POLITICAL BUSINESS CYCLES IN THE NEW KEYNESIAN MODEL

FABIO MILANI*

This paper tests various political business cycle theories in a New Keynesian model with a monetary and fiscal policy mix. All the policy coefficients, the target levels of inflation and the budget deficit, the firms' frequency of price setting, and the standard deviations of the structural shocks are allowed to depend on "political" regimes: a preelection versus postelection regime, a regime that depends on whether the president (or the Fed chairman) is a Democrat or a Republican, and a regime under which the president and the Fed chairman share party affiliation in preelection quarters or not. The results provide evidence that several coefficients are influenced by political variables. The best-fitting specification, in fact, is one that allows coefficients to vary according to a regime that depends on whether the economy is in the few quarters before a presidential election or not. Monetary policy becomes considerably more inertial before elections and fiscal policy deviations from a simple rule are more common. There is some evidence that policies become more expansionary before elections, but this evidence disappears for monetary policy in the post-1985 sample. (*JEL* C11, D72, E32, E52, E58, E63)

"I know there's the myth of the autonomous Fed..." Nixon barked a quick laugh.

—Richard Nixon, talking to Arthur Burns on October 23, 1969, just after Burns's nomination to the Fed had been announced.[1]

"I'd like to see another lowering of interest rates. I think there's room to do that. I can understand people worrying about inflation. But I don't think that's the big problem now."

—George H. W. Bush, interview with New York Times, June 24, 1992.

I. INTRODUCTION

Economic conditions before elections affect election outcomes.[2] Rational politicians who recognize this regularity may, therefore, be tempted to try to influence the economy in the quarters preceding an election date to maximize their chances of being reelected.

The literature on political business cycles (PBC) has developed models that rationalize economic fluctuations induced by political cycles. Nordhaus (1975) presented a model of "opportunistic" political cycles: the party in power stimulates the economy before elections to improve its reelection probability. Others have observed that different parties may have different preferences over inflation and output or unemployment outcomes and, therefore, we should observe "partisan" political cycles. Hibbs (1977) was the first to introduce the partisan cycle model, in which left-wing parties were assumed to have at least one of the following: a higher output target, a higher inflation target, or a higher relative weight on minimizing output rather than

ABBREVIATIONS

DSGE: Dynamic Stochastic General Equilibrium
FOMC: Federal Open Market Committee
GDP: Gross Domestic Product
PBC: Political Business Cycles
PLM: Perceived Law of Motion

*I would like to thank the editor and two anonymous referees, as well as Michelle Garfinkel, Ami Glazer, Kevin Grier, and my conference discussants Fabio Mendez and Rodrigo Martins for helpful comments and suggestions.

Milani: Assistant Professor, Department of Economics, University of California, 3151 Social Science Plaza, Irvine, CA 92697-5100. Phone 949-824-4519, Fax 949-824-2182, E-mail fmilani@uci.edu, Homepage: http://www.socsci.uci.edu/~fmilani

1. Abrams (2006).
2. Kramer (1971), Tufte (1975, 1978), Fair (1978), Blomberg and Hess (2003), and Alesina, Londregan, and Rosenthal (1993) provide evidence that favorable economic conditions in the quarters prior to a presidential election enhance the probability of the incumbent's being reelected.

Economic Inquiry
(ISSN 1465-7295)
doi:10.1111/j.1465-7295.2009.00212.x

inflation deviations from the targets, compared with right-wing parties.

Several papers test for the existence of opportunistic or partisan cycles in the United States. Alesina, Cohen, and Roubini (1992) and Alesina, Roubini, and Cohen (1997) find only weak evidence of an opportunistic political cycle looking at M1 growth rates. Grier (1989) and Beck (1987), instead, find support for the effect of political variables on M1 growth rates for the 1960–1980 period, but not on the mean level of the federal funds rate. As discussed in Drazen (2000a, 2000b), there is basically no evidence, instead, that political cycles matter for macroeconomic outcomes by looking at data on unemployment and output growth (Grier 2008 is a recent exception), and only weak evidence for inflation.

Empirical tests of the partisan cycle model (Alesina, Roubini, and Cohen 1997; Faust and Irons 1999) find partisan differences in output growth rates, but no support for partisan cycles in inflation and monetary policy.

Tests of PBC typically assume monetary policy as the main tool that is exploited by politicians to manipulate the economy. These studies usually focus on comparing the level of inflation, output, money growth rates, or interest rates across political cycles, or they add a political dummy variable to the relevant regression and test its significance.

This paper offers a different approach. The paper aims to empirically test various political business cycle theories adopting an optimizing New Keynesian model with a monetary and fiscal policy mix as the main setting (the inclusion of both fiscal and monetary policy is motivated by Drazen 2000b).[3] The New Keynesian model is a baseline setting for the analysis of monetary policy, but it has not been widely used to study PBC. An advantage of this paper with respect to most of the previous PBC literature lies in the use of a general equilibrium framework: this is, in fact, necessary when testing the importance of politically motivated policy choices to effectively control for differences in the macroeconomic conditions, the set of shocks, or the private sector expectations that prevail when the policy decision is taken.

The monetary and fiscal policy rule parameters, as well as the parameters that reflect the frequency of price adjustment by firms and the steady-state level of inflation, are allowed to *depend on* the (observed) political regime.

Several hypotheses can, therefore, be tested. The coefficients may, in fact, differ in preelection versus no-election periods, they may depend on the party affiliation of either the president or the Federal Reserve chairman, and on whether the president and the Fed chairman share the same affiliation or not in a preelection period (the different cases are introduced one at a time in the model to save degrees of freedom).

Political cycles in monetary and fiscal policy are tested by looking at the various policy feedback coefficients rather than at the mean levels of outcome variables or money growth rates as often done in the literature. The paper is, therefore, more closely related to recent studies by Krause and Mendez (2005), who try to infer policy makers' revealed preferences toward inflation and output stability and test whether these are affected by the proximity to elections or by the ruling party's ideology, and by Abrams and Iossifov (2006), who use a Taylor rule during the 1957–2004 sample to test political cycle theories. Abrams and Iossifov use a single equation approach, while this paper employs a full-information Bayesian approach to estimate a general equilibrium model with both monetary and fiscal policy. The paper is also related to Faust and Irons (1999), who estimate an identified vector autoregression (VAR) in which the coefficients are contingent on the regime. The current paper, instead, uses a structural model to judge the importance of political regimes. The structural model is considerably more parsimonious than Faust and Irons' VAR and allows for an easier interpretation of the coefficients.

If political cycles were important, agents should be able to incorporate this information into their expectations. Under the conventional assumption of rational expectations, however, agents would be assumed to know that political cycles exist and to have known

3. Drazen (2000b) reviews the evidence accumulated in 25 yr of political business cycle research and concludes that models based on monetary policy are not entirely convincing; he argues that a larger focus on fiscal policy, often disregarded in the literature, may prove more promising. There is evidence, in fact, that fiscal transfers are manipulated to gain an electoral advantage (Tufte, 1978; Keech and Pak, 1989; Alesina, 1988). Moreover, the use of monetary policy as the main driving force may be problematic since politicians typically do not have full control of monetary policy, this task being left to independent central banks.

this for the whole sample period. Besides, they would also have perfect knowledge about the "size" of the political cycle effect and, under partisan cycles, about the different political parties' objective functions.

These are, of course, strong informational assumptions. In this paper, I relax rational expectations, by assuming that economic subjects have to learn about economic relationships over time (in the spirit of the adaptive learning literature; e.g., Evans and Honkapohja 2001). In this specification, the agents are allowed to learn from past observations how PBC affect fluctuations in output, inflation, and future policies. From a more empirical point of view, learning introduces time variation in the model, which helps fitting macroeconomic data, again in a very parsimonious way.

The model is estimated using likelihood-based Bayesian methods on postwar U.S. data. The estimation approach follows Milani (2007), who shows how to estimate a dynamic stochastic general equilibrium (DSGE) model with near-rational expectations and learning. The Bayesian approach facilitates the joint estimation of the learning parameters together with the "deep" parameters of the economy and the policy feedback parameters. In this way, the learning process is *jointly* extrapolated from the data, rather than imposed *a priori* and the analysis conditioned on it. The relevance of different PBC theories can then be gauged by looking at how the parameters' posterior distributions vary across regimes and by comparing the marginal likelihoods of the alternative model specifications.

A. Results

The results are supportive of the notion that political variables matter. Several policy parameters, as well as some of the economy's structural parameters, vary across political regimes. The best-fitting specification is one in which the relevant political regime is defined by whether the economy is in the few quarters preceding a presidential election or not.

The results show that monetary policy becomes extremely inertial before the election. The rarity of policy changes is consistent with an independent Fed, which is also concerned about giving an impression of not actively participating in the political race. Apart from the inertia, there is some evidence, although not strong, that both monetary policy (but only before 1979) and fiscal policy become more expansionary before elections.

This paper aims to add to the empirical literature on PBC. But the paper can also be seen as a contribution to empirical studies of the New Keynesian model aimed at testing whether the exclusion of political variables may have represented an important misspecification of the model. The paper is finally related to the literature that studies the monetary–fiscal policy mix (e.g., Favero and Monacelli 2005; Muscatelli, Tirelli, and Trecroci 2004) and to empirical applications of models with adaptive learning (e.g., Adam 2005; Milani 2007; Orphanides and Williams 2005).

II. THE MODEL

I assume that the aggregate dynamics of the economy can be summarized by the following New Keynesian model, which is widely used to study monetary policy issues and which can be derived from the optimizing decisions of economic agents (see Woodford 2003, for a standard derivation):

$$x_t = \hat{E}_t x_{t+1} - \sigma(i_t - \hat{E}_t \pi_{t+1} - r_t^N) \tag{1}$$

$$\pi_t - \pi^*(S_t) = \beta \hat{E}_t(\pi_{t+1} - \pi^*(S_t)) + \kappa(S_t)x_t + u_t \tag{2}$$

$$\begin{aligned} i_t = {} & \rho_{MP}(S_t) i_{t-1} + (1 - \rho_{\mathrm{MP}}(S_t))[r_t^N \\ & + \pi^*(S_t) + \chi_\pi(S_t)(\pi_{t-1} - \pi^*(S_t)) \\ & + \chi_x(S_t)x_{t-1}] + \varepsilon_t \end{aligned} \tag{3}$$

$$\begin{aligned} d_t = {} & \rho_{\mathrm{FP}}(S_t)d_{t-1} + (1 - \rho_{\mathrm{FP}})(S_t)[\tau_0(S_t) \\ & + \tau_B(S_t)B_{t-1} + \tau_x(S_t)x_{t-1}] + \eta_t \end{aligned} \tag{4}$$

where x_t denotes the output gap (the deviation of real from potential gross domestic product [GDP]), π_t denotes inflation, i_t is the nominal interest rate, d_t denotes the budget deficit, $B_t = \beta^{-1}(B_{t-1} - \pi_{t-1} + (1-\beta)d_{t-1}) + i_{t-1}$ is the debt to GDP ratio, r_t^N denotes the natural rate of interest, u_t is a cost-push supply shock, and ε_t and η_t are monetary and fiscal policy shocks. In this model, r_t^N is typically affected by changes in potential output as well as by shocks to government spending (fiscal policy affects demand in the model only through changes in r_t^N). r_t^N and u_t are assumed to follow AR(1) processes $r_t^N = \rho_r r_{t-1}^N + \sigma_r(S_t)\nu_t^r$ and $u_t = \rho_u u_{t-1} + \sigma_u(S_t)\nu_t^u$, while ε_t and η_t are i.i.d. with mean 0 and variances $\sigma_\varepsilon(S_t)$ and $\sigma_\eta(S_t)$. S_t denotes the "political" regime, which will be defined in more detail in Section IIB.

Equation (1) represents the log-linearized intertemporal Euler equation that derives from the households' optimal choice of consumption. The output gap depends on the expected one-period-ahead output gap and on the ex ante real interest rate. The coefficient $\sigma > 0$ represents the intertemporal elasticity of substitution of consumption. Equation (2) is the forward-looking New Keynesian Phillips curve that can be derived from the optimizing behavior of monopolistically competitive firms under Calvo price setting. Inflation depends on expected inflation in $t + 1$ and on current output gap. The parameter $0 < \beta < 1$ represents the households' discount factor, π^* denotes the steady-state level of inflation, which is also the inflation target adopted by the central bank, and κ denotes the slope of the Phillips curve. Equation (3) describes monetary policy. The central bank follows a Taylor rule by adjusting its policy instrument, a short-term nominal interest rate, in response to deviations of inflation and output gap from their targets (equal to π^* for inflation and 0 for the output gap). χ_π and χ_x are the policy feedback coefficients and ρ_{MP} accounts for interest rate inertia.

This setting incorporates two extensions of the baseline 3 equations New Keynesian model. First, the model includes a fiscal policy rule along with a Taylor rule that describes monetary policy. Typical studies of monetary policy in a New Keynesian framework often ignore fiscal policy, by assuming that the fiscal authority operates to maintain a zero-balance budget at all times. The details of fiscal policy usually do not affect the dynamics of the economy in such a model and are, therefore, ignored. Here, fiscal policy is, instead, included to test its dependence on political variables, in light of Drazen's (2000b) argument that fiscal policy may be more relevant than monetary policy in revealing the effects of politics on macroeconomic decisions. The fiscal policy rule (4) implies a reaction of the budget deficit to the output gap and to current debt (debt to GDP ratio), with feedback coefficients τ_x and τ_B (Taylor 2000 and Favero and Monacelli 2005 analyze similar rules and show that they can accurately describe the behavior of postwar U.S. fiscal policy).[4]

Second, the paper relaxes the strong informational assumption that requires agents to form fully rational expectations. I assume what is usually considered as a "small" deviation from rationality: agents use the endogenous variables that appear in the model's solution under rational expectations in their perceived model of the economy. But they are assumed to lack knowledge about the structural parameters. As explained, for example, in Preston (2005) and Milani (2006), although they may be assumed to know their own preference parameters, they cannot infer the aggregate laws of motion because they neither know other agents' preferences nor the value of aggregate parameters, such as Calvo's price stickiness coefficient. Therefore, they use historical data to estimate the model and learn the values of the relevant parameters over time. $\hat{E}_t$ indicates subjective (near-rational) expectations and may differ from the expectation operator E_t. I follow the choice of most papers in the adaptive learning literature in introducing learning on the same linearized equations obtained under rational expectations. Preston (2005) and Honkapohja, Mitra, and Evans (2002) debate the validity of the model microfoundations under different informational assumptions. Preston (2005) notes that when agents solve for their optimal economic plans under imperfect information, output and inflation will depend on long-horizon forecasts of macroeconomic variables and not simply on one-period-ahead expectations as one would obtain under rational expectations. Honkapohja, Mitra, and Evans (2002), instead, argue that if agents are assumed to possess a slightly larger amount of knowledge, by correctly noticing that the market-clearing equality $C_t = Y_t$ holds at all times, the aggregate laws of motion would reduce to those obtained under rational expectations. This paper follows this latter approach in introducing learning.

4. The reaction to the output gap aims to account for the cyclical components of fiscal policy and can also contain the effect due to the operation of automatic stabilizers.

In the model, several coefficients are assumed to depend on the political regime.[5] First, to test for the existence of PBC induced by policy, the monetary and fiscal policy coefficients are allowed to differ across political regimes. This differs from many previous PBC studies which test the existence of cycles by comparing mean inflation, output, or money growth rates across regimes. Here, instead, I test whether the feedback coefficients to inflation and output, and, consequently, the relative importance of the two objectives, depend on political variables. Besides, I also allow the steady states of inflation and of the budget balance, which can be interpreted as the target levels that policy makers try to achieve, to be regime dependent.

If opportunistic cycles are important, we might expect to observe, for example, an attenuated monetary policy reaction to deviations of inflation from target, possibly along with a higher inflation target and a higher budget deficit, while if partisan cycles matter we would probably observe a higher reaction coefficient to output than to inflation under Democratic presidents (and again higher inflation and budget-deficit targets). If, instead, the Fed is not politically motivated, but, as some observers argue, simply wants to avoid taking any action as elections approach, the policy rule would still be characterized by lower reaction coefficients in preelection quarters and maybe by more inertia.

The "deep" parameters of the economy should not, in principle, vary across regimes: β is typically fixed in the literature and σ will be estimated at a common value across regimes. It may be argued that κ, instead, which represents the slope of the Phillips curve and which is a negative function of the Calvo pricing parameter (the probability of resetting a price in any given period) may not be really interpreted as "structural." The likelihood of firms' changing prices, in fact, may depend on the specific policy environment and, in particular, on the prevailing inflation rate. Therefore, I let the data decide whether κ varies across regimes or not. Finally, the different macroeconomic outcomes may be due to various degrees of luck rather than different policies: to account for this, the standard deviations of the supply and demand shocks, as well as the standard deviations of monetary and fiscal policy surprises, are allowed to vary across regimes.

By relaxing the standard assumptions that are usually imposed under rational expectations, economic agents are not endowed with the information that the parameters of the economy depend on political variables and they do not know their exact values. They are, however, allowed to learn from actual data the nature of economic relationships and the extent to which political regimes matter.

A. Expectations Formation and Learning by Economic Agents

As made clear by Equations (1) and (2), economic agents need to form expectations of future macroeconomic variables. To form such expectations, I follow the adaptive learning literature (e.g., Evans and Honkapohja, 2001) in assuming that they use a linear model of the economy, which represents their perceived law of motion (PLM):

$$(5) \qquad Z_t = a_t + b_t Z_{t-1} + c_t B_{t-1} + d_t S_t + e_t$$

where $Z_t \equiv [x_t, \pi_t, i_t, d_t]'$.[6] Agents do not know the relevant model parameters. They use historical data to learn those parameters over time. As additional data become available in subsequent periods, they update their estimates of the coefficients (a_t, b_t ,c_t, d_t) according to the constant gain learning formula

$$(6) \qquad \hat{\phi}_t = \hat{\phi}_{t-1} + \mathbf{\bar{g}} R_t^{-1} X_t (Z_t - X_t' \hat{\phi}_{t-1})$$

$$(7) \qquad R_t = R_{t-1} + \mathbf{\bar{g}} (X_t X_t' - R_{t-1}),$$

5. Here the regimes are assumed to be observed; therefore, the estimation of the model basically reduces to an estimation with an added dummy variable (S_t). Faust and Irons (1999) assume a similar regime-contingent structure in their VAR model.

6. The PLM includes the lagged values of the endogenous variables as does the minimum state variable solution of the system under rational expectations. Agents are, therefore, estimating a VAR(1) in the endogenous variables and they are assumed not to be able to observe the current value of the shocks r_t^N and u_t, which would also appear in the rational expectations (RE) solution. Not including the shocks in the VAR does not significantly affect the results and it appears as a more realistic description of the information set of economic agents. As the shocks are unobserved, however, and the PLM does not allow for regime-dependent coefficients, agents' learning will not ensure convergence to the rational expectations equilibrium of the economy or to a distribution around it.

where Equation (6) describes the updating of the learning rule coefficients $\hat{\phi}_t = (a_t', \text{vec}(b_t, c_t, d_t)')'$, and Equation (7) describes the updating of the precision matrix R_t of the stacked regressors $X_t \equiv \{1, x_{t-1}, \pi_{t-1}, i_{t-1}, d_{t-1}, B_{t-1}, S_t\}_0^{t-1}$. Therefore, agents' beliefs in $\hat{\phi}_t$ are equal to their previous period values plus an update that is based on period t's forecast error. $\bar{\mathbf{g}}$ denotes the constant gain coefficient, which captures how quickly agents revise their beliefs due to incoming information (constant gain learning has been used in Sargent 1999, Orphanides and Williams 2005, Primiceri 2006, and Milani 2006, 2007, 2008, among others).

B. Political Regimes

The different regimes I consider are:

1. *A preelection versus postelection regime.* Here S_t equals 1 in the seven quarters before an election and 0 otherwise (I have experimented with different lengths and the results are not very sensitive to this choice). Allowing the model parameters to depend on the regime allows me to test the role of *opportunistic cycles* in both monetary and fiscal policy.

2. *Republican versus Democratic president.* S_t equals 1 if the president is a Democrat and 0 if Republican. I can, therefore, estimate the importance of *partisan cycles* in monetary and fiscal policy.

3. *Republican versus Democratic Federal Reserve chairman*: S_t equals 1 if the chairman is a Democrat and 0 if Republican.[7] This division may be more relevant than Equation (2) to test for the existence of *partisan cycles* in monetary policy.

4. *A preelection regime when the president and the Fed chairman share party affiliation versus a different party or postelection regime.* S_t equals 1 when the president and the chairman are both Democrats or both Republicans and we are in the seven quarters preceding a presidential election. These regimes may provide a better test of the *opportunistic cycles* hypothesis, particularly in monetary policy.

Using Equation (5) and the updated estimates in Equation (6), economic agents can form expectations as

$$\hat{E}_{t-1}Z_{t+1} = a_{t-1}(I + b_{t-1}) + b_{t-1}^2 Z_{t-1} + (I + b_{t-1})c_{t-1}B_{t-1} + d_{t-1}\hat{E}_{t-1}S_{t+1}, \quad (8)$$

where I denotes the identity matrix. I assume that economic agents can observe only macroeconomic variables up to $t-1$ when forming their expectations for $t+1$. In forming expectations about future output and inflation, they also need to forecast the future regime ($\hat{E}_{t-1}S_{t+1}$). When the regime is only a preelection or postelection regime, this is always trivial since election dates are known in advance in the United States, and therefore $\hat{E}_{t-1}S_{t+1} = S_{t+1}$. When the regimes, instead, depend on the winning party, the agents are assumed to forecast S_{t+1} in the following way:

$$\begin{cases} \hat{E}_{t-1}S_{t+1} = S_{t+1} & \text{if } q_t \neq 0 \\ \hat{E}_{t-1}S_{t+1} = \phi(S_t, x_{t-1}, x_{t-2}, x_{t-3}, x_{t-4}) & \text{if } q_t = 0 \end{cases}, \quad (9)$$

where $q_t \in \{0, \ldots, 15\}$ denotes the number of quarters that have passed since the presidential election date (a similar structure was assumed in Faust and Irons 1999). Therefore, when there is no upcoming election, S_{t+1} is perfectly known. Every 16 quarters, however, economic subjects need to forecast the outcome of elections. They do it using estimates from a probit model with past output gaps as regressors.[8] In this way, they can forecast

7. The partisanship of a chairman is measured by looking at the party of the president who first nominated him. Greenspan, for example, who was first nominated by a Republican president and then renominated by Clinton, a Democrat, is counted as Republican for the whole term. Whether other FOMC members are Republicans or Democrats may also matter, but this complication is not considered here under the assumption that the chairman plays a dominant role in decisions and that occasions in which the chairman is put in minority during FOMC votes are extremely rare (this is documented in Chappell, McGregor, and Vermilyea 2005).

8. They are able to forecast the correct winner in seven of the nine elections in the sample. It may be more realistic to allow agents to learn also about the probit coefficients. Because of the small number of elections in the sample, however, I assume that they know the values of the full-sample probit estimates, rather than letting them update the estimates over time. Notice that agents need only to forecast future election winners; they are assumed, instead, to be able to perfectly predict the party affiliation of the future Fed chairman, since this has always coincided in the sample with the affiliation of the president who has to decide the first nomination. The specification of the probit has virtually no effect on the estimation results.

FIGURE 1
Data Series

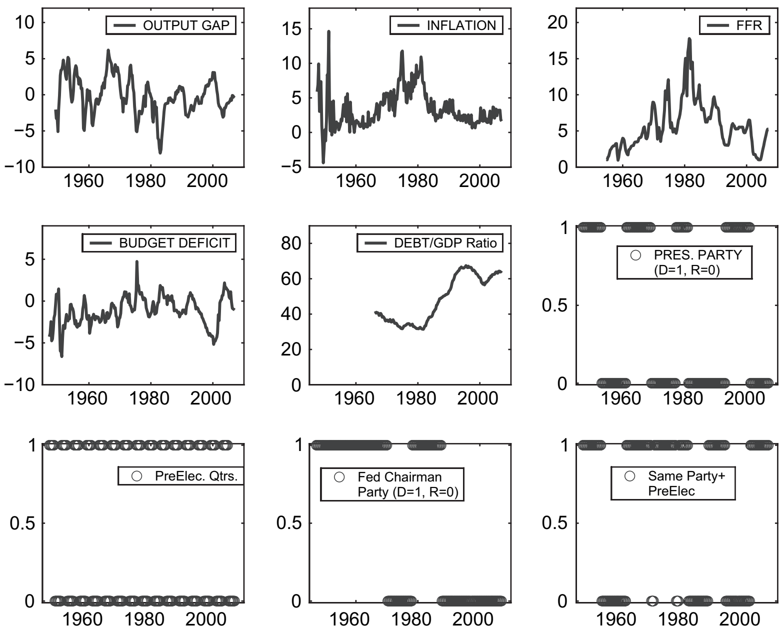


TABLE 1
Prior Distributions

		Prior Distribution			
Description	**Parameter**	**Distribution**	**Support**	**Prior Mean**	**95% Prior Probability Interval**
Inverse IES	σ^{-1}	Γ	$\mathbb{R}^+$	2	0.36–8.29
Discount factor	β	—	—	0.99	—
Slope Phillips curve	$\kappa(S_t)$	Γ	$\mathbb{R}^+$	0.25	0.03–0.69
Inflation target	$\pi^*(S_t)$	N	$\mathbb{R}$	3	1.04–4.96
MP inertia	$\rho_{\mathrm{MP}}(S_t)$	B	0,1	0.8	0.459–0.985
MP inflation feedback	$\chi_\pi(S_t)$	N	$\mathbb{R}$	1.5	1.01–1.99
MP output gap feedback	$\chi_x(S_t)$	N	$\mathbb{R}$	0.5	0.01–0.99
FP inertia	$\rho_{\mathrm{FP}}(S_t)$	B	0,1	0.8	0.459–0.985
Budget deficit target	$\tau_0(S_t)$	N	$\mathbb{R}$	0	−2.66 to 1.26
FP debt feedback	$\tau_B(S_t)$	N	$\mathbb{R}$	0	−0.49 to 0.49
FP output gap feedback	$\tau_x(S_t)$	N	$\mathbb{R}$	−0.5	−0.99 to −0.01
Standard demand shock	$\sigma_r(S_t)$	Γ^{-1}	$\mathbb{R}^+$	1	0.34–2.76
Standard supply shock	$\sigma_u(S_t)$	Γ^{-1}	$\mathbb{R}^+$	1	0.34–2.76
Standard MP shock	$\sigma_\varepsilon(S_t)$	Γ^{-1}	$\mathbb{R}^+$	1	0.34–2.76
Standard FP shock	$\sigma_\eta(S_t)$	Γ^{-1}	$\mathbb{R}^+$	1	0.34–2.76
Autoregressive coefficient r_t^N	ρ_r	B	0,1	0.8	0.459–0.985
Autoregressive coefficient u_t	ρ_u	B	0,1	0.8	0.459–0.985
Constant gain	$\bar{g}$	Γ	$\mathbb{R}^+$	0.031	0.003–0.087

Note: U, uniform; N, normal; Γ, gamma; B, beta; Γ^{-1}, inverse gamma.
IES, intertemporal elasticity of substitution; MP, monetary policy; FP, fiscal policy.

TABLE 2
Posterior Estimates: Preelection versus Postelection Regime ($S_t = 1$ if the economy is in the seven quarters before an election date, $S_t = 0$ otherwise)

		Preelection versus Postelection			
		Posterior Distribution			
		$S_t = 0$		$S_t = 1$	
Description	Parameter	Mean	95% PPI	Mean	95% PPI
Inverse IES	σ^{-1}	8.33	5.88–11.47	8.33	5.88–11.47
Discount factor	β	0.99	—	0.99	—
Slope Phillips curve	$\kappa(S_t)$	0.108	0.03–0.20	0.036	0.004–0.09
Inflation target	$\pi^*(S_t)$	2.54	0.62–4.42	3.16	1.21–5.16
MP inertia	$\rho_{MP}(S_t)$	0.877	0.80–0.94	0.97	0.93–0.995
MP inflation feedback	$\chi_\pi(S_t)$	1.479	1.06–1.92	1.335	0.84–1.82
MP output gap feedback	$\chi_x(S_t)$	0.35	−0.09 to 0.85	0.54	0.05–1.03
FP inertia	$\rho_{FP}(S_t)$	0.84	0.74–0.93	0.89	0.79–0.97
Budget deficit target	$\tau_0(S_t)$	−0.74	−1.52 to 0.05	−0.61	−1.48 to 0.33
FP debt feedback	$\tau_B(S_t)$	−0.0016	−0.04 to 0.04	−0.004	−0.044 to 0.038
FP output gap feedback	$\tau_x(S_t)$	−0.42	−0.7 to −0.17	−0.52	−0.89 to −0.17
Standard demand shock	$\sigma_r(S_t)$	0.62	0.54–0.63	0.56	0.47–0.66
Standard supply shock	$\sigma_u(S_t)$	0.87	0.77–1.01	0.82	0.69–0.99
Standard MP shock	$\sigma_\varepsilon(S_t)$	1.07	0.93–1.24	0.88	0.75–1.05
Standard FP shock	$\sigma_\eta(S_t)$	0.58	0.5–0.67	0.70	0.59–0.83
Autoregressive coefficient r_t^N	ρ_r	0.81	0.72–0.91	0.81	0.72–0.91
Autoregressive coefficient u_t	ρ_u	0.47	0.33–0.71	0.47	0.33–0.71
Constant gain	$\bar{g}$	0.058	0.055–0.061	0.058	0.055–0.061

Note: The table displays the posterior mean estimates across regimes and the 95% posterior probability intervals.

the probability that the incumbent will win the elections given the past relation between election outcomes and macroeconomic conditions.

Therefore, the formation of expectations, as characterized in Equation (8), may differ according to the political cycle. Agents may learn from experience whether political variables matter or not.

III. BAYESIAN ESTIMATION

I estimate the model by likelihood-based Bayesian methods.[9] The Bayesian approach facilitates the estimation of the learning parameters jointly with the structural parameters of the economy. In particular, here I estimate the constant gain coefficient *jointly* with the parameters describing preferences and the monetary and fiscal policy rule parameters.[10]

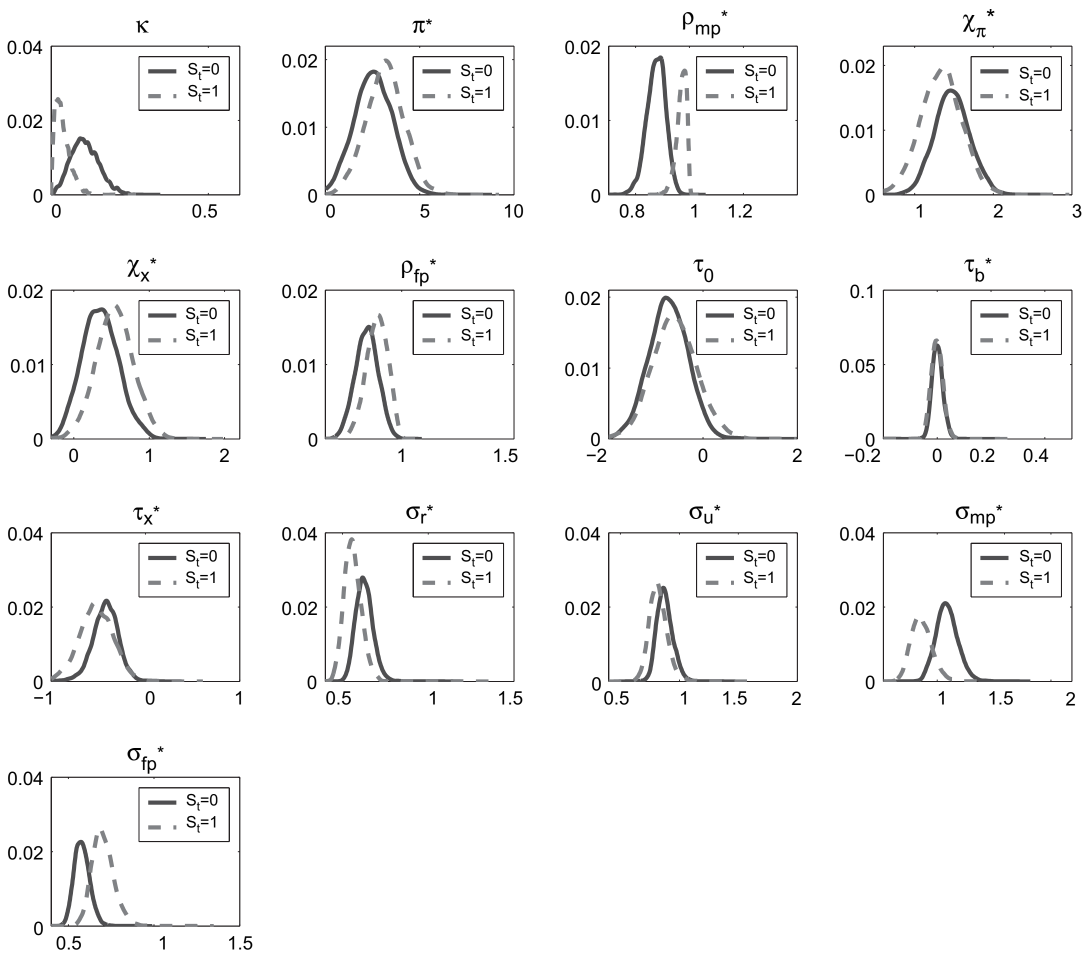
Milani (2007) shows that learning improves the empirical fit of a similar New Keynesian model compared with the rational expectations case and it allows researchers to avoid including some of the so-called "mechanical" sources of persistence that are needed to make the model match the sluggishness of macroeconomic variables.

I use quarterly U.S. data on inflation, output gap, the federal funds rate, the budget balance, and the debt to GDP ratio. Inflation is calculated as the log change in the GDP implicit price deflator converted at annual rates, and the output gap as the log deviation

9. See An and Schorfheide (2007) for a review of the Bayesian estimation of DSGE models under rational expectations.

10. The estimation strategy follows Milani (2007). Estimating also the constant gain coefficient is crucial since the results are sometimes dependent on the chosen gain. For instance, Milani (2004) shows how the estimates of the backward-looking term in inflation vary over the possible gain values.

FIGURE 2
Posterior Distributions: Preelection versus Postelection Regime



of real GDP from potential GDP (using the series computed by the Congressional Budget Office). The federal funds rate represents the monetary policy instrument, while the fiscal policy instrument is assumed to be the budget deficit, which is computed as federal government current expenditures minus interest payments and minus federal government current receipts as a fraction of GDP. B_t in the model is given by the debt to GDP ratio. The data are shown in Figure 1. All data series were downloaded from FRED, the economic database of the Federal Reserve of St. Louis, and are demeaned before the estimation.

The model coefficients are collected in the vector θ:

$$\theta(S_t)=\{\sigma,\pi^*(S_t),\kappa(S_t),\rho_{MP}(S_t),\chi_\pi(S_t),\chi_x(S_t),\rho_{FP}(S_t),\tau_0(S_t),\tau_B(S_t),\tau_x(S_t),Q(S_t),\bar{\mathbf{g}}\}, \tag{10}$$

where $Q(S_t)$ groups the regime-dependent standard deviations of the supply, demand, and policy shocks. The parameters depend on the political regime:

$$\theta(S_t) = \theta_0(1 - S_t) + \theta_1(S_t), \tag{11}$$

where S_t corresponds to one of the regimes discussed in the previous section.

The learning process in Equations (6) and (7) needs to be initialized. The initial

TABLE 3
Posterior Estimates: Partisan Cycles, Republican vs. Democratic President ($S_t = 1$ if the president is a Democrat, $S_t = 0$ if a Republican)

		President's Party			
		Posterior Distribution			
		$S_t = 0$		$S_t = 1$	
Description	Parameter	Mean	95% PPI	Mean	95% PPI
Inverse IES	σ^{-1}	7.65	5.42–10.64	7.65	5.42–10.64
Discount factor	β	0.99	—	0.99	—
Slope Phillips curve	$\kappa(S_t)$	0.062	0.01–0.13	0.054	0.008–0.13
Inflation target	$\pi^*(S_t)$	2.98	1.04–4.87	3.01	1.01–4.93
MP inertia	$\rho_{MP}(S_t)$	0.906	0.85–0.96	0.837	0.69–0.95
MP inflation feedback	$\chi_\pi(S_t)$	1.11	0.65–1.60	1.37	0.96–1.84
MP output gap feedback	$\chi_x(S_t)$	0.59	0.19–1.02	0.19	−0.19 to 0.73
FP inertia	$\rho_{FP}(S_t)$	0.83	0.72–0.93	0.97	0.93–0.995
Budget deficit target	$\tau_0(S_t)$	−0.35	−1.27 to 0.56	−0.72	−1.72 to 0.26
FP debt feedback	$\tau_B(S_t)$	0.014	−0.02 to 0.05	0.03	−0.01 to 0.07
FP output gap feedback	$\tau_x(S_t)$	−0.357	−0.68 to −0.07	−0.50	−0.92 to −0.05
Standard demand shock	$\sigma_r(S_t)$	0.65	0.57–0.74	0.89	0.73–1.07
Standard supply shock	$\sigma_u(S_t)$	0.83	0.72–0.95	0.98	0.82–1.19
Standard MP shock	$\sigma_\varepsilon(S_t)$	0.96	0.84–1.11	1.02	0.85–1.23
Standard FP shock	$\sigma_\eta(S_t)$	0.73	0.64–0.84	0.40	0.34–0.49
Autoregressive coefficient r_t^N	ρ_r	0.865	0.79–0.94	0.865	0.79–0.94
Autoregressive coefficient u_t	ρ_u	0.22	0.11–0.35	0.22	0.11–0.35
Constant gain	$\bar{g}$	0.0508	0.048–0.053	0.0508	0.048–0.053

Note: The table displays the posterior mean estimates across regimes and the 95% posterior probability intervals.

beliefs $\hat{\phi}_0$ and R_0 are derived from estimating the PLM (Equation 5) on presample data (using observations from 1954:III to 1965:IV).

The model is then estimated using data from 1966:I to 2006:IV. The likelihood is computed for the four endogenous variables: inflation, output gap, federal funds rate, and budget deficit.

I use the Metropolis-Hastings algorithm to generate draws from the posterior distribution. At each iteration, the likelihood is evaluated using the Kalman filter. I consider 300,000 draws, discarding an initial burn-in of 75,000 draws.

Table 1 describes the priors. I fix β equal to 0.99. I assume a gamma distribution with mean 2 for σ^{-1}. The slope coefficient of the Phillips curve, κ, follows a normal distribution with mean 0.2 and standard deviation 0.1. The monetary policy rule coefficients also follow normal distributions with mean 1.5 and standard deviation 0.25 for the inflation feedback coefficients, and mean 0.5 and standard deviation 0.25 for the output feedback coefficients. I choose inverse gamma distributions for the standard deviations of the shocks and beta distributions for the autoregressive coefficients. Finally, the constant gain coefficient follows a gamma distribution with prior mean 0.031 and prior standard deviation 0.022.

I will emphasize in describing the results the cases in which the likelihood seems flat for some of the parameters and those for which the priors appear to have a strong influence on the shape of the posterior.[11]

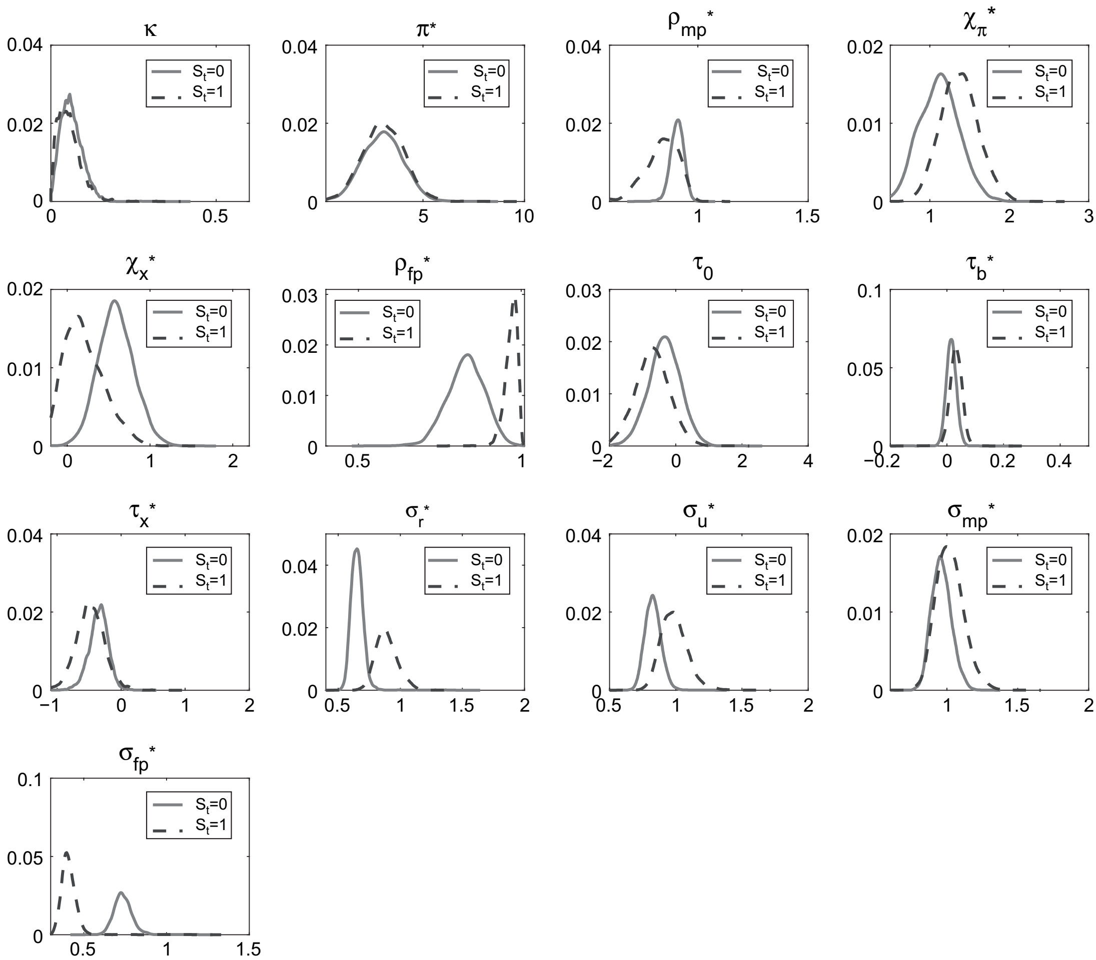
IV. RESULTS

A. Opportunistic Cycles in Fiscal and Monetary Policies

I start by testing for the existence of opportunistic cycles. These can manifest themselves

11. Under the Bayesian approach, the potential non-identification of some of the parameters does not pose particular difficulties in the estimation (e.g., Poirier 1998). I will therefore estimate all the parameters and let the data speak about their identification.

FIGURE 3
Posterior Distributions: Regime Given by Presidential Party



as an overstimulation of the economy during the quarters preceding an election.

Table 2 reports the estimation results, while Figure 2 compares the posterior distributions for the estimated parameters across regimes.

The monetary policy coefficients seem to depend on the political regime. During preelection quarters, the posterior distribution of the interest rate smoothing coefficient ρ_{MP} clearly shifts to the right (the estimated posterior mean switches from 0.877 to 0.97); the probability that the value of ρ_{MP} under $S_t = 0$ is smaller than under $S_t = 1$, that is, $P_r(\rho_{MP}(S_t = 0) < \rho_{MP}(S_t = 1)|\, Y^T)$ is above 0.99. This indicates that policy changes are rare before elections. The monetary policymaker prefers to keep rates fixed and to delay decisions until elections are over. This result supports the notion of an independent Fed that tries not to affect the political race and that wants to avoid being perceived as partisan. Some evidence, albeit moderate, of opportunistic cycles appears by looking at the other monetary policy coefficients: the reaction to inflation declines before elections (the posterior mean goes from 1.479 to 1.335), while the inflation target and the reaction to output become higher (the mean target increases from 2.54 to 3.16, the gap coefficient from .35 to .54). For these coefficients, the probabilities $P_r(\chi_\pi(S_t = 0) < \chi_\pi(S_t = 1)|\, Y^T)$ and $P_r(\chi_X(S_t = 0) < \chi_X(S_t = 1)|\, Y^T)$ equal .673 and .725.

TABLE 4
Posterior Estimates: Partisan Affiliation of Federal Reserve's Chairman ($S_t = 1$ if the chairman is Democrat, $S_t = 0$ if the chairman is Republican)

		Fed Chairman's Party			
		Posterior Distribution			
		$S_t = 0$		$S_t = 1$	
Description	**Parameter**	**Mean**	**95% PPI**	**Mean**	**95% PPI**
Inverse IES	σ^{-1}	5.64	3.75–8.25	5.64	3.75–8.25
Discount factor	β	0.99	—	0.99	—
Slope Phillips curve	$\kappa(S_t)$	0.062	0.01–0.15	0.069	0.01–0.17
Inflation target	$\pi^*(S_t)$	2.98	0.78–4.92	2.77	0.85–4.58
MP inertia	$\rho_{MP}(S_t)$	0.904	0.78–0.99	0.834	0.70–0.94
MP inflation feedback	$\chi_\pi(S_t)$	0.91	0.32–1.68	1.47	1.01–1.92
MP output gap feedback	$\chi_x(S_t)$	0.71	0.24–1.13	0.12	−0.34 to 1.65
FP inertia	ρ_{FP}	0.90	0.83–0.96	0.90	0.83–0.96
Budget deficit target	τ_0	−0.82	−1.78 to 0.15	−0.82	−1.78 to 0.15
FP debt feedback	τ_B	0.035	−0.005 to 0.074	0.035	−0.005 to 0.074
FP output gap feedback	τ_x	−0.47	−0.79 to −0.18	−0.47	−0.79 to −0.18
Standard demand shock	$\sigma_r(S_t)$	0.59	0.51–0.67	0.90	0.74–1.10
Standard supply shock	$\sigma_u(S_t)$	0.83	0.73–0.94	1.00	0.83–1.24
Standard MP shock	$\sigma_\varepsilon(S_t)$	0.75	0.65–0.86	1.3	1.07–1.57
Standard FP shock	σ_η	0.64	0.57–0.71	0.64	0.57–0.71
Autoregressive coefficient r_t^N	ρ_r	0.85	0.75–0.931	0.85	0.75–0.93
Autoregressive coefficient u_t	ρ_u	0.42	0.28–0.57	0.42	0.28–0.57
Constant gain	$\bar{g}$	0.0517	0.048–0.054	0.0517	0.048–0.054

Note: The table displays the posterior mean estimates across regimes and the 95% posterior probability intervals.

Fiscal policy is likewise more inertial before elections (the posterior mean for ρ_{FP} is 0.89 in preelection quarters, 0.84 otherwise) and the target deficit higher before elections. The standard deviations of both monetary and fiscal policy surprises are strongly affected by the proximity of an election: fiscal policy deviations from the rule are considerably more common and sizeable before elections (the posterior distribution shifts to the right), while monetary policy deviations are less so (since, as seen, monetary policy decisions are unlikely in this regime).

Finally, another parameter that is crucially affected by the proximity to an election is κ, which denotes the slope of the Phillips curve and is an inverse function of the degree of price rigidity in the economy. The distribution of κ tilts toward 0 when $S_t = 1$, signaling that firms tend to have higher probability to keep prices fixed in the quarters before elections (for κ, the probability $P_r(\kappa(S_t = 0) < \kappa(S_t = 1) | Y^T)$ equals 0.95). From the estimated κ, we can derive the implied Calvo parameter α, such that $(1 - \alpha)$ denotes the probability of firms' changing prices in a given quarter (or equivalently, the fraction of firms that change prices in a given quarter). $(1 - \alpha)$ goes from 0.28 in after-election quarters to 0.17 right before elections.[12] Therefore, firms prefer to delay the price-setting decision until the electoral uncertainty is resolved.[13]

12. In the presented model, κ is a function of primitive parameters, $\kappa \equiv \frac{(1-\alpha)(1-\alpha\beta)}{\alpha}\frac{(\omega+\sigma^{-1})}{1+\omega\theta}$, where α is the Calvo parameter, ω is the elasticity of marginal costs to changes in income, σ is the inverse of the intertemporal elasticity of substitution, and θ is the elasticity of substitution between differentiated goods. The calibration to calculate the implied α here assumes standard values: $\omega = 0.8$, $\sigma = 1$, and $\theta = 7$.

13. Garfinkel and Glazer (1994) looked at the distribution of wage contracts in election and nonelection years and found that union and firms prefer to negotiate in the quarters immediately after the election rather than those immediately before. This paper's results similarly suggest that firms rationally choose to postpone their decision until after the election outcome is known.

TABLE 5

Posterior Estimates: Regime is $S_t = 1$ if the president and the Fed's chairman share party affiliation in preelection quarters, $S_t = 0$ if they are from different parties or in a nonelection quarter.

		Same Party/Preelection			
		Posterior Distribution			
		$S_t = 0$		$S_t = 1$	
Description	**Parameter**	**Mean**	**95% PPI**	**Mean**	**95% PPI**
Inverse IES	σ^{-1}	7.517	5.37–10.29	7.517	5.37–10.29
Discount factor	β	0.99	—	0.99	—
Slope Phillips curve	$\kappa(S_t)$	0.074	0.016–0.16	0.042	0.005–0.116
Inflation target	$\pi^*(S_t)$	2.49	0.57–4.45	3.20	1.13–5.20
MP inertia	$\rho_{MP}(S_t)$	0.89	0.82–0.94	0.95	0.87–0.99
MP inflation feedback	$\chi_\pi(S_t)$	1.47	1.06–1.93	1.29	0.68–1.83
MP output gap feedback	$\chi_x(S_t)$	0.33	−0.08 to 0.79	0.56	0.09–1.06
FP inertia	ρ_{FP}	0.88	0.81–0.98	0.88	0.81–0.98
Budget deficit target	τ_0	−0.65	−1.64 to 0.33	−0.65	−1.64 to 0.33
FP debt feedback	τ_B	0.017	−0.02 to 0.06	0.017	−0.02 to 0.06
FP output gap feedback	τ_x	−0.46	−0.76 to −0.2	−0.46	−0.76 to −0.2
Standard demand shock	$\sigma_r(S_t)$	0.62	0.54–0.71	0.57	0.47–0.79
Standard supply shock	$\sigma_u(S_t)$	0.87	0.76–0.99	0.89	0.73–1.11
Standard MP shock	$\sigma_\varepsilon(S_t)$	0.99	0.87–1.13	1.03	0.85–1.26
Standard FP shock	σ_η	0.63	0.57–0.71	0.63	0.57–0.71
Autoregressive coefficient r_t^N	ρ_r	0.84	0.76–0.92	0.84	0.76–0.92
Autoregressive coefficient u_t	ρ_u	0.4	0.25–0.55	0.4	0.25–0.55
Constant gain	$\bar{g}$	0.0579	0.055–0.061	0.0579	0.055–0.061

Note: The table displays the posterior mean estimates across regimes and the 95% posterior probability intervals.

B. Partisan Cycles in Fiscal and Monetary Policies

Economic parameters and policies may systematically differ depending on whether a Republican or Democratic president is in the White House. Table 3 and Figure 3 provide evidence on this hypothesis. Again the monetary and fiscal policy parameters differ across political regimes, although in a way that seems to contradict the theory. Monetary policy is more inertial during Republican terms; the feedback coefficient to inflation is higher and the feedback to the output gap lower under Democrats than under Republicans.[14] This is the opposite of what is usually theorized by PBC studies (and of what was found by Fang and Jeliazkov 2007). The posterior distributions of monetary policy parameters during Republican presidencies are also such that a nontrivial probability mass refers to policies that do not respect the Taylor principle.[15] Fiscal policy also displays a higher target for the budget deficit and a lower reaction to changes in the output gap under Republican presidents than under Democrats (fiscal policy with Democratic presidents is considerably inertial, instead).[16] Turning to other parameters, the demand and supply shocks that

14. The data do not appear very informative, in this case, about the value of the inflation target: the posterior distributions are very close to the priors.

15. The Taylor principle in this model is given by the following condition (Woodford 2003): $\chi_\pi + (\frac{1-\beta}{\kappa})\chi_x > 1$.

16. The results could, of course, depend on the smaller variation in the regime variable when partisan cycles, rather than opportunistic cycles, are analyzed. Therefore, episodes such as Volcker's fight against inflation (during Carter's term) and Burns's accommodating monetary policy in the Nixon years can significantly affect the monetary policy results, as, in the same way, the budget surplus during Clinton's presidency along with the deficits during Bush and Reagan's presidencies may greatly influence the fiscal policy conclusions.

TABLE 6
Posterior Estimates: Post-1985 Sample, Preelection versus Postelection Regime

		Preelection versus Postelection			
		Posterior Distribution			
		$S_t = 0$		$S_t = 1$	
Description	**Parameter**	**Mean**	**95% PPI**	**Mean**	**95% PPI**
Inverse IES	σ^{-1}	6.22	4.12–9.19	6.22	4.12–9.19
Discount factor	β	0.99	—	0.99	—
Slope Phillips curve	$\kappa(S_t)$	0.127	0.02–0.31	0.096	0.014–0.24
Inflation target	$\pi^*(S_t)$	2.44	0.5–4.31	2.57	0.65–4.47
MP inertia	$\rho_{MP}(S_t)$	0.88	0.79–0.95	0.92	0.83–0.99
MP inflation feedback	$\chi_\pi(S_t)$	1.35	0.88–1.81	1.31	0.88–1.81
MP output gap feedback	$\chi_x(S_t)$	0.44	0.02–0.91	0.84	0.27–1.34
FP inertia	$\rho_{FP}(S_t)$	0.77	0.61–0.92	0.88	0.73–0.98
Budget deficit target	$\tau_0(S_t)$	−0.88	−1.71 to −0.17	−1.18	−2.15 to −0.23
FP debt feedback	$\tau_B(S_t)$	−0.01	−0.08 to 0.06	0.015	−0.07 to 0.1
FP output gap feedback	$\tau_x(S_t)$	−0.816	−1.25 to −0.3	−0.822	−1.29 to −0.24
Standard demand shock	$\sigma_r(S_t)$	0.47	0.37–0.58	0.43	0.33–0.54
Standard supply shock	$\sigma_u(S_t)$	0.67	0.55–0.81	0.93	0.73–1.19
Standard MP shock	$\sigma_\varepsilon(S_t)$	0.48	0.39–0.58	0.44	0.34–0.56
Standard FP shock	$\sigma_\eta(S_t)$	0.53	0.43–0.66	0.45	0.35–0.58
Autoregressive coefficient r_t^N	ρ_r	0.8	0.66–0.92	0.8	0.66–0.92
Autoregressive coefficient u_t	ρ_u	0.77	0.64–0.9	0.77	0.64–0.9
Constant gain	$\bar{g}$	0.061	0.055–0.067	0.061	0.055–0.067

Note: The table displays the posterior mean estimates across regimes and the 95% posterior probability intervals.

have hit the economy had higher standard deviation during Democratic terms.

C. Partisan Cycles Using Fed Chairman's Affiliation

Since the Federal Reserve has full independence in setting monetary policy, the party's affiliation or sympathy of the Fed chairman could, in principle, be more relevant than the president's party to test for partisan differences in monetary policy.

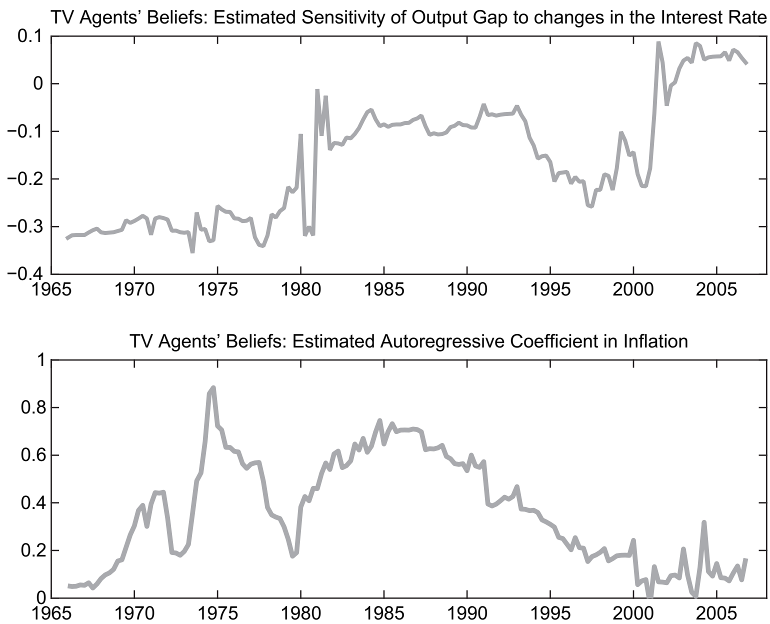
The estimation results (shown in Table 4), however, mirror those in the previous section. Fed chairmen that were appointed by Democratic presidents have on average reacted more aggressively toward inflation and worried less about output fluctuations compared with those appointed by Republican presidents. It should be emphasized, however, that only a few changes in the relevant political variable are available in the sample and, therefore, the results are likely to depend a lot on Arthur Burns's passive monetary policy (which is counted as Republican) and Paul Volcker's aggressive policy during the disinflation (which affects the results for Democrats).

D. Opportunistic Cycles in Monetary Policy When the President and the Fed Chairman Share Party Affiliation

It may be realistic to argue that opportunistic cycles are present only when the Fed chairman shares political party with the president. Abrams and Iossifov (2006), in fact, find that this is the only case in which political cycles matter in their estimated Taylor rules. Along the same lines, Chappell, McGregor, and Vermilyea (2005), analyzing Federal Open Market Committee (FOMC) voting records, show that FOMC members are more likely to support a preelection expansionary monetary policy when they were appointed by a president of the incumbent party.

The evidence, presented in Table 5, is similar to that on opportunistic cycles. Monetary policy is especially inertial before elections even

FIGURE 4
Selected Beliefs



when the president and the Fed chairman have similar political sympathies. There is evidence of a lower reaction toward inflation, a higher inflation target, and a larger reaction to changes in the output gap before elections.

E. Beliefs

Economic agents were allowed to update their beliefs over time. Figure 4 shows two selected parameters that appear to have

FIGURE 5
Selected Beliefs (political variables)

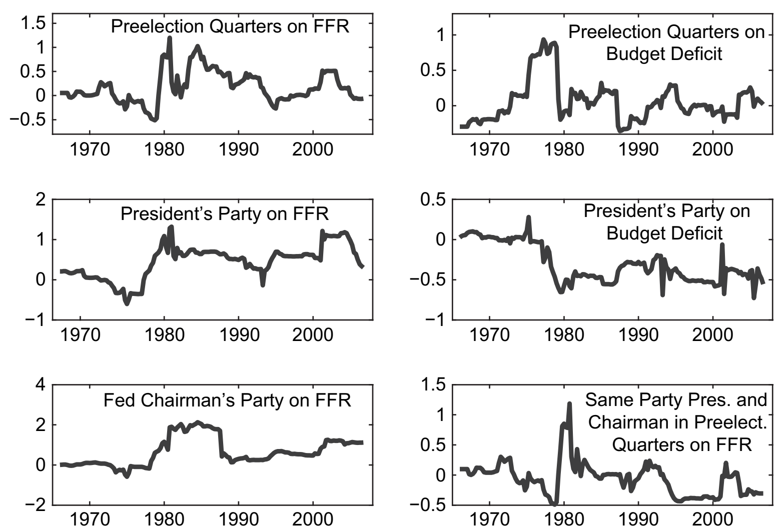
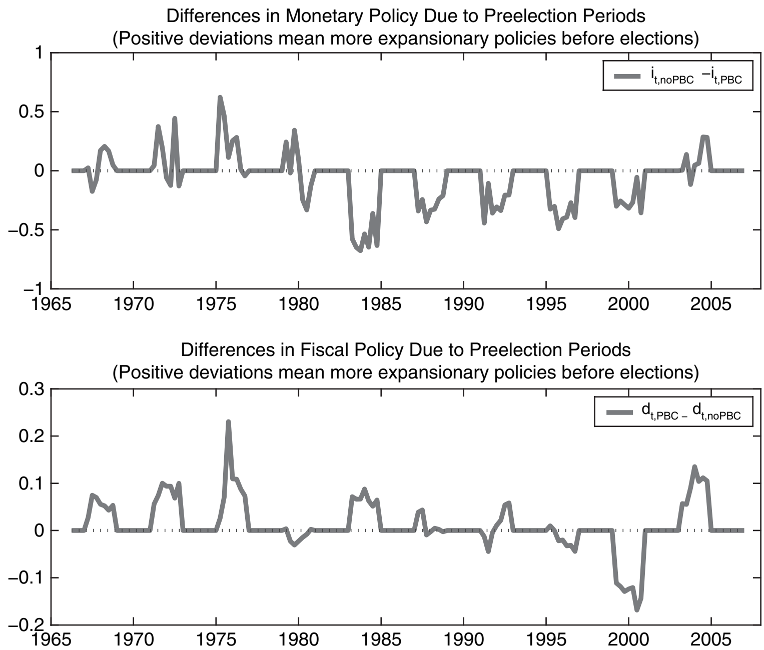


FIGURE 6

Differences in Monetary and Fiscal Policies in Preelection Periods. (Figure 6 compares interest rates and budget deficits implied by policy rules with and without political effects)



considerably changed over the sample. One is the perceived sensitivity of the output gap to changes in the interest rate. Agents' beliefs evolve over the sample to reflect the perception of declining sensitivity. The second is the autoregressive coefficient in the PLM for inflation, which indicates changes in the perceived persistence of this variable. The estimated coefficient starts at values close to 0, but it considerably increases from the late 1960s to the early 1970s and later in the 1980s, to decline again to low values at the end of the sample. Adding learning to the model admits this important time variation in beliefs, which would be ruled out under rational expectations.

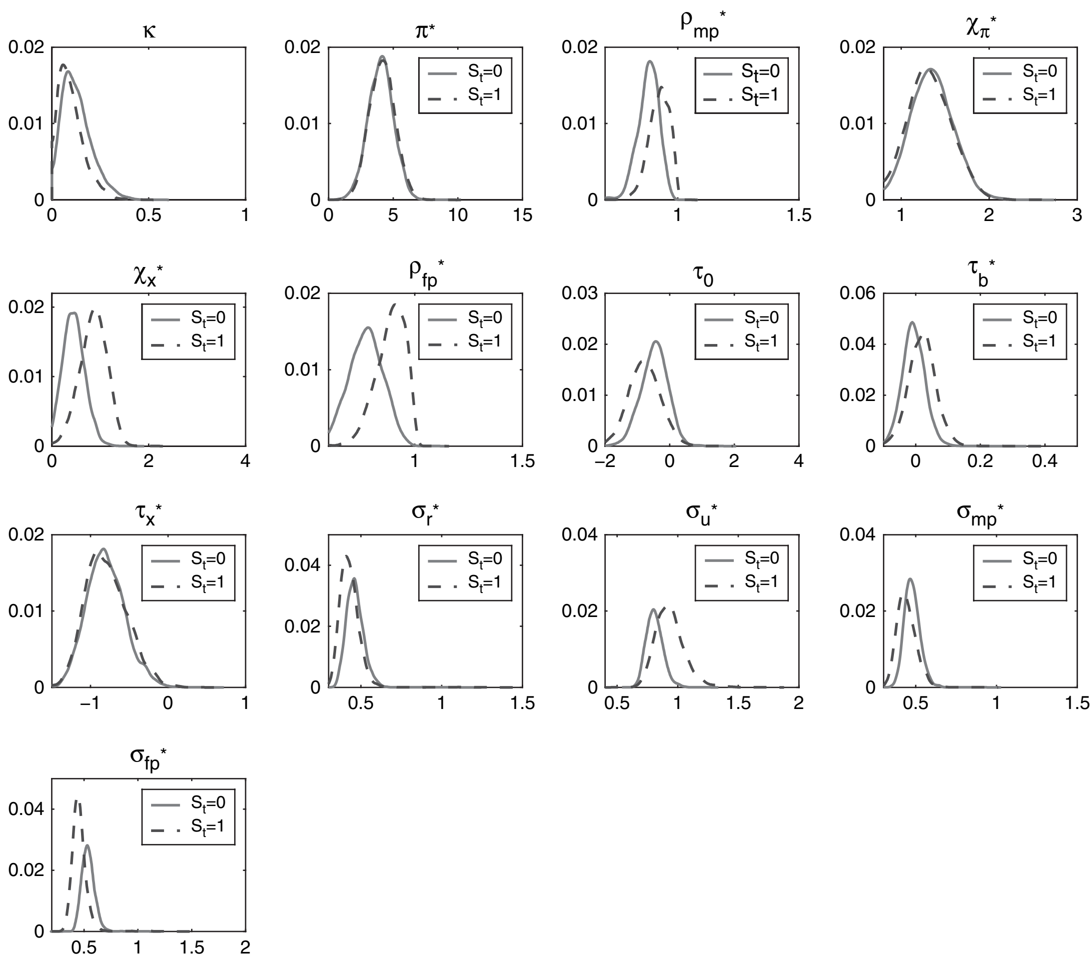
Figure 5, instead, shows the evolving agents' beliefs about the importance of the different political variables. For example, looking at the first row in the graph, it can be seen that agents adjust their beliefs in the 1970s as they are learning that policy rates are lower and the budget deficit higher before elections. During Carter's term, though, these beliefs are quickly revised. In a way that is consistent with the model estimates, agents perceive more contractionary monetary and fiscal policies during Democratic terms.

F. Model Comparison

To assess which model provides the best fit of the data, I compare the models' marginal likelihoods using Geweke's modified harmonic mean approximation. The marginal likelihoods favor the opportunistic cycles model (the log marginal likelihood equals −785.67). The opportunistic cycle when the president and the Fed chairman come from the same party ranks second (−790.83). Of course, partisan cycles may also be present—I simply find that, as a single explanation, they fit less well than opportunistic cycles—but the limited data do not allow including more than one regime at a time in the model. Partisan cycles may also suffer from a lower variability of the regime over the sample.[17]

17. Their log marginal likelihoods equal −794.22 for the model with partisan Fed chairmen and −818.64 for the one that uses a regime based on the president's party.

FIGURE 7
Posterior Distributions: Post-1985 Sample, Preelection versus Postelection Regime



Allowing coefficients to depend on the political regime can improve the model fit. Although the traditional New Keynesian model with no political variables fits better than the model in which almost all coefficients depend on the political regime (the log marginal likelihood equals −777.62 vs. −785.67), it is outperformed by more parsimonious models that assume that politics affects only a subset of coefficients, as for example the one in which only the monetary and fiscal policy inertia coefficients, $\rho_{MP}(S_t)$ and $\rho_{FP}(S_t)$, and the standard deviations of policy shocks, $\sigma_{\varepsilon}(S_t)$ and $\sigma_{\eta}(S_t)$, are regime dependent (the log marginal likelihood in this case, in fact, increases to −776.93).

G. What Would Monetary and Fiscal Policy Have Been in the Absence of Political Effects?

Under opportunistic cycles, which is the case that is most supported by the data, the monetary and fiscal policy rules differ in preelection versus postelection quarters. But how large are the differences in practice?

Figure 6 displays the deviations in the monetary and fiscal policy instruments that are found by comparing the implied Federal Funds rate and budget deficit obtained by using the same policy rules that are estimated for nonelection quarters for the whole sample with those implied by rules that differ, as estimated, in preelection quarters. The graph shows that monetary policy has typically been more expansionary before elections in the pre-1979 sample, but after Volcker, the increased inertia seems to have led the central bank to be, instead, more contractionary, except in the later part of the sample. Fiscal policy has been consistently more expansionary before elections, with the main exception being during the Clinton years.

H. Post-1985 Sample

I repeat the estimation on data starting from 1985:I. Monetary policy is still considerably more inertial before elections, and so is fiscal policy (Table 6 and Figure 7). There is no evidence that monetary policy reacts differently to inflation in the proximity of elections: the inflation target and inflation feedback coefficient are characterized by posterior distributions that substantially overlap. The reaction to the output gap is slightly larger before elections.

V. CONCLUSIONS

This paper has tested whether the coefficients of a baseline New Keynesian model depend on political variables. The paper has provided empirical evidence on PBC theories, testing different versions of both opportunistic and partisan cycle models.

The results provide some support for the existence of changes in the economic structure and policies that are due to political variables. The best-fitting model is one that allows policy and structural parameters to depend on whether the economy is or is not in preelection quarters, as in opportunistic cycles' models. The results, however, are not entirely consistent with opportunistic cycles as they are usually interpreted.

The major difference in preelection quarters is that monetary policy becomes considerably more inertial: the Fed seems to delay changes in policy until after the election. This is consistent with the view of an independent Fed, which does not want to be seen as an active player in the presidential race. Some evidence, however, exists that both monetary (before Volcker) and fiscal policies have been somewhat less concerned about inflation and more about output before elections.

As a future avenue for research, it may be worthwhile testing for electoral effects in fiscal policy at a lower level of aggregation. In this paper, the fiscal policy instrument has been considered to be the budget deficit. But future work may fruitfully test whether political variables matter more for government spending or for average tax rates, and, regarding spending, for which categories of government spending in particular. Likewise, future research should investigate whether the change in policies before elections displays asymmetries across recessions and expansions or periods of rising versus falling inflation.

APPENDIX: METROPOLIS-HASTINGS ALGORITHM

The information about the parameters is summarized by the posterior distribution, obtained by Bayes theorem

$$p(\theta|Y^T) = \frac{p(Y^T|\theta)p(\theta),}{p(Y^T)} \tag{12}$$

where $p(Y^T|\theta)$ is the likelihood function, $p(\theta)$ the prior for the parameters, and $Y^T = [y_1,\ldots,y_T]'$ collects the data histories.

To generate draws from the posterior distribution $p(\theta|Y^T)$, I use the Metropolis algorithm. The procedure works as follows.

1. Start from an arbitrary value for the parameter vector θ_0. Set $j = 1$.
2. Evaluate $p(Y^T|\theta_0)p(\theta_0)$.
3. Generate $\theta_j^* = \theta_{j-1} + \varepsilon$, where θ_j^* is the proposal draw and $\varepsilon \sim N(0, c\Sigma_\varepsilon)$. c is a scale factor that is usually adjusted to keep the acceptance ratio of the MH algorithm at an optimal rate (25–50%). The acceptance rates in the estimation are all between 35 and 40%.
4. Generate u from a *Uniform*[0, 1].
5. Set

$$\begin{cases} \theta_j = \theta_j^* & \text{if } u \leq \alpha(\theta_{j-1}, \theta_j^*) = \min\left\{\frac{p(Y^T|\theta_j^*)p(\theta_j^*)}{p(Y^T|\theta_{j-1})p(\theta_{j-1})}, 1\right\} \\ \theta_j = \theta_{j-1} & \text{if } u > \alpha(\theta_{j-1}, \theta_j^*). \end{cases}$$

6. Repeat for $j + 1$ from 2 until $j = D$ (D = total number of draws).

Convergence

To assess convergence of the Markov chain Monte Carlo simulation, I performed various checks, besides looking at the trace plots of the draws. I have considered the convergence tests proposed by Geweke (1992) and Raftery and Lewis (1995). Raftery and Lewis's (1995) diagnostics suggests a minimum number of total draws, a thinning parameter, and a minimum burn-in, by computing the autocorrelation of the draws. Geweke's test instead compares the partial means $\hat{\mu}_1 = \frac{1}{D_1}\sum_{j=1}^{D_1} g(\theta_j)$ and $\hat{\mu}_2 = \frac{1}{D_2}\sum_{j=D_1+1}^{D_2} g(\theta_j)$, obtained from the first D_1 and last D_2 simulation draws. The null hypothesis of equal means between the two samples of draws can be tested knowing that, for $D \rightarrow \infty$, the quantity $(\hat{\mu}_1 - \hat{\mu}_2)/(\frac{\hat{S}_g^1(0)}{D_1} + \frac{\hat{S}_g^2(0)}{D_2})^{1/2} \Rightarrow N(0, 1)$. I also look at the plots derived from the test proposed by Yu and Mykland (1994), based on CUMSUM plots of the draws.[18] Finally, I ascertain convergence by looking at the recursive mean plots and bivariate scatter plots among the parameters to evaluate the mixing of the chain.

REFERENCES

Abrams, B. A. "How Richard Nixon Pressured Arthur Burns: Evidence From the Nixon Tapes." *Journal of Economic Perspectives*, 20(4), 2006, 177–88.

Abrams B. A., and P. Iossifov. "Does the Fed Contribute to the Political Business Cycle?" *Public Choice*, 129, 2006, 249–62.

Adam, K. "Learning to Forecast and Cyclical Behavior of Output and Inflation." *Macroeconomic Dynamics*, 9, 2005, 1–27.

Alesina, A. "Macroeconomics and Politics," in *NBER Macroeconomics Annual,* edited by Stanley Fischer. Cambridge, MA: MIT Press, 1988, 17–52.

Alesina, A., G. Cohen, and N. Roubini. "Macroeconomic Policy and Elections in OECD Democracies." *Economics and Politics*, 4, 1992, 1–30.

Alesina, A., J. Londregan, and H. Rosenthal. "A Model of the Political Economy of the United States." *American Political Science Review*, 87, 1993, 12–33.

Alesina, A., N. Roubini, and G. Cohen. *Political Cycles and the Macroeconomy*. Cambridge, MA: MIT Press, 1997.

An, S., and F. Schorfheide. "Bayesian Analysis of DSGE Models." *Econometric Reviews*, 26, 2007, 113–72.

Beck, N. "Elections and the Fed: Is There a Political Monetary Cycle?" *American Journal of Political Science*, 31, 1987, 194–216.

Blomberg, B. S., and G. D. Hess. "Is the Political Business Cycle for Real?" *Journal of Public Economics*, 87, 2003, 1091–121.

Chappell, E. W., R. R. McGregor, and T. Vermilyea. *Committee Decisions on Monetary Policy: Evidence from Historical Records of the Federal Open Market Committee*. Cambridge, MA: MIT Press, 2005.

Drazen, A. *Political Economy in Macroeconomics*. Princeton, NJ: Princeton University Press, 2000a.

Drazen, A. "The Political Business Cycle after 25 Years," in *NBER Macroeconomics Annual*, edited by Ben S. Bernanke and Kenneth Rogoff. Cambridge, MA: MIT Press. 2000b, 75–117.

Evans, G. W., and S. Honkapohja. *Learning and Expectations in Macroeconomics*. Princeton, NJ: Princeton University Press, 2001.

Fair, R. "The Effect of Economic Events on Votes for President." *Review of Economics and Statistics*, 60, 1978, 159–72.

Fang, A., and I. Jeliazkov. Politics and Macroeconomic Performance in the United States: Cycles and Long-Run Outcomes. Manuscript, University of California, Irvine, 2007.

Faust, J., and J. Irons. "Money, Politics, and the Post-War Business Cycle." *Journal of Monetary Economics*, 43, 1999, 61–89.

18. They propose the statistics $CS_t = (\frac{1}{t}\sum_{d=1}^{t} \theta^d) - \mu_\theta / \sigma_\theta$, where μ_θ and σ_θ are the empirical mean and standard deviations of the *D* draws of the Markov chain. The plot of CS_t converges to 0 as *t* increases.

Favero, C. A., and T. Monacelli. *Monetary-Fiscal Mix and Inflation Performance: Evidence from the U.S*. Mimeo, IGIER–Bocconi University, 2005.

Garfinkel, M., and A. Glazer. "Does Electoral Uncertainty Cause Economic Fluctuations?" *American Economic Review*, 84, 1994, 169–73.

Grier, K. B. "On the Existence of a Political Monetary Cycle." *American Journal of Political Science*, 33, 1989, 376–89.

Grier, K. B. Forthcoming. "Presidential Elections and Real GDP Growth in the USA, 1961–2004." *Public Choice*, 135, 2008, 337–52.

Hibbs, D. "Political Parties and Macroeconomic Policy." *American Political Science Review*, 71, 1977, 1467–87.

Honkapohja, S., K. Mitra, and G. W. Evans. "Notes on Agents' Behavioral Rules Under Adaptive Learning and Recent Studies of Monetary Policy." Manuscript, Cambridge University, University of St. Andrews, and University of Oregon, 2002.

Keech, W., and K. Pak. "Electoral Cycles and Budgetary Growth in Veterans' Benefit Programs." *American Journal of Political Science*, 33, 1989, 901–11.

Kramer, G. H. "Short-Term Fluctuations in U.S. Voting Behavior, 1896-1964." *The American Political Science Review*, 65, 1971, 131–43.

Krause, S., and F. Mendez. "Policy Makers' Preferences, Party Ideology and the Political Business Cycle." *Southern Economic Journal*, 71, 2005, 752–67.

Milani, F. *Adaptive Learning and Inflation Persistence*. Mimeo, University of California, Irvine, 2004.

Milani, F. "A Bayesian DSGE Model with Infinite-Horizon Learning: Do "Mechanical" Sources of Persistence Become Superfluous?" *International Journal of Central Banking*, 2, 2006, 87–106.

Milani, F. "Expectations, Learning and Macroeconomic Persistence." *Journal of Monetary Economics*, 54, 2007, 2065–82.

Milani, F. "Learning, Monetary Policy Rules, and Macroeconomic Stability." *Journal of Economic, Dynamics, and Control*, 32, 2008, 3148–65.

Muscatelli, A., P. Tirelli, and C. Trecroci. "Fiscal and Monetary Policy Interactions: Empirical Evidence and Optimal Policy Using a Structural New-Keynesian Model." *Journal of Macroeconomics*, 26, 2004, 257–80.

Nordhaus, W. "The Political Business Cycle." *Review of Economic Studies*, 42, 1975, 169–90.

Orphanides, A., and J. Williams. "The Decline of Activist Stabilization Policy: Natural Rate Misperceptions, Learning, and Expectations." *Journal of Economic Dynamics and Control*, 29, 2005, 1927–50.

Poirier, D. "Revising Beliefs in Nonidentified Models." *Econometric Theory*, 14, 1998, 483–509.

Preston, B. "Learning About Monetary Policy Rules When Long-Horizon Expectations Matter." *International Journal of Central Banking*, 1, 2005, 81–126.

Primiceri, G. "Why Inflation Rose and Fell: Policymakers' Beliefs and Postwar Stabilization Policy." *Quarterly Journal of Economics*, 121, 2006, 867–901.

Raftery, A. E., and S. M. Lewis. "The Number of Iterations, Convergence Diagnostics, and Generic Metropolis Algorithms." *Practical Markov Chain Monte Carlo*, edited by W. R. Gilks, D. J. Spiegelhalter, and S. Richardson. London: Chapman and Hall, 1995.

Sargent, T. J. *The Conquest of American Inflation*. Princeton, NJ: Princeton University Press. 1999.

Taylor, J. B. "Reassessing Discretionary Fiscal Policy." *Journal of Economic Perspectives*, 14(3), 2000, 21–36.

Tufte, E. "Determinants of the Outcomes of Midterm Congressional Elections." *American Political Science Review*, 69, 1975, 812–26.

Tufte, E. *Political Control of the Economy*, Princeton NJ: Princeton University Press, 1978.

Woodford, M. *Interest and Prices: Foundations of a Theory of Monetary Policy*. Princeton, NJ: Princeton University Press, 2003.

Yu, B. and P. Bykland. "Looking at Markov Samplers through CUMSUM Path Plots: A Simple Diagnostic Idea." Technical Report 413, Department of Statistics, University of California, Berkeley.