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Economic Consequences of Political Approval Management in Comparative Perspective[1]

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We develop a dynamic, stochastic, computable general equilibrium model of political approval management and fiscal policy in order to analyze how political approval management affects United States' Presidential and United Kingdom's parliamentary business cycles. We find that governments in both systems respond to declining political approval by pursuing suboptimal fiscal policies that stimulate household consumption expenditures. Relative to a baseline optimal policy, we estimate that politically motivated fiscal policy reduces aggregate output in the United Kingdom and United States by 0.35 and 0.20%, respectively. Moreover, we find that most of the difference in output costs can be explained by differences between the American and British polities. *J. Comp. Econ.*, December 2001, **29**(4), pp. 692–721. University of Arizona, 401 McClelland Hall, Tucson, Arizona 85721; Department of Political Science, University of Minnesota, 1414 Social Sciences Building, Minneapolis, Minnesota 55455. © 2001 Elsevier Science

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1. INTRODUCTION

Presidential-plurality and parliamentary-plurality democracies are distinguished sharply by the fact that the executive in Presidential systems is elected for a fixed term and is relatively difficult to remove from office, while the executive in parliamentary democracies is not elected for a fixed term and can be dismissed if he or

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she loses a relatively easily implemented vote of confidence. Consequently, executives in parliamentary systems might systematically have a greater incentive to manage their level of popular support, or political approval, than their Presidential counterparts. One tool that many governments regularly use to manage political approval is fiscal policy (Erickson and Stimson, forthcoming).[4] Hence, fiscal policy in parliamentary systems might differ systematically from fiscal policy in Presidential systems; this might generate systematic and observable differences in the two systems' business cycles. This paper investigates this possibility by developing a dynamic, stochastic, computable general equilibrium model of political approval management. We use the model, along with data on Presidential and Prime Minister political approval from the United States and United Kingdom, respectively, to conduct a comparative empirical analysis of the way political approval management affects the cyclical behaviors of the American and British macroeconomic aggregates.

Several authors have provided comparisons of Presidential-plurality and parliamentary-plurality systems but these comparisons have ignored business-cycle phenomena. Lijphart (1992, 1994), for example, provides important contrasts between the two systems but pays little attention to the economy (see also Lijphart and Crepaz, 1991). Other studies have compared Presidential and parliamentary systems in terms of the provision of public goods, e.g., Persson et al. (1997), and the efficiency of the decision-making process. A study by Crepaz (1996) compares inflation and unemployment rates across these two systems. Our work is novel in that it explores ways in which political approval management might differ between the two systems and investigates empirically the links between such differences and the behavior of various macroeconomic aggregates.

Our empirical analysis is based on a dynamic, stochastic general equilibrium model that derives from the standard Ramsey model of optimal fiscal policy; see, e.g., Chari et al. (1994). We modify the Ramsey model by endowing the government with a preference for political approval and by incorporating exogenous political approval shocks. This framework generates an empirically tractable relationship between political approval management and fiscal policy. In particular, we obtain sharp and empirically testable predictions with respect to the way political approval management strategies affect cyclical behaviors of various macroeconomic aggregates. Moreover, our framework ensures that all of the model's parameters have clear interpretations in terms of preferences, technologies, and polities.

[4] Political approval refers to aggregate public evaluations of government performance at different points in time. Because it is one of the only frequently measured indicators of citizen's evaluations of government and it is available now in many OECD countries, political scientists have spent much effort studying this series and linking it to various political and economic variables (MacKuen et al., 1992; Ostrom and Smith, 1992; Erickson and Stimson, forthcoming). This study examines Presidential and Prime Minister approval series. Evidence that approval and other measures of public opinion since the 1960s have figured prominently in the policy-making process in the U.S. and other countries can be found in, for example, Jacobs (1992), Jacobs and Shapiro (1995, 1996), and Herbst (1995).

While our model provides a useful tool for a first empirical investigation of political approval management effects, it also inherits several of the strong assumptions present in any empirical analysis based on a Ramsey-type model; see, e.g., Chari et al. (1991, 1994). One of these is that the government can credibly commit, perhaps via constitutional statutes, to time-inconsistent future policies.[5] Another limitation is that, in a representative agent model, issues of redistribution do not play a role. Yet another is that the model does not incorporate electoral turnover. Instead, we choose to endow our government with preferences that reflect those of incumbents who care about their level of popular support continuously. We are not aware of any theory of political approval management and the economy in which commitment, redistribution, or electoral turnover is determined endogenously.[6]

We adopt the widely used approach to inference advocated by Kydland and Prescott (1982). After specifying our model, we use the data and the restrictions implied by economic and political theory to calibrate our model's structural parameters.[7] We provide two calibrations of the model using two sets of quarterly macroeconomic data. One data set is drawn from the United States, representing Presidential-plurality democracy, and covers the years 1977 through 1995. The other data set is drawn from the United Kingdom, representing parliamentary-plurality democracy, and covers the years 1980 through 1995. We examine each calibrated model's fit along several dimensions and in relation to the performance of the standard Ramsey model of optimal fiscal policy (see, e.g., Chari et al., 1994). We use the Ramsey model as a point of comparison since it is well-understood and

[5] Loosely speaking, one says that a government has committed to a time-inconsistent policy if the government chooses it at period t and then is prevented from changing it at $t+1$ when it would prefer to do so. Kydland and Prescott (1977) provide the seminal theoretical treatment of time-inconsistency in finite and infinite-horizon models and Sargent (1987, pp. 41–47) provides a nice textbook discussion of this same issue. More recent work on time-inconsistency has focused on its psychological foundations (see, e.g., Caplin and Leahy, 2001) and the way it can arise due to inconsistencies in rates of time-preference (see, e.g., Krusell, et al., 2000). In the present case, a main limitation that commitment to time-inconsistent policies imposes is that our model cannot address the effects of dramatic changes in policy ideology, such as might result from government turnover. Doing this would require that we allow governments and households to reoptimize each period and unfortunately this leads to an intractable and computationally burdensome model. As a result, it is standard in this literature to assume that governments can commit credibly at time-period zero to the time-inconsistent policies they will use over time.

[6] Krusell and Rios-Rull (1999) develop an important nonstochastic dynamic political-economic model that includes heterogeneity in both wealth and labor productivity and in which redistribution and fiscal policies are determined by the median voter. Our interest is in cyclical fluctuations so that the framework described in their paper is not suited to our purposes. Adding uncertainty to their framework is theoretically straightforward, although it seems that it would be computationally burdensome to implement such a model empirically. Moreover, there is no guarantee that a median voter analysis would be appropriate in the stochastic environment since preferences need not be single-peaked over fiscal policies in that case (for a related discussion, see Krusell and Rios-Rull, 1999, p. 1163).

[7] The nonlinearity of our model makes estimating its parameters computationally burdensome. The calibration and computation approach that we follow is an attractive alternative that has been well defended by, among others, Kydland and Prescott (1996).

since it emerges as a special case of the model developed in this paper. We find that the political approval management model fits the data better than the Ramsey baseline. For example, the political approval management model generates volatilities in aggregate consumption, leisure, and labor income taxes that are higher than those generated by the Ramsey model and relatively close to the values found in the data.[8]

We use the calibrated models to quantify and examine critically the links between political approval management and behaviors of macroeconomic aggregates. The models predict that governments in each democracy respond to reductions in political approval by pursuing fiscal policies that provide incentives for greater contemporaneous consumption. Therefore, consumption is predicted to be negatively correlated with political approval over the business cycle; this prediction is consistent with the data of both the United States and the United Kingdom.

Simulations of the calibrated models enable us to predict differences in the specific policies adopted in the two democracies as well as to quantify the welfare costs of approval management. Relative to a baseline of optimal fiscal policy, we estimate that politically motivated fiscal policy reduces aggregate output in the United Kingdom and United States by 0.35 and 0.20%, respectively. Moreover, our results suggest that most of the difference in lost output stems from institutional differences between their forms of democracy.

2. THE MODEL

2.1. The Economy

The stochastic environment, technology, and private decision problem are standard; our development and notation follow Chari et al. (1991). There is a large number of identical, infinitely lived agents. In each period, the economy experiences one of a finite number of events, s_t. Define the history of events to data t by $s^t = \{s_1, \ldots, s_t\}$. We denote the time-zero probability that history s^t occurs by $\mu(s^t)$.

The economy is endowed with a state-dependent, constant returns to scale production technology. $F(k(s^{t-1}), l(s^t) \mid s^t)$, that takes as inputs physical capital $k(s^{t-1})$ and labor $l(s^t)$ to produce an output good that may be used in private consumption $c(s^t)$, invested in next period's physical capital $k(s^t)$, or used for government consumption $g(s^t)$. Throughout, we assume that the government spending stream is strictly exogenous. Therefore, feasibility requires that

$$c(s^t) + k(s^t) + g(s^t) = F(k(s^{t-1}), l(s^t) \mid s^t) + (1-\delta)k(s^{t-1}), \tag{1}$$

where $\delta \in [0, 1]$ represents the exogenous rate of physical capital depreciation.

[8] Including tax variables improves the fit of business-cycle models, as has been demonstrated by several others (see, e.g., Braun, 1994; McGrattan, 1994). Our research provides within and between country evidence that an important source of fiscal policy variation is political approval management.

Each agent orders stochastic streams of consumption and labor according to

$$\sum_{t,s^t} \beta^t \mu(s^t) U(c(s^t), l(s^t)), \tag{2}$$

where $\beta \in (0, 1)$ denotes the rate of time preference and U is strictly concave, increasing in consumption, decreasing in labor supplied to the market, and the Inada conditions hold.

Government consumption is financed by proportional income taxes $\tau(s^t)$, proportional capital taxes $\theta(s^t)$, and debt $b(s^t)$. We assume that all debt is of 1 year maturity. Using this notation, each agent's budget constraint at any history s^t can be written as

$$c(s^t)+k(s^t)+b(s^t) \leq (1-\tau(s^t))w(s^t)l(s^t)+R_k(s^t)k(s^{t-1})+R_b(s^t)b(s^{t-1}), \tag{3}$$

where $R_k(s^t) = (1 + (1 - \theta(s^t))(r(s^t) - \delta))$, $r(\cdot)$ is the gross return on capital and $R_b(s^t)$ denotes the gross return on debt. We rule out Ponzi schemes by assuming that debt purchases are bounded from above and below by some large number. Also, note that private debt has been excluded from the budget constraint. The reason is that agents are identical so that they have no incentive to trade private claims in equilibrium. Hence, omitting private claims is done without loss of generality and the model may be interpreted as including complete private capital markets.

We assume that the government sets taxes and the return on debt to finance a stream of strictly exogenous expenses. Therefore, the government faces the following budget constraint:

$$b(s^t) = R_b(s^t)b(s^{t-1}) + g(s^t) - \tau(s^t)w(s^t)l(s^t) - \theta(s^t)(r(s^t) - \delta)k(s^{t-1}). \tag{4}$$

We let $\pi(s^t) \equiv (\tau(s^t), \theta(s^t), R_b(s^t))$ denote the government's policy given history s^t. The initial stock of debt and capital, as well as their returns and tax rate, are exogenously specified. It is well known that, without this latter assumption, the problem becomes uninteresting because the government will have an incentive to mitigate future distortionary taxation by imposing extremely high tax rates upon the initial quantities.

2.2. Political Approval

Our characterization of the political approval process is rich enough to provide insights about the questions that motivate this paper and yet simple enough to ensure an empirically tractable model. In this research, the level of political approval that consumers dispense depends on their contemporaneous utility and on stochastic events that are exogenous both to consumers and to the government. Restricting attention to contemporaneous utility outcomes is common in studies that attempt to tie politics to the business cycle and is justified by research that argues citizens are short-sighted and short-memoried when forming political evaluations, e.g., Nordhaus (1975) or Chappell and Keech (1983). The exogenous events proxy the approval effects of, for example, domestic scandals or foreign policy victories or losses. We also allow for the fact that the level of approval any single party can command may fall, all else equal, as the number of parties with which it competes increases. Perhaps the simplest specification consistent with these considerations is that the state-contingent political approval level $A(s^t)$ follows,

$$A(s^t) = \bar{A} + U(c(s^t), l(s^t)) + a(s^t), \tag{5}$$

where $a(s^t)$ is stochastic and represents the effect on approval of exogenous events and $\bar{A}$ is the location parameter whose value is influenced by the amount of political competition.[9]

Democratically elected governments are accountable to their citizenry and, consequently, may be averse to secular approval variation. Although this paper abstracts from electoral turnover, we can nevertheless endow our government with preferences that reflect those of democratically elected governments. We capture accountability by endowing our government with preferences that are increasing in approval. We capture the notion that a government may want to smooth approval by allowing for concavity of the approval preference function.

Another important feature of democratically elected governments is that they often require a minimum level of support to govern effectively. To capture this, our framework incorporates a reference approval level. This is the level of approval that governments try to attain, although it can vary with the prevailing political institutions. In our case, the reference approval level represents the minimal level of support needed to govern in plurality systems. To summarize, we assume that the government's preferences are ordered according to

$$\sum_{t,s^t} \beta^t \mu(s^t) V(A(s^t) - A^*), \tag{6}$$

where $V(\cdot)$ is concave and increasing in approval, $A(s^t)$, and A^* is the reference approval level.

2.3. Political Approval Management in Comparative Perspective

Table 1 describes how the three features of polity that we model vary between Presidential-plurality and Parliamentary-plurality democracies. These three

[9] The approval rating in our data results from aggregating binary responses to questions of the following type, "Do you approve of the President's/Prime Minister's performance?" Our interest is in the proportion of positive responses to this question since this is the statistic of interest to politicians. Accordingly, our model's agents dispense approval along a continuum. Also note that, unlike the actual approval process, (5) is not necessarily bounded since utility's value can exhibit secular growth. We address this point in Section 3.1.

TABLE 1
Approval Management in Two Democracies

Type of Democracy	Aversion to approval volatility	Approval target value	Interparty competition for approval
Presidential-plurality	Lower than in parliamentary-plurality	Minimum winning level (55%) for President's party	Relatively low. Two-party competition is common
Parliamentary-plurality	Higher than in Presidential-plurality	Minimum winning level (55%) for incumbent single party	Relatively high, Multi-party competition is more common

important comparisons will be used in Section 3 to guide the calibration of our models. First, the parliamentary-plurality system might lead its executives to be relatively more averse to secular approval volatility than executives within the Presidential-plurality system. An important reason is that Presidents are elected for fixed terms and are relatively difficult to remove from office, while the executive in parliamentary systems can be dismissed if he or she loses a relatively easily implemented vote of confidence, and, in any event, elections are not for fixed terms (Dragnitch et al., 1991). Of course, both governments should be somewhat sensitive to fluctuations in approval. For example, even if removal from office is not threatened, low levels of popular support will likely make it more difficult to advance policy agendas and, therefore, may force expenditures of accumulated political capital (Erickson and Stimson, forthcoming; Jacobs, 1992; Jacobs and Shapiro 1995, 1996).

Second, in both Presidential-plurality and parliamentary-plurality systems it is reasonable to assume that the reference approval level A* is in the vicinity of 55%. The reason is that these systems are usually dominated by two parties. For example, regardless of how assembly-executive relations are structured, executive ambition encourages bipartism (Cox, 1997, especially pp. 191–192). Hence, we expect that an incumbent will strive to obtain at least a weak majority. Finally, in multiparty systems political support is spread out over a larger number of competitors than in two party systems. This means that one would expect $\bar{A}$ to be lower, all else equal, in the United Kingdom's multiparty than in the two-party system of the United States.[10]

2.4. Equilibrium

Recall that state-contingent government policy is defined by $\pi(s^t) \equiv (\tau(s^t), \theta(s^t), R_b(s^t))$. Our Ramsey-type governments announce policies at the beginning

[10] The U.K.'s governments over our sample period are single party and the approval data are for the executive. If political approval were dispensed to a coalition, $\bar{A}$ would not necessarily be lower in the U.K.

of time and have access to a technology that commits them to these chosen policies. Consumers from optimal plans taking policies, including policy-dependent wages and rents, as given. We emphasize this by using the notation $x(s^t \mid \pi) \equiv (c(s^t), l(s^t), k(s^t), b(s^t) \mid \pi)$ to denote a state- and policy-dependent allocation of consumption, labor, capital, and bonds. An equilibrium in our model is defined as follows.

Government optimization. The policy π maximizes (6) subject to (5) given wages, capital rents and allocations as given by $x(\pi)$.

Consumer optimization. For every π' the allocation $x(\pi')$ maximizes (2) subject to (3), wages, rents, and the bound on debt accumulation.

Competitive pricing. Wages and capital rents are determined competitively. That is, given any policy π',

$$w(s^t \mid \pi') = F_l(k(s^{t-1} \mid \pi'), l(s^t \mid \pi'), s^t) \tag{7}$$

and

$$r(s^t \mid \pi') = F_k(k(s^{t-1} \mid \pi'), l(s^t \mid \pi'), s^t). \tag{8}$$

In Appendix B, we show that an equilibrium exists.

There are several standard methods to solve for the model's equilibrium allocations. Freeman and Houser (1998) describe a way to find exact solutions to the problem if physical capital is excluded from the model. Chari et al. (1994) propose a way to approximate the Ramsey equilibrium decision rules if physical capital is part of the environment. In this paper, we approximate the equilibrium decision rules with a standard linear-quadratic procedure described near the end of Appendix B.[11]

Observe that the standard Ramsey model emerges as a special case of our approval management model. In particular, if $V(\cdot)$ is the identity map, it is easy to see that any equilibrium maximizes consumer welfare subject to the government's revenue requirements and under budget constraints with competitively determined prices. However, this is a Ramsey equilibrium as described, for example, by Chari et al. (1994). Since the properties of Ramsey equilibria are well-understood, we use a standard Ramsey model as a baseline against which to compare the approval management model in the empirical analysis.

3. EMPIRICAL ANALYSIS

3.1. Functional Forms

The functional forms we use are standard features of the real business-cycle literature and allow for exogenous growth at a rate ρ. Our politico-economic

[11] Additional details about our solution procedure, including software, are available on request.

model, like the standard Ramsey model, admits a nonstochastic balanced growth equilibrium path. In Appendix C, we describe a straightforward transformation between the exogenous-growth economy and the no-growth model described above and show that only the discount rates and the rate of depreciation are affected.

We assume that the household's utility function is

$$U(c, l) = \frac{1}{\Psi}[c^{\gamma}(1 - l)^{1-\gamma}]^{\Psi}, \tag{9}$$

where the endowment of available labor resources per period has been normalized to unity. The value of γ lies in the interval [0, 1] and determines the household's preference for consumption relative to leisure within each period. The value of $\Psi \leq 1$ determines the household's preference for risk. If $\Psi = 0$, preferences are logarithmic while increasingly negative values for Ψ imply increased risk aversion and, hence, a greater desire for intertemporal smoothing of composite consumption and leisure allocations.

The value of utility increases monotonically and without bound along a balanced growth path. Since approval is bounded between zero and one in the data, we choose to deflate the level of utility in expression (5) so that, along a nonstochastic balanced growth path, the approval level is constant. As we show in Appendix C, this requires redefining the approval process as follows:

$$A(s^t) = \bar{A} + e^{-\rho\gamma\Psi t}U(c(s^t), l(s^t)) + a(s^t). \tag{10}$$

A government's preference for approval is

$$V(A(s^t) - A^*) = \frac{1}{\Sigma}(1 + A(s^t) - A^*)^{\Sigma}, \tag{11}$$

where $1 + A(s^t) - A^*$ is strictly positive, Σ is less than one, and $1/(1 - \Sigma) \geq 0$ is the government's intertemporal elasticity of substitution for approval. As Σ becomes increasingly negative the benefit to smoothing secular variations in approval is increased. If $\Sigma = 1$, the government is infinitely willing to substitute intertemporally, which is equivalent to the usual Ramsey formulation.

The technology is given by the standard, exogenous growth, Cobb-Douglas formulation,

$$f(k, l, z, t) = z(s^t)k(s^t)^{\phi}(e^{\rho t}l(s^t))^{1-\phi}, \tag{12}$$

and we assume that the technology shock z evolves according to the following stochastic process:

$$\log z(s^t) = \rho_z \log z(s^{t-1}) + \varepsilon_z, \quad \text{where } \varepsilon_z \in \{-\sigma_z, \sigma_z\}, \quad \Pr(\varepsilon_z > 0) = 0.5. \tag{13}$$

Government spending follows a process similar to that of the technology shock, i.e.,

$$g(s^t) = e^{\rho t} g^*(s^{t-1}), \quad \text{and} \quad g^*(s^t) = G + \rho_g g^*(s^{t-1}) + \varepsilon_g, \\ \text{where } \varepsilon_g \in \{-\sigma_g, \sigma_g\}, \quad \Pr(\varepsilon_g > 0) = 0.5. \tag{14}$$

The stochastic component for approval evolves according to

$$a(s^t) = \rho_a a(s^{t-1}) + \varepsilon_a, \quad \text{where } \varepsilon_a \in \{-\sigma_a, \sigma_a\}, \quad \Pr(\varepsilon_a > 0) = 0.5. \tag{15}$$

3.2. The Data

A concise description of the data can be found in Appendix A. Briefly, data on macroeconomic aggregates was taken from national account and labor force statistic sources. Annual tax rates for each country were calculated using the method of Mendoza et al. (1994, p. 305) and revenue data from OECD national account revenue statistics. Quarterly revenue data are not available; hence we are restricted to examining annual tax rate series. It is worthwhile to point out that the volatility of our tax rate series is very similar to that reported by Chari et al. (1994), who used a slightly different construction method. Political approval is based on national survey data. We study the period 1977 to 1995 for the United States and 1980 to 1995 for the United Kingdom.

Note that the labor tax rates we construct are effective tax rates and are, therefore, influenced by both the usual nonpolitical cyclical factors as well as by political factors. The political factors could include changes in the statutory rate as well as changes in the political will for tax code enforcement. Indeed, there is evidence that previous U.S. presidents have used public opinion data to help shape their fiscal policy decisions.[12] Our results shed light on the relative importance of political and nonpolitical factors on effective labor tax rate volatility.

Figures 1 and 2 plot quarterly approval and annual labor income tax rates, respectively, over the years we study. There is substantial quarterly volatility in approval in both countries and each approval series exhibits positive serial correlation. Labor tax rates are smoother over time, but we are not aware of any structural model that provides a positive explanation for their variance. We argue below that approval management is one explanation.

Table 2 compares the behavior of logged and detrended labor tax rates with logged and detrended annual aggregates of approval.[13] The U.K. exhibits the highest level of both approval volatility and tax volatility, while the U.S. and U.K.

[12] Jacobs and Shapiro provide accounts of the ways in which the Nixon, Johnson, and Reagan administrations used polling data as a guide to fiscal policy (see Jacobs, 1992; Jacobs and Shapiro, 1995, 1996). This information supports the view that fiscal policy and public opinion are connected.

[13] We aggregated approval by taking the equally weighted average of its four quarterly observations.

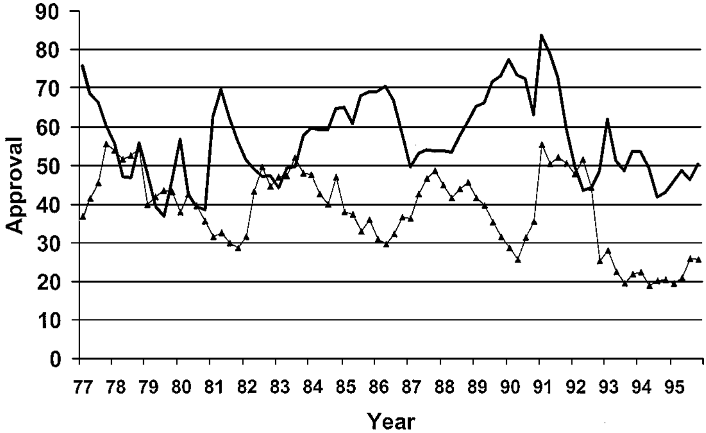

FIG. 1. United States' (—) and United Kingdom's (▲) approval process.

approval and labor tax series are both positively correlated. These findings are consistent with political approval and fiscal policy being related.

The behavior of the logged and detrended, using the Hodrick-Prescott filter with a smoothing parameter of 1600, quarterly data for the United States and the United Kingdom is described in Table 3. The Statistics resemble those reported by other authors, e.g., Prescott (1986). Interestingly, and perhaps counterintuitively, the correlation between detrended approval and detrended consumption is negative in both countries. We show below that, even when political approval is positively related to consumption, approval management can generate this negative correlation.

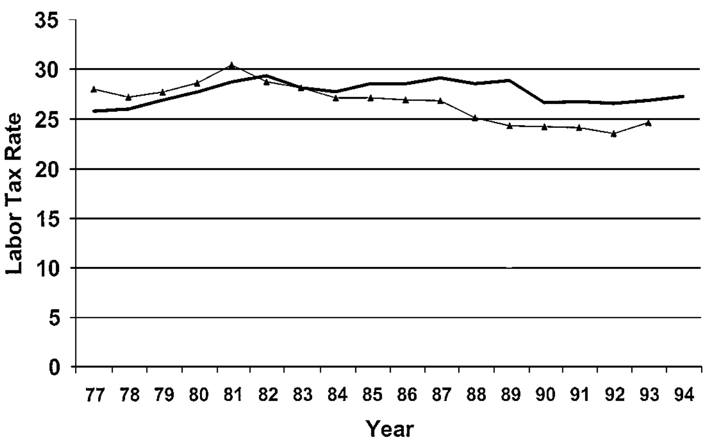

FIG. 2. United States' (—) and United Kingdom's (▲) labor income tax rate process.

TABLE 2
Approval and Labor Taxes

	U.S.	U.K.
Labor tax[a]		
Standard deviation[b]	2.5	3.0
Serial correlation	0.42	0.20
Approval[a]		
Standard deviation[b]	15	21
Serial correlation	0.12	0.15

[a] Deviations from the Hodrick-Precott detrended log series.
[b] Statistics are in terms of percentages.

3.3. Calibration

Preferences (Ψ, γ, β)

The parameter β represents the rate of time preference. Since we use quarterly data, we set $\beta = 1/(1+r)$, where r is the average real quarterly interest rate over the sample periods. We valued Ψ and γ so that the average labor tax rate and the amount of time spent working were matched in the nonstochastic steady-state equilibrium.

Technology ($\phi, \delta, \rho_z, \sigma_z$)

We adopt the standard Cobb-Douglas production function with a capital parameter equal to ϕ. Wages are determined competitively so that $1-\phi$ corresponds to labor's share of national income, which we derived from national accounts. We value δ by assuming a quarterly rate of depreciation of 2.5%. Finally, we assume that the technology shock process in each country follows the distribution estimated by Prescott (1986): $\rho_z = 0.95$ and $\sigma_z = 0.0090$.[14]

Government Spending (G, ρ_g, σ_g)

Following Chari et al. (1994), we valued these parameters by matching the autocorrelation and variance of actual government spending in each country and by setting the models' steady-state government spending to output ratio to the values found in the data.

Approval Shock ($\bar{A}, \rho_A, \sigma_a$)

The value of the location parameter $\bar{A}$ was set so that the level of approval dispensed along the balanced growth path was equal to the mean level of approval

[14] Prescott (1986) uses United States' postwar data to estimate the technology process. We are not aware of any evidence that the technology process is very different in the United Kingdom. Since our focus is on differences in polities, we chose to use the same process in our study of the United Kingdom.

TABLE 3
HP-Detrended Quarterly Data for U.S. and U.K.

		U.S.: 1977–1995						U.K.: 1980–1995					
		Output	Cons	Gov	Inv	LabSup	App	Output	Cons	Gov	Inv	LabSup	App
Standard deviation		0.017	0.011	0.015	0.052	0.013	0.145	0.018	0.018	0.009	0.047	0.018	0.207
Serial correlation		0.892	0.857	0.649	0.871	0.956	0.649	0.898	0.888	0.533	0.818	0.960	0.768
Cross-correlations	Output	1.000	0.946	0.267	0.944	0.804	−0.001	1.000	0.951	−0.005	0.908	0.909	−0.071
	Cons	0.946	1.000	0.209	0.824	0.701	−0.095	0.951	1.000	−0.090	0.749	0.833	−0.156
	Gov	0.267	0.209	1.000	0.046	0.167	0.068	−0.005	−0.090	1.000	−0.080	−0.069	0.382
	Inv	0.944	0.824	0.046	1.000	0.814	0.056	0.908	0.749	−0.080	1.000	0.883	−0.006
	LabSup	0.804	0.701	0.167	0.814	1.000	0.017	0.909	0.833	−0.069	0.883	1.000	−0.083
	App	−0.001	−0.095	0.068	0.056	0.017	1.000	−0.071	−0.156	0.382	−0.006	−0.083	1.000

TABLE 4
Calibrated Parameter Values

	United States	United Kingdom
Consumer preferences:	$\Psi = -0.500$, $\gamma = 0.245$, $\beta = 0.990$	$\Psi = -1.750$, $\gamma = 0.236$, $\beta = 0.990$
Government preferences:	$\Sigma = 0.80$, $\beta_g = 0.989$	$\Sigma = 0.70$, $\beta_g = 0.988$
Production function:	$\phi = 0.340$	$\phi = 0.340$
Depreciation:	$\delta = 0.025$	$\delta = 0.025$
Technology shock:	$\rho_z = 0.95$, $\sigma_z = .009$	$\rho_z = 0.95$, $\sigma_z = .009$
Gov Spending shock:	$G = 0.003$, $\rho_g = 0.970$, $\sigma_g = .001$	$G = 0.005$, $\rho_g = 0.960$, $\sigma_g = .001$
Approval shock:	$\bar{A} = -0.650$, $\rho_a = 0.750$, $\sigma_a = .070$	$\bar{A} = -.850$, $\rho_a = 0.850$, $\sigma_a = .0550$
Approval target:	$A^* = 0.55$	$A^* = 0.55$
Quarterly growth rate:	$\rho = 0.006$	$\rho = 0.004$

observed over each country's sample period. The autocorrelation ρ_a and standard error σ_a of the shock were set to match the corresponding statistics from the data.

Approval Management (Σ, A^*)

Following the arguments set forth in Sections 2.2 and 2.3, we set A^* to 0.55 for both the United States and the United Kingdom. Also, we chose to set $\Sigma = 0.8$ in the United States and $\Sigma = 0.7$ in the United Kingdom. These values were chosen because they satisfy the ordering restrictions implied by the political institutions, particularly that governments in parliamentary-plurality systems are likely to have a relatively greater interest in smoothing secular approval variation, and because the volatility of output under these values, and conditional on all other parameters values as described above, was reasonably well matched.

Table 4 summarizes the calibrated parameter values for each model.

3.4. Fit to the Business Cycle, Labor Taxes, and Political Approval

We assess the fit of the approval management models by comparing their simulated business cycles to the appropriate quarterly data, as reported in Table 3, and relative to the simulated cycles of the appropriate Ramsey equilibrium baselines. The Ramsey models, which are special cases of our approval management framework, use the same parameter values as the approval management models, except that Σ is set to unity. We conduct 500 simulations of each model for a number of periods equal to the number of available quarterly observations, i.e., 76 for the United States and 64 for the United Kingdom.

Table 5 reports the results for the United States. The first five rows describe the actual and simulated volatility of the aggregates, including standard deviations of the simulated statistics. The fifth through tenth rows report the same for the

TABLE 5
Statistics from Calibrated and Simulated Approval Management and Ramsey Models[a]

United States: 1977–1995

			Output	Cons	Gov	Inv	Hours	App
Standard deviation		Data	0.017	0.011	0.015	0.052	0.013	0.145
		App man	0.017	0.013	0.013	0.064	0.011	0.141
		SD	*0.002*	*0.001*	*0.002*	*0.009*	*0.001*	*0.011*
		Ramsey	0.016	0.008	0.013	0.048	0.007	0.151
		SD	*0.002*	*0.001*	*0.002*	*0.005*	*0.001*	*0.012*
Serial correlation		Data	0.892	0.857	0.649	0.871	0.956	0.649
		App man	0.690	0.647	0.696	0.630	0.607	0.596
		SD	*0.071*	*0.054*	*0.100*	*0.085*	*0.087*	*0.053*
		Ramsey	0.706	0.759	0.696	0.695	0.692	0.595
		SD	*0.062*	*0.056*	*0.100*	*0.062*	*0.069*	*0.055*
Cross-correlations	Output	Data	1.000	0.946	0.267	0.944	0.804	−0.001
		App man	1.000	0.325	0.079	0.888	0.798	0.305
		SD	*0.000*	*0.134*	*0.218*	*0.036*	*0.052*	*0.203*
		Ramsey	1.000	0.912	0.092	0.987	0.941	0.002
		SD	*0.000*	*0.035*	*0.213*	*0.004*	*0.018*	*0.229*
	Cons	Data	0.946	1.000	0.209	0.824	0.701	−0.095
		App man	0.325	1.000	−0.078	−0.114	−0.295	−0.739
		SD	*0.134*	*0.000*	*0.204*	*0.119*	*0.109*	*0.085*
		Ramsey	0.912	1.000	−0.170	0.883	0.724	0.015
		SD	*0.035*	*0.000*	*0.192*	*0.038*	*0.088*	*0.170*
	Gov	Data	0.267	0.209	1.000	0.046	0.167	0.068
		App man	0.079	−0.078	1.000	−0.018	0.179	−0.043
		SD	*0.218*	*0.204*	*0.000*	*0.230*	*0.221*	*0.262*
		Ramsey	0.092	−0.170	1.000	0.006	0.298	−0.042
		SD	*0.213*	*0.192*	*0.000*	*0.226*	*0.220*	*0.260*
	Inv	Data	0.944	0.824	0.046	1.000	0.814	0.056
		App man	0.888	−0.114	−0.018	1.000	0.958	0.680
		SD	*0.036*	*0.119*	*0.230*	*0.000*	*0.014*	*0.116*
		Ramsey	0.987	0.883	0.006	1.000	0.940	0.006
		SD	*0.004*	*0.038*	*0.226*	*0.000*	*0.021*	*0.248*
	Hours	Data	0.804	0.701	0.167	0.814	1.000	0.017
		App man	0.798	−0.295	0.179	0.958	1.000	0.748
		SD	*0.052*	*0.109*	*0.221*	*0.014*	*0.000*	*0.103*
		Ramsey	0.941	0.724	0.298	0.940	1.000	−0.009
		SD	*0.018*	*0.088*	*0.220*	*0.021*	*0.000*	*0.270*
	App	Data	−0.001	−0.095	0.068	0.056	0.017	1.000
		App man	0.305	−0.739	−0.043	0.680	0.748	1.000
		SD	*0.203*	*0.085*	*0.262*	*0.116*	*0.103*	*0.000*
		Ramsey	0.002	0.015	−0.042	0.006	−0.009	1.000
		SD	*0.229*	*0.170*	*0.260*	*0.248*	*0.270*	*0.000*

[a] Statistics refer to HP-detrended data. All variables were logged before detrending. Approval management model statistics based on 500 simulations of 76 periods each.

serial correlations of the processes, and the last 30 rows give the cross-correlation matrix with standard deviations. The volatility of the aggregates of the simulated approval management model seems to provide an overall better fit to the data than the Ramsey model. In all cases, the volatility of the approval management model's simulated output is within two standard deviations of the actual volatility. Unlike the approval management model, the Ramsey model does not generate enough volatility in hours. We explain below that the source of the additional volatility in hours in the approval management model is more volatile labor tax rates.

The serial correlation statistics reported in the second row of Table 5 reveal that the simulated aggregates from both models are highly persistent, although they do not have quite as much persistence as the data. Since our data set is rather small, it is not surprising that neither model makes precise predictions about the cross-correlation structure. The Ramsey simulations suggest a correlation between output and hours of 0.93; in the data and the simulations of the approval management model this correlation is 0.80. The hours-output relationship is weakened in the approval management model because of its relatively more active fiscal policy.

Since utility is increasing in consumption, political approval is increasing in consumption in both the Ramsey and the approval management models. Nevertheless, the mean correlation between political approval and consumption is negative in the approval management model's simulations, as it is in the U.S. data. In contrast, the Ramsey model generates a positive mean correlation between approval and consumption. We explain below that the source of the negative correlation in the approval management model is that the government responds to negative approval shocks by manipulating fiscal policy in order to increase aggregate consumption.

Table 6 gives a similar accounting for the United Kingdom. The main findings are that volatility is matched better in the approval management environment while persistence is about the same in each environment. There is generally less persistence predicted by the models than found in the data. The standard deviations of the cross-correlation statistics tend to be large relative to their mean, but the approval management model is able to generate a negative correlation between consumption and approval.

We compare the labor taxes of the models to each other and to the data.[15] The reason we focus on labor tax rates is that, as in the case of the standard Ramsey model, our framework identifies only three policy variables. These are the labor tax, the tax on private assets, and the ex-ante tax rate on capital. Of these, only

[15] Recall, from Section 3.2, that labor tax data are available only annually. Hence, to compare the behavior of labor income taxes and approval in the data to their behavior in the simulations, we aggregated as follows. First, the simulated annual labor tax rate was defined as the percentage of the value of four consecutive quarters of output paid to the government in the form of labor income taxes. Then, simulated annual approval was defined as the average over its corresponding four consecutive quarterly values. We emphasize that part of the variation in a country's observed tax rates is due to changes in the strength of enforcement of the tax code. Our models generate this result through changes in the proportional tax rate.

TABLE 6
Statistics from Calibrated and Simulated Approval Management and Ramsey Models[a]

United Kingdom: 1980–1995

			Output	Cons	Gov	Inv	Hours	App
Standard deviation		Data	0.018	0.018	0.009	0.047	0.018	0.207
		App man	0.015	0.013	0.010	0.057	0.008	0.188
		SD	*0.002*	*0.001*	*0.002*	*0.009*	*0.001*	*0.037*
		Ramsey	0.015	0.009	0.010	0.042	0.005	0.220
		SD	*0.001*	*0.001*	*0.002*	*0.004*	*0.001*	*0.049*
Serial correlation		Data	0.898	0.888	0.533	0.818	0.960	0.768
		App man	0.688	0.674	0.670	0.657	0.643	0.655
		SD	*0.069*	*0.070*	*0.121*	*0.087*	*0.087*	*0.062*
		Ramsey	0.694	0.728	0.670	0.683	0.678	0.651
		SD	*0.063*	*0.061*	*0.121*	*0.063*	*0.070*	*0.066*
Cross-correlations	Output	Data	1.000	0.951	−0.005	0.908	0.909	−0.071
		App man	1.000	0.429	0.068	0.858	0.746	0.272
		SD	*0.000*	*0.134*	*0.174*	*0.050*	*0.073*	*0.227*
		Ramsey	1.000	0.958	0.073	0.986	0.937	0.029
		SD	*0.000*	*0.020*	*0.159*	*0.006*	*0.023*	*0.247*
	Cons	Data	0.951	1.000	−0.090	0.749	0.833	−0.156
		App man	0.429	1.000	−0.055	−0.059	−0.255	−0.683
		SD	*0.134*	*0.000*	*0.239*	*0.126*	*0.120*	*0.112*
		Ramsey	0.958	1.000	−0.117	0.946	0.802	0.034
		SD	*0.020*	*0.000*	*0.153*	*0.021*	*0.076*	*0.216*
	Gov	Data	−0.005	−0.090	1.000	−0.080	−0.069	0.382
		App man	0.068	−0.055	1.000	−0.045	0.190	−0.027
		SD	*0.174*	*0.239*	*0.000*	*0.245*	*0.250*	*0.308*
		Ramsey	0.073	−0.117	1.000	−0.043	0.304	−0.025
		SD	*0.159*	*0.153*	*0.000*	*0.169*	*0.181*	*0.304*
	Inv	Data	0.908	0.749	−0.080	1.000	0.883	−0.006
		App man	0.858	−0.059	−0.045	1.000	0.942	0.692
		SD	*0.050*	*0.126*	*0.245*	*0.000*	*0.021*	*0.125*
		Ramsey	0.986	0.946	−0.043	1.000	0.918	0.033
		SD	*0.006*	*0.021*	*0.169*	*0.000*	*0.032*	*0.257*
	Hours	Data	0.909	0.833	−0.069	0.883	1.000	−0.083
		App man	0.746	−0.255	0.190	0.942	1.000	0.755
		SD	*0.073*	*0.120*	*0.250*	*0.021*	*0.000*	*0.104*
		Ramsey	0.937	0.802	0.304	0.918	1.000	0.016
		SD	*0.023*	*0.076*	*0.181*	*0.032*	*0.000*	*0.282*
	App	Data	−0.071	−0.156	0.382	−0.006	−0.083	1.000
		App man	0.272	−0.683	−0.027	0.692	0.755	1.000
		SD	*0.227*	*0.112*	*0.308*	*0.125*	*0.104*	*0.000*
		Ramsey	0.029	0.034	−0.025	0.033	0.016	1.000
		SD	*0.247*	*0.216*	*0.304*	*0.257*	*0.282*	*0.000*

[a] Statistics refer to HP-detrended data. All variables were logged before detrending. Approval management model statistics based on 500 simulations of 64 periods each.

TABLE 7
Simulated Approval and Labor Tax Rate Statistics for Approval Management and Ramsey Models

		U.S.	U.K.
Labor tax[a]			
	Data standard deviation[b]	2.5	3.0
	App man standard deviation[b]	1.2	1.8
	SD	*0.2*	*0.4*
	Ramsey standard deviation[b]	*0.2*	*0.2*
	SD	*0.1*	*0.1*
	Data serial correlation	0.42	0.20
	App man serial correlation	0.22	0.27
	SD	*0.17*	*0.19*
	Ramsey serial correlation	0.31	0.32
	SD	*0.17*	*0.18*
Approval[a]			
	Data standard deviation[b]	15	21
	App man standard deviation[b]	13	19
	SD	*2*	*6*
	Ramsey standard deviation[b]	14	*22*
	SD	*2*	*7*
	Data serial correlation	0.12	0.15
	App man serial correlation	0.21	0.26
	SD	*0.17*	*0.19*
	Ramsey serial correlation	0.21	0.26
	SD	*0.17*	*0.19*

[a] Deviations from the HP-detrended log series.
[b] Statistics are in terms of percentages.

the labor tax has an obvious counterpart in the data. The model's labor tax is the proportion of aggregate labor income that is paid to the government. However, as described in Chari et al. (1994), both the tax on private assets and the ex-ante capital tax rate depend on expectations and these are not easily observed in the data.[16]

Table 7 compares the labor tax and approval statistics between the simulations and the data. In all cases, the approval management model generates labor tax rate volatility that is greater than that in the Ramsey model. The actual U.S. volatility is 2.5% while the approval management simulations generate 1.2%; in the U.K., the statistics are 3.0 and 1.8%, respectively. Hence, fiscal policy designed to manage

[16] Following Chari et al. (1994), we define the tax on private assets as follows. The difference between the state-contingent and expected return on debt can be interpreted as a state-contingent tax on interest payments from the government. It is easy to show that the state-contingent sum of tax revenues from capital and debt is determined by the theory. The tax on private assets is this total tax revenue divided by the state-contingent income derived from capital and bond holdings. The ex-ante tax rate on capital represents expectations over future capital tax rate realizations. Hence, unlike the labor tax rate and the tax on private assets, the ex-ante tax rate on capital does not represent an amount actually paid to the government.

political approval could be the source of around 40% of the effective labor tax variation that these countries experience.

3.5. Real Economic Consequences of Political Approval Management

In this section, we report the results of two additional simulations of the calibrated models that sharpen our understanding of the possible links between political approval management and macroeconomic aggregates. The first simulation analyzes the impulse responses of the United States' and the United Kingdom's macroeconomic aggregates to a ten percentage point negative approval shock. This shock could result from a foreign policy disaster or a severe domestic scandal; see Freeman and Houser (1998) for further discussion of the nature of approval shocks. Figure 3 provides the results for several economic aggregates and the level of political approval. The first three columns plot the paths of the economic and political aggregates, while the fourth column describes the policy responses. Note that we report the behavior of each of the three policies described in Section 3.4, although only the labor tax has a natural empirical counterpart. The tax on private assets, the ex-ante capital tax, and the approval shock are plotted in terms of their actual values. All other variables are plotted in terms of deviations from their baseline steady-state value.

The political approval management model predicts that, within each democracy, the government reduces labor taxes and uses an increased tax on capital to finance its expenditures in response to falling popular support. A higher capital tax discourages investment and stimulates contemporaneous consumption. Since the calibrated parameter values imply that consumption and leisure are complements, labor supply tends to fall and, consequently, the level of political approval is increased unambiguously. Due to approval management strategies, the initial level of approval falls about 11% less in the United Kingdom than it would if steady-state policies were followed, that is, if it fell identically with the approval shock, and about 6% less in the United States.

An interesting dynamic in Fig. 3 is that labor taxes and output fall together. Output falls because investment is lower than necessary to replace fully depreciated capital stock and because the labor supply falls. The labor supply falls despite of lower labor taxes and slightly higher net wages. The reason is that the labor supply depends on both the wage net of labor taxes and the level of consumption, because it and leisure are complements. Therefore, labor supply falls because the effect of rising consumption dominates the slightly higher net wage. In the face of a negative approval shock, reductions in the labor tax are necessary to counterbalance the consumption effect on labor supply generated by the substantial increase in the capital tax rate.

The models predict that political approval management will generate a negative correlation between political approval and consumption over the business cycle. The models also predict that political approval should be positively correlated with both investment and labor hours. Table 5 shows that these predictions are matched

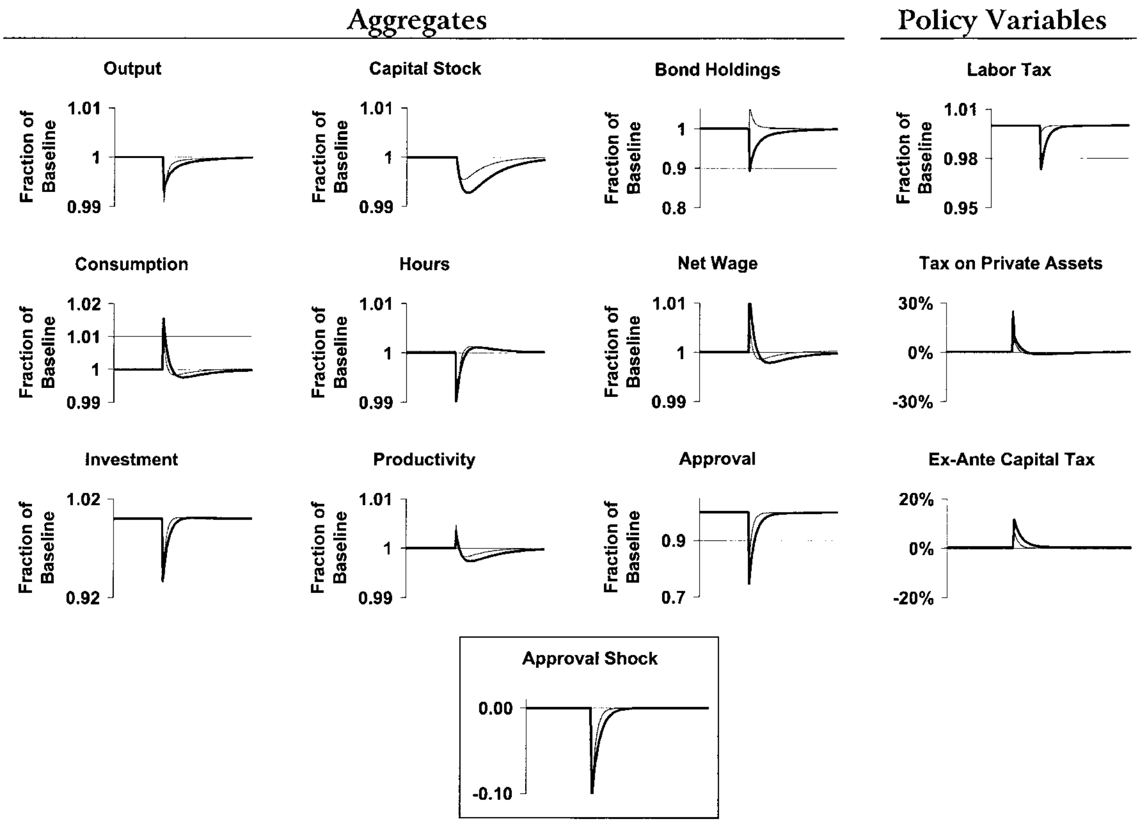

FIG. 3. Real consequences of approval shock in United States and United Kingdom. The thick line plots the response in the United Kingdom and the thin line plots the response in the United States.

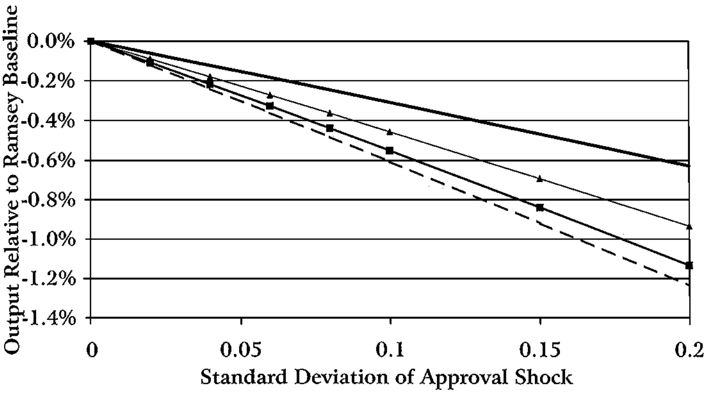

FIG. 4. Sources of output loss differences. (—) U.S., (– –) U.K., (▲) U.S. with U.K. Σ values, (■) U.S. with U.K. Σ and $\bar{A}$ values.

by the United States' data. However, while the model generates correlations that are rather large in magnitude, the correlations in the data are rather weak. A possible reason is that in our model political approval is managed continuously, while actual governments are likely to adjust fiscal policies somewhat less frequently.

A second simulation compares output in political approval management models to appropriate Ramsey baselines. For each model, we average the output produced over 25 simulations of 2000 periods.[17] Initial conditions for the simulations were identical; bonds were set equal to zero and the capital stock was set to its steady-state value. At their calibrated values, mean output in the U.K. is roughly 0.35% lower than the Ramsey baseline while in the U.S. it is about 0.20% lower. Hence, in terms of 1993 United States' dollars, politically motivated fiscal policy might reduce the gross domestic product of the United States and the United Kingdom by as much as 12.7 and 3.3 billion dollars, respectively.[18]

The United States' and United Kingdom's calibrations differ in the values of both political parameters and preference parameters. To determine how much of the difference in output costs is due to differences in political parameters, we simulate the United States' model under the U.K.'s values for Σ, i.e., the U.K. government's intertemporal substitution elasticity for approval and $\bar{A}$, i.e., the location parameter for approval in British society. Moreover, we investigate the effect of approval shock volatility by comparing output costs at several values for σ_a, which is the standard deviation of the approval shock. All other parameters that are not directly tied to the polity remain fixed at their U.S. values.

Figure 4 describes the results. The solid black line shows the amount of output lost, relative to the Ramsey baseline, in the U.S. political approval model for approval shock standard deviations ranging from zero to 0.20. Recall, from Table 4,

[17] We use a large number of periods to ensure precise estimates of expected output for each country.
[18] Gross domestic product statistics, in terms of U.S. dollars, are from OECD national accounts.

that the calibrated value for σ_a in the U.S. is 0.07, and in the U.K. is 0.055. A value of zero for σ_a represents a situation in which there is no political approval shock. This generates the standard Ramsey equilibrium and, therefore, there is no difference in output between the two models. As the standard deviation of the approval shock increases, the government responds with more active approval management strategies and, consequently, output falls.

The dotted line reports the analogous results for the U.K.'s calibration. The line with triangle markers indicates the effect of solving and simulating the U.S. model using the U.K.'s value for Σ, while holding all other parameters fixed at their U.S. calibrated values. Comparing these lines shows that differences in Σ alone account for about 50% of the differences in output costs at any given value of σ_a. The line with square markers indicates the additional influence of using the U.K.'s value for $\bar{A}$. It shows that differences in those two political parameters account for about 83% of the disparity in output reductions at any given σ_a. Finally, it is straightforward to determine the amount of output lost under the values for Σ, $\bar{A}$, and σ_a in the U.K., while holding all remaining parameters fixed at their U.S. values. This calculation reveals that about three-fourths of the output loss difference reported above is due to differences in these three political parameters. These differences stem from disparities in polities.

4. CONCLUSION

In both Parliamentary-plurality and Presidential-plurality democracies, we argue that political approval is managed with fiscal policy. Two calibrations of a political approval management model of the business cycle are developed. The calibrated models predict that governments will respond to negative approval shocks by implementing policies that change the intertemporal incentives faced by consumers. In particular, higher capital taxes will be used to reduce the incentive to save and, consequently, to increase contemporaneous consumption and therefore political approval. While these findings hold for both types of democracies, the model also suggests that the specifics of the approval management strategies differ between them. The possibility that executives in parliamentary-plurality systems are relatively more averse to secular approval variation is a source of these differences.

Our results points to an interesting trade-off between what is advantageous to a citizenry's political concerns and what is beneficial to their economic welfare. Institutions that hold governments relatively accountable for their actions, e.g., by making it relatively easy for legislatures to change governments, may lead incumbents to be rather more responsive to a wide variety of the citizenry's public policy concerns. However, such institutions also leave governments with an incentive to manage their political approval ratings through relatively active fiscal policy and such behavior might not be optimal with respect to the citizenry's long-run economic welfare. We estimate that political approval management costs the United States and United Kingdom about 0.20 and 0.35% of annual output, respectively.

The avenue identified in this research through which political approval management affects the economy is broadly consistent with the data. However, our work is only a first step and we point out several limitations of the analysis. For example, although it is well accepted that the redistributive consequences of fiscal policies are particularly important in obtaining and maintaining political support (e.g., Krusell et al., 1996; or Krusell and Rios-Rull, 1999), our representative agent analysis abstracts from this issue entirely. Future research incorporating heterogeneity in the approval management environment would be useful. It would also be interesting to explore the importance of approval as a signaling device. When information is incomplete, approval can be used by citizens to signal their judgments about the competence of Presidents and Prime Ministers. Such behavior might also have implications for the business cycle (Persson and Tabellini, 2000, especially Chap. 16).

APPENDIX A

Data Sources and Definitions

Country	Series	Dates	Period	Source
United Kingdom	GDP[a]	1980–1995	Quarterly	Quarterly National Accounts
United Kingdom	Private Consumption[a]	1980–1995	Quarterly	Quarterly National Accounts
United Kingdom	Government Consumption[a]	1980–1995	Quarterly	Quarterly National Accounts
United Kingdom	Depreciation[b]	1980–1995	Quarterly[d]	Annual Abstract of Statistics
United Kingdom	Net Investment[c]	1980–1995	Quarterly	Annual Abstract of Statistics, QNA
United Kingdom	Employee Compensation[b]	1980–1995	Quarterly	Quarterly National Accounts
United Kingdom	Prop/Entrepreneurial Inc.[b]	1980–1995	Quarterly	Quarterly National Accounts
United Kingdom	Employment	1980–1995	Quarterly[d]	Economic Outlook
United Kingdom	Real Interest Rate[e]	1980–1995	Quarterly	Main Economic Indicators, QNA
United Kingdom	15+ Population	1980–1995	Quarterly[d]	Labor Force Statistics
United Kingdom	Weekly Hours Worked	1980–1995	Quarterly[d]	Annual Abstract of Statistics
United Kingdom	Labor Tax Rate[f]	1980–1994	Annual	National Accounts, Revenue Statistics
United Kingdom	Prime Minister's Approval	1980–1995	Quarterly[g]	Political Barometer Survey, Gallup

APPENDIX A—*Continued*

Country	Series	Dates	Period	Source
United States	GDP[a]	1977–1995	Quarterly	Quarterly National Accounts
United States	Private Consumption[a]	1977–1995	Quarterly	Quarterly National Accounts
United States	Government Consumption[a]	1977–1995	Quarterly	Quarterly National Accounts
United States	Depreciation[b]	1977–1995	Quarterly	Quarterly National Accounts
United States	Net Investment[c]	1977–1995	Quarterly	Quarterly National Accounts
United States	Employee Compensation[b]	1977–1995	Quarterly	Quarterly National Accounts
United States	Prop/Entrepreneurial Inc.[b]	1977–1995	Quarterly	Quarterly National Accounts
United States	Employment	1977–1995	Quarterly[d]	Economic Outlook
United States	Real Interest Rate[e]	1977–1995	Quarterly	Main Economic Indicators, QNA
United States	16+, Noninstitutional Population	1977–1995	Quarterly	BLS LABSTAT Data Set
United States	Weekly Hours Worked	1977–1995	Quarterly[d]	Statistical Abstract of the U.S.
United States	Labor Tax Rate[f]	1977–1994	Annual	National Accounts, Revenue Statistics
United States	President's Approval	1977–1995	Quarterly[g]	Macropolity Data Set

Data definitions: OUTPUT: CONS + GOV + INV (each in 1985 dollars); CONS: Private Consumption Expenditures/16+ Population; GOV: Government Expenditures/16+ Population; INV: Gross Investment/16+ Population; HOURS: Labor Supply (average hours × Employment)/16+ Population; APP: Approval series.

[a] Series constructed using the quarterly volume indices (1985 = 100) from the OECD's Quarterly National Accounts.

[b] Series expressed in 1985 prices using the quarterly price indices from QNA.

[c] Constructed by subtracting depreciation from gross fixed capital formation.

[d] Original data are annual. Quarterly data created using cubic spline interpolation.

[e] Calculated using $R = ((1 + r)/(1 + i)) - 1$ where R is the real rate of interest, r is the nominal interest rate, and i is the rate of inflation.

[f] Calculated using the method of Mendoza et al. (1994, p. 305).

[g] Original data are monthly. Quarterly data created by taking the average monthly value for each quarter.

APPENDIX B

Existence and Computation of Equilibrium

PROPOSITION 1. *Any equilibrium consumption, labor and capital allocations* *solve*

$$\max_{\{c(s^t),l(s^t),k(s^t)\}} \sum_{s^t,t} \beta^t \mu(s^t) V(A(s^t) - A^*) \tag{B.1}$$

subject to

$$c(s^t) + k(s^t) + g(s^t) = F(k(s^{t-1}), l(s^t) \mid s^t) + (1-\delta)k(s^{t-1}) \tag{B.2}$$

$$\sum_{t,s^t} \beta^t \mu(s^t)[U_c(s^t)c(s^t) + U_\ell(s^t)l(s^t)] = U_c(s_0)\,[R_b(s_0)b_{-1} + R_k(s_0)k_{-1}] \tag{B.3}$$

$$A(s^t) = \bar{A} + U(c(s^t), l(s^t)) + a(s^t) \tag{B.4}$$

$$c(s^t), l(s^t), k(s^t) \geq 0,\ l(s^t) \leq 1 \qquad (\forall s^t \in s^\infty), \tag{B.5}$$

where b_{-1} is the exogenously specified initial holding of bonds, k_{-1} is the exogenously specified initial holding of physical capital, and U_C and U_ℓ represent the marginal utility of consumption and leisure, respectively.

Proof. The proof requires only simple modifications to the proof found in Chari et al. (1994); nevertheless, it is useful to sketch the argument. First, we show that any equilibrium consumption, labor, and capital allocation must satisfy (B.2) through (B.5). Then, we show that any solution to this programming problem can be supported as an equilibrium.

Suppose $\{c(s^t), l(s^t), k(s^t)\}$ are elements of an equilibrium allocation. Then they must satisfy the budget constraints (3) and (4) and summing these constraints gives (B.2). To show that (B.3) must hold, we begin by defining the necessary and sufficient conditions for consumer optimization that any equilibrium allocation must satisfy. Assuming interior solutions and denoting the LaGrange multiplier of the period s^t budget constraint by $p(s^t)$, it is easy to show that these conditions are

$$c(s^t): \beta^t \mu(s^t) U_c(s^t) = p(s^t) \tag{B.6}$$

$$l(s^t): \beta^t \mu(s^t) U_l(s^t) = -p(s^t)(1 - \tau(s^t))w(s^t) \tag{B.7}$$

$$k(s^t): p(s^t) = \sum_{s^{t+1} \mid s^t} p(s^{t+1}) R_k(s^{t+1}) \tag{B.8}$$

$$b(s^t): p(s^t) = \sum_{s^{t+1} \mid s^t} p(s^{t+1}) R_b(s^{t+1}). \tag{B.9}$$

The transversality conditions are

$$\lim_{s^t \in s^\infty} \sum_{s^t} p(s^t) k(s^t) = 0 \tag{B.10}$$

and

$$\lim_{s^t \in s^\infty} \sum_{s^t} p(s^t) b(s^t) = 0 \tag{B.11}$$

where the limit is taken over sequences of histories s^t in the infinite history s^∞.

Now, multiply the consumer's budget constraint (3) by $p(s^t)$ and sum over all dates and states to period T. The resulting equation can be written as

$$\begin{aligned} &\sum_{s^T} p(s^T)(k(s^T) + b(s^T)) + \sum_{t=0,T-1} \sum_{s^t} \Bigg\{ p(s^t)(k(s^t) + b(s^t)) \\ &\quad - \sum_{s^{t+1} \mid s^t} p(s^{t+1})(R_k(s^{t+1})k(s^t) + R_b(s^{t+1})b(s^t)) \Bigg\} \\ &\quad + \sum_{t=0,T} \sum_{s^t} p(s^t)(c(s^t) - (1 - \tau(s^t))w(s^t)l(s^t)) \\ &= p(s_0)(R_k(s_0)k_{-1} + R_b(s_0)b_{-1}). \end{aligned} \tag{B.12}$$

As $T \to \infty$, the first line of this expression tends to zero by (B.10) and (B.11) and the second line is zero by (B.8) and (B.9). It follows that, as T grows large, (B.12) becomes

$$\sum_t \sum_{s^t} p(s^t)(c(s^t) - (1 - \tau(s^t))w(s^t)l(s^t)) = p(s_0)(R_k(s_0)k_{-1} + R_b(s_0)b_{-1}). \tag{B.13}$$

Using (B.6) and (B.7) in (B.13) gives (B.3). Finally, constraint (B.4) holds by definition. Hence, any equilibrium must solve the programming problem.

Next we show that, for any allocation that solves the programming problem, there are prices $\{p(s^t), w(s^t), r(s^t)\}$, policies $\{\tau(s^t), \theta(s^t), R_b(s^t)\}$, and a debt allocation $b(s^t)$ that support it as an equilibrium. That is, we must find prices, policies, and a debt allocation that satisfy the budget constraints of the consumer and the government and the marginal conditions necessary to ensure consumer optimization. To do this, first note that wages and rents are required to satisfy the marginal product conditions (7) and (8). Using (7) in (B.7), and then dividing by (B.6), generates an expression for the labor tax policy. Also, given labor taxes and wages, along with the consumption, capital, and labor allocation, supporting prices are immediate from the consumers first-order condition (B.6) or (B.7). Finally, it is easy to show that, in order to satisfy the consumer's budget constraint given the consumption, capital, and labor allocation, it is necessary and sufficient that the bond allocation evolves according to

$$b(s^r) = \sum_{t>r,s^t} \beta^{t-r} \mu(s^t \mid s^r)[U_c(s^t)c(s^t) + U_l(s^t)l(s^t)]/U_c(s^r) - k(s^r). \quad \text{(B.14)}$$

Hence, all that remains is to determine the policy for capital taxes and return on bonds. To do so, we have available the budget constraint, (B.8), and (B.9). In fact, Chari et al. (1994) show that in exactly this situation there are many sets of capital taxes and bond returns that satisfy the restrictions imposed by these equations. Therefore, it is possible to find policies and prices so that the marginal conditions and the budget constraints are satisfied, which finishes the proof.

Computation of the Equilibrium

To compute this equilibrium, note that the programming problem described by Proposition 1 can be written as

$$\max_{\{c(s^t),l(s^t),k(s^t)\}} \sum \beta^t \mu(s^t) W(c(s^t), l(s^t), k(s^t), \lambda) - \lambda U_c(s_0)[R_b(s_0)b_{-1} + R_k(s_0)k_{-1}], \quad \text{(B.15)}$$

subject to (B.2), where W is determined by substituting (B.4) into the period objective function in (B.1), and then substituting the so-called implementability constraint (B.3) into the objective function, along with its LaGrange multiplier λ. This yields

$$W(s^t) = V(s^t) + \lambda(U_c(s^t)c(s^t) + U_l(s^t)l(s^t)). \quad \text{(B.16)}$$

Note that, if λ is taken as given, the problem of solving (B.15) subject to (B.2) is simplified greatly. One needs only to use some technique to solve the problem conditional on a value for λ and then to check whether, at that value for λ, the implementability constraint holds. In this paper, we proceed by first transforming the growth model into its equivalent no-growth formulation and then, after fixing a value for λ, forming a linear-quadratic (LQ) approximation of (B.15) about the transformed model's nonstochastic steady state. We then solve this LQ problem using standard techniques. Finally, we check the implementability constraint by direct simulation of the equilibrium decision rules. We repeat this procedure for different λ values until we find one for which the implementability constraint is satisfied. In all cases, when evaluating the implementability constraint, we set the initial level of bonds to zero and the initial level of capital to its steady-state value.

APPENDIX C

Transformation from a Growth to No-Growth Specification

Using the functional forms from Section 3.1, the programming problem described by Proposition 1 in Appendix B but including growth, denoted here by (GP), can be written as follows.

$$\max_{\{c(s^t),l(s^t),k(s^t)\}} \sum_{s^t,t} \beta_G^t \mu(s^t)\left\{\frac{1}{\Sigma}\left(\bar{A}+\frac{e^{-\rho\gamma\Psi_t}}{\Psi}(c(s^t)^\gamma l(s^t)^{1-\gamma})^\Psi + a(s^t) - A^*\right)^\Sigma\right\} \tag{GP.1}$$

subject to

$$c(s^t)+e^{\rho t}g(s^t)+i(s^t) = z(s^t)k(s^{t-1})^\phi(e^{\rho t}l(s^t))^{1-\phi} \tag{GP.2}$$

$$i(s^t) \equiv (1-\delta)k(s^{t-1}) - k(s^t) \tag{GP.3}$$

$$\begin{aligned}
&\sum_{t,s^t} \beta^t \mu(s^t)[\{c(s^t)^\gamma(1-l)^{1-\gamma}\}^{\Psi-1}\gamma c(s^t)^\gamma(1-l)^{1-\gamma} \\
&\quad - \{c(s^t)^\gamma(1-l)^{1-\gamma}\}^{\Psi-1}(1-\gamma)c(s^t)^\gamma(1-l(s^t))^{-\gamma}l(s^t)] \\
&= U_c(s_0)[R_b(s_0)b_{-1}+R_k(s_0)k_{-1}], \qquad \text{(GP.4)}\\
&c(s^t), l(s^t), k(s^t) \geq 0,\ \ l(s^t) \leq 1 \qquad (\forall s^t \in s^\infty).
\end{aligned}$$

Note that the governments and the households may have different rates of time preference, as given by β_G and β, respectively.

Now define $c^*(s^t) = c(s^t)e^{-\rho t}$, $i^*(s^t) = i(s^t)e^{-\rho t}$, and $k^*(s^t) = k(s^t)e^{-\rho(t+1)}$. Then GP becomes

$$\max_{\{c^*(s^t),l(s^t),k^*(s^t)\}} \sum_{s^t,t} \beta_G^t \mu(s^t)\left\{\frac{1}{\Sigma}\left(\bar{A}+\frac{1}{\Psi}(c^*(s^t)^\gamma l(s^t)^{1-\gamma})^\Psi + a(s^t) - A^*\right)^\Sigma\right\} \tag{C.1}$$

subject to

$$c^*(s^t)+g(s^t)+i^*(s^t) = z(s^t)k^*(s^{t-1})^\phi l(s^t)^{1-\phi}, \tag{C.2}$$

$$k^*(s^t) = i^{**}(s^t)(1-\delta^*)k^*(s^{t-1}), \tag{C.3}$$

$$\begin{aligned}
&\sum_{t,s^t} \beta^{*t} \mu(s^t)[\{c^*(s^t)^\gamma(1-l)^{1-\gamma}\}^{\Psi-1}\gamma c^*(s^t)^\gamma(1-l)^{1-\gamma} \\
&\quad - \{c^*(s^t)^\gamma(1-l)^{1-\gamma}\}^{\Psi-1}(1-\gamma)c^*(s^t)^\gamma(1-l(s^t))^{-\gamma}l(s^t)] \\
&= U_c(s_0)[R_b(s_0)b_{-1}+R_k(s_0)k_{-1}]; \qquad \text{(C.4)}
\end{aligned}$$

$$c^*(s^t), l(s^t), k^*(s^t) \geq 0,\ l(s^t) \leq 1, \qquad (\forall s^t \in s^\infty),$$

where $i^{**}(s^t) = i^*(s^t)e^{-\rho}$, $\delta^* = 1-(1-\delta)e^{-\rho}$, and $\beta^* = \beta e^{\rho\gamma\Psi}$. So long as $\beta^* = \beta_G$ and this value is positive and less than unity, the problem given by (C.1) through (C.4) and the boundary conditions is exactly equivalent to (GP.1) through (GP.4) and its boundary conditions. In particular, if the functions $\{c^*(s^t), k^*(s^t), l(s^t)\}$ solve (C.1) through (C.4), then the functions $\{c^*(s^t)e^{\rho t}, k^*(s^t)e^{\rho t}, l(s^t)\}$ solve (GP.1) through (GP.4). It is worthwhile to point out that, under the parameterizations that we employ, the difference between the household's and the government's rate of time preference needed to make the transformation work is extremely small. In the United States' parameterization, the household's discount factor is 0.99, while the government's is 0.989. The similar numbers for the United Kingdom are 0.99 and 0.988. Hence, in both cases, the government is just slightly more myopic than the citizenry it represents.

REFERENCES

Braun, Anton R., "Tax Disturbances and Real Economic Activity in the Postwar United States." *J. Monetary Econ.* **33,** 3:441–462, June 1994.

Caplin, Andrew, and Leahy, John, "Psychological Expected Utility Theory and Anticipatory Feelings." *Quart. J. Econ.* **116,** 1:55–79, February 2001.

Chappell, Henry W., Jr., and Keech, William R., "Welfare Consequences of the Six-Year Presidential Term Evaluated in the Context of a Model of the U.S. Economy." *Amer. Polit. Sci. Rev.* **77,** 1:75–91, March 1983.

Chari, V. V., Christiano, Lawrence J., and Kehoe, Patrick J., "Optimal Fiscal and Monetary Policy: Some Recent Results." *J. Money, Credit Banking* **23,** 3:519–539, August 1991.

Chari, V. V., Christiano, Lawrence J., and Kehoe, Patrick J., "Optimal Fiscal Policy in a Business-Cycle Model." *J. Polit. Econ.* **102,** 4:617–652, August 1994.

Cox, Gary, *Making Votes Count*. New York: Cambridge Univ. Press, 1997.

Crepaz, Markus M., "Constitutional Structures and Regime Performance in 18 Democracies: A Test of Olson's Hypothesis." *Eur. J. Polit. Res.* **29,** 1:87–104, 1996.

Dragnich, Alex N., Rasmussen, Jorgen S., and Moses, Joel C., *Major European Governments,* 8th ed. Pacific Grove, CA: Brooks/Cole, 1991.

Erickson, Robert, and Stimson, James, *The MacroPolity*. New York: Cambridge Univ. Press, forthcoming.

Freeman, John, and Houser, Daniel, "A Computable Equilibrium Model for the Study of Political Economy." *Amer. J. Polit. Sci.* **42,** 2:628–660, April 1998.

Herbst, Susan, *Numbered Voices: How Opinion Polling Has Shaped American Politics.* Chicago: Univ. of Chicago Press, 1995.

Jacobs, Lawrence, "The Recoil Effect: Public Opinion and Policy Making in the United States and Britain." *Comp. Polit.* **24,** 199–217, January 1992.

Jacobs, Lawrence, and Shapiro, Robert Y., "Presidential Manipulation of Public Opinion: The Nixon Administration and the Pollsters" *Polit. Sci. Quart.* **110,** 4:519–538, Winter 1995.

Jacobs, Lawrence, and Shapiro, Robert, "The Rise of Presidential Polling: The Nixon White House in Historical Perspective" *Public Opin. Quart.* **59,** 2:163–195, 1995.

Krusell, Per, Quadrini, Vincenzo, and Rios-Rull, José-Victor, "Are Consumption Taxes really Better than Income Taxes?" *J. Monet. Econ.* **37,** 3:475–504, June 1996.

Krusell, Per, Kuruscu, Burhanettin, and Smith, Anthony A., Jr., "Tax Policy with Quasi-geometric Discounting." *Int. Econ. J.* **14,** 3:1–40, Autumn 2000.

Krusell, Per, and Rios-Rull, José-Victor, "On the Size of U.S. Government: Political Economy in the Neoclassical Growth Model." *Amer. Econ. Rev.* **89,** 5:1156–1181, December 1999.

Kydland, Finn E., and Prescott, Edward C., "Rules Rather than Discretion: The Inconsistency of Optimal Plans." *J. Polit. Econ.* **85,** 3:473–491, June 1977.

Kydland, Finn E., and Prescott, Edward C., "Time to Build and Aggregate Fluctuations." *Econometrica* **50,** 6:1345–1370, November 1982.

Kydland, Finn E., and Prescott, Edward C., "The Computational Experiment: An Econometric Tool." *J. Econ. Perspect.* **10,** 1:69–85, Winter 1996.

Lijphart, Arend, *Democracies*. New Haven: Yale Univ. Press, 1992.

Lijphart, Arend, "Democracies: Forms, Performance and Constitutional Engineering." *Euro. J. Polit. Res.* **25,** 1:1–17, 1994.

Lijphart, Arend, and Crepaz, Markus, "Corporatism and Consensus Democracy in Eighteen Countries: Conceptual and Empirical Linkages." *Brit. J. Polit. Sci.* **21,** 2:235–246, April 1991.

MacKuen, Michael, Erickson, Robert, and Stimson, James, "Peasants or Bankers? The American Electorate and the U.S. Economy," *Amer. Polit. Sci. Rev.* **86,** 3:597–611, September 1992.

McGrattan, Ellen R., "The Macroeconomic Effects of Distortionary Taxation," *J. Monet. Econ.* **33,** 3:573–601, June 1994.

Mendoza, Enrique G., Razin, Assaf, and Tesar, Linda L., "Effective Tax Rates in Macroeconomics: Cross-Country Estimates of Tax Rates on Factor Incomes and Consumption." *J. Monet. Econ.* **34,** 3:297–323, December 1994.

Nordhaus, William, "The Political Business Cycle." *Rev. Econ. Studies* **42,** 2:169–190, April 1975.

Ostrom, Charles W., and Smith, Renee M., "Error Correction, Attitude Persistence, and Executive Rewards and Punishments: A Behavioral Theory of Presidential Approval." In John R. Freeman, Ed., *Political Analysis.* Ann Arbor: Univ. of Michigan Press, 1993.

Persson, Torsten, and Tabellini, Guido, *Political Economics: Explaining Economic Policy.* Cambridge: MIT Press, 2000.

Persson, Torsten, Roland, Gérard, and Tabellini, Guido, "Comparative Politics and Public Finance." Discussion Paper 1737, Stockholm: Centre for Economic Policy Research, November 1997.

Prescott, Edward C., "Theory Ahead of Business-Cycle Measurement." *Fed. Reserve Bank of Minneapolis Quart. Rev.* **10,** 4:9–22, Fall 1986.

Sargent, Thomas, *Dynamic Macroeconomic Theory.* Boston: Harvard Univ. Press, 1987.