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IS THE POLITICAL BUSINESS CYCLE FOR REAL?

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Abstract

This paper constructs and examines a macroeconomic model which combines features from both real and political business cycle models. We augment a standard real business cycle tax model by allowing for varying levels of government partisanship and competence in order to replicate two important empirical regularities: First, that on average the economy expands early under Democratic Presidents and contracts early under Republican Presidents. Second, that Presidents whose parties successfully retain the presidency have stronger than average growth in the second half of their terms. The model generates both of these features that conform to U.S. Post World War II data.

Keywords: Political business cycle

JEL Classification: H1, H5, H8

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1 Introduction

Understanding what drives and sustains fluctuations in economic activity has always been an important goal for macroeconomists and policymakers. The suspicion that these same policymakers in turn affect the economy has also always been present. Opinions vary widely on this, from those who feel politically-induced nominal shocks are the primary cause of economic fluctuations (the political business cycle) to those that feel economic fluctuations are driven by real shocks (the real business cycle). As elements of both these hypotheses seem plausible, we were curious to see what might happen if we synthesized these approaches into one unifying framework. Hence, the purpose of this paper is to introduce political shocks (i.e. politics) into a dynamic general equilibrium model to see what can be gained in our understanding of economic fluctuations. While we acknowledge that there are other shocks that drive economic activity, we find that a model with partisan fiscal impulses creates movement in real activity that is consistent with those found in post-war U.S. data.

We adopt a standard real business cycle (RBC) model as our benchmark for analysis. RBC models (e.g. Prescott [1986] and Plosser [1989]) are general equilibrium economies wherein productivity shocks are the predominant source of fluctuations in output. As productivity rises or falls, agents substitute labor and consumption intertemporally and so accumulate or de-accumulate capital. This creates the dynamic equilibrium fluctuations associated with a business cycle. Prescott [1986] asserts that these shocks can explain 70 percent of the fluctuations in GDP.[1]

Fiscal policy as embodied in stochastic government spending and distortionary taxation have more recently been introduced into these models as an additional real source of fluctuations (e.g. Baxter and King [1993], Braun [1994], McGrattan [1994a] and Ludvigson [1996]). By allowing for the potential role of distortionary fiscal policy in dynamic general equilibrium models, these models have established a better foundation for understanding the effects of fiscal policy and have improved the fit of theory as compared to the data.[2]

[1] Criticisms of RBC models can be found in Ball and Mankiw (1994) and Cogley and Nasson (1995).

[2] Specifically, McGrattan [1994b] argues that the major contribution of Braun [1994] and McGrattan [1994a] is to combine distortionary taxes into a standard RBC model with indivisible labor (see Hansen [1985]). In doing so, this approach provides a better match with the data in terms of the variability of consumption and hours worked, and a zero correlation between hours worked and productivity. See

Unfortunately, these models do not allow for the possibility that an important component of fiscal policy is political, and that partisan politics drives much of individuals' views of the current and future path of fiscal policy and the economy.

In contrast to RBC models, political business cycle models take the view that the economy shifts or cycles as power is transferred from President to President. 'Partisan' varieties of political business cycle models associate the political business cycle with the President's political party (e.g. Hibbs [1978] and Alesina [1987]). The 'opportunistic' approach argues that the desire to be reelected drives the cycle without reference to political party affiliation (e.g. Nordhaus [1975] and Rogoff and Sibert [1988]).[3]

The early opportunistic models (Nordhaus [1975]) predicted that output growth increases in the year-and-a-half before each election, as incumbents stimulated economic growth to improve their chance of re-election. However, if the public is rational then it would be impossible for incumbents to systematically fool the public, and so more advanced models were developed. In the second wave of models, Rogoff and Sibert [1988] demonstrated that opportunistic cycles can occur when voters are assumed to be rational, as long as individual leaders had private information about their 'competence', i.e. ability to provide government services at a low cost. Hereafter we refer to these models as 'competency/opportunistic' political business cycle models.

The second class of political business cycle models (partisan models) associated with Hibbs [1978] and Alesina [1987] require differences in policy objectives of political parties to be the impulse. For example, Democrats will stimulate the economy once elected whereas Republicans will contract the economy due to ideological differences concerning their aversion towards higher inflation versus higher unemployment. The important difference between Alesina [1987] and Hibbs [1978] is that under the rational specification adopted by Alesina, only the unanticipated effects of monetary policy differences between the two parties can

McGrattan [1994b] for further details. Ludvigson [1996] introduces government debt into the standard RBC framework and highlights the role that intertemporal tax finance has on the dynamic equilibrium path of the economy. For our purposes, we allow labor to be divisible in order to see what features of a simple dynamic general equilibrium model are needed to generate the partisan cycle.

[3]This approach is also adopted in Hess and Orphanides [1995] for their explanation of why the frequency of U.S. involvement in foreign conflicts rises when the President seeks reelection and the economy is in recession.

be a cause of the political business cycle.

These two approaches to understanding political business cycles generate the following important predictions. First, the partisan model predicts that Democratic governments expand while Republicans contract early to mid-way through their terms. Second, according to the competence model, Presidents whose parties subsequently hold on to the Presidency at the following election (either by reelection or another member of their party winning) will have expanding economies as the election approaches.

1.1 Some Political Business Cycle Facts

As a preliminary exercise, we examine these models' predictions to establish the empirical regularities and highlight our contribution. To capture presidential partisanship and competence effects on U.S. economic activity, Tables 1A and 1B report estimation results of the following regression using post-war cyclical GDP and Manufacturing Productivity:

$$\hat{y}_t = \beta_0 + \beta_1 \cdot Partisan_t + \beta_2 \cdot Competence_t + \beta_3 \cdot \hat{y}_{t-1} + \epsilon_t \tag{1}$$

where cyclical economic activity, $\hat{y}_t$, is measured by GDP per-capita and Manufacturing Productivity Growth, both in log growth rates and deviations from trend by the Hodrick-Prescott (HP) filter. In the table, dummy variables denoting partisanship are labeled with a 'P'. P2 is coded $+1$ for Democratic Presidents in their second year, and -1 for Republican Presidents in their second year, and zero otherwise. P23 is similarly defined and so it takes a value of $+1$ in years two or three for Democrats and -1 in years two and three for Republicans. The dummy variables for Competence are denoted with a 'C'. C34 is coded $+1$ for Presidents in their third or fourth years when their party maintains control of the presidency in the following Presidential election, and zero otherwise. C4 is similarly defined for fourth years only.[4]

The results in Tables 1A and 1B provide evidence that both the partisan and competence

[4]It is not unusual for partisan models to use simple 'dummy variables' based on the President's party affiliation as measures of unexpected inflation rather than direct measures of unexpected inflation, e.g. Alesina, Londregan and Rosenthal [1993] and Blomberg and Hess [1997]. As discussed below, this approach is not universally accepted – see Faust and Irons [1999]. We adopt this simpler dummy variable approach, however, as it represents the major findings in the literature.

approaches have some merit. Consistent with work by Alesina and Sachs [1988], Alesina and Roubini [1991], and Blomberg and Cohen [1997], since World War II the real economy has grown more rapidly after every Democratic president has begun his term and has grown more slowly after every Republican president has begun his term. This is demonstrated by the coefficient on 'P2' being positive and significantly different from zero at below the 5 percent level in all four cases, and 'P23' being positive and significantly different from zero at the 10 percent level in three out of four cases. Roughly speaking, the data suggest that output and productivity rise (fall) by about one percent in the second or third year of Democratic (Republican) President's term in office.[5]

Opportunistic/competence models are also consistent with the empirical regularities, as the coefficients on 'C34' and 'C4' are positive and significantly different from zero at or below the 10 percent level for seven of the eight cases explored. Based on these coefficient estimates, Presidents who are reelected should experience economic growth that is approximately 1 percent higher than average in the year before the election. Interestingly, these findings give additional support to Fair's [1996] view that economic growth closer to election time periods is what is important for explaining party control of the presidency.

While establishing the empirical regularities of output and productivity is an important first step for establishing the existence of a political business cycle, we must also strive to uncover what evidence exists for the underlying impulse which drives this cycle. For example, the standard partisan theory assumes that Presidents create the political business cycle by employing policies that lead to inflating or deflating prices. The transmission mechanism is that wages are set prior to learning which party will win the election so that rational voters set their inflation expectation based on the probabilities that each party will win the election. Hence, if the Democrat wins, the actual inflation rate will be above expected as long as voters attached some weight to the Republican party candidate winning. Therefore, inflation should be higher under Democratic administrations than under Republican administrations. Unfortunately, for the United States we believe there is

[5]In addition, Hall [1988,1990] reports that Presidential Party is correlated with productivity at below the 10 percent level of statistical significance for three of seven one digit industries using Cost-based Solow residuals: Construction, Finance, Insurance and Real Estate, and Services.

little evidence to support this conclusion.

We present results from estimating a similar relation with cyclical prices as we did for cyclical output in equation (1). Table 1C reports these estimates of the following regression:

$$\hat{p}_t = \beta_0 + \beta_1 \cdot Partisan_t + \beta_3 \cdot \hat{p}_{t-1} + \epsilon_t \tag{2}$$

where the cyclical price level, $\hat{p}_t$, is measured by the GDP deflator measured both in log growth rates and detrended by the HP filter. Using the same partisan dummy variables as before, P2 and P23, we uncover the empirical regularities consistent with those found in other papers: prices are not significantly higher under Democratic Presidents early to mid-way through their terms, nor are they similarly lower under Republican Presidents. This result is robust for the U.S. across different detrending procedures and measures of partisanship.[6,7] Hence, while the Partisan model produces the empirical regularity that the economy expands under Democratic Presidents and contracts under Republican ones, it does so via an impulse (unexpected inflation) for which there is not a strong empirical foundation.[8]

This is not to say that other researchers have not found some evidence that inflationary movements are driven by partisanship. The most compelling argument for an inflationary partisan effect can be found in Alesina, Roubini and Cohen [1997]. Indeed, they argue that there is weak evidence of a rational political cycle after 1973 in the U.S.[9] Subsequently,

[6]To be fair, advocates of the Partisan approach believe that prior to the election nominal wages are contracted based on expected inflation, so that unexpected inflations/deflations occur very early in a term and unwinds through output over a few years as wage contracts expire. If we construct a variable P1 that takes the value +1 for Democratic presidents in their first year, -1 for Republican presidents in their first year, and zero otherwise, our empirical puzzle further deepens (not shown). When the data is in log differences, the coefficient on P1 is insignificantly different from zero, but when the data is HP filtered the coefficient is significantly different from zero; however, the sign is opposite (negative) to that predicted by the theory.

[7]Waller [2000] demonstrates that since monetary policy in the United States is delegated by partisan leaders to a policy board whose members have overlapping tenures, that this should substantially diminish the partisanship phenomena due to monetary policy. From our standpoint, since fiscal policy in the U.S. is not delegated in such a manner, the partisanship aspect would still be present.

[8]This point has also been made by Blomberg and Cohen [1997].

[9]The results are not robust across different time periods and even the post 1972 period merits a caveat as the authors suggest: 'for the post-1972 period, the higher inflation rate of Democratic administrations is mostly driven by the inflation during the Carter administration.' [endnote 24, p. 270.] Accordingly, in many studies the unexpected inflation measure has just been the partisan dummy variable itself. See, for example, Alesina, Londregan and Rosenthal [1993].

Faust and Irons (1999), using a more sophisticated econometric framework, do not find support for partisan effects via monetary policy channels. These findings have lead Drazen (2000) to conclude that "there is no consensus on the role of monetary policy or inflation surprises in driving partisan effects, with views varying widely."

Given the lack of consensus surrounding the role of inflationary shocks as the driving force behind the partisan political business cycle, and the inability for opportunistic/competency models to generate a partisan cycle (as demonstrated clearly in Tables 1A and 1B), we provide an alternative theory of the political business cycle. Rather than explain the political business cycle as the natural consequence of shifts in regime between two parties who have different tastes for inflation, we model the political business cycle as an equilibrium dynamic process which responds to both partisan and individual leader characteristics in *real* phenomena. Moreover, while the parties themselves differ on the size of government, individual leaders also differ in their abilities to deliver on their promises at the lowest cost. Methodologically, our paper blends a Partisan and Competence explanation of real phenomena that drive the political business cycle.

The remainder of the paper is organized as follows: Section 2 provides preliminary data analysis and the paper's basic idea. Sections 3 and 4 describe the model and simulations, respectively. Section 5 provides concluding comments.

2 The Idea and Preliminary Analysis

Our political business cycle model is based on a very simple premise: due to ideological differences, Democrats attempt to stimulate the production of government services once elected whereas Republicans wish to contract their production in favor of more resources remaining for the private sector. What are these ideological differences that cause systematic shifts in the economy? If the 1996 Presidential election is any indication, it might be differences in taxation. The Republicans advocated reducing tax rates by 15 percent across the board, whereas the Democrats did not support such a tax cut. Could such differences in taxation create the political business cycle? The purpose of our paper is to develop and provide support for a theory that ideological differences in the role of government could be

the impulse to generate the political business cycle.

There are four key components to our story. First, Democrats and Republicans directly impact take-home pay by changing the tax code. To explore how changes in the tax code could generate a political business cycle, suppose that each party has different preferences for the size and scope of the government. Democrats advocate a larger role for government services and therefore are likely to require higher taxes, on average, than Republicans.

Second, when a new administration takes office, they set taxes in accordance with their preferences. However, the adjustment does not take place instantaneously, rather it takes time for the new policies to be implemented. For example, a new budget is not passed until October of the year after the election. Sometimes, the budget does not fundamentally change until the year after that. Therefore, in 1992, when Bill Clinton was elected, individuals believed that as a Democrat he would raise the level of government services and hence expected taxes to rise in late 1993 or 1994.

The third crucial ingredient to our story is that while political parties are different based on their view of the size of government services in the economy, individual leaders also differ based on their abilities. Moreover, a leader's abilities also have a particular partisan component: competent Democrats can deliver more services at the same cost due to increases in efficiency in providing government services, whereas incompetent ones provide higher taxes without any increase in *productive* government spending. Alternatively, competent Republicans can deliver fewer *productive* government services by reducing distortionary taxes which frees up more resources for private consumption, whereas incompetent ones reduce *productive* government spending without the benefits of lower taxes.[10] Competence is thus revealed by Democrats (more services without more cost) differently than by Republicans (cutting taxes to free up more resources for private sector activity). Hence, consistent with the data and conventional wisdom, averaging over competent and incompetent leaders separately for each party, Democrats have higher taxes and a larger government on average, and Republicans have lower taxes and a smaller government on average.

[10]Consistent with Rogoff and Sibert [1988] and Hess and Orphanides [1995], a candidate cannot credibly communicate that she is competent, so that 'All voters are from Missouri'. In our model, leaders have no private information about their competence and hence they cannot exaggerate it as in Rogoff and Sibert [1988].

In order for our story to provide a better characterization of the impulse to the partisan model, taxes and spending must be on average higher for Democrats. The results presented in Tables 2A -2C empirically demonstrate this commonly held view. Tables 2A and 2B report the estimation results from the following regression:

$$\hat{\tau}_t = \beta_0 + \beta_1 \cdot Partisan_t + \beta_3 \cdot \hat{\tau}_{t-1} + \epsilon_t \tag{3}$$

where $\hat{\tau}_t$ is the cyclical tax rate, both in growth rates and HP filtered. To demonstrate robustness, we measure taxes using both the Hakkio, Rush & Schmidt [1996] average marginal tax rate and the average aggregate tax rate (i.e. federal tax revenue divided by GDP) used in such studies as Bizer and Durlauf (1990).[11] Using the same partisan dummy variables as before, P2 and P23, we uncover the following: tax rates are higher in the second or third years of a Democratic President's term, and similarly are lower under Republican Presidents.[12] While the strength of the effect differs across the detrending procedures and the measures of partisanship, in seven out of the eight regressions the coefficient on partisanship is positive and significantly different from zero at below the five percent level of statistical significance. On average, using the more conservative estimate in Table 2A, tax rates rise by 2 to 2.5 percent under Democratic Presidents and similarly fall by -2 to -2.5 percent under Republican Presidents.[13]

In addition, it is also crucial that the higher tax rates by Democrats lead to systematically higher *productive* federal government expenditures relative to Republicans. Otherwise, there would be little incentive to ever vote for a Democratic leader. To examine whether Democratic leaders spend more on average, we estimate for government expenditures the

[11] These tax measures are highly correlated (.85 and higher) with other tax measures as Barro [1990a], Seater [1985] and Sahasakul [1986].

[12] In statistical tests (not shown), we fail to reject the null hypothesis the impact of Republicans and Democrats are symmetric. Hence, we do not allow for the impacts to be asymmetric.

[13] One may wonder whether our tax data displays a significant form of reverse causality such that the tax rate rises (falls) endogenously as the economy expands (contracts) independent of the partisan cycle. We included (not shown) in equation (3) a number of recession measures obtained from NBER dates, e.g., a dummy variable for whether there was there a designated recession during the year, a variable for how many months of the current year were designated by a recession, etc... The coefficients on these recession variables were insignificant and the coefficient estimates on partisanship shown in the tables were unaffected.

following equation:

$$\hat{g}_t = \beta_0 + \beta_1 \cdot Partisan_t + \beta_3 \cdot \hat{g}_{t-1} + \epsilon_t. \tag{4}$$

As our theory is predicated on the assumption that Democrats raise *productive* government spending, we remove transfer payments (net of social insurance) from federal spending, as this component is likely to be "unproductive". Hence, we measure productive spending as the federal government's real consumption and investment spending plus spending on social insurance as defined by NIPA, which accounts for about two-thirds of federal spending. Equation (4) is estimated using both data in log-growth rates and detrended using the HP filter.

Similar to the revenue side demonstrated in Tables 2A and 2B, spending also reveals a strong partisan influence as indicated by the estimation results for equation (4) presented in Table 2C. In each of the four regressions results reported, there is a sharp increase in spending for Democrats in the second or third years of the election term, with a symmetric decrease in spending by Republicans. The magnitude of the increase (decrease) in spending growth is two to four percent for Democrats (Republicans) and is statistically significant at or below the 0.05 level in each regression. Hence, there seems to be an increase in spending on average for Democrats versus Republicans.

The results in Tables 2A-2C are best seen by considering Figure 1. Figure 1 demonstrates how, on average, spending and taxation patterns evolve over the election cycle. It depicts average de-meaned spending growth and tax rates by year and by party.[14] Both taxes and spending do in fact rise in years two and three for Democrats and fall in years two and three for Republicans. These empirical regularities tend to provide ample evidence to support our conjectures, as well as the popular view, that Democratic leaders are both associated with both higher taxes and higher spending.

It is of course important to mention that there has been previous research that has not found such a partisan cycle in spending. In particular, Alesina Roubini and Cohen (1997) find no partisan effect. However, as Alesina, Roubini and Cohen (1997) try to

[14]This figure measures the data in a fashion more easily obtainable to the reader than is used for the empirical results in Tables 2A-2C, though the figure is quite similar for data in growth rates or detrended by the HP filter.

capture that portion of spending that is most likely to be wasteful and manipulated for electoral considerations, they use transfers net of social insurance as a percent of GDP as their measure of government spending. Since our thesis abstracts from this sort of "pork-barrel" election spending, we examine spending for more productive projects. When we consider non-productive spending in our government spending measure, our results are not as promising for the fiscal partisan story via spending.

The fourth and final key ingredient to our approach is that we assume the individual leader's ability to productively (or unproductively) produce government services can also impact on the private sector's productivity of output. In this way, the productivity of government services can spillover into the production of total output.[15] We have two motivations for this spin-off factor. First, in order for a government to more productively provide services, it must reduce bureaucracy and red-tape which are also potential bottlenecks in private sector production. Second, to the extent that cheaper (or more expensive) government services are delivered through enhanced (deteriorating) public capital, this element of public goods could have a strong benefit in terms of output.[16],[17]

At an impressionistic level then, real activity does systematically differ by party (Table 1A-B) as do policy variables such as tax rates (Tables 2A-2B) and productive government spending (Table 2C). These differences in output, however, do not appear to be driven by partisan nominal shocks (Table 1C). In the following sections we build a model to explain such phenomenon by extending a standard real business cycle model. Then, we compare predictions of our model to the data to gauge its overall performance.

[15] In Table 1B we also demonstrated the partisan patterns in manufacturing productivity over the time period 1949-1994. While our interpretation of these empirical regularities is new, the results are consistent with those in Hall [1988,1990]. See also Baxter and King [1991]. In fact, these authors argue that the correlation between productivity and presidential party affiliation is potential evidence of increasing returns to scale, which is consistent with our interpretation of the potential spin-off effect (externality) from government services.

[16] See Barro [1990b] for an introductory approach to the role of government spending in determining growth.

[17] In a working paper version of this paper, we demonstrate this link empirically. These results are available from the authors upon request.

3 The Model

In this section, we build our dynamic general equilibrium model and analyze its ability to replicate features of the partisan political business cycle. Households obtain utility from both private consumption and services chosen by the government based on a government's underlying preferences and competence. Analogously, firms maximize expected profits subject to the above criteria. From this model we calibrate how output fluctuates around a steady state equilibria due to the political shocks induced by ideological preferences and competence. Hence, we derive conditions consistent with the notion of a *real* political business cycle.

3.1 Preferences

We begin with individual preferences, which are specified to depend on private consumption, c_t^p, services from government spending, g_t, and leisure, $l_t = 1 - h_t$ where h_t is the fraction of time spent working. The representative agent maximizes his expected present discounted value of utility, which is specified as:

$$E_0 \sum_{t=0}^{\infty} \beta^t U(c_t^p, g_t, l_t) = E_0 \sum_{t=0}^{\infty} \beta^t \left\{ log(c_t^p + \psi g_t) + A(1 - h_t) \right\} \tag{5}$$

where $\beta < 1$ is the discount factor and A measures the substitutability between consumption and leisure.[18] Total consumption is defined as $c_t = c_t^p + \psi g_t$ with ψ being the parameter which measures substitutability between private consumption and government services.

Services from government expenditures, g_t, are related to government spending, x_t, as follows:

$$g_t = x_t \cdot z_t \tag{6}$$

with $z_t > 1$ ($z_t < 1$) denoting a government's ability to deliver more (fewer) services for a given level of spending. Equation (6) introduces a government's competence at providing services into the model. However, this is not the only type of competence we consider in this

[18] Simulations of the dynamic responses of the endogenous variables, particularly for output, are largely unchanged for utility functions with CRRA parameters near one (not shown).

paper. The ability to cut taxes and to shrink spending, x_t, is another form of competence. These two types of competence, and their interaction with partisanship, are discussed at length in sub-section 4.2.

3.2 Technology

Production takes place in this economy with a Cobb-Douglas production function which takes as inputs capital (k_t) and labor (h_t), and which may be affected by the government's competence at delivering services.

$$y_t = k_t^{\alpha} h_t^{1-\alpha} z_t^{\nu} \tag{7}$$

As stated above, one motivation for allowing a government's competence in providing services to improve productivity is that a competent government reduces bureaucracy and red tape which is often argued to be an impediment to productivity ($\nu > 0$). A second motivation is that to the extent that the improved low cost services are related to expenditure on public capital, this could also have a role in enhancing private output. To note, in addition to the results presented in Tables 1A-B, Hall [1988,1990] and Baxter and King [1991] find an important relationship between partisanship and government spending, respectively, on productivity.

Capital accumulates in this model according to:

$$k_{t+1} = (1-\delta)k_t + y_t - c_t^p - x_t \tag{8}$$

where δ is the rate of physical depreciation of the capital stock. Finally, we assume that current government expenditures are paid for out of current taxes on labor income, $w_t \cdot h_t$.[19]

[19] The results for this paper are robust to allowing for the tax rate to apply to both labor and capital income. These simulations are available from the author upon request.

The government, therefore runs a balanced budget every period.[20]

$$x_t = \tau_t \cdot w_t h_t \tag{9}$$

3.3 Equilibrium Conditions

As this economy is distorted by non-lump sum taxes, τ, we must consider the decentralized solution to analyze the business cycle. The representative firm maximizes profits by hiring inputs until their marginal product equal their marginal cost, namely:

$$w_t = (1-\alpha)k_t^{\alpha} h_t^{-\alpha} z_t^{\nu} \tag{10}$$

$$r_t = \alpha k_t^{\alpha-1} h_t^{1-\alpha} z_t^{\nu} \tag{11}$$

Using this with our specification of technology $y_t = w_t h_t + r_t k_t$ the representative agent maximizes expression (5) subject to (6) – (11). The following equations, together with equations (10) and (11) describe the equilibrium law of motion for the economy.

$$A = c_t^{-1} w_t (1-\tau_t) \tag{12}$$

$$c_t^{-1} = E_t \beta c_{t+1}^{-1} \left(1 - \delta + r_{t+1}\right) \tag{13}$$

$$k_{t+1} = (1-\delta)k_t + w_t h_t (1-\tau_t) + r_t k_t - c_t^p \tag{14}$$

Equations (10) – (14) have the standard interpretations. Expression (12) is the intratemporal optimality condition whereby the representative agent equates the marginal utility of leisure with the foregone utility of consumption from not working an extra unit. Expres-

[20] We do not allow for governments to accumulate debt for a variety of reasons. First, the empirical regularities show that output initially rises for Democrats and falls for Republicans independent of the deficit situation, e.g. in periods of high deficits (late 1980s) or low deficits (late 1990s). Second, the technical complexities are greatly reduced by limiting the scope to the balanced budget case. Third, the purpose of this paper is not to investigate public debt issues associated with the political business cycle. For these see, among others, Alesina and Tabellini [1990] and Persson and Svensson [1989].

sion (13) is the standard optimality condition where the representative agent equates the marginal utility from consuming today to the expected discounted marginal utility from having purchased a unit of capital instead and consuming next period. Equation (14) is the dynamic resource constraint.

Following King, Plosser and Rebelo [1990], we linearize expressions (6) and (9) – (14) around their steady state values. Combining these expressions, we derive a stochastic difference equation for the capital stock:

$$\hat{k}_{t+1} = \lambda_1 \hat{k}_t + \lambda_2^{-1} E_t \sum_{i=0}^{\infty} \lambda_2^{-i} \left[d_1 \Delta \hat{\tau}_{t+i+1} + d_2 \hat{\tau}_{t+i} + d_3 \Delta \hat{z}_{t+i+1} + d_4 \hat{z}_{t+i} \right] \tag{15}$$

where λ_1 and λ_2 are the roots of the second order stochastic difference equation with $\lambda_1 < 1$ and $\lambda_2 > 1$. The constants $d_1 - d_4$ are functions of the underlying deep parameters.[21]

Our contribution to equation (15) comes from how politics affects the equilibrium dynamic path of capital. If we specify a dynamic sequence for $\hat{\tau}_t$ and $\hat{z}_t$, based on partisan political preferences and competence, we find the dynamic paths for $\hat{k}_t$ which naturally impact $\hat{c}_t^p$ and $\hat{h}_t$. Together these determine output, $\hat{y}_t$, and subsequently government spending and services once the exogenous paths for $\hat{\tau}_t$ and $\hat{z}_t$ have been specified. Hence, as control of government changes between the parties and as competence is revealed, agents respond by optimally choosing leisure, consumption and next period's capital stock based on the realizations and expected future paths of $\hat{\tau}_t$ and $\hat{z}_t$. This creates a real political business cycle.

4 Evidence For a Real Political Business Cycle

Below we analyze the model's implications following the traditions of the real business cycle literature. We specify a dynamic, general equilibrium model and then trace out the economy's dynamic response when faced with our combination of shocks to partisanship and competency. We simulate our model and compare the model's features to a benchmark RBC model and the actual data.

[21] The solution is available from the authors upon request.

4.1 Calibration

To calibrate the impulse response for a partisan fiscal policy shock, we specify values for the tastes (β, ψ and A) and technology in this economy (α, δ, ν) as well as steady state values (denoted with a '$\bar{}$') for the size of government spending and taxation, $\bar{g}$, and $\bar{\tau}$, respectively. We set $\beta = .95$, $\alpha = .36$, and $\delta = .10$ to match the steady state ratio's of capital-to-output, capital earnings-to-total earnings and investment-to-output on an annual basis. A is set so that $\bar{h} = .3$, which is consistent with the fraction of time that individuals spend in market activity. The remaining values for the parameters are discussed below.

To develop steady state values for government spending and the associated parameters, we rely on historical data. The historical post war average ratio of federal government expenditures on goods and services to GDP is approximately 11 percent, hence $\bar{g}/\bar{y}$=.11.[22] From (6), (9) and (10), it follows then that $\bar{\tau} = (\bar{g}/(1-\alpha)\bar{y})$. The steady state value for the government services competence shock is $\bar{z} = 1$ with the spin-off of government services competence ranging from zero up to one-half. This captures a wide range of views on the nature of how output responds to improved services, independent of distortions implied in the method of financing government expenditures.

We assume that the substitution parameter for government services and private consumption (ψ) is also related to the historical ratio of the data, which fluctuates between over .2 and below .1. For more direct evidence on this parameter value, Ni [1995] demonstrates the sensitive nature of estimating this substitutability parameter. More recently, Kuehlwein [1998] finds strong evidence against large estimates for this substitutability term. Accordingly we simulate the model for a range of ψ's from .05 to .25, although our results are robust to increasing this parameter to higher values (not shown). A summary of the parameters used in the simulations and the steady state values of the variables is provided in Table 3.

[22] Note that this differs from government spending as a percent of GDP which is typically around .20. In our framework, we do not allow certain transfers to be considered. We do this because we specify *federal* government services to have a positive "spin-off" on production. This spin-off is more easily defended as public capital such as roads rather than transfers. While the dynamic multipliers we simulate below depend on the overall level of taxation (e.g. see McGrattan [1994b]) our results are robust to increasing the size of government.

4.2 Simulation

The fiscal experiment we conduct is as follows: we begin by assuming our model is in steady state equilibrium and then that at the beginning of time $t = 1$ a political party is chosen which will create deviations from the steady state due to fiscal policy actions. We then compare these deviations to actual business cycle fluctuations to see under what conditions our model replicates the actual data.

Why do policy shocks differ by party? Consider the following exposition and associated timeline in Figure 2.[23] We hypothesize that Democratic and Republican leaders differ in their views as to whether to try to alter the level of government services: Democrats credibly offer to raise government services, while Republicans credibly offer to cut them. But while each partisan leader is earnest in their desire to affect the time path of services, individual leaders may differ in their ability to make this change and bring about the most benefits from this reform. In addition, since policies take time to implement, we assume that it takes 'J' time periods to bring about these policy changes. For instance, a Democratic leader offers to increase $\hat{g}_{t+J}$ and suggests that he can do so only through enhanced efficiency, meaning $\hat{z}_{t+J}$ rises. Of course, voters are not naive and know that there is some chance that these additional services can only be brought about through higher tax rates (i.e. higher $\hat{\tau}_{t+J}$). Suppose that there is probability 'p' that the Democrat can deliver theses higher services only through enhanced efficiency and probability '1-p' that he can do so only through increased taxes. Therefore, in expectation, distortionary taxes are expected to rise with Democrats, as is productivity if $\nu > 0$, both of which are observed characteristics in the data (see Tables 1B, 2A, 2B.)

In contrast, a Republican leader offers to lower government services (g_{t+J} falls) but that in turn he can lower distortionary taxes which frees up more resources for private consumption (recall that for our parameterization, government services are imperfect substitutes for private consumption, $\psi < 1$). The representative agent knows a Republican leader displays this competence by lowering taxes only with probability 'p'. Alternatively, while the Re-

[23] By construction, the expected paths for Democrat and Republican responses are mirror images so that an upward movement for a variable under a Democrat is actually an downward movement for the same variable under a Republican. Therefore when it is clear we will only discuss the results for the Democrat.

publican leader may lower services, it may be because he is very inefficient at providing these services (z_{t+J} falls), which will occur with probability '1-p'.

Formally, to simulate this partisan political fiscal shock, we linearize the government budget constraint around its steady state value,

$$\hat{g}_t = \hat{\tau}_t + \alpha\hat{k}_t + (1-\alpha)\hat{l}_t + (1+\nu)\hat{z}_t \tag{16}$$

and note how $\hat{\tau}$ and $\hat{z}$ impact $\hat{g}$.[24] To keep the fiscal experiment simple, we assume that if competent, the Democratic leader accomplishes an increase in government expenditures of magnitude Φ by increasing $\hat{z}_{t+J}$ by $\Phi/(1+\nu)$, and if not competent by increasing $\hat{\tau}_{t+J}$ by Φ.[25] However, an important fact about Presidential election results is that they are often moderated through subsequent (e.g. midterm) elections at the Congressional or Senatorial levels – see Alesina, Londregan and Rosenthal [1993]. Therefore, we assume that the increase in $\hat{g}$ is not permanent and that government services diminishes over time according to: $\hat{z}_{t+J+i} = \rho^i\hat{z}_{t+J}$ and $\hat{\tau}_{t+J+i} = \rho^i\hat{\tau}_{t+i}$, for $i \geq 1$. Hence, the economy will evolve back to its steady state equilibrium.

To finalize the discussion of our experiment, we must still specify the number of periods it takes to implement changes in fiscal policy (J), the persistence of the fiscal shock (ρ), the size of the fiscal shock (Φ), and the probability of competence (p). As before, rather than search over a range of values for these parameters to fit the data, we rely on historical examples and evidence. First, consistent with the inertia in implementing tax changes in the U.S., we assume that for the first year in office the leader can neither change taxes nor demonstrate his competence (i.e. $J = 1$ year), but that fiscal changes occur in his second and subsequent years. Second, as tax changes display tremendous persistence we set $\rho = .7$, which is consistent with our findings for the persistence of tax and spending reported in Table 2A-C and findings by Braun [1994], McGrattan [1994a] and Ludvigson [1996]. Third, we assume that half of individual Presidents are competent, $p = .5$, which is consistent with

[24] Note that $\hat{g}_t$, $\hat{\tau}_t$ and $\hat{z}_t$ are linked through (16), which is why $\hat{g}_t$ does not appear in the equilibrium dynamic path for capital, (15).

[25] Both create shifts in $\hat{g}_t$ but since the path of $\hat{k}_t$ and $\hat{h}_t$ are equilibrium functions of the paths of $\hat{z}_t$ and $\hat{\tau}_t$, the value of $\hat{g}_{t+J}$ will not exactly equal Φ. An alternative approach would be to introduce government transfers.

Democrats and Republicans roughly equally sharing the presidency during this period.[26]

Finally, to calibrate the size of the shock, we see from Tables 2A-C that Democrats increase taxes and spending by approximately 2.5 percent midway through their terms whereas Republicans cut taxes and spending by a similar amount on average.[27] To simulate a tax shock of this size, the value for Φ must be 5 percent, since for the case of Democrats (Republicans), the expected change in taxes will be $p \cdot \Phi$ which equals 2.5 percent, when $p = .5$ and $\Phi = 5$ percent. Moreover, as there is no direct empirical counterpart for ν, we simulate the model for a range of values from low, $\nu = 0$, to reasonably high, $\nu = 0.50$. Importantly, since we demonstrated in Table 1B that there is a partisan element to productivity of about 1 percent for Democrats in the second year, we should expect that a value for ν that is greater than zero will be more consistent with the data.[28]

The results from the experiment are provided in Table 4. Here we compare the model's theoretical, ex ante path to actual data for a variety of values of the substitutability parameter of government services for private consumption (ψ), and the coefficient which measures the impact of competence on providing government services on private sector productivity (ν). These parameter values are listed in columns one and two. While the actual paths of data over the four year presidential term should not be expected to exactly coincide with the model's expected path (e.g. there are other independent shocks such as those to productivity), the theory and data should be correlated on average if the model is to truly capture the partisan path of output. Columns three, four and five of Table 4 report the average correlation of the simulated annual expected path for output, consumption, and investment, respectively, based on partisanship for the 5 Democratic terms and 7 Republican terms in the data.[29]

[26] We have experimented with changing the parameters J, ρ and p. The results in the remainder of the paper are robust to changes in these parameters. found small changes in each do not qualitatively change the results in the remainder of the paper.

[27] Our results are not systematically changed when we consider the alternative magnitudes consistent with Tables 2A-2B.

[28] Indeed, with probability p the shock to $\hat{z}_{t+J}$ from a competent Democrat is $\hat{z}_{t+J} = \Phi/(1+\nu)$, so that the average productivity spin-off is equal to $E_t(\hat{z}_{t+J}) = p * \nu * \Phi/(1+\nu)$ which for the case of $\Phi = .05$, $\nu = .5$ and $p = .5$ is 0.83 of one percentage point. Hence, a value of $\nu = .5$ is roughly consistent with Table 1B which shows that Democrats get a 1 percentage point productivity shock in the second year.

[29] For each of these variables, the observed data (HP filtered) is arranged in a 12×4 panel for the 12 terms (5 Democrat and 7 Republican from 1948-1996) which each last 4 years. The relevant simulated expected

Columns six and seven of Table 4 show the simulated expected path for output based on partisanship over a Democrat's term in office. Here we report the model's ex ante increased path of output in years two (P2) and years two or three (P23) for a Democrat from the impulse response. The expected value for output for a Republican, not shown, would be of opposite sign. The final two columns present the average growth rate of output across parties in either the final two years or final year for leaders that are competent – C34 and C4, respectively. Recall that since the source of competence in the two parties is different – for Democrats it is through providing government services at a lower cost and potential spillovers into private production, while for Republicans it is via decreased taxes which have positive supply effects – competent leaders will have different growth rates depending on their party affiliation.

There are several key findings reported in Table 4. First, when ν is zero, the anticipated future increase in taxes leads to increased economic activity in year one prior to the tax increase, and then output contracts. This is at odds with the data as output rises substantially in years 2 and 3, not in year 1. Correspondingly, on average, the simulated partisan path is negatively correlated with the data, which suggests that without a spin-off effect for government services on production, the model is at distinct odds with the data. For values of $\nu > 0$, output takes a dramatically different path, peaking in year 2 and falling output thereafter. Hence, an important conclusion that can be drawn from our investigation is that positive spillovers ($\nu > 0$) from partisan fiscal shocks are essential to replicate the magnitude of the shock in the mid-term observed in the data.

Second, the impacts are bigger in absolute value as government services become poorer substitutes for private consumption. Therefore, to reproduce the amplitude of the partisan cycle in the mid-term, a relatively low value of ψ must be used. Taken together, the set of parameters that best captures the real partisan business cycle in these simulations are those where $\psi = .05$ and $\nu = .50$, consistent with a significant but not extraordinarily large role of government in the model. This specification also provides a reasonable fit with output and investment as the average correlations between the theory and data are approximately .66

partisan paths (one for Democrats and one for Republicans) is then correlated with each of the 12 episodes in the data and the average correlation is reported.

and .58, respectively.[30] The correlation coefficient with private consumption of non-durables and services, however, is somewhat lower at around .23. Perhaps most importantly however, is that the specification generates approximately a 1 percent bounce to output for Democrats in years two and three as well as over a 1 percent increase in output for competent leaders for both parties in years three or four of the term broadly consistent with the data.

To better understand what underlies these findings, Figure 3 demonstrates the paths of output and other key variables under competent democrats, incompetent ones, and the expected path. The first panel shows the impact of policy shocks on output, the second shows the impact on taxes, the third shows the impact on productivity and the last shows the impact on services. Notice that competent Democrats raise output and productivity by raising services without raising taxes. This is opposite, of course, for incompetent Democrats who reveal their failings by raising taxes, thereby forcing output below the steady state. Hence, if we expect *a priori* that any new elected Democrat has some probability of being competent and incompetent, we get an outcome that is a weighted average of competence and incompetence. Since the simulated values assume the probability of competence vs. incompetence is one-half, we expect output and productivity to rise as Democrats provide more services, but this impact is muted by the increase in taxes due to some probability of incompetence. The magnitude and timing of these impacts are consistent with the data.

The intuition for why the model generates a partisan cycle in the model is due to the positive value for the spin-off factor ν. Consider, for example, a Democrat. If competent he provides extra productive government services without raising taxes, which feeds directly into higher output and productivity (via the spin-off) in period 2, and diminishes later due to the autoregressive term. Thus if the Democrat is competent, it shows up early and with much force for $\nu = .5$ which is what makes the model consistent with the data's partisan cycle. If incompetent, however, the negative effect from higher taxes adjusts labor activity and capital accumulation so that it tends to have effects that are later. Hence if you weight these two scenarios together, then on average a Democrat gets lifter earlier

[30]The bunching of the correlations for output is due to the fact that if the spin-off term, ν is zero, higher (lower) expected taxes lead to an expected fall (rise) in output for a Democratic (Republican) president. This would be in direct contrast to the data. Once one allows for a positive spin-off term, the expected partisan path begins to reverse. A value of $\nu < .25$ (not shown) does provide a wider variety of correlations.

because his competence feeds through faster than does his incompetence. The opposite, of course, works for Republicans, in that if he is incompetent (providing fewer services without reduced taxes) this will shows up in economic activity earlier than if they are competent (via tax cuts and enhanced labor supply and capital accumulation).

The experiment considered above and reported in Table 4 and Figure 3 can be thought of as calculating the dynamic multiplier from political shocks and introducing them into an intertemporal model to see how well the model's simulated expected path over a four year term corresponds with actual data. As an alternative exercise that we present below, we begin with a standard RBC model with exogenous technological shocks as a benchmark, and then ask whether introducing partisan fiscal shocks over a four year term significantly improves the standard RBC model's performance.

Table 5 provides the results from this exercise. The top panel reports the actual statistics of the data. The middle panel presents the mean of these business cycle statistics from simulations of the benchmark standard RBC model. The bottom panel presents the mean of some key business cycle statistics from the our partisan RBC model (i.e. with both independent technological shocks and partisan fiscal shocks) over a broad range of parameters for the substitutability of government services with private consumption, and the spin-off effect from government services on private output. The first and second columns report the parameter values for ψ and ν. The third and four columns report the mean correlations between consumption with output and investment with output, respectively. The final two columns report the mean ratios of the relative standard deviations of consumption to output and investment to output. Each model was simulated one thousand times over the relevant 4 year horizon.

While Table 5 reports the mean values from these simulations, one can also test the extent to which the simulated distribution of statistics is consistent with the observed statistics in the data. Following Cogley and Nasson (1995) and Hess and Iwata (1997), we can construct a Q-statistic for each business cycle characteristic B as $Q = (\hat{B} - B)'\hat{V}_B(\hat{B} - B)$ where the elements of the vector B are the simulated value of the real business cycle characteristic, $\hat{B}$ is the characteristics sample mean in the data, and $\hat{V}_B$ is the estimated variance of B from the simulations. Each Q statistic is approximately distributed as $\chi^2(1)$.

Rather than report p-values, we denote with a † that one cannot reject the hypothesis that the simulated distribution of statistics is equal to the observed statistic at or below the .05 level of statistical significance. This statistic can help in constructing a more formal gauge of the extent to which a model's simulated statistics are consistent with those in the data.

We begin by replicating the standard RBC model with our annual data.[31] While the model does a good job at matching the correlation of consumption and output, and the relative volatility of investment to output, one can see some of the deficiencies in the model. It is clear that in the benchmark model consumption is not volatile enough relative to output, and investment is too correlated with output.[32] Below, we examine the extent to which our model shares these same shortcomings.

If we turn our attention to the bottom panel of Table 5 where partisan fiscal shocks are introduced, we obtain better findings for the theory.[33] While our model shares the failure with the standard RBC model of having investment that is too highly correlated with output, in an important way our model outperforms this benchmark. In particular, for many combinations of ψ and ν the simulations of the relative variances of consumption and output from our model are not statistically different from what is found in the data. In effect, the more weight that one places on the substitutability between government services and private consumption, the more private consumption will move in response to the fiscal shocks which will raise its volatility vis-a-vis output.

Using the case in which $\psi = .05$ and $\nu = .5$, we find that both the correlation between investment and output is lower and consumption becomes more volatile relative to the benchmark RBC model. Unfortunately, both are still different in magnitude from the actual data. However, as compared to the simple RBC model, the partisan RBC model is more closely linked to the data as relative consumption volatility is no longer statistically different from that found in actual U.S. data.

[31] The process for the productivity shock for the middle panel were obtained from the data used in Table 1B: $\hat{z}_t = .6 \cdot \hat{z}_{t-1} + e_t$ where $\sigma_e = 1.72$.

[32] These shortcomings can also be found in Cooley and Prescott (1995).

[33] The process for the productivity shock for the bottom panel were obtained from the data used in Table 1B: $\hat{z}_t = .6 \cdot \hat{z}_{t-1} + e_t$ where $\sigma_e = 1.60$. The difference in the standard deviation in the innovation as compared to the innovation used for the simple RBC model is due to the fact that we removed the partisan element from the productivity shock when calibrating the process, similar to the results provided in the third column of Table 1B.

In summary, we have examined both simulations and empirical support for our real political business cycle model. In both cases, we find evidence to support a model where that Democrats (Republicans) on average raise (lower) taxes relative to Republicans and agents adjust their labor, consumption and savings choices in response to these changes in magnitudes sufficient to explain a large fraction of post-war annual fluctuations.

5 Conclusion

In this paper, we build and test the implications of a real political business cycle model. We do this by combining features from both the real and political business cycle literature. There are four main features to our approach of using partisan fiscal shocks to drive output fluctuations. First, Democrat and Republican Presidents are different in that the former wishes to increase government services whereas the latter wants to cut them to free up resources for private consumption. Second, these policy changes take time to implement so that these fiscal impulses do not take effect for at least one year. Third, not all leaders from the same party are alike: competent Democrats can deliver more services at the same cost through enhanced productivity of providing services, whereas incompetent ones must raise taxes. Alternatively, competent Republicans provide fewer government services by cutting distortionary taxes while incompetent ones provide the fewer services but can't deliver the tax cuts as they are simply unproductive at providing government services. Finally, we allow for a government's competency in providing services to have a potential spin-off effect on the production of total output. This is consistent with enhanced (deficient) competency reducing (increasing) bottlenecks that affect both the government supply of services as well as private output. Furthermore, if the efficiency (inefficiency) in improving (worsening) government services is due to enhanced (deteriorating) public capital, this would also have a positive (negative) impact on total output. By incorporating these features, we find results that are consistent with both political and economic events since World War II.

A potential shortcoming to our approach is that our partisan fiscal theory does not have explicit voting.[34] To be sure, this is an avenue for additional research. However, we believe

[34]This is justified as the objective of this paper is to explain the impact of political shocks on economic

that our identification of the role of partisan fiscal shocks is consistent with voter rationality for the following reason: leaders and their political parties retain office if the economy is expanding near to the election, which in our model is what distinguishes competent leaders from incompetent ones. That competent leaders and their parties should retain office follows from the fact that it is better to reelect competent leadership regardless of party than to elect the opponent who may or may not be competent.[35]

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cycles rather than explain political cycles and turnover. The latter could be accomplished in our model if the representative agent were to receive an exogenous preference shock for more (Democrat) or less (Republican) government services. This would be consistent with the approach used in many partisan models, e.g. Alesina, Londregan and Rosenthal (1993), whereby the median voter's ideal point is subject to exogenous preference shocks.

[35] In fact, while growth is higher on average for Democrats one may wonder why voters do not always elect Democrats. From our perspective, the reason is as follows: All post war presidential elections after 1952 have included either an incumbent president or vice-president (who presumably share or inherit some fraction of the president's abilities). Therefore, elections involve the choice between an incumbent about whom one knows their party affiliation and something about their abilities, and an opponent drawn from the other party who may be either competent or not (it is not credible to signal competency without actually being in office). Accordingly, a presidential challenger will be preferred to an incompetent incumbent, but not a competent one, regardless of party affiliation.

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$$\hat{y}_t = \beta_0 + \beta_1 \cdot Partisan_t + \beta_2 \cdot Competence_t + \beta_3 \cdot \hat{y}_{t-1} + \epsilon_t$$

Table 1A: Empirical Regularities of Political Business Cycles for Real GDP

Explanatory Variable	Growth Rates		HP Filter	
P2	2.95^{***}		2.45^{***}	
	(0.46)		(0.53)	
P23		1.86^{***}		1.32^{***}
		(0.43)		(0.39)
C34	1.17^{*}		0.92	
	(0.61)		(0.55)	
C4		1.41^{*}		1.07^{**}
		(0.79)		(0.56)
$\hat{y}_{t-1}$	0.07	-0.20	0.79^{***}	0.66^{***}
	(0.12)	(0.13)	(0.10)	(.09)
$\bar{R}^2$	0.36	.22	.51	.45
DW	2.00	1.74	1.77	1.79
N	47	47	47	47

Table 1B: Empirical Regularities of Political Business Cycles for Manufacturing Productivity

Explanatory Variable	Growth Rates		HP Filter	
P2	1.43^{**}		1.35^{***}	
	(0.57)		(0.35)	
P23		0.47		0.57^{*}
		(0.50)		(0.34)
C34	1.71^{***}		1.59^{***}	
	(0.44)		(0.46)	
C4		1.30^{*}		1.51^{**}
		(0.78)		(0.73)
$\hat{y}_{t-1}$	-0.04	-0.05	0.63^{***}	$.54^{***}$
	(0.17)	(0.20)	(0.12)	(0.13)
$\bar{R}^2$	.24	.15	.52	.39
DW	1.94	1.86	1.85	1.80
N	45	45	45	45

Notes: ***,**, and * refer to statistical significance at below the .01, .05 and .10 confidence level, respectively. Heteroskedasticity robust standard errors are reported in parentheses. $P2 = +1$ ($P23 = +1$) for a Democratic President's second (or third) years of a term and -1 for Republican Presidents second (or third) years. $C4 = +1$ ($C34 = +1$) for Presidents in their third (or fourth) years when their party maintains control of the presidency in the following Presidential election. DW is the Durbin-Watson statistic and $\bar{R}^2$ is the adjusted R-squared. N is the number of annual observations. Manufacturing Productivity data is from 1949-1994. Real per-capita GDP data is from 1949-1996. The smoothing parameter for the HP filter is 400.

$$\hat{p}_t = \beta_0 + \beta_1 \cdot Partisan_t + \beta_3 \cdot \hat{p}_{t-1} + \epsilon_t$$

Table 1C: Empirical Regularities of Political Business Cycles for Prices

Explanatory Variable	Growth Rates		HP Filter	
P2	0.18		-0.37	
	(0.41)		(0.33)	
P23		0.35		-0.10
		(0.33)		(0.33)
$\hat{p}_{t-1}$	0.77^{***}	0.79^{***}	0.91^{***}	0.91^{***}
	(0.11)	(0.11)	(0.06)	(0.06)
$\bar{R}^2$	.60	.61	.80	.80
DW	1.93	1.97	1.07	1.05
N	45	45	45	45

Notes: See Tables 1A-B. The average marginal tax rate is from Rush, et. al [1996] from 1949-1990. The price data is the GDP deflator from 1949-1996. The smoothing parameter for the HP filter is set to 400.

$$\hat{\tau}_t = \beta_0 + \beta_1 \cdot Partisan_t + \beta_3 \cdot \hat{\tau}_{t-1} + \epsilon_t$$

Table 2A: Empirical Regularities of the Political Business Cycle for Tax Rates*

Explanatory Variable	Growth Rates		HP Filter	
P2	2.92^{***}		0.92	
	(1.10)		(0.91)	
P23		2.77^{**}		1.89^{**}
		(1.09)		(0.86)
$\hat{\tau}_{t-1}$	0.44^{***}	0.38^{***}	0.71^{***}	0.75^{***}
	(0.10)	(0.09)	(0.11)	(.11)
$\bar{R}^2$	0.20	.26	.49	.53
DW	1.95	1.84	1.30	1.32
N	39	39	39	39

Table 2B: Empirical Regularities of the Political Business Cycle for Tax Rates**

Explanatory Variable	Growth Rates		HP Filter	
P2	3.57^{***}		1.67^{*}	
	(1.08)		(0.87)	
P23		2.85^{***}		1.65^{***}
		(0.81)		(0.56)
$\hat{\tau}_{t-1}$	0.13	-0.02	0.38^{***}	0.35^{**}
	(0.17)	(0.16)	(0.17)	(0.15)
$\bar{R}^2$	0.16	0.19	0.09	0.16
DW	2.33	2.11	1.72	1.72
N	48	48	48	48

$$\hat{g}_t = \beta_0 + \beta_1 \cdot Partisan_t + \beta_3 \cdot \hat{g}_{t-1} + \epsilon_t$$

Table 2C: Empirical Regularities of the Political Business Cycle for Government Spending***

Explanatory Variable	Growth Rates		HP Filter	
P2	4.04^{***}		2.50^{**}	
	(1.40)		(1.17)	
P23		2.37^{***}		2.02^{***}
		(0.96)		(0.77)
$\hat{g}_{t-1}$	0.44^{***}	0.36^{**}	0.77^{***}	0.79^{***}
	(0.09)	(0.12)	(0.09)	(0.11)
$\bar{R}^2$	0.37	0.27	0.60	0.62
DW	1.44	1.28	0.96	0.94
N	44	44	44	44

Notes: See Tables 1A-B. For Table 2A, the average marginal tax rate is from Rush, et. al [1996] from 1949-1990. For Table 2B, the average tax rate is calculated as tax revenue/income from 1949-1996. For Table 2C, Government spending is calculated as real Government consumption and investment plus social insurance. The smoothing parameter for the HP filter is set to 400.

Table 3: Calibrated Parameter Values

β	.95	Implies Annual Risk Free Rate of $\beta^{-1} - 1 \approx .05$.
α	.36	Average share of Capital Income.
δ	.10	Annual Depreciation Rate.
ψ	$(.05, .25)$	Substitutability parameter between Federal to Private Spending on Goods and Services.
ν	$\{0, .25, .50\}$	Impact of Government Competence on Private Sector Productivity.
$\bar{h}$	.30	Fraction of Time Spent Working.
$\bar{g}/\bar{y}$	.11	Post-War Ratio of Federal Spending on Goods and Services to GDP
Φ	$(-)0.05$	Democratic (Republican) Shock to Government Services.
ρ	.70	Persistence of Fiscal Shock.

Notes: These parameters imply the following steady state values on an annual basis: $\bar{k} = 0.96$, $\bar{y} = 0.46$, $\bar{c}^p = 0.31$, $\bar{g} = .05$, $\bar{i} = 0.09$, so that $\bar{k}/\bar{y} = 2.10$, $\bar{c}^p/\bar{y} = .68$, and $\bar{i}/\bar{y} = 0.21$.

Table 4: Simulated Political Business Cycles for Output from an Expected Shock to Government Services of 5 Percentage Points

Model Parameters		Average Correlation Between Simulated and Actual			Simulated Partisan and Competency Features			
ψ	ν	$\hat{y}$	$\hat{c}^p$	$\hat{i}$	$P2$	$P23$	$C34$	$C4$
0.050	0.00	−0.663	−0.336	−0.554	−0.361	−0.332	0.247	0.271
0.100	0.00	−0.664	−0.359	−0.554	−0.379	−0.347	0.241	0.265
0.150	0.00	−0.664	−0.372	−0.555	−0.397	−0.362	0.234	0.259
0.200	0.00	−0.665	−0.380	−0.556	−0.414	−0.377	0.228	0.253
0.250	0.00	−0.665	−0.386	−0.556	−0.431	−0.392	0.223	0.247
0.050	0.25	0.654	0.160	0.393	0.493	0.447	0.833	0.920
0.100	0.25	0.656	−0.008	0.491	0.467	0.423	0.817	0.904
0.150	0.25	0.657	−0.190	0.544	0.441	0.400	0.801	0.888
0.200	0.25	0.659	−0.305	0.568	0.417	0.377	0.786	0.873
0.250	0.25	0.660	−0.360	0.577	0.393	0.355	0.772	0.859
0.050	**0.50**	**0.663**	**0.234**	**0.577**	**1.062**	**0.967**	**1.224**	**1.353**
0.100	0.50	0.663	0.184	0.573	1.031	0.937	1.201	1.330
0.150	0.50	0.664	0.117	0.575	1.000	0.908	1.178	1.308
0.200	0.50	0.664	0.034	0.573	0.971	0.880	1.157	1.287
0.250	0.50	0.664	−0.056	0.572	0.942	0.854	1.138	1.267
Actual					2.45	1.32	0.92	1.07

Notes: See Tables 1A-B. Multipliers are in percentage point deviations from steady state. ψ is the parameter for the substitutability of Government services for private consumption in the composite consumption good, and ν is the parameter for the proportion of competence in the provision of government services that affects the productivity of output. C34 and C4 are averages across competent Democratic and Republican leaders. The correlations are constructed as the average correlation of the relevant simulated series for each party with the year by year performance of each Presidential term, where the data has been HP filtered. The actual political business cycle features are reported in the bottom row of the table and can also be found in Tables 1A-B.

TABLE 5: SIMULATED REAL POLITICAL BUSINESS CYCLES

Observed Statistics From HP filtered Data

		$corr(c,y)$	$corr(i,y)$	σ_c/σ_y	σ_i/σ_y
		0.819	0.734	0.654	3.395

Simulated Mean Statistics From Standard RBC Model

ψ	ν	$corr(c,y)$	$corr(i,y)$	σ_c/σ_y	σ_i/σ_y
0.00	0.00	$0.743^{\dagger}$	0.987	0.248	$3.350^{\dagger}$

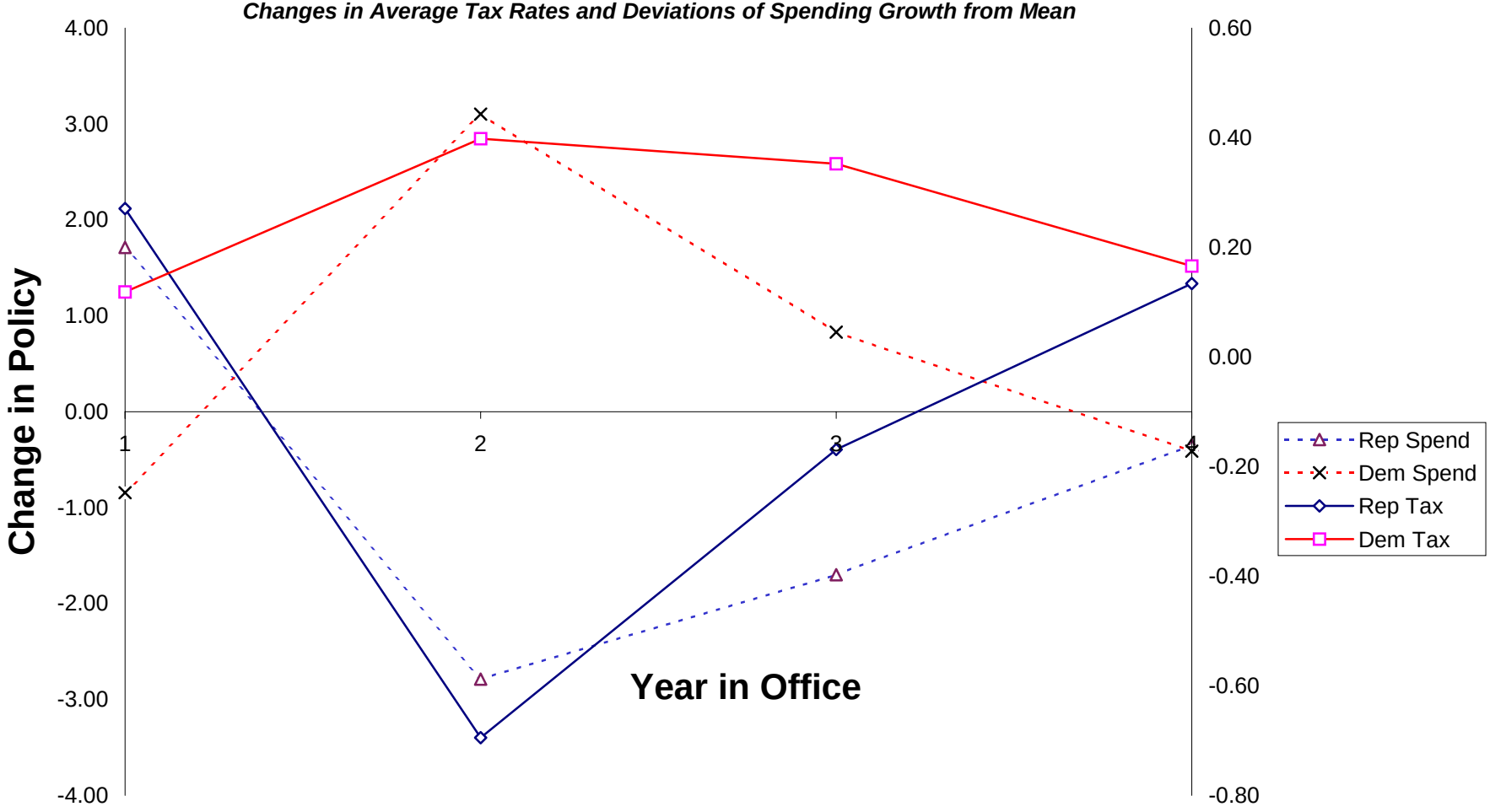
Simulated Mean Statistics From Standard RBC Model

ψ	ν	$corr(c,y)$	$corr(i,y)$	σ_c/σ_y	σ_i/σ_y
0.05	0.00	$0.721^{\dagger}$	0.985	0.262	$3.406^{\dagger}$
0.10	0.00	$0.660^{\dagger}$	0.986	$0.257^{\dagger}$	$3.449^{\dagger}$
0.15	0.00	$0.691^{\dagger}$	0.987	0.263	$3.429^{\dagger}$
0.20	0.00	$0.661^{\dagger}$	0.987	$0.268^{\dagger}$	$3.463^{\dagger}$
0.25	0.00	$0.655^{\dagger}$	0.990	0.266	$3.481^{\dagger}$
0.05	0.25	$0.657^{\dagger}$	0.986	$0.292^{\dagger}$	$3.388^{\dagger}$
0.10	0.25	$0.654^{\dagger}$	0.988	0.276	$3.373^{\dagger}$
0.15	0.25	$0.645^{\dagger}$	0.990	0.271	$3.412^{\dagger}$
0.20	0.25	$0.625^{\dagger}$	0.990	0.267	$3.446^{\dagger}$
0.25	0.25	$0.626^{\dagger}$	0.992	0.279	$3.446^{\dagger}$
0.05	**0.50**	$\mathbf{0.681}^{\dagger}$	**0.985**	$\mathbf{0.298}^{\dagger}$	$\mathbf{3.347}^{\dagger}$
0.10	0.50	$0.651^{\dagger}$	0.985	$0.296^{\dagger}$	$3.366^{\dagger}$
0.15	0.50	$0.657^{\dagger}$	0.989	$0.299^{\dagger}$	$3.373^{\dagger}$
0.20	0.50	$0.650^{\dagger}$	0.988	$0.300^{\dagger}$	$3.407^{\dagger}$
0.25	0.50	$0.587^{\dagger}$	0.990	$0.300^{\dagger}$	$3.422^{\dagger}$

Notes: A '†' represents that one cannot reject the hypothesis that the simulated distribution of statistics is equal to the observed statistic at or below the .05 level of statistical significance.

Figure 1: Partisan Pattern of Taxes and "Productive" Government Spending

Changes in Average Tax Rates and Deviations of Spending Growth from Mean



Spend is Deviation of the Growth Rate of Real Government Consumption and Investment Plus Social Insurance from its mean(leftscale)

Tax is the change in Tax Receipts divided by GDP(rightscale) Source: BEA

Figure 2: Summary of Events

Party	Offer	Probability	Abilities	$\hat{Z}_{t+J}$	$\hat{\tau}_{t+J}$
Democrat	$\uparrow G = \Phi > 0$	P	Competent	$\uparrow \Phi/(1+\nu)$	0
		(1-P)	Incompetent	0	$\uparrow \Phi$
Republican	$\downarrow G = -\Phi < 0$	P	Competent	0	$\downarrow \Phi$
		(1-P)	Incompetent	$\downarrow \Phi/(1+\nu)$	0

Notes: At time t a new leader is chosen with an associated party affiliation. The leader credibly offers to affect the path of government services from time $t+J$ onwards consistent with his party affiliation. At time $t+J$ the leader with probability P is revealed to be competent, and with probability $(1-P)$ is revealed to be incompetent. Based on partisanship, this competence or incompetence is revealed in different ways as presented by the figure.

Figure 3: Simulations of Key Variables For a Democratic President Elected at Time t=1

(Deviations from Steady State. Gov't Substitution (Psi) = .05 and Spin-off (nu) = .5)