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Accepted 20 March 2000

Abstract

We present a two-party dynamic model of optimal fiscal policy which integrates stabilizing, electoral and partisan motives. The political equilibrium determines the path of government expenditures, taxes and debt. It shows how electoral and partisan policies weaken stabilizing feedback efforts. When we use Greek data, the theoretical restrictions are not rejected and we get sensible estimates. The early period 1960–1973 and the Maastricht Treaty period 1993 to today differ from the period in between, 1974–1992. There is evidence of pre-election cycles during 1960–1992. There are no partisan differences; both Conservative and Socialist administrations can be equally blamed for fiscal laxity. The latter started in 1974, became stronger in the late 1970s and continued until the early 1990s.

\textit{JEL classifications:} H1; H6; H7

\textit{Keywords:} Political business cycles; Fiscal policy; Public debt; Structural breaks

1. Introduction

Empirical work suggests that political (electoral and partisan) motives affect fiscal policy (Roubini and Sachs, 1989; Alesina et al., 1993). Several authors have modeled the effects of these motives on fiscal policy in a rational expectations
framework (Rogoff and Sibert, 1988; Persson and Svensson, 1989; Alesina and Tabellini, 1990; Rogoff, 1990). Recently, Lockwood et al. (1996) showed how stabilizing, feedback effects from the outstanding stock of government debt to current fiscal policy instruments are weakened by electoral and partisan policies.

The present paper tests a modified version of the model in Lockwood et al. (1996) on Greek data during 1960–1997. Here, we study a case in which policymakers do not care — or care little — about the public debt they are going to inherit when they come back to power. This is consistent with evidence from the political science literature that politicians in south European countries like Greece do not really look beyond the end of their terms of office (Laver and Hunt, 1992).

The theoretical model is as follows. Two political parties (named ‘Conservatives’ and ‘Socialists’), which have different expenditure and tax targets, may alternate in power. The parties do not care about: (i) policy outcomes when out of power; (ii) the public debt they are going to inherit when they come back to power. When we solve for Markov-perfect equilibria, we show that near to the end of term in office, all administrations over-spend, under-tax and hence over-borrow, knowing that they will not (with some non-zero probability) have to face the consequences for a while. We call this the ‘quasi finite-horizon effect’. There are also standard partisan results, i.e. Socialists choose systematically a larger size of the public sector than Conservatives.

The model leads to structural equations for government expenditures, taxes and public debt. We test and estimate the model for Greece 1960–1997. We follow a two-step approach to estimation. At the first stage, we follow Perron (1989) and use the Zivot–Andrews unit root test to check whether the series are stationary around broken intercepts and/or time-trends (Zivot and Andrews, 1992). The message from the raw data is that the major structural breaks in public finance series occurred in 1974 and around 1980 (see below for interpretation of these dates). At the second stage, we take into account the statistical properties of the data, and estimate the model by using Generalized Methods of Moments (GMM). The theoretical cross-equation restrictions are not rejected, and all estimated structural parameters are significant and have the right sign and magnitude.

Our main empirical findings are as follows. First, the early ‘autocratic’ period 1960–1973 and the ‘Maastricht Treaty’ period 1993 to today differ from the period in between, i.e. 1974–1992. In particular, after democracy was restored in 1974, a period of fiscal laxity started which became worse in the late 1970s and continued until the early 1990s. Since 1993 there have been efforts to reverse this process and stabilize the public finances so as to gain entry into the European Monetary Union. Second, there is strong evidence of pre-election fiscal euphoria under all administrations during 1960–1992. That is, during that period, immediate pre-election years are characterized by higher government expenditures and debt, and lower taxes. Such opportunist policies have become weaker since 1993. Third, during the period of fiscal laxity 1974–1992, there are no partisan differences. In particu-

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1 For a survey of the literature on political economy, see Persson and Tabellini (1994).
lar, the data show that it was Conservatives who engineered a big jump in fiscal deficits during 1979–1981, while things took a turn for the worse during the 1980s, decade of Socialist administrations (Conservatives were in power until October 1981, when they were succeeded by Socialists who remained in power until 1989).

The rest of the paper is organized as follows. Section 2 presents the theoretical model. The econometric model is in Section 3. Section 4 concludes and discusses policy implications. Mathematical proofs are in Appendices A and B.

2. The theoretical model

The model introduces political motives into a linear–quadratic dynamic model (Barro, 1979) of optimal fiscal policy. The economy is real. Time is discrete and infinite, \( t = 1, 2, \ldots, \infty \) Government expenditures (\( G \)) are financed by tax revenues (\( T \)) and bonds (\( B \)) which have one period maturity and pay a gross rate of return (\( R \)). The per-period budget constraint of the government is:

\[
B_t = G_t - T_t + R B_{t-1}
\]

(1)

where \( B_0 \) is given, and \( R \) is exogenous and constant over time [this is for simplicity; see also Barro (1979)].

There are two political parties called Conservatives (denoted by the superscript \( c \)) and Socialists (denoted by the superscript \( s \)). Elections take place every second period. The incumbent party has an exogenous and constant probability, \( 0 < q < 1 \), of winning the election and remaining in power (see also below). Therefore, in the period before an election (which we call non-election period and denote by the subscript \( n \)), there is electoral uncertainty because there is only a probability \( q \) of remaining in office in the next period (which we call election period and denote by the subscript \( e \)).

The political parties dislike deviations of actual government expenditures and taxes (\( G_t \) and \( T_t \)) from exogenous targets (\( \bar{G}_t \) and \( \bar{T}_t \)). This is consistent with evidence provided by the political science literature that the ‘tax cuts vs. public spending’ issue is one of the most important policy dimensions (Laver and Hunt, 1992). The per-period loss function of party \( i = (c, s) \) is:

\[
L_i = \mu (G_i - \bar{G}_i)^2 + (T_i - \bar{T}_i)^2 \quad \text{when in power}
\]

\[
L_i = 0 \quad \text{when out of power}
\]

(2)

where the parameter \( \mu > 0 \) is the weight given by both parties to government expenditures relative to taxes, and \( \bar{G}_i \) and \( \bar{T}_i \) are party-specific exogenous targets.

\(^2\)Lockwood et al. (1996) constructed a general equilibrium model with microfoundations consistent with Barro’s macromodel (Barro, 1979). In particular, a small open economy populated by infinitely-lived citizens, who care about consumption and leisure, and two political parties, which represent different groups with different attitudes towards public goods.
for expenditures and tax revenues respectively (see below). We make the testable assumption that $\bar{G}_i > \bar{G}_j$ and $\bar{T}_i > \bar{T}_j$, i.e. Socialists go for a larger size of the public sector than Conservatives. Note that when out of power, the parties do not care about policy outcomes and hence their loss is zero.

We will solve for Markov-perfect equilibria, in which optimal policies (Markov strategies) are functions of only the current state of the game. Since the model is linear–quadratic, we will focus on linear Markov strategies (Stokey and Lucas, 1989).

To simplify notation, we express variables in terms of deviations from targets. So let us define $g_i^t = (G_i^t - \bar{G}_i)$, $\tau_i^t = (T_i^t - \bar{T}_i)$ and $b_i^t = (B_i^t - \bar{B}_i)$. Here, $\{\bar{B}_i\}$ solves $\bar{B}_i = \bar{G}_i - \bar{T}_i + R\bar{B}_{i-1}$ with $B_0$ given, i.e. the path of $\bar{B}_i$ follows from the choice of $\{\bar{G}_i\}$ and $\{\bar{T}_i\}$ and the initial condition $\bar{B}_0$. We assume $b_0 = (B_0 - \bar{B}_0) > 0$, i.e. initial debt is too high to allow the party in power to achieve its expenditure and tax targets simultaneously; otherwise, the solution is trivial with $g_i^t = \tau_i^t = 0$ in all periods.

Let $\beta_{c}^{i} b_{t-1}^{i}$ and $\beta_{n}^{i} b_{t-1}^{i}$ be the present value of losses to party $i$ in election years (e) and non-election years (n), respectively, at time $t$, where $\beta_{c}^{i}$ and $\beta_{n}^{i}$ are undetermined coefficients. Then, the solution is characterized by the following pair of Bellman equations:

\[
\beta_{c}^{i} b_{t-1}^{i} = \min_{g_{t}, \tau_{t}} \left[ \mu (g_{t})^2 + (\tau_{t})^2 + \delta \beta_{n}^{i} (g_{t} - \tau_{t} + Rb_{t-1})^2 \right] \\
\text{ (election year)}
\]

\[
\beta_{n}^{i} b_{t-1}^{i} = \min_{g_{t}, \tau_{t}} \left[ \mu (g_{t})^2 + (\tau_{t})^2 + \delta q \beta_{c}^{i} (g_{t} - \tau_{t} + Rb_{t-1})^2 \right] \\
\text{ (non-election year)}
\]

where $0 < \delta < 1$ is the discount rate. Notice two things in Eqs. (3a) and (3b). First, since there are no cross-terms in strategies, we have two pairs of simultaneous equations like Eqs. (3a) and (3b), so that $(\beta_{c}^{i}, \beta_{n}^{i})$ can be solved independently of $(\beta_{c}^{j}, \beta_{n}^{j})$ where $i, j = (c, s)$ and $i \neq j$. Second, since the parties differ only in the exogenous targets $(\bar{G}_i, \bar{T}_i)$, and we work with deviations from targets, we can now drop the superscript $i$. That is, as long as we work in terms of deviations from targets, the solution is party-independent.\(^4\)

\(^3\)That is, there is no direct strategic interdependence (the only interdependence is through the physical state variable, $b$). This happens because: (i) the parties do not care about policy outcomes when out of power; (ii) the parties do not care about the debt they are going to inherit when they come back to power with probability $1 - q > 0$ in the next election. Alesina and Tabellini (1990) have studied case (i), while Lockwood et al. (1996) have studied case (ii). See also the discussion after Proposition 2 below.

\(^4\)We will restore the superscript $i = (c, s)$ when we re-express variables in actual values (see Eqs. (5a), (5b) and (5c) below). Notice that if we had additional partisan differences, the solution would be party-dependent. Here, we work with partisan differences in targets only, because this simplifies the notation and, more importantly, is consistent with the empirical results below.
Differentiating Eqs. (3a) and (3b) with respect to $g_t$ and $\tau_t$, we get the Markov strategies:

$$g_t = -\gamma_j R_b t_{j-1} \quad j = (e,n) \quad (4a)$$

$$\tau_t = \mu \gamma_j R_b t_{j-1} \quad j = (e,n) \quad (4b)$$

$$b_t = [1 - \gamma_j (1 + \mu)] R_b t_{j-1} \quad j = (e,n) \quad (4c)$$

where $0 \leq \gamma_e \equiv \frac{\delta \beta_n}{\mu + \delta \beta_n (1 + \mu)} < 1$ and $0 \leq \gamma_n \equiv \frac{\delta q \beta_c}{\mu + \delta q \beta_c (1 + \mu)} < 1.5$

In other words, expenditures $g_t$ are a negative function of inherited debt $b_{t-1}$, while taxes $\tau_t$ are a positive function of $b_{t-1}$. Hence, policy instruments are used to stabilize the public debt. However, as Propositions 2 and 3 below show, stabilizing feedback policies are weakened by political motives.

The main properties of the political equilibrium are summarized by the following three propositions.

2.1. Proposition 1

A Markov-perfect political equilibrium exists, and it is unique.

Proof: see Appendix A.

2.2. Proposition 2

For both parties, expenditures and debt are higher, and taxation is lower, before elections than after elections. That is, $g_e < g_n$, $\tau_e > \tau_n$ and $b_e > b_n$.

Proof: see Appendix B.

The idea is that as the probability of losing office comes closer, the government cares less about the future cost of debt. In particular, it is shown in the Appendices A and B that $q \beta_c < \beta_n$ (i.e. the marginal cost of a given level of inherited debt is lower before elections than after elections). As a result, stabilization policy is weaker in pre-election periods. We call this the ‘quasi finite-horizon effect’. Namely, near to elections, the party in power over-runs deficits and over-accu-

mulates debt, because it faces a quasi finite horizon (i.e. it knows that it will not — with some non-zero probability $(1 - q)$ — have to face the consequences for a while). See below for a comparison with other models.

Finally, by using the transformations $g_t^i \equiv (G_t^i - \bar{G}_t)$, $\tau_t^i \equiv (T_t^i - \bar{T}_t^i)$ and $b_t^i \equiv (B_t^i - \bar{B}_t^i)$ into Eqs. (4a), (4b) and (4c), we get the actual values of $G_t^i$, $T_t^i$ and $B_t^i$.

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5Conditions Eqs. (3a), (3b), (4a), (4b) and (4c) are also sufficient for an equilibrium if the transversality condition $\lim_{t \to \infty} [\delta \beta t_{j-1}] = 0$ is satisfied. Using Eq. (4c), a sufficient condition for this to hold is $[1 - \gamma_j (1 + \mu)]R < 1/\sqrt{\delta}$, which implies that debt grows at a rate less than $1/\sqrt{\delta}$. 
This can give standard partisan effects. That is,

\[ G_i = \overline{G}_i - \gamma_i R(B_{t-1} - \overline{B}_{t-1}) \quad i = (c,s) \text{ and } j = (e,n) \] (5a)

\[ T_i = \overline{T}_i + \mu \gamma_j R(B_{t-1} - \overline{B}_{t-1}) \quad i = (c,s) \text{ and } j = (e,n) \] (5b)

\[ B_i = \overline{B}_i + [1 - \gamma_j (1 + \mu)] R(B_{t-1} - \overline{B}_{t-1}) \quad i = (c,s) \text{ and } j = (e,n) \] (5c)

2.3. Proposition 3

If \( \overline{G}^i > \overline{C}^c \) and \( \overline{T}^s > \overline{T}^c \), then, conditional on inherited debt \( B_{t-1} \), expenditures and taxes are higher under Socialists. That is, \( G^s > G^c \) and \( T^s > T^c \).

Proof: It follows directly from Eqs. (5a), (5b) and (5c).

We close this section by comparing our results with those of the literature. Our model has extended Barro’s tax smoothing model (Barro, 1979). That is, it is a linear–quadratic model of optimal fiscal policy which incorporates stabilizing and political (electoral and partisan) motives. We showed that it is optimal for the government to run a deficit in pre-election periods (see Proposition 2), while ad hoc differences in policy targets can lead to standard partisan cycles in fiscal policy (see Proposition 3).

Our model generates electoral cycles which are similar to those generated by other models, but for different reasons. Rogoff and Sibert (1988) and Rogoff (1990) assume that the re-election probability is endogenous, and then develop a theory of electoral effects on fiscal policy based on signaling. However, they do not allow for public debt or partisan differences. On the other hand, Persson and Svensson (1989) and Alesina and Tabellini (1990) developed a theory based on the strategic use of public debt. However, when their models allow for partisan differences over the aggregate level of government expenditures, they may lead to under-spending and under-accumulation of debt before elections, which is counter-factual. In our paper, by contrast, it is the ‘quasi finite-horizon effect’ that leads to electoral cycles; this effect follows from the assumption that the parties do not care about policy outcomes when out of power.\(^6\) Therefore, the ‘quasi finite-horizon effect’ allows us to get an electoral cycle similar to the one generated by Rogoff-type manipulation of the endogenous re-election probability, although here the re-election probability is exogenous. It also allows us to get predictions consistent with the

\(^6\)In particular, Lockwood et al. (1996) show that this result holds even if the parties care about the debt they will inherit when they return to office. That is, even if there is a strategic effect (in the sense that since party \( i \) knows that it will come back to power in the next election with probability \( 1 - q \), it has a strategic incentive to reduce the debt inherited to party \( j \neq i \)), this strategic effect is more than offset by the quasi finite horizon effect. Therefore, it is the assumption that parties do not care about policy outcomes when out of power that drives our result. However, our results carry through, if the parties care sufficiently less about policy outcomes when out of power than when in power.
empirical literature (i.e. under all administrations, government expenditures and debt increase, while taxes decrease, before elections) which is not always the prediction of the existing literature on the strategic use of public debt (Persson and Svensson, 1989; Alesina and Tabellini, 1990).

Our model also differs from the model of Alesina and Drazen (1991) on the strategic delay of fiscal stabilization. Alesina and Drazen study a war of attrition between two political parties that have an incentive to delay stabilization in the hope that the other party will be the first one to give in and bear the cost of stabilization. This is based on asymmetric information and belongs to a different research area, i.e. the literature on economic reforms (Persson and Tabellini, 1994).

Finally, our model differs from Lockwood et al. (1996) in the respect that it considers the case where policymakers do not care — or care sufficiently little — about the public debt they are going to inherit when they come back to power with a non-zero probability, $1 - q$. Technically, this allows us to use the contraction mapping argument to establish uniqueness and show the properties of the political equilibrium (see the proofs in the Appendices A and B). More importantly, the choice of the model is deliberate: we want to test and estimate the model on Greek data, and Greece is judged to have politicians with particularly short-time horizons (Laver and Hunt, 1992).


This section presents the econometric specification of the model by using Greek annual data during 1960–1997. Our approach is in three stages: First, we derive an estimable model. Second, we check the stationarity of the data. Third, we test and estimate the model by taking into account the statistical properties of the data.

3.1. Specification of unobservable policy targets and coefficients

To derive an estimable model, we have to specify the unobservable policy targets $(G^i_t, T^i_t, B^i_t)$ and the coefficients $(\gamma_j, G')$. We start with policy targets. We assume that expenditure targets $(G^i_t)$ Granger cause tax targets $(T^i_t)$. In particular\

$$G^i_t = T^i_t \equiv G^i$$  \hspace{1cm} (6a)

where $G^i$ denotes the expenditures target of administration $i$ (specified in Eq. (7b) below). Eq. (6a) implies that the government would like its expenditures to lead to equal tax revenues (choosing a balanced budget as a target is only for simplicity; alternative targets would not change our results but complicate the econometrics unnecessarily).

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$^7$The idea is as in Barro (1979). We report that the data do not reject this model specification. For a general analysis of the tax-spending causality with US data, see Hoover and Sheffrin (1992).
Using Eq. (6a) and imposing the terminal condition \( \lim_{N \to \infty} \left[ \frac{\overline{B}_{t+N}}{R^{N+1}} \right] = 0 \), recursive forward substitution applied to the budget constraint \( \overline{B}_t = \overline{G}_t - \overline{T}_t + R\overline{B}_{t-1} \) yields:

\[
\overline{B}_t = \overline{B}_{t-1} = 0
\]  

(6b)

We continue with the unobservable coefficient \( \gamma_j \) in Eqs. (5a), (5b) and (5c), and the exogenous target \( G^i \) in Eq. (6a). To model them, we will use appropriate dummy variables.

Consider \( \gamma_j \) where \( j = (e,n) \) is an index of the year of the electoral cycle. In our theoretical model, there are post-election years (e) and pre-election years (n). Define ‘de’ to be a zero-one dummy that takes on the value one in pre-election years. Then, following the theoretical model, we define \( \gamma_j \) to be:

\[
\gamma_j = \gamma_0 + \gamma_e de
\]  

(7a)

Eqs. (4a), (4b) and (4c) and Proposition 2 predict \( \gamma_0 > 0 \) and \( \gamma_e < 0 \). Thus, fiscal policy is used to stabilize public debt (\( \gamma_0 > 0 \)), but this is weakened in pre-election years (\( \gamma_e < 0 \)).

Now consider \( G^i \), where \( i = (c,s) \) is an index of the identity of political administration in power. The theoretical model distinguished between Conservatives (c) and Socialists (s). In our empirical investigation, without any loss of generality, we distinguish three regimes, i.e. we divide the full sample period 1960–1997 into three sub-periods. First, the period 1960–1973 which was an autocratic regime, both politically and economically. Second, the period 1974–1992. This regime started with the restoration of democracy in 1974, and evolved as ‘an unplanned outcome of a social struggle for income shares between various socio-economic groups, and governments trying to satisfy conflicting interests and objectives without any mechanisms to sustain efficiency’ (Alogoskoufis, 1995). At the same time, there were sharp ideological differences between the Conservative party (which was in power during 1974–1981 and 1990–1992) and the Socialist party (which was in power during 1982–1989). The third period is from 1993 onwards. This is the period of stabilization (although policy reforms were introduced in 1990–1, they started working only after 1992). Since 1993, Greece has made continuing progress in correcting its macroeconomic imbalances in an effort to gain entry into the European Monetary Union (see recent issues of OECD Economic Surveys).

\[\text{Having more than two parties/administrations does not affect our theoretical analysis. We report that we have experimented with various regimes. However, the data indicate three regimes. This is consistent with the literature on post-war politico-economic history in Greece (Alogoskoufis, 1995).}\]

\[\text{In particular, there were strong right-wing governments between 1956 and 1963 which — after a short period of socialist administration and political instability in the mid 1960s — were followed by a military coup in April 1967. This led to a dictatorship that lasted until July 1974. So, it was after the restoration of democracy in 1974 that the Greek political system was fully liberalized.}\]
Then, we define $G^i$ to be:

$$G^i = G_1 da + G_2 dlc + G_3 dls + G_4 dmt$$  \hspace{1cm} (7b)$$

where ‘da’ is a zero-one dummy that takes on the value one during the autocratic period 1960–1973, ‘dlc’ (resp. ‘dls’) is a zero-one dummy that takes on the value one during 1974–1981 and 1990–1992 (resp. 1982–1989) which are years of Conservative (resp. Socialist) administrations in the liberal period 1974–1992, and finally ‘dmt’ is a zero-one dummy that takes on the value one during the post-1993 period, i.e. the Maastricht Treaty period. Proposition 3 predicts $G_3 > G_1, G_2, G_4$. Thus, socialist administrations go for a relatively large size of the public sector.

### 3.2. Integrability tests

Before estimating the model, we check whether the series $G_t$, $T_t$ and $B_t$ are stationary.\footnote{Dickey–Fuller (DF) test results are reported in Panel A of Table 1 below and indicate the presence of unit roots in all three series. However, since DF tests favor the null of unit roots when there are structural breaks (Perron, 1989; Rappoport and Reichlin, 1989), we also carry out the ZA test (Zivot and Andrews, 1992). This test belongs to the same category with the test of Perron and Vogelsang (1992), and can endogenously determine possible breaks in data mimicking unit roots.}

Dickey–Fuller (DF) test results are reported in Panel A of Table 1 below and indicate the presence of unit roots in all three series. However, since DF tests favor the null of unit roots when there are structural breaks (Perron, 1989; Rappoport and Reichlin, 1989), we also carry out the ZA test (Zivot and Andrews, 1992). This test belongs to the same category with the test of Perron and Vogelsang (1992), and can endogenously determine possible breaks in data mimicking unit roots.

ZA tests are reported in Panel B of Table 1.\footnote{The ZA test rejects the null of non-stationarity, when the minimum value of the DF statistic calculated across all possible breaks in the data, denoted by $\text{Inf} \text{DF}$, is less than the critical value of the test (Zivot and Andrews, 1992).} In addition to the endogenously determined dummies detected by the ZA test, we include arbitrarily two other dummies, ‘da’ and ‘dmt’, which were defined above and capture, respectively, the autocratic period 1960–1973 and the Maastricht Treaty period 1993 to today. These two dummies are included to separate exogenous regime switches from possible endogenous switches driven by political motives.\footnote{The finite sample critical values of the ZA test, being augmented by the exogenously included dummies, have been calculated by Monte Carlo simulations using a sample of 37 observations. A total of 5000 replications were performed. At the fractions of the break point reported in Panel B of Table 1, the 5% critical value of the test is found to be $-4.20$ for all series.}

There are three main results from Panel B: (i) There is evidence of structural breaks in intercept and/or time-trend in all public-finance series; (ii) The breaks
Table 1
Unit root tests: Greece 1960–1997

Panel A: Dickey–Fuller unit root tests
Model: $X_t = c + \delta t + \rho X_{t-1} + \epsilon_t$

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<td>$c$</td>
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<td>$G_t$</td>
<td>0.027</td>
<td>0.006</td>
<td>0.70</td>
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<td></td>
<td>(2.84)</td>
<td>(2.84)</td>
<td>(5.64)</td>
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<tr>
<td>$T_t$</td>
<td>0.045</td>
<td>0.001</td>
<td>0.60</td>
<td>-2.96</td>
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<td></td>
<td>(3.00)</td>
<td>(2.97)</td>
<td>(4.00)</td>
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<tr>
<td>$B_t$</td>
<td>-0.014</td>
<td>0.003</td>
<td>0.97</td>
<td>-0.55</td>
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<tr>
<td></td>
<td>(0.82)</td>
<td>(1.83)</td>
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Panel B: Zivot–Andrews sequential unit root tests
Model: $X_t = c_0 + c_1 d + c_2 dmt + c_3 DU + \delta t + \kappa DT + \rho X_{t-1} + \epsilon_t$

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<td></td>
<td>$c_0$</td>
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<td>$c_3$</td>
<td>$\delta$</td>
<td>$\kappa$</td>
<td>$\rho$</td>
<td>Inf DF</td>
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<td>$G_t$</td>
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<td>-0.01</td>
<td>-0.004</td>
<td>0.013</td>
<td>-0.00001</td>
<td>0.0007</td>
<td>0.32</td>
<td>-5.23* (1981)</td>
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<td></td>
<td>(5.65)</td>
<td>(3.86)</td>
<td>(0.84)</td>
<td>(3.60)</td>
<td>(0.05)</td>
<td>(1.38)</td>
<td>(2.50)</td>
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<td>$T_t$</td>
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<td>-0.007</td>
<td>-0.014</td>
<td>0.0014</td>
<td>0.002</td>
<td>0.31</td>
<td>-4.41* (1979)</td>
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<td>(0.10)</td>
<td>(1.11)</td>
<td>(2.46)</td>
<td>(1.97)</td>
<td>(2.48)</td>
<td>(1.77)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$B_t$</td>
<td>0.042</td>
<td>0.04</td>
<td>0.24</td>
<td>-0.06</td>
<td>0.01</td>
<td>0.04</td>
<td>-0.03</td>
<td>-9.08* (1980)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(1.32)</td>
<td>(1.75)</td>
<td>(7.87)</td>
<td>(2.75)</td>
<td>(4.49)</td>
<td>(8.20)</td>
<td>(0.25)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(i) $t$ is a time-trend, $da$ is a zero-one dummy for the autocratic period 1960–1973, and $dmt$ is a zero-one dummy for the Maastricht Treaty period 1993 to today. Also, $G_t$, $T_t$ and $B_t$ are, respectively, government consumption expenditures, total tax revenues and public debt as GDP ratios. (ii) $t$-Statistics (in absolute values) are in parentheses below estimated coefficients. (iii) An asterisk indicates significance at the 5% level. (iv) In Panel A, DF is the Dickey–Fuller $t$-statistic for unit roots. (v) In Panel B, $DU_t$ and $DT_t$ are the endogenously determined breaks in intercept and time-trend, respectively. Here $DU_t = 1$ if $t > T_B$ and 0 otherwise, $DT_t = t - T_B - 1$ if $t \geq T_B$ and 0 otherwise, and $T_B$ denotes the time of break in the intercept and the slope. The value of the ZA test statistic is the minimum value of the DF statistic, denoted as Inf DF, over all possible break points in the full sample. As the numbers in parentheses show, the dates of break are 1981, 1979 and 1980 for $G_t$, $T_t$ and $B_t$, respectively.
occurred in 1974 and around 1980 (see below for interpretation of these dates); (iii) All series become stationary once we allow for these breaks. In particular, the results in Panel B imply the following: concerning government consumption \( (G_t) \), there is evidence of a break in intercept in 1974 (see \( c_1 \)), while the ZA test detects an additional break in intercept in 1981 (see \( c_3 \)). Concerning tax revenues \( (T_t) \), the ZA test detects a break in both intercept and trend in 1979 (see \( c_3 \) and \( \kappa \)). Finally, the ZA test indicates a break in both intercept and trend of public debt \( (B_t) \) in 1980 (see \( c_3 \) and \( \kappa \)).

Summing up, the main message from the raw data is that the major changes occurred in 1974 and around 1980. Recall that 1974 is the year that democracy was restored. After that, the public started demanding redistribution and an expansion of the economic role of the state. As a result, government consumption started to rise. After 1979 things became worse, as both the outgoing conservatives (who engineered a spectacular jump in deficits during 1979–1981) and the incoming socialists (who won the election in October 1981 and ruled until 1989) ran persistent fiscal deficits. See below for details. These results are consistent with the econometric evidence of Makrydakis et al. (1999) and the interpretation of Alogoskoufis (1995).

3.3. The econometric model, tests and estimation results

To get the final econometric model, we substitute Eqs. (6a) and (6b) and Eqs. (7a) and (7b) into Eqs. (5a), (5b) and (5c), and also include unrestricted intercepts and time-trends with breaks as separate variables (with the break dates determined from the ZA tests above).

\[
G_t = G_0 + a_{G1} d_t + a_{G2} dlc + a_{G3} dmt - a_{G4} B_{t-1} - a_{G5} de_1 B_{t-1} + \delta_1 t + \delta_2 DT_t^G + \delta_3 DU_t^G
\]  
\[T_t = T_0 + a_{T1} d_t + a_{T2} dlc + a_{T3} dmt + a_{T4} B_{t-1} + a_{T5} de_1 B_{t-1} + \delta_4 t + \delta_5 DT_t^T + \delta_6 DU_t^T\]  
\[B_t = B_0 + a_{B4} B_{t-1} - a_{B5} de_1 B_{t-1} + \delta_7 t + \delta_8 DT_t^B + \delta_9 DU_t^B\]  

The data also indicate a jump in the stock of debt in 1993 (captured by \( c_2 \)). This looks paradoxical since the Maastricht Treaty is expected to exert a stabilization effect. However, the jump is in fact due to a change in government accounts. Namely, since that year, the debt of public enterprises has been measured as government debt.

We include unrestricted intercepts even though the constant terms (policy targets) in the regressions for expenditures and taxes are the same, and the regression for debt does not contain a constant term (Eqs. (6a) and (6b)). Given the evidence in Table 1, this is a sensible thing to do. Also, we drop the dummy ‘dls’ (see Eq. (7b)) to avoid linear dependence (alternatively, we could drop the intercept).
where

\[ a_{G1} = a_{T1} = G_1, a_{G2} = a_{T2} = G_2, a_{G3} = a_{T3} = G_4, a_{G4} = R_0, a_{G5} = R_c \]

\[ a_{T4} = R_0 \mu, a_{T5} = R_c \mu, a_{B4} = R[1 - \gamma_0(1 + \mu)], a_{B5} = R_c(1 + \mu) \quad (9) \]

In Eqs. (8a), (8b) and (8c), \( G_0, T_0 \) and \( B_0 \) are intercepts, \( t \) is a time-trend, and \( DT^h_i, DU^h_i \), where \( h = (G,T,B) \), are breaks in time-trend and intercept, respectively (see Panel B in Table 1). Given the statistical properties of the data, these effectively de-trended series are stationary, which enables us to use standard asymptotic theory.

Eqs. (8a), (8b) and (8c) are estimated subject to Eq. (9) by using GMM. The instruments used are the independent variables. It is known that GMM estimators claim orthogonality restrictions between the instruments and the disturbance terms. A number of these restrictions, which are necessary to identify the number of parameters for estimation, is satisfied by construction. The remaining number of restrictions, which equals the total number of orthogonality conditions minus the number of parameters, constitutes extra (over-identified) conditions which can be used to test the specification of the model. This test, known as the over-identifying restrictions test (Hansen, 1982), is asymptotically distributed as \( \chi^2(d) \), where \( d \) denotes degrees of freedom and equals the number of over-identifying restrictions. Here, \( d = 22 \). The GMM results are reported in Table 2 below. The over-identifying restrictions test statistic, denoted by \( J(d) \), equals 33.45. Hence, the theoretical cross-equation restrictions Eq. (9) cannot be rejected at the 5% level. We feel that this is impressive given the complexity of the restrictions.

We now discuss the estimation results in Table 2. All crucial parameters are significant, and have the expected sign and magnitude. We start with electoral cycles. As predicted by the model (see Eq. (7a) above), \( \gamma_0 > 0 \) (i.e. there are stabilizing — although insignificant — feedback effects from inherited debt to current expenditures and taxes), and \( \gamma_c < 0 \) (i.e. in pre-election years, incumbents raise expenditures and lower taxes, so that stabilizing policies become weaker). Note that (after some experimentation) we have also distinguished pre-election effects during the Maastricht Treaty period 1973 to today (see the parameter \( \gamma_c^{93-97} \)) from pre-election effects during all other years 1960–1992 (see the parameter \( \gamma_c^{60-92} \)). Efforts to ‘bribe’ the electorate have become weaker since 1993.

The estimated parameters \( G_1 \) and \( G_4 \) are significantly negative as predicted by the model (see Eq. (7b) above). This implies that the early autocratic period 1960–1973 and the Maastricht Treaty period 1993 to today are characterized by tighter fiscal policies than the liberal period in between, i.e. 1974–1992. The next question to ask is whether there are partisan differences between Conservative and Socialist administrations during the liberal period 1974–1992. The parameter \( G_2 \) has the right sign but is not significant, an indication that Conservative administrations do not really differ from Socialist ones (see Eq. (7b) above).
Table 2
Restricted GMM estimates of Eqs. (8a), (8b) and (8c) subject to Eq. (9): Greece 1960–1997

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Estimate</th>
<th>t-Statistic</th>
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<tbody>
<tr>
<td>G1</td>
<td>-0.015</td>
<td>-3.55</td>
</tr>
<tr>
<td>G2</td>
<td>-0.004</td>
<td>-0.00</td>
</tr>
<tr>
<td>G3</td>
<td>-0.016</td>
<td>-3.65</td>
</tr>
<tr>
<td>γ0</td>
<td>0.007</td>
<td>1.12</td>
</tr>
<tr>
<td>γ60–92</td>
<td>-0.023</td>
<td>-2.54</td>
</tr>
<tr>
<td>γ93–97</td>
<td>-0.003</td>
<td>-1.03</td>
</tr>
<tr>
<td>μ</td>
<td>2.488</td>
<td>2.25</td>
</tr>
<tr>
<td>R</td>
<td>0.666</td>
<td>4.27</td>
</tr>
</tbody>
</table>

Intercept

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>G0</td>
<td>0.104</td>
<td>18.20</td>
</tr>
<tr>
<td>T0</td>
<td>0.130</td>
<td>22.15</td>
</tr>
<tr>
<td>B0</td>
<td>0.038</td>
<td>2.48</td>
</tr>
</tbody>
</table>

Coefficient

<p>| | | |</p>
<table>
<thead>
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<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>δ1</td>
<td>0.0006</td>
<td>1.52</td>
</tr>
<tr>
<td>δ2</td>
<td>0.002</td>
<td>2.93</td>
</tr>
<tr>
<td>δ3</td>
<td>0.011</td>
<td>3.10</td>
</tr>
<tr>
<td>δ4</td>
<td>0.001</td>
<td>3.70</td>
</tr>
<tr>
<td>δ5</td>
<td>0.003</td>
<td>3.34</td>
</tr>
<tr>
<td>δ6</td>
<td>-0.021</td>
<td>-3.66</td>
</tr>
<tr>
<td>δ7</td>
<td>0.002</td>
<td>1.52</td>
</tr>
<tr>
<td>δ8</td>
<td>0.021</td>
<td>2.13</td>
</tr>
<tr>
<td>δ9</td>
<td>-0.031</td>
<td>-0.94</td>
</tr>
</tbody>
</table>

(i) For definitions, see the text and Table 1 above. (ii) The instruments used are the independent variables. (iii) J(22) = 33.45. (iv) Results are based on a specification of the disturbance terms that allows for serial correlation of order two, given the evidence of LM test statistics.

The coefficients of the various dummy variables capturing structural breaks indicate that: (i) in 1981, both the growth rate and the level of government consumption increased (see the coefficients on δ2 and δ3, respectively); (ii) in 1979, the level of taxes fell (see the coefficient on δ0 in Table 2), while its growth rate increased (see the coefficient on δ5). However, it is the former that dominates in absolute value, i.e. 0.021 > 0.003. (iii) in 1980, the growth rate of public debt increased (see the coefficient on δ8). Taken all these results together, and recalling that Conservatives were in power until October 1981 when they were succeeded by Socialists who remained in power until 1989, there is evidence that it was Conservatives who started to follow lax fiscal policies in the late 1970s, but things took a turn for the worse when Socialists came to power. Then, public finance imbalances soared during the 1980s, decade of Socialist administrations. Therefore, both Socialists and Conservatives have to be blamed for the explosion of public dept. It is only after the early 1990s that (both Conservative and Socialists) governments started to reverse this process and take measures to stabilize the public finances.
Finally, notice that the estimated values of $\mu$ (i.e. the relative weight given to expenditures relative to taxes) and $R$ (i.e. the real interest rate) have plausible magnitudes.

Therefore, the data support our theoretical model. Note that our econometric work differs from that of the relevant literature. Contrary to most of the literature (Alesina et al., 1993), here we test and estimate a theoretical model subject to cross-equation restrictions between government expenditures, tax and debt equations; hence, we respect the Lucas critique and also get estimates of the structural parameters of the model. Also, to the extend that we look for political effects not only on the policy instruments but also on the feedback coefficients on state variables (here public debt), we provide an alternative test to that of the literature; namely, we investigate how political motives weaken stabilizing, feedback policies. Finally, our work differs from Lockwood et al. (1996) who have estimated a similar model on UK data. Here, we also take into account the time-series properties of the data when we estimate the model on Greek data.

4. Conclusions and policy implications

We have presented a dynamic model of optimal fiscal policy which integrated political and stabilizing motives. The political equilibrium determined the paths of government expenditures, taxes and debt. Then, we estimated the model by using Greek annual data over the period 1960–1997. Our empirical findings verify the belief (Laver and Hunt, 1992) that Greece had had office-seeking politicians with short time-horizons.

The evidence of political effects on fiscal policy justifies the introduction of strict budgetary rules. In fact, there is evidence that since the early 1990s there have been attempts by all administrations to control budget deficits. This period coincides with the Maastricht Treaty. Of course, we know that there can be a common budgetary performance independent of the Maastricht Treaty. That is, a country can stabilize on its own. However, the interesting question is not whether a country can stabilize on its own or not, but whether fiscal rules of the Maastricht Treaty type can make the stabilization process easier. If membership to the European

16As with almost any empirical work, our findings can be interpreted differently. For instance, it is possible that the high deficits in the late 1970s and 1980s were due to external shocks and not to changes in political regime. While this interpretation is possible, we believe that our empirical results are consistent with the theory we have put forward. That is, the data do not reject the theoretical cross-equation restrictions Eq. (9), and also give sensible results. We also report that our results are robust to changes in the econometric model (for instance, they do not change when we use additive dummy variables to capture political effects, or estimate special categories of government expenditures and taxes). Alogoskoufis (1995) also believes that the deterioration in Greek performance during that period had little to do with external shocks.
Union can work as a binding constraint on discretionary national fiscal policies, it cannot make stabilization harder (Buiter et al., 1993).

Acknowledgements

We are grateful to the editor and two anonymous referees for constructive criticisms. We thank G. Alogoskoufis, C. Gatsios, T. Kollintzas, T. Moutos, A. Muthoo, B. Saltoglu, A. Snell and seminar participants in Athens, Essex, Louvain-La-Neuve, Tilburg and Warwick for comments. We also thank M. Katsimi and S. Makrydakis for providing us with the data. All errors are ours.

Appendix A.

Proof of Proposition 1

We will use the fixed-point theorem (Friedman, 1986). Substituting Eqs. (4a), (4b) and (4c) back into Eqs. (3a) and (3b) and equating coefficients on $b_{t-1}^2$, we get two simultaneous Riccati equations in $(\beta^c, \beta^h)$. For clarity, let use the superscript $i$, so that $\beta_i^j$ is a strategy for player $i$, and let $S$ be the space of strategy combinations. Define $\Gamma$ to be the best reply mapping from $\beta_i^j \in S$ into itself such that $\beta_i^j = \Gamma(\beta_i^j)$. Then, we can show that: (i) $\Gamma$ is a single-valued function; (ii) $\Gamma$ is a contraction mapping because it satisfies Blackwell’s sufficient conditions, i.e. monotonicity and discounting (Stokey and Lucas, 1989). Therefore, $\Gamma$ is a contraction mapping with modulus $0 < \delta < 1$, and hence it has a unique fixed point. $\text{QED}^{17}$

Appendix B.

Proof of Proposition 2

Proposition 1 showed that Eqs. (3a) and (3b) defining the $\beta_i^j$ are contractions. Therefore, we can apply a standard method of proof only valid for contractions, which is to assume that a property holds on the right-hand side of Eqs. (3a) and (3b) and then show that it is replicated on the left-hand side. Then, the Proposition is true if $q \beta^c < \beta^h$. Suppose that the opposite is true, i.e. $q \beta^c \geq \beta^h$. This certainly would require $\beta^c > \beta^h$, because $0 < q < 1$. But then from the comparative statics of the Riccati equations, this implies $\beta^h > \beta^c$, which is a contradiction. QED

$^{17}$Lockwood et al. (1996) show existence but they cannot use the contraction mapping argument to establish uniqueness. This happens because in their paper there are strategic interactions arising from the assumption that parties care about the debt they will inherit in the next election with probability $1 - q$. 
References