi_1 r_t + \psi_2 v_{t-2}^h + \psi_3 mm_t + \psi^* \hat{g}_t + \psi_5 \mu_t^* + \varphi_t^p \qquad (46)$$

where $\hat{g}_t$ is the predicted growth rate from equation (44). In the context of equation (46), which is logically equivalent to equation (45), naive retrospective voting implies that $\psi_5 = \psi^*$. In contrast, our model is more readily tested in the context of equation (45), where it implies that $\psi_4 = 0$. In the estimation, we compare results when these two restrictions are imposed.

<u>House Elections</u>

For House elections, we distinguish between presidential election years and midterm contests. In both cases we include military mobilization, the lagged House vote, and the incumbent's party affiliation, the latter to allow Congressional cutpoints to differ from the median.

In presidential years, we allow for coattails (Calvert and Ferejohn, 1983). Three avenues for coattails need to be considered. First, the random preference shock, **a**, in the theoretical model affects both races and induces positive correlation between the presidential vote and the Congressional vote. We allow for this effect by making the House vote dependent on the presidential vote shock φ_t^p. We expect a coefficient on this variable of less than one, since the presidential shock may contain candidate specific effects that are "outside" our formal model.[31] Second, the Congressional vote is affected indirectly by the performance of the economy. The Congressional cutpoint in (38) depends indirectly on competency shocks. Competency shocks that benefit one party in the presidential race lead to moderating behavior in the Congressional vote, which creates negative coattails. Thus preference shifts and moderation act in opposite directions, leaving the sign of coattails ambiguous. Third, unlike our model but as in Erikson (1989), a portion of the retrospective vote for president may induce positive coattails in Congressional elections due to a naive "feel good" effect: some of the effect of economic performance on the presidential vote carries over to the benefit of the party's Congressional delegation.

We test for positive or negative coattails based on economic performance by estimating two versions of the presidential voting equation. In the first specification of coattails, there is no direct effect from the presidential vote. The growth rate shock and its lag enter directly. Coattails arise solely from the shock to the presidential vote:

$$v_t^{hp} = \eta_0 + \eta_1 r_t + \eta_2 v_{t-2}^{hm} + \eta_3 mm_t + \eta_4 \mu_{t-1}^{*} + \eta_5 \mu_t^{*} + \eta_6 \varphi_t^{p} + \varphi_t^{hp} \qquad (47)$$

The second specification imposes the restriction that the only effect of growth on the House vote comes via presidential "coattails", as in our theoretical model. This specification still allows for some correlation between the disturbance to the presidential voting equation and the residual House vote ($\eta_6 \neq 0$):

$$v_t^{hp} = \eta_0 + \eta_1 r_t + \eta_2 v_{t-2}^{hm} + \eta_3 mm_t + \eta^{*} v_t^{p} + \eta_6 \varphi_t^{p} + \varphi_t^{hp} \quad (48)$$

This equation embodies the restriction that the presidential vote is a sufficient statistic for the impact of the economy on the presidential year House vote. We test this restriction.

As for midterm elections, our theory predicts a consistent midterm backlash against the incumbent president's party as voters seek to moderate the policy impact of the incumbent president. Two specifications of this equation are used. In the first, the midterm House vote is depends on all variables that appear in the other equations (save for pe_t, which is perfectly collinear with r_t during midterm years):

$$v_t^{hm} = \kappa_0 + \kappa_1 r_t + \kappa_2 v_{t-2}^{hm} + \kappa_3 mm_t + \kappa_4 \mu_{t-1}^{*} + \kappa_5 \mu_t^{*} + \varphi_t^{hm} \quad (49)$$

A more extreme form of the midterm effect is that the seat loss is unaffected by anything other than the previous election's winning margin. This is embodied in our second specification of midterm voting:

$$v_t^{hm} = \kappa_0 + \kappa_2 v_{t-2}^{hp} + \kappa_5 \mu_t^{*} + \varphi_t^{hm} \quad (50)$$

Estimation Results

Some simple descriptive statistics for our data appear in Table 1.

[Table 1 about here]

Estimates of the unrestricted growth equation, (44), appear in the first column of Table 2. This equation was estimated jointly with equations (45), (47), and (49) via maximum likelihood. All coefficients are significant at the 5 per cent level. The estimated variances for presidential and midterm election years are essentially the same, while the estimated variance for non-election years is somewhat lower.

[Table 2 about here]

The estimated partisan effects parameter, γ_1 is of the same magnitude found by Alesina and Sachs (1988). It indicates that growth rates during the second year of Republican administrations with no changes in the level of the armed forces will average barely 1%, while during the corresponding year of a Democratic administration the economy will typically grow by almost 5%.

As expected, the beginnings and endings of wars overshadow other economic events. We estimate the economy expands by about 3% for each 1% of the population that is mobilized into military service. When the same 1% are demobilized, the economy contracts, again by approximately 3%.[32]

Our estimate of ρ^* indicates that the effect of the lagged competence shock, μ^*_{t-1}, is approximately half the effect of the current shock, μ^*_t. This estimate is very similar to Nelson and Plosser's (1982) estimate of the MA(1) representation of annual GNP. It is this lagged effect of the shock to growth that motivates rational retrospective voting in our model of presidential elections. Voters in our model respond to μ^*_t because reelection of the incumbent will result in a growth rate that differs from the challenger's post election performance by approximately $\mu^*_t/2$.

Parameter estimates for the unrestricted midterm House election equation, (49), appear in the first column of Table 3. This equation, which was estimated jointly with equations (44), (45), and (47) has an R^2 of 0.791. However, the predictive power of this equation stems almost entirely from the presence of the lagged House vote among the regressors. While no other explanatory variable in this equation is significant at the $\alpha = 0.10$ level, the coefficient of the lagged House vote has a "t-ratio" of almost 8. Consistent with our model, the state of the economy does not affect House elections, at least at midterm.

Equation (50) imposes the restriction that only the intercept and the coefficient of the lagged House vote matter in this equation. We test this restriction by estimating equation (50) jointly with (44), (45), and (47). The appropriate test statistic has an asymptotic χ^2_3 distribution and a value of 0.787, indicating acceptance of the null hypothesis at all conventional significance levels.

[Table 3 about here]

Estimates of equation (50) appear in the second column of Table 3[33]. Notice that these estimates combine to indicate that the incumbent president's party loses seats during the midterm election, with the magnitude of the seat loss depending on the size of the incumbent president's party's House delegation. The intercept is insignificantly different from zero, and the coefficient of the lagged vote is insignificantly different from 1. Nevertheless, as indicated by Table 4, the seat loss predicted by this equation is significant for values of the lagged House vote between 39% and 86%. This interval includes all of the observations of this variable in our sample. Table 4 indicates the predicted midterm vote share loss for the incumbent president's House delegation for various vote shares from the preceding midterm election. The larger the House delegation, the more the incumbent president's party stands to lose. The party of an incumbent president that received 50% of the House vote during the preceding presidential election year can expect to poll just over 46% of the midterm vote, a loss of almost 4%. For lagged vote shares in the neighborhood of 50% these estimated seat losses are very similar to the those of Erikson (1990), who imposed a value of 1 for κ_2. These estimates of seat loss are consistent with the prediction of our theoretical model that voters use midterm elections to moderate the policy of the president[34].

[Table 4 about here]

The first column of Table 5 displays the unrestricted presidential vote shares equation, equation (45), which is estimated jointly with the other "unrestricted" equations, (44), (47), and (49). The estimated pro-Republican bias of 10 percent (ψ_1) is only partly counteracted by the effect of the lagged House vote which favors the Democrats. Ceteris paribus, for a Democratic incumbent president to be more favored than a Republican, the Democrats would have to have done exceptionally well in the preceding midterm election, obtaining at least 56.9 percent of the House vote.

[Table 5 about here]

The coefficient of the military mobilization variable in equation (45) represents a strong "rally 'round the flag" effect: voters tend to support the incumbent during times of national crisis. Demobilization has the opposite effect, a rapid "peace dividend" is costly to the incumbent administration.

The economy has a pronounced effect on presidential voting. Both the current growth shock μ^*_t, and its lagged value, μ^*_{t-1} have statistically significant coefficients. The effect of the current growth shock is more precisely estimated; its coefficient is over five times its standard error. Moreover, the effect is substantial; a 1% innovation to the growth rate in the election year increases the vote for the incumbent president by 1.15%.

If the shock to competence is MA(1), then μ^*_{t-1} should have no bearing on the gap between the post-electoral economic performances of the two candidates, and rational voters would ignore it in casting their ballots. Although this coefficient, ψ_4, is less precisely estimated than that of the contemporaneous shock, it does significantly differ from zero at the $\alpha = 0.05$ level. This implies rejection of the null hypothesis of rational retrospection with MA(1) competence shocks.

One possible reason for this rejection of the model is that, although voters only respond to presidential competence, competency is autoregressive, in contrast to the MA(1) process posited in our model. This would mean that the incumbent's economic performance during previous years conveys information about his post-election competence. As discussed above, an autoregressive competence shock would lead to a qualitatively similar, but harder to analyze theoretical model. A second, and testable, alternative is that voters are really myopic, and naively respond to the GNP growth rate in casting their ballots.

To further explore this issue, the myopic model of presidential voting, equation (46), was estimated in conjunction with the unconstrained versions of the other equations of our model (equations (44), (47), (49)). Parameter estimates for equation (46) are shown in column 2 of Table 5. Under the null hypothesis that the restriction is valid, the coefficients of competence and growth will be identical: $\Delta = \psi_5 - \psi^* = 0$. The actual gap between the parameter values is $\Delta = -0.489$. The asymptotic distribution of this parameter is normal, with a standard error of $\sigma(\Delta) = 0.708$. The asymptotic t-ratio of -0.691 indicates acceptance of the null hypothesis of naive retrospective voting at all standard significance levels. However, when equation (46) is estimated with equations (44), (48), and (50) the results are not as favorable for naive retrospective voting: the estimate of Δ becomes -0.788, and the asymptotic t-ratio of -1.78 leads to a p-value of 0.074, barely permitting acceptance at the $\alpha = 0.05$ level.

While the evidence is mixed, the positive weight on the lagged growth innovation in the presidential voting equation that led us to reject rational retrospection with an MA(1) competence shock may be consistent with myopic retrospective voting on the economy, depending on which specification we adopt for the House voting equations. However, we cannot rule out the possibility of rational retrospective voting with a competency process that is more persistent than MA(1).

While our model allows for a bias toward one party by the voters, it requires that voters treat presidential incumbents and challengers symmetrically: a challenger is treated by the voters the same as an incumbent with a competency shock of zero. This hypothesis is testable: the sum of the predicted vote for a Republican incumbent, with all of the explanatory variables (save party) at their sample mean, plus the predicted vote for a Democratic incumbent, also with the explanatory variables at the sample mean, should sum to 100% of the two party vote. If the sum is significantly greater, then there is a bias toward incumbents in addition to the pro-Republican bias. We test this in the context of the unrestricted model (equation (45) estimated jointly with equations (44), (47), and (49)). The sum of the predicted incumbent totals is 104.823, 1.859 standard deviations above 100. This indicates rejection of the null hypothesis of a no bias toward incumbents at the $\alpha = 0.05$ level. We conducted the same test using our preferred system (equation (46) estimated jointly with equations (44), (48), and (50)). This test provided stronger evidence against the null hypothesis, the sum of the predicted incumbent totals of 106.400 permits rejection at the $\alpha = 0.01$ significance level.

Our coefficient of 1.643 for the GNP growth rate is within one standard deviation of Fair's (1988) estimate that an extra 1% of income growth corresponds to an additional 1.01% of the incumbent's popular vote share. While our myopic equation for presidential voting is similar to Fair's model (1988) in its treatment of the economy, there are some important differences. Our specification captures evolving partisan differences with the lagged vote for the House. Fair omits this variable and instead includes three others: an insignificant inflation variable and two significant variables. One of the latter is a time trend whose presence is not theoretically based. The other is a dummy (DPER) which indicates whether the incumbent is running for reelection. This variable has an endogeneity problem; only presidents who expect to be reelected are likely to run again.

Table 6 compares residuals from our model[35], which appear in the first column, with Fair's residuals[36], shown in the second column. The final column of Table 6 displays the residuals that result when we reestimate Fair's model using our data set.[37] The R^2 value for our model is somewhat lower than for Fair's model.

[Table 6 about here]

The closer fit to the data that arises from Fair's model stems from his use of time trend and DPER. The role of the DPER variable is especially clear in the 1948 election, in which our model predicts a substantial loss by Truman, while Fair's model makes a very small prediction error. When Truman decided to seek reelection, it is plausible he used political skills to anticipate a large positive shock to the voting equation. Fair's use of the information contained in the incumbent's decision to seek reelection is quite appropriate as a matter of short-term forecasting but more questionable in establishing a structural model of the national political economy.

Another problem with the use of Fair's equation as a structural model of presidential voting is suggested by our analysis of the long run stable path of the system, which is presented below. This indicates that there are partisan cycles, with the White House changing hands between the two parties at regular intervals. Such cyclical behavior cannot be captured by a time trend, which implies eventual evolution of the political system toward monopolization of the White House by one party (the Democrats according to Fair's estimates).

Parameter estimates for the presidential year House voting equation (47), which is estimated in conjunction with the "unrestricted" versions of the other equations: (44), (45), and (49), appear in the first column of

Table 7. Neither Republican incumbency, nor the lagged competence shock receive statistically significant coefficients. The coefficient of the previous House vote is near one, reflecting an important incumbency advantage.

[Table 7 about here]

The coefficient of the lagged House vote exceeds the estimate for the midterm voting equation. In presidential elections, control of the White House does not appear to be a liability for the president's House delegation. As in the presidential voting equation, the Congressional voting equation exhibits an important "solidarity-in-times-of-crisis" effect: military mobilization appears to help the incumbent president's party.

Both the current competence shock, μ_t, and the presidential vote shock, φ_t^P have statistically significant effects on the House vote. The coefficient of the shock to the presidential voting equation of 0.544 may be interpreted as a presidential "coattails" effect. The estimated coefficient of the growth shock is about 1/2 its value in the presidential voting equation. This raises the possibility that the growth effect is really operating thorough presidential coattails. To test this, we estimate equation (48) to test whether in fact the entire effect of the economy on House voting is captured by the effect of the economy on the presidential vote, as it is in our theoretical model.

The second column of Table 7 reports estimates of the parameters of equation (48).[38] The test statistic corresponding to the restrictions imposed by this model, which is asymptotically distributed as χ_1^2, is 0.309, indicating acceptance at all standard significance levels.

The coattails themselves are highly statistically significant (the estimate of η^* is over four times its standard error), and the instrumented component of the presidential vote has almost the same effect on the House vote as the disturbance to the presidential voting equation. This is exactly what we would expect to see if there were a common shock to voter preferences, and voters then jointly decided on a Congressional delegation and a president, as predicted by our model.

These estimates indicate that presidential coattails are important, and that, with respect to the House vote, the vote for the president is a sufficient statistic for the state of the economy. The latter finding is consistent with recent work by Erikson (1990), who included both the current presidential vote and the current growth rate on the righthand side of a House voting equation, and found that the coefficient of growth was insignificant. Our analysis confirms this result, in a context that is free from the possible simultaneity bias of Erickson's estimator.

Our preferred model consists of equations (44), (46), (48), and (50). The estimated parameter values for these four equations when estimated jointly are reported as the "system restricted" estimates in the righthand columns of Tables 2, 3, 5, and 7. The dynamic behavior of this system is stable. Absent shocks to growth, or to voting behavior, the system settles down to non-explosive oscillations, displaying a 28-year cycle, with the White House changing hands at regular intervals. (See Table 8.)

[Table 8 about here]

The cycling results from the cumulative effect of midterm losses. Each midterm loss costs the party of the incumbent a larger share of the vote than it wins back through presidential coattails two years later. The longer a party retains control of the White House, the greater the cumulative erosion of its Congressional delegation. Because the presidential vote is an increasing function of the lagged House vote, erosion of support for the incumbent's House delegation in turn leads to a reduced presidential vote, with weaker presidential coattails. This process eventually costs the incumbent's party the White House.

The marked partisan bias toward Republican presidential candidates, discussed above, results in the Republican party retaining control of the White House for 20 of the 28 years of the cycle. However, Republican control of the White House typically occurs with a divided government. There is unified Republican control of the executive and legislative branches for only 2 of the 28 years. Although the Democratic party only controls the White House for 8 years of the cycle, it receives a majority of the House vote during 6 of these years. Thus, to the extent unified government is important to policy initiatives, the Democrats may actually have more opportunities to implement new policies than the Republicans.

The pattern of divided government, with Republicans occupying the White House, and Democrats entrenched in Congress is similar to actual post-World War Two experience. However, it does not resemble the political climate of the thirties, which was dominated by the "shock" of the Great Depression.

4. Conclusion

In this paper, we have tested a macro model of economic growth and national elections. Our model incorporates in a unified framework: (i) the partisan model of election "surprises" originally suggested by Alesina (1987), (ii) voters' moderating behavior which counterbalances the president via the Congressional vote both in on years via split tickets (Fiorina, 1988; Alesina and Rosenthal, 1989a, b) and in midterm elections (Alesina and Rosenthal, 1989a, 1989b), (iii) the "competency" model of rational retrospective voting as exposited by Rogoff and Sibert (1988).

There are two inherent limitations to this enterprise. On the theoretical side, formulating a tractable model has forced us to limit dynamic considerations to the anticipation of midterm elections in years when the presidency is at stake. That is, with respect to the strategies pursued by political and economic agents, "the world starts over" every four years. Our finding of a bias in favor of presidential incumbents suggests an interest in developing a model with a longer time horizon where voters are risk averse with regard to the growth rate. On the empirical side, data is thin. In the model, only presidential elections have an important impact on the economy, and they occur only every four years. While output is produced continuously, persistence in the time series acts to reduce the information available for testing. In addition, the presence of only 7 shifts in party control of the presidency since 1912 makes it difficult to distinguish persistence in administrative competence from other forms of persistence in the economy.

With these reservations in mind, we feel the estimation has been quite successful. We have largely confirmed and extended the recent results of Alesina and Sachs (1988) on the impact of elections on the economy, of Alesina and Rosenthal (1989a) on the midterm Congressional cycle, and of Erikson (1989, 1990) on the impact of the economy on presidential and Congressional elections. Unlike this earlier work, our estimation of a system of equations does not have endogeneity bias. Moreover, our estimation holds for 1916 onwards rather than simply the postwar period. In addition, we have adjusted for military mobilizations, which have a major impact on both the economy and presidential voting.

Our paper also provides the first empirical test of "rational" retrospective voting behavior versus "naive", myopic behavior. The results are mixed. On the one hand, we clearly reject the MA(1) specification of "rational" voting, but this rejection does not rule out the possibility that competency may follow a less tractable autoregressive process. On the other, whether we accept "naive" voting is borderline since the evaluation is not robust to the form of the statistical test. The small number of presidential elections and the high degree of persistence in the economic time series make it difficult to obtain a firm answer on rationality on the basis of aggregate time series data.

A major limitation of the empirical work is that it does not take into account the model's implication that the probability of victory of the incumbent president affects economic outcomes and Congressional voting. With regard to the "inflation surprise" on the economy, the relevant probability is the probability many months before the elections--certainly before the party conventions. Measuring such a probability would of course be quite difficult. Polls might be used to estimate the probability seen by the voters just before elections, at least in the postwar period, but, in any event, estimating the mapping between vote shares in polls and perceived probabilities would further tax the degrees of freedom available in the estimation. Nonetheless, an explicit treatment of voter expectations just prior to voting is a strong candidate for future research.

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NOTES

[1]See Chappell and Suzuki (1990), Kramer (1971), Fair (1978, 1982,1988), Fiorina (1981), Erikson (1989, 1990), and further references in Alesina and Rosenthal (1989a).

[2]The seminal work in this area is by Hibbs (1977, 1987). See also Alesina and Sachs (1988), Alesina (1988a), Alesina and Roubini (1990), and Chappell and Keech (1988). Beck (1982) suggests that in addition to partisan effects, there are important administration specific effects as well. We do not incorporate this refinement into the model.

[3]See Nordhaus (1975, 1989), Tufte (1978), Haynes and Stone (1987), (1989), and Alesina and Roubini (1990).

[4]Alesina and Rosenthal (1989a), Erikson (1990), Chappell and Suzuki (1990), Lepper (1974). See Jacobson (1990) for a contrasting view.

[5]Erikson (1988), Alesina and Rosenthal (1989a).

[6]Alesina and Sachs (1988) and Alesina (1988a). Similar partisan effects are observed in many other industrial democracies; see Alesina and Roubini (1990) and the references cited therein.

[7]This treatment of administration-specific "competence" was pioneered by Rogoff and Sibert (1988) and extended in a context similar to ours by Persson and Tabellini (1990). Notice that we could have emended this model by allowing the variance of the initial competency shock for a new administration to exceed σ_{μ}^2. However, the presence of only seven inter-party transfers of executive control in our sample period (1916-1988) makes estimation of this form of heteroskedasticity impractical.

[8] This reflects the relatively high retention rates of members of the previous administration in key posts during the initial year of the successor administration's term of office. Since 1916, the beginning of our sample period, most presidential successions that left the White House in the hands of the same party were accessions by the incumbent vice president.

[9] Note that we can allow for variations in presidential competency to have indirect long term effects on the economy via $\alpha > 0$ in (1).

[10] Needless to say, this is a very rough characterization of the American electoral system. We ignore the electoral college and the bicameral legislature and its division into geographically based constituencies. We also ignore the presence of staggered terms in the Senate. For a model which tackles some of these institutional issues for Senate elections, see Alesina, Fiorina, and Rosenthal (1990).

[11] Since party positions are fixed, the presence of two preference parameters does not lead to voting cycles.

[12] The qualitative results of the model would be preserved if there were serial dependence in α.

[13] This differs from models analyzed by Rogoff and Sibert (1988), and Persson and Tabellini (1990) in which incumbents distort their policy choices in order to signal their competence.

[14] More formally, (13) guarantees that the fraction of the electorate without weakly dominant strategies of voting is uniformly distributed over the interval $(\bar{\pi}^{D*}, \bar{\pi}^{R*})$ for *any* realization of a. See Alesina and Rosenthal (1989b).

[15]Recall that $V^R = 1 - V^D$. Substituting this into equation (15) and subtracting equation (14), we obtain:

$$\pi_t^D - \pi_t^R = \pi^{D*} - \frac{K}{1+K}\left(\pi^{D*} - \pi^{R*}\right)(1-V_t^D) - \pi^{R*} + \frac{K}{1+K}\left(\pi^{D*} - \pi^{R*}\right)V_t^D$$
$$= \left(\pi^{D*} - \pi^{R*}\right)/(1+K) > 0$$

[16]<u>Proof:</u> Substituting equation (20) into equation (18), and differentiating with respect to K we obtain:

$$\frac{\partial}{\partial K}E(V_1^D) \quad = \quad \frac{\left(\pi^{R*}-b\gamma -1\right)\left(\pi^{D*}-\pi^{R*}\right)}{[1 + K + K\left(\pi^{D*} - \pi^{R*}\right)]^2} < 0 \qquad \square$$

[17]Equation (29) implies a condition on w needed to guarantee $Q \in (0,1)$. See Alesina and Rosenthal (1989b) for further discussion.

[18]Note that voter expectations depend upon the election forecasts, represented by Q, of the agents in the economy. Say the agents in the economy had some forecast $\hat{Q}$. It might be thought that $\bar{\pi}^P$ depended on $\hat{Q}$, so we would require $\bar{\pi}^P(\hat{Q})$, and at the wage-setting stage, wages would be set taking into account the "reaction function" of the electorate. However, the functional forms in our model imply that $\bar{\pi}^P$ is independent of the electoral forecasts of the agents in the economy. The basic intuition is that increasing $\hat{Q}$ makes for a larger recession in the case of a R victory but at the same time results in a smaller expansion if D wins. The <u>difference</u> in growth rates offered by the parties remains constant as $\hat{Q}$ varies. Thus, there is a single value of $\bar{\pi}^P$. We assume that agents in the economy act as if they know the voter equilibrium and use (29) to compute Q.

[19]Mankiw, Miron, and Weil (1987) provide empirical evidence of an important regime shift in 1914. Following Fair (1978,1988), we avoid the three party presidential election of 1912 by starting our election observations in 1916.

[20]For a recent discussion and survey, see Romer and Romer (1989).

[21] We could allow for a stochastic term in (43). We omit it, because its effect cannot be identified apart from other transitory effects on GNP that are captured by ζ_t.

[22] We did experiment with a specification that allowed for a constant Q different from 1/2. This entailed estimating separate impacts for Democrats and Republicans. We were not able to reject the null hypothesis of equal coefficients (Q = 1/2), a not surprising result given our small sample size. However, the simulation results represented in Table 8 below represent a discrepancy from equation (43).

[23] The price of oil represents an additional source of transitory shocks. Alesina (1988a) shows that a partisan dummy (our "pe") remains significant when oil prices are introduced as an additional regressor in a growth equation. As adding a measure of oil prices to our growth equation leaves results virtually unchanged and uses degrees of freedom, we have chosen not to use this variable.

[24] Notice that mm_t is part of the transitory shock ζ_t. Because we can observe it directly, it makes sense to include it among the explanatory variables. However, when mm_t can be separately observed, the definition of μ_t^* changes, agents will be able to disentangle the effects of military mobilization, from the competency shock: $\mu_t^* = (\zeta_t - mm_t) + \mu_t$. The signal extraction formula used by agents is then modified to:

$$E(\mu_t) = \frac{\sigma_\mu^2}{Var(\zeta_t - mm_t) + \sigma_\mu^2}$$

This modification does not affect any of our substantive results.

[25] See Christiano and Eichenbaum (1989) and Campbell and Mankiw (1987) on the difficulty of discriminating among ARMA models of GNP growth.

[26]Our model embodies the extreme assumption that the only source of persistence in GNP growth is presidential competence. This leads to a tractable model. However, an observationally equivalent model allows for other sources of persistence as well, combined with greater voter sensitivity to the importance of the economy, relative to the left-right inflation issue. This would result in a lower value of ρ^* that would be offset by a higher weight on growth in the voter choice equation.

[27]There are 7 changes of party control of the White House during our sample interval, so that if we attempted to estimated "presample" values for the competency shocks for each of these administrations, plus the 1914 shock for Woodrow Wilson, we would add 8 parameters to our model. Given the sparseness of our data (which only include 74 observations for the growth equation) we prefer to impose the assumption of presample competency realizations equal to zero, the average competency level.

[28]Alternatively, the lagged House vote may reflect the incumbency advantage in Congressional races, although incumbency effects are outside of our model.

[29]See Fair (1978,1988) for empirical use of the GNP series. Work in a similar spirit, using income rather than GNP is represented by Erikson (1989), who also references other work based on income.

[30]See equation (36). The result continues to hold when the model is extended to include the simultaneous election of Congress and when the MA(1) process pertains to periods of one year.

[31]Kramer (1971) introduced this form of coattails modeling.

[32] It is important to control for demobilization as well as mobilization in evaluating the partisan surprise to the economy. In particular, the massive demobilization following World War II picks up the recession of 1946, the second year of a Democratic watch.

[33] Equation (5) was estimated jointly with equations (44), (45), and (47).

[34] Erickson (1988) has demonstrated that regression to the mean and surge-and-decline based on presidential coattails do not account for the data.

[35] The predictions from our presidential voting equation are calculated using equation (46) estimated jointly with equations (44), (48), and (50), which is our preferred model of voting.

[36] Fair (1988), page 170.

[37] We use Fair's coding of DPER, with Gerald Ford not being counted as an incumbent. Our economic data differs slightly from Fair's. The R^2 for Fair's model is slightly higher using our data.

[38] This equation is estimated jointly with the unrestricted versions of the other equations.

Table 1: Descriptive Statistics

Variable	Mean	Std. Deviation	N
Growth Rate	3.061	5.940	74
Nonelection Year Growth Rate	3.610	4.899	37
Midterm Year Growth Rate	1.527	7.960	18
Presidential Year Growth Rate	3.446	5.260	19
Vote for President	53.053	7.597	19
Midterm Year House Vote	49.220	4.783	18
Midterm Partisan Effect	0.000	1.000	18
Presidential Year House Vote	49.906	5.460	19
Party of President (D=0, R=1)	0.486	0.499	74
Lagged House Vote (at Midterm)	53.320	4.423	18
Lagged House Vote (Pres. Year)	49.279	4.662	19
Military Mobilization	0.009	1.000	74

Table 2: The Growth Equation

Variable	Coefficient	Unrestricted	System Restricted	
Constant	γ_0	2.929 (0.682)	2.943 (0.681)	
Partisan Effect	γ_1	-1.818 (0.913)	-1.863 (0.899)	
Military Mobilization	γ_2	3.013 (0.546)	2.839 (0.499)	
Lagged Competency Shock	ρ^*	0.509 (0.128)	0.526 (0.121)	
Type of Year		Residual Variance	Std. Error of Estimate	R^2
Non-election Years	$\sigma^2_{\mu n}$	14.272	3.371	0.405
Midterm Election Years	$\sigma^2_{\mu m}$	23.115	7.829	0.635
Presidential Election Years	$\sigma^2_{\mu p}$	20.005	6.580	0.277

Note The restricted estimates are computed using Newey's (1987) version of minimum χ^2 estimation, which does not produce fresh estimates of σ^2 for the equation. Standard errors are in parentheses.

Table 3: **Midterm Election House Vote Equation**

Variable		Parameter Estimates: Unrestricted	Equation Restricted	System Restricted
Constant	κ_0	-0.871 (6.644)	-0.307 (6.188)	-0.298 (6.188)
Republican incumbent	κ_1	0.256 (1.077)	-	-
Previous House vote	κ_2	0.939 (0.120)	0.929 (0.115)	0.929 (0.115)
Military Mobilization	κ_3	0.223 (0.332)	-	-
Lagged Competence Shock	κ_4	0.030 (0.142)	-	-
Current Competence Shock	κ_5	0.098 (0.106)	0.103 (0.104)	0.103 (0.104)
Residual Variance	σ^2_{hm}	4.774 (1.520)		
	$R^2 = 0.791$			

Note. See note to Table 2.

Table 4: **Predicted Midterm Loss**

Previous Vote Share	Predicted Loss	Pr(Loss > 0)
41%	3.179%	0.981
45%	3.459%	0.999
50%	3.809%	1.000
55%	4.160%	1.000
60%	4.510%	0.999

Table 5: Presidential Vote Shares Equation

Variable		Parameter Estimates: Unrestricted	Reparametrized	System Restricted
Constant	ψ_0	10.036 (10.170)	5.223 (10.854)	3.659 (10.479)
Republican incumbent	ψ_1	10.423 (1.948)	10.423 (1.948)	10.574 (1.932)
Previous House vote	ψ_2	0.753 (0.196)	0.753 (0.196)	0.765 (0.195)
Military Mobilization	ψ_3	4.510 (2.200)	-0.442 (3.018)	-1.378 (2.581)
Lagged Competence Shock	ψ_4	0.836 (0.339)	-	-
Current Competence Shock	ψ_5	1.153 (0.201)	1.153 (0.201)	1.110 (0.185)
Current Growth Rate	ψ^*	-	1.643 (0.666)	1.898 (0.465)
Residual Variance	σ_p^2	13.626 (4.434)		
		$R^2 = 0.763$		

Note. See note to Table 2.

Table 6: Comparison with Fair's Model

Year	Vote for the Incumbent	Residual		
		Our Specification	Fair's Specification	
		Our Data	Fair's Data*	Our Data
1916	51.6	-2.27	-0.5	0.93
1920	36.1	-3.50	0.9	2.02
1924	65.2	3.00	-4.2	-1.02
1928	58.7	-2.59	3.6	-3.19
1932	40.8	0.98	-1.6	0.46
1936	62.4	-2.33	-0.8	-0.52
1940	54.9	-0.96	-2.3	-0.65
1944	53.7	0.16	-3.2	-2.85
1948	52.3	7.44	1.1	1.33
1952	44.6	-4.48	-1.0	-2.09
1956	57.7	1.69	1.5	0.43
1960	49.8	-3.48	-0.9	2.72
1964	61.3	8.98	7.1	5.72
1968	49.5	-0.46	-1.3	0.91
1972	61.8	4.67	1.4	-2.11
1976	48.9	-3.99	-1.4	4.43
1980	44.7	-2.62	-0.0	-4.80
1984	59.1	0.97	1.7	1.41
1988	53.9	-1.25	-	-3.13

*Source: Fair, 1988.

Table 7: **Presidential Election Year House Vote Equation**

Variable		Parameter Estimates: Unrestricted	Equation Restricted	System Restricted
Constant	η_0	5.267 (7.199)	-0.019 (7.494)	-0.048 (7.494)
Republican incumbent	η_1	1.344 (1.377)	-3.471 (1.415)	-3.466 (1.415)
Previous House vote	η_2	0.885 (0.139)	0.537 (0.142)	0.538 (0.142)
Military Mobilization	η_3	3.242 (1.467)	1.166 (1.534)	1.135 (1.533)
Lagged Competence Shock	η_4	0.287 (0.212)	-	-
Current Competence Shock	η_5	0.586 (0.144)	-	-
Presidential Vote Shock	η_6	0.544 (0.105)	0.545 0.105)	0.544 (0.105)
Presidential Vote	η^*	-	0.472 0.106)	0.472 (0.106)
Residual Variance	σ^2_{hp}	2.879 (0.948)		
		$R^2 = 0.903$		

Note. See note to Table2.

Table 8: Long Run Steady Path for the System

Year	Growth Rate	Vote for Incumbent President's Party: Presidency	Vote for Incumbent President's Party: House	President's Party	Election Winner: Presidency	Election Winner: House
0	3.010	49.89	41.18	R	D	D
1	3.010	.	.	D		
2	4.836	.	54.39	D		D
3	3.010	.	.	D		
4	3.010	50.87	53.25	D	D	D
5	3.010	.	.	D		
6	4.836	.	49.21	D		R
7	3.010	.	.	D		
8	3.010	46.92	48.59	D	R	R
9	3.010	.	.	R		
10	1.184	.	47.51	R		D
11	3.010	.	.	R		
12	3.010	56.18	48.58	R	R	D
13	3.010	.	.	R		
14	1.184	.	44.88	R		D
15	3.010	.	.	R		
16	3.010	54.17	46.21	R	R	D
17	3.010	.	.	R		
18	1.184	.	42.67	R		D
19	3.010	.	.	R		
20	3.010	52.49	44.23	R	R	D
21	3.010	.	.	R		
22	1.184	.	40.83	R		D
23	3.010	.	.	R		
24	3.010	51.07	42.57	R	R	D
25	3.010	.	.	R		
26	1.184	.	39.29	R		D
27	3.010	.	.	R		
28	3.010	49.89	41.18	R	D	D

Appendix

A. Theory

Alesina and Rosenthal (1989b) characterize the Greenberg (1989) abstract stable sets in a general one dimensional voting model with two polarized parties and the institutional structure used in this paper. With a common b to all voters, the model in this paper is also one dimensional. It is straightforward to redefine variables and apply the results in Alesina and Rosenthal (1989b). The indirect bliss points given in the text play the role of the one dimensional bliss points in Alesina and Rosenthal (1989b). The additional technical problem introduced in this paper is provided by the second dimension of preference parameters represented by b^i.

1. Equilibrium at t=1 with Heterogeneous b.

Alesina and Rosenthal (1989b) show that the midterm equilibrium characterized by (18), (19), and (20) not only is the Abstract Stable set defined in Greenberg (1989) but is also Strong Nash. In this section, we show how to generalize this result to the case in which the b^i are different across voters.

Using (8) and (2) in the text, it is immediate to show that voter i maximizes:

$$E\left(W_2^i = -\frac{1}{2}\left(\pi_2 \quad - \bar{\pi}_i\right)^2 + b^i g_2\right) =$$

$$E\left(-\frac{1}{2}\left(\pi_{t+2} - \bar{\pi}_i\right)^2 + b^i\left[\bar{g} + \gamma\left(\pi_2 - \pi_2^e\right) + \varepsilon_t\right]\right) \qquad \text{(A-1)}$$

While the party of the president for the second period is known at the midterm elections, second period inflation is treated as a random variable by the voters since actual inflation will reflect the outcome of the midterm elections by (10) and (11). We use the notation $\pi_2(V_1^D)$ to express this dependence. The growth shock ε, long-term growth parameter $\bar{g}$, and expected inflation rate π_2^e are all unaffected by the voting decisions. Consequently, maximization of expected utility is equivalent to maximization of:

$$W^{*i} = -\tfrac{1}{2}E\left[\left(\pi_2(V_1^D) - \bar{\pi}_i\right)^2\right] + b^i\gamma E\left[\pi_2(V_1^D)\right] \qquad \text{(A-2)}$$

Without loss of generality, we assume that R is president, the D president case being symmetric. We also assume:

$$b_i \sim f(b_i),\ E(b_i)=b,\ \bar{\pi}^i|b_i \sim U[\mathbf{a},\ 1+\mathbf{a}] \qquad \text{(B1)}$$

In other words, for every b^i, voter preferences on inflation have the same uniform distribution. (The marginal density of b^i is unrestricted.)

Using (14), we write:

$$\pi_2 = \pi^{R*} + K^* V_1^D \qquad \text{(A-3)}$$

where $K^* = \frac{K}{1+K}\left(\pi^{D*} - \pi^{R*}\right)$

After substitution and some algebra, we have:

$$W^{*\,i} = -\tfrac{1}{2}K^{*2}\left[E\left(V_1^D\right)\right]^2 + (\bar{\pi}^i + b^i\gamma - \pi^{R*})K^*E\left(V_1^D\right) + K^{*2}\mathrm{Var}\left(V_1^D\right) + \text{constants} \qquad \text{(A-4)}$$

Assumption (13) and the restriction that voters do not use weakly dominated strategies suffice to prove (see Alesina and Rosenthal, 1989b, proof of Proposition 7) that $\mathrm{Var}\left(V_1^D\right)$ is constant for all voter strategies and, hence, for all $E\left(V_1^D\right)$. It follows, using the first-order condition, that there is a unique value of $E\left(V_1^D\right)$ that maximizes expected utility given by:

$$E\left(V_1^D\right)^{*i} = \frac{\bar{\pi}^i + b^i\gamma - \pi^{R*}}{K^*} \qquad \text{(A-5)}$$

Using (17), we can verify that the maximizing expected vote level leads to expected inflation equal to the time-consistent inflation policy that would be pursued by a voter-dictator:

$$E\left(\pi_2\right)^{*i} = \bar{\pi}^i + b^i\gamma \tag{18}$$

It can also be seen that there is a linear $(\bar{\pi}_i, b_i)$ locus that describes voters with identical preferences. Assume a voter with preferences $\bar{\pi}^{CR} + b\gamma$ is at his maximum. Then (Alesina and Rosenthal, 1989b), Strong Nash implies that voters with "lower" indirect preferences vote R and voters with "higher" preferences vote D. Consequently, voter types with growth preference b^i vote D with probability $1 + a - \bar{\pi}^{CR} - b\gamma + b^i\gamma$. We thus have,

$$V_1^D = \int_{b_L}^{b_U} (1 + a - \bar{\pi}^{CR} - b\gamma + b^i\gamma) f(b^i) db^i = 1 + a - \bar{\pi}^{CR}$$

$$\text{and } E\left(V_1^D\right) = 1 - \bar{\pi}^{CR} \tag{17}$$

More generally, assume that $\bar{\pi}^i$ and b^i obey some general density $f(\bar{\pi}^i, b^i)$, subject to the marginal density of $\bar{\pi}^i$ continuing to be uniform. Assume some voter with preferences $\bar{\pi}^{CR} + b\gamma$ [where b need not equal $E(b^i)$] is at his maximum. Then,

$$V_1^D = \int_a^{1+a} \int_{\frac{\bar{\pi}^{CR}+b\gamma-\bar{\pi}^i}{\gamma}}^{b^U} f(b^i | \bar{\pi}^i) db^i d\bar{\pi}^i$$

and $V_1^D = 1 + a - \bar{\pi}^{CR}$ if:

$$\int_a^{\bar{\pi}^{CR}} \int_{\frac{\bar{\pi}^{CR}+b\gamma-\bar{\pi}^i}{\gamma}}^{b_U} f(b^i | \bar{\pi}^i) db^i d\bar{\pi}^i = \int_{\bar{\pi}^{CR}}^{1+a} \int_{b_L}^{\frac{\bar{\pi}^{CR}+b\gamma-\bar{\pi}^i}{\gamma}} f(b^i | \bar{\pi}^i) db^i d\bar{\pi}^i \tag{B2}$$

Assumption (B2) says that voters with $\bar{\pi}^i > \bar{\pi}^{CR}$ who vote R are exactly offset by voters with $\bar{\pi}^i < \bar{\pi}^{CR}$ who vote D. [This is similar to conditions of radial symmetry or median in all directions that appear in spatial voting theory (Enelow and Hinich, 1984). The assumption is different than these conditions in that it applies to a pivotal voter type rather than a median. It is also weaker in that it applies, through integration, only to an aggregated property of the distribution of voter types.] Assumption (B1) implies (B2). Assumption (13) guarantees that if (B2) holds for any a it holds for all a. Thus, if we find that there exists a $\bar{\pi}^{CR}$ such that (18) holds and (B2) is valid at $\bar{\pi}^{CR}$, equation (17) holds. Thus, independence is sufficient, but not necessary for (17).

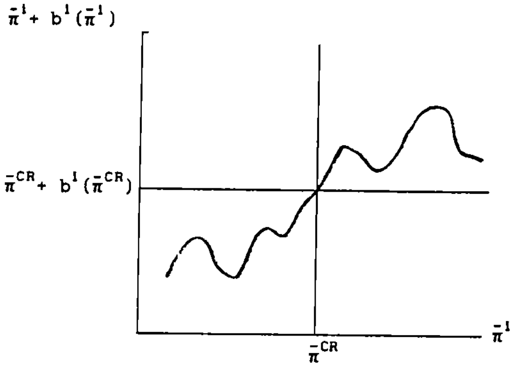
Equation (17) can also hold when, rather than having a conditional density given $\bar{\pi}^i$, b^i is functionally dependent on $\bar{\pi}^i$. Assume a voter with preferences $\bar{\pi}^{CR} + b^i(\bar{\pi}^{CR})\gamma$ is at his maximum. It is direct to show that:

$$\text{if } \bar{\pi}^i > \bar{\pi}^{CR},\ \bar{\pi}^i + b^i(\bar{\pi}^i)\gamma > \bar{\pi}^{CR} + b^i(\bar{\pi}^{CR})\gamma$$
$$\text{and if } \bar{\pi}^i < \bar{\pi}^{CR},\ \bar{\pi}^i + b^i(\bar{\pi}^i)\gamma < \bar{\pi}^{CR} + b^i(\bar{\pi}^{CR})\gamma \qquad \text{(B3)}$$

equation (17) holds with $b=b^i(\bar{\pi}^{CR})$. Figure A1 illustrates (B3).

Assumption (B3) holds when b_i is a strictly increasing function of $\bar{\pi}_i$. Therefore, equation (17) holds for two polar cases of heterogeneity of b_i--independence and perfect correlation. Showing that (17) and (18) define a Strong Nash equilibrium follows, with appropriate redefinition of variables, from the proof in Alesina and Rosenthal (1989b).

Figure A1. Illustration of Assumption B3.



2. The Two Period Voting Equilibrium With Heterogeneous b^i and President Unconstrained in Period 1.

Assume analogs to B2 or B3 also hold, with $\bar{\pi}^P$ substituted for $\bar{\pi}^{CR}$.

Equation (36) in the text, with $\bar{\pi}^i$ substituted for $\bar{\pi}^P$ and b^i substituted for the last b in the numerator shows the indifference condition for a voter type $\bar{\pi}^i$, b^i. As in Section 1 of this Appendix, the locus of indifferent types is linear. Let $\bar{\pi}^P$ define the indifferent voter with growth preference b. Then (26) and (36) will continue to hold, by proof similar to Section 1. Alternatively, let $\bar{\pi}^P$ represent an indifferent voter with $b^i(\bar{\pi}^P)$. Again (26) and (36) continue to hold. In turn, (26) and (36) can be mapped into the framework of Alesina and Rosenthal (1989b).

3. The full model with heterogeneous growth preferences.

The setup directly parallels that of the first two sections of this Appendix. It is direct to show that the relevant loci are again linear.

4. A general annualized model.

In this section, we recast the model as an annual model with elections occurring only at the end of even periods, with on year elections in periods 0, 4, etc. and midterm elections in periods 2, 6, etc. The policy π depends only upon the identity of the president and the vote in the previous Congressional election. Thus, the policy is constant for two periods. We use the notation $\pi_{12}^{J}(V_{0}^{D})$ to denote the policy for the first two periods when party J won the presidential election in period 0 and the Congressional vote for D was V_{0}^{D}. Similarly, $\pi_{34}^{J}(V_{2}^{D})$ gives the policy for periods three and four. Except where noted below, the specification of the model is unchanged from the text. The generalization of the model assumes that the competency shock follows an MA(4) process:

$$\eta_t = \mu_t + \sum_{k=1}^{4} \rho_k i_{t-k} \mu_{t-k} \qquad (4')$$

$0 < \rho_k \leq 1$; μ_t is i.i.d.; $E(\mu_t) = 0$

$i_{t-k} = 1$ if the party of the president at t and t-k is the same

$= 0$ otherwise.

By (4') any competency shocks that arrive in a four year presidential term will not carry over beyond the next term. In addition, Congress is entirely elected every two years. Consequently, we can analyze the model as a four period model where elections occur at the ends of periods 0 and 2 and realizations to utility occur in periods 1, 2, 3, and 4.

In midterm elections, therefore, utility maximizing voters are concerned only with how their midterm vote affects the t=3 and t=4 components of their additive utility functions. As a result, the relevant objective function becomes:

$$W^{*1}=-\frac{1}{2}(1+\beta)\left(E\left[\left(\pi_{34}(V_2^D)-\bar{\pi}_1\right)^2\right]+b^1\gamma E\left[\pi_{34}(V_2^D)\right]\right) \tag{A-2'}$$

Since (A-2) and (A-2') differ only in the presence of the constant $1+\beta$ in (A-2'), equations (17)-(20) continue to give the equilibrium for midterm elections.

We now turn to the on year elections. The recasting of equations (22)-(27) in the context of the annual model is straightforward. Equation (28) becomes:

$$-\frac{1}{2}(1+\beta)\left(\pi^{D*}-\bar{\pi}^P\right)^2 - \frac{\beta^2}{2}(1+\beta)\cdot\left[\mathrm{Var}(\pi_{34}^D)+\left(\bar{\pi}^{CD}+\gamma b-\bar{\pi}^P\right)^2\right] + \gamma b\left(\sum_{k=1}^{4}\beta^{k-1}E(g_k^D)\right)=$$

$$-\frac{1}{2}(1+\beta)\left(\pi^{R*}-\bar{\pi}^P\right)^2 - \frac{\beta^2}{2}(1+\beta)\cdot[\mathrm{Var}(\pi_{34}^R)+\left(\pi^{CR}+\gamma b-\bar{\pi}^P\right)^2] + \gamma b\left(\sum_{k=1}^{4}\beta^{k-1}E(g_2^R)\right) \tag{28'}$$

The adaptations of equations (30) and (31) are straightforward. The growth expectations are:

$$E(g_4^D) = \bar{g} + \rho_4^*\mu_0^* \tag{32'a}$$

$$E(g_3^D) = \bar{g} + \rho_3^*\mu_0^* + \rho_4\mu_{-1} \tag{32'b}$$

$$E(g_t^R) = \bar{g} \qquad t \in \{3,4\} \tag{32'c}$$

$$E(g_2^D) = \bar{g} + (1-Q)(\bar{\pi}^{D*} - \bar{\pi}^{R*}) + \rho_2^*\mu_0^* + \rho_3\mu_{-1} + \rho_4\mu_{-2} \tag{33'a}$$

$$E(g_1^D) = \bar{g} + (1-Q)(\bar{\pi}^{D*} - \bar{\pi}^{R*}) + \rho_1^*\mu_0^* + \rho_2\mu_{-1} + \rho_3\mu_{-2} + \rho_4\mu_{-3} \tag{33'b}$$

$$E(g_t^R) = \bar{g} + Q(\bar{\pi}^{D*} - \bar{\pi}^{R*}) \qquad t \in \{1,2\} \tag{34'}$$

$$\text{where } \rho_k^* = \rho_k\frac{\sigma_\mu^2}{\sigma_\mu^2 + \sigma_\zeta^2}$$

As in (35), variance terms vanish, and we obtain:

$$\bar{\pi}^{P} =$$

$$\frac{\frac{(1+\beta)}{2}\left((\pi^{D*})^2-(\pi^{R*2}\right)+\frac{\beta^2(1+\beta)}{2}\left((\bar{\pi}^{CD}+\gamma b)^2-(\bar{\pi}^{CR}+\gamma b)^2\right)-\gamma b\left((1+\beta)(\pi^{D*}-\pi^{R*})+\vartheta\right)}{(1+\beta)\left(\pi^{D*}-\pi^{R*}\right)+\beta^2(1+\beta)\left(\bar{\pi}^{CD}-\bar{\pi}^{CR}\right)} \tag{38'}$$

where $\vartheta = \sum_{k=1}^{4}\beta^{k-1}\rho_k^*\mu_0^* + \sum_{k=2}^{4}\beta^{k-2}\rho_k\mu_{-1} + \sum_{k=3}^{4}\beta^{k-3}\rho_k\mu_{-2} + \rho_4\mu_{-3}$

This equation shows that the qualitative conclusions of the model are maintained. First, the incumbent's vote is increasing in any competency shock the incumbent receives throughout his tenure. Second, the incumbent's vote is increasing in the growth rate for the election year.

The model also continues to hold in the case where the president and the Congress are both elected in the first period. Because (1) growth shocks are unaffected by the outcome of Congressional elections and (2) the policy π will be constant in periods 1 and 2, equations (37) and (38) continue to hold and equations (41), (42), and (30') can be adapted readily. A presidential cutpoint equation can then be developed that is qualitatively similar to the equation for the two period model.

B. Maximum Likelihood Estimation

The log of the likelihood function for the "unrestricted" version of our model is:

$$\ell ik(\hat{\underline{\tau}}) = \sum_{t\in\mathcal{N}} \ell_t^{n}(\hat{\underline{\tau}}) + \sum_{t\in\mathcal{M}} \ell_t^{m}(\hat{\underline{\tau}}) + \sum_{t\in\mathcal{P}} \ell_t^{p}(\hat{\underline{\tau}})$$

where $\mathcal{N}$ denotes the subset of observations with no election (e.g. 1915, 1917, 1919,...), $\mathcal{M}$ denotes the set of observations with a midterm congressional election (1918, 1922, 1926,...), and $\mathcal{P}$ indicates the set of presidential election years (1916, 1920, 1924,...), and $\hat{\underline{\tau}}$ is a vector of parameter estimates:

$$\hat{\underline{\tau}} = (\hat{\gamma}_0, \hat{\gamma}_1, \hat{\gamma}_2, \hat{\rho}, \hat{\psi}_0, \hat{\psi}_1, \hat{\psi}_2, \hat{\psi}_3, \hat{\psi}_4, \hat{\psi}_5, \hat{\eta}_0, \hat{\eta}_1, \hat{\eta}_2, \hat{\eta}_3, \hat{\eta}_4, \hat{\eta}_5, \hat{\eta}_6, \hat{\kappa}_0, \hat{\kappa}_1, \hat{\kappa}_2, \hat{\kappa}_3, \hat{\kappa}_4, \hat{\kappa}_5, \hat{\kappa}_6, \hat{\sigma}^2_{\mu n}, \hat{\sigma}^2_{\mu m}, \hat{\sigma}^2_{\varphi h}, \hat{\sigma}^2_{\mu p}, \hat{\sigma}^2_{\varphi p}, \hat{\sigma}^2_{\varphi hp})'$$

The contribution to the likelihood function of a non-election year observation is:

$$\ell^n_t(\hat{\underline{\tau}}) = -1/2 \cdot \ln(2\pi) - \ln(\hat{\sigma}^2_{\mu n}) - \hat{\mu}_t/(2\hat{\sigma}^2_{\mu n})$$

where $\hat{\mu}_t(\hat{\underline{\tau}})$ is defined recursively by:

$$\hat{\mu}_t(\hat{\underline{\tau}}) = g_t - \hat{\gamma}_0 - \hat{\gamma}_1 pe_t - \hat{\gamma}_2 mm_t - \hat{\rho}\xi_t\hat{\mu}_{t-1}(\hat{\underline{\tau}}) \tag{44'}$$

To simplify notation, we shall frequently denote $\hat{\mu}_t(\hat{\underline{\tau}})$ by $\hat{\mu}_t$. As mentioned in the text, we set $\hat{\mu}_{t-1} = 0$ at the beginning of our sample, and whenever control of the presidency switches from one party to another. Notice that each new set of values for $\hat{\gamma}_0$, $\hat{\gamma}_1$, $\hat{\gamma}_2$, and $\hat{\rho}$ implies a new sequence of $\hat{\mu}_t$'s.

The contribution of a midterm election year to the log likelihood is:

$$\ell^m_t(\hat{\underline{\tau}}) = -\ln(2\pi) - 1/2 \cdot \ln(\det(\begin{bmatrix} \hat{\sigma}^2_{\mu m} & \hat{\kappa}_5\hat{\sigma}^2_{\mu m} \\ \hat{\kappa}_5\hat{\sigma}^2_{\mu m} & \hat{\sigma}^2_{\varphi hm} \end{bmatrix})) - 1/2 \cdot (\hat{\mu}_t, \hat{\varphi}^{hp}_t) \begin{bmatrix} \hat{\sigma}^2_{\mu m} & \hat{\kappa}_5\hat{\sigma}^2_{\mu m} \\ \hat{\kappa}_5\hat{\sigma}^2_{\mu m} & \hat{\sigma}^2_{\varphi hm} \end{bmatrix}^{-1} \begin{pmatrix} \hat{\mu}_t \\ \hat{\varphi}^{hp}_t \end{pmatrix}$$

where $\hat{\mu}_t$ is given by (E2'), while:

$$\hat{\varphi}_t^{hp}(\hat{\underline{\tau}}) = v_t^{hm} - \hat{\kappa}_0 - \hat{\kappa}_1 pe_t - \hat{\kappa}_2 r_t - \hat{\kappa}_3 v_{t-2}^{hm} - \hat{\kappa}_4 mm_t - \hat{\kappa}_5 \hat{\mu}_t - \hat{\kappa}_6 \hat{\mu}_{t-1} \quad (49')$$

The contribution of a presidential election year to the log likelihood is:

$$\ell_t^p(\hat{\underline{\tau}}) = -3/2 \cdot \ln(2\pi) - 1/2 \cdot \ln(\det(\hat{\Sigma}^p)) - 1/2 \cdot (\hat{\mu}_t, \hat{\varphi}_t^p, \hat{\varphi}_t^{hp}) \hat{\Sigma}^{p^{-1}} \begin{pmatrix} \hat{\mu}_t \\ \hat{\varphi}_t^p \\ \hat{\varphi}_t^{hp} \end{pmatrix}$$

where:

$$\hat{\Sigma}^p = \begin{bmatrix} \hat{\sigma}_{\mu p}^2 & \hat{\psi}_5 \hat{\sigma}_{\mu p}^2 & \hat{\eta}_5 \hat{\sigma}_{\mu p}^2 \\ \hat{\psi}_5 \hat{\sigma}_{\mu p}^2 & \hat{\psi}_5^2 \hat{\sigma}_{\mu p}^2 + \hat{\sigma}_{\varphi p}^2 & \hat{\eta}_5 \hat{\psi}_5 \hat{\sigma}_{\mu p}^2 + \hat{\eta}_6 \hat{\sigma}_{\varphi p}^2 \\ \hat{\eta}_5 \hat{\sigma}_{\mu p}^2 & \hat{\eta}_5 \hat{\psi}_5 \hat{\sigma}_{\mu p}^2 + \hat{\eta}_6 \hat{\sigma}_{\varphi p}^2 & \hat{\sigma}_{\varphi hp}^2 + \hat{\eta}_5^2 \hat{\sigma}_{\mu p}^2 + \hat{\eta}_6^2 \hat{\sigma}_{\varphi p}^2 \end{bmatrix}$$

and $\hat{\mu}_t$ is given by (E2'), while:

$$\hat{\varphi}_t^p = v_t^p - \hat{\psi}_0 - \hat{\psi}_1 r_t - \hat{\psi}_2 v_{t-2}^h - \hat{\psi}_3 mm_t - \hat{\psi}_4 \hat{\mu}_{t-1} - \hat{\psi}_5 \hat{\mu}_t \quad (45')$$

$$\hat{\varphi}_t^{hp} = v_t^{hp} - \hat{\eta}_0 - \hat{\eta}_1 r_t - \hat{\eta}_2 v_{t-2}^{hm} - \hat{\eta}_3 mm_t - \hat{\eta}_4 \hat{\mu}_{t-1} - \hat{\eta}_5 \hat{\mu}_t - \hat{\eta}_6 \hat{\varphi}_t^p \quad (47')$$

Notice that this model is not linear in the vector of parameters $\hat{\underline{\tau}}$, as $\hat{\mu}_{t-1}(\hat{\underline{\tau}})$ enters every equation, for every year.

Starting values for maximum likelihood estimation can be obtained by grid searching over $(\rho, \kappa_6, \psi_4, \eta_4)$. Conditional on these parameter values, it is possible to obtain consistent estimates of the remaining parameters of the model via iterative GLS estimation, using transformed values of the variables, where the transformation matrix is a non-linear function of $(\rho, \kappa_6, \psi_4, \eta_4)$. The likelihood function for the unrestricted model is then maximized using a numerical Gauss-Newton algorithm.

The restrictions embodied in equations 46, 48, and 50 could in principle be tested by a standard likelihood ratio test. This would require reestimating the entire model by maximum likelihood, a non-trivial task when equation 46 or 48 is introduced into the model. We instead adopt a more manageable, asymptotically equivalent procedure. For the restriction in equation (50), we compute, using Newey's (1987) method, minimum χ^2 estimation of the model given by equations (44), (43), (45), and (50) from the parameters of the unrestricted model. The other restrictions are treated in a similar fashion.