FISCAL POLICY, PUBLIC DEBT STABILISATION AND POLITICS: THEORY AND UK EVIDENCE*

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This paper presents a two-party model of fiscal and debt policy in which the parties do not care about policy outcomes when out of office. Unlike other models of this type, our model has predictions that are largely consistent with existing empirical findings about partisan and electoral effects on government expenditure, tax revenue, and debt. It also yields new predictions about how the feedback of fiscal policy on lagged debt may depend on partisan and electoral effects. These new predictions are not rejected by a test of the model on UK data.

In multi-party democracies, the motives of the party in power undoubtedly affect fiscal and monetary policy. Many economists and political scientists believe that economic policy-makers are driven by two – not mutually exclusive – motives. First, they wish to remain in office as long as possible (the survival or opportunistic motive). Second, they wish to benefit their constituencies (partisan motive). The effects of these motives may show up in two ways in the data. First, there may be effects of ideological differences of the parties in power on fiscal and monetary policy – so-called partisan effects. For example, we might expect 'left-wing' governments to tax and spend more, and (possibly) accumulate more debt. Second, there may be attempts by the incumbent party to use fiscal and monetary policy to 'bribe' the electorate prior to elections e.g. by cutting taxes and interest rates – so-called electoral effects.

Recent econometric work has established some interesting 'stylised facts' which are broadly consistent with these predictions. Several studies report evidence of electoral effects on various fiscal policy instruments for the United States; Tufte (1978) for transfers, Bizer and Durlauf (1990) for taxes, and MacDonald (1991) for state-level public expenditure. More recently, Alesina et al. (1992; 1993) have found evidence of electoral effects on government debt in a panel study of OECD countries. Evidence of partisan effects on fiscal policy is scarcer. Alesina et al. (1993) report partisan effects on debt, and Roubini and Sachs (1989) report in a study of OECD democracies that countries with a higher percentage of 'left-wing' governments have significantly higher long-run government spending to GNP ratios.

Concurrently with the accumulation of this evidence, a theoretical literature, notably Alesina and Tabellini (1990), Rogoff (1990), and Rogoff and Sibert (1988) has provided new explanations of observed electoral effects1 on

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1 Providing theoretical explanations of partisan effects on fiscal policy is trivial, as long as one is willing to accept that different parties simply have different given preferences over the levels of taxation and expenditure. Modelling the sources of these differences, e.g. through modelling electoral competition, is much more difficult.
government expenditure and debt that are consistent with rational and forward-looking behaviour on the part of voters.\textsuperscript{2}

Rogoff and Sibert (1988) and Rogoff (1990) develop a theory of electoral effects in government expenditure and taxes based on signalling. They make the assumption that voters are rational but imperfectly informed about the incumbent party’s competence in transforming tax revenue into public goods, i.e. information about competence is asymmetric. In their model, there is a signalling equilibrium, when prior to elections, the incumbent attempts to signal competence to the electorate by increasing its level of production of public goods. Rogoff and Sibert do not allow for public debt, or partisan differences between parties, although these could probably be introduced without overturning their main results.

A rival approach to explaining these ‘stylised facts’ (in particular, electoral cycles in public debt) is the strategic debt accumulation literature, initiated by Persson and Svensson (1989), and Alesina and Tabellini (1990).\textsuperscript{3} In Alesina and Tabellini’s model two parties alternate in power; each party has different preferences over the mix of two public goods (e.g. education and defence), although they agree over the overall level of public expenditure. Suppose that the ‘education’ and ‘defence’ parties alternate in office. Then, near the end of its term of office, the incumbent (e.g. education) party will accumulate debt in order to increase the debt burden on its successor so as to try to induce the successor government to spend less on defence which the incumbent does not value (and \textit{vice versa} when the ‘defence’ party is incumbent). This strategic effect generates electoral cycles in debt consistent with those observed.

In our view, although these papers have made important contributions, they are limited in a number of ways. Rogoff and Sibert do not model debt accumulation at all, yet it is in debt where there is the most persuasive evidence of partisan and electoral effects (Alesina \textit{et al.} (1993) fail to find electoral effects in government expenditure and tax revenue using their OECD panel data set). Alesina and Tabellini’s model predicts that in equilibrium, both parties will choose identical levels of aggregate government expenditure, and identical tax rates; this seems very restrictive and is at variance with the findings of Roubini and Sachs (1989) described above. Moreover, altering Alesina and Tabellini’s model to allow for partisan differences over the aggregate level of public expenditure between parties may lead to debt under-accumulation before elections, demonstrating the non-robustness of their results (Persson and Svensson, 1989). Finally, (and perhaps most importantly) we feel that existing theoretical and empirical work has ignored some of the implications of the

\textsuperscript{2} On the face of it, this seems difficult to do. If the voters know they are being ‘bribed’ to vote for the incumbent party, and that this party has no way of withdrawing these bribes \textit{ex post}, for those that fail to vote in the prescribed way, voters will rationally ignore these bribes and vote according to the ‘fundamentals’ e.g. perceived competence of the parties. So there are no gains to be had from offering these ‘bribes’ in the first place.

\textsuperscript{3} Other contributions to the strategic debt accumulation literature include Persson and Tabellini (1990), and Aghion and Bolton (1990). However, models presented in these papers do not predict, in general, debt overaccumulation before elections – rather, in some cases, debt underaccumulation.

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government budget constraint. The existence of this constraint implies that in political equilibrium, current expenditure and tax decisions by the party in power are conditional upon the level of existing debt—in other words, the party in power follows feedback rules from current debt levels to expenditure and taxation. We would expect these feedback rules to exhibit electoral and partisan effects.

The purpose of this paper is to address these issues. We do so in two ways. First, we construct a two-party model of fiscal and debt policy such that: (i) the survival and partisan motives referred to above are explicitly modelled; (ii) the equilibrium debt feedback rules can be explicitly characterised even with an infinite horizon and stochastic re-election probabilities; (iii) the predictions of the model are largely consistent with the empirical literature described above; (iv) there are additional empirical predictions about debt feedback rules.

Second, we test the model on UK data. We choose the United Kingdom because it has a two-party system with clear ideological differences between the parties on spending and taxation, and thus corresponds more closely to our model than most other OECD democracies. We find that we can accept the overidentifying restrictions of the model, and we get sensible estimates of the key parameters.

Our model is based on Persson and Svensson (1989). Two parties with different preferences over the level of public good provision alternate in power, and each is forward-looking, and so takes into account the effect of debt accumulation on its successor in government. The innovation is that parties do not care about—or care sufficiently less about—policy outcomes when not in power. This means that when in power, parties face a ‘quasi finite-horizon’; near to the end of their terms of office, they will therefore have the incentive to finance their expenditure with debt, knowing that they will not (with some probability) have to face the consequences for a while. This effect implies pre-election debt expansion, and dominates the strategic debt effects of the Persson and Svensson type, which are also present in the model, albeit in a slightly different form.

4 Of course the ‘strategic debt’ literature referred to above is based on the idea that the present government can ‘tie the hands’ of the successor government through the government budget constraint. However, in none of this literature are these debt feedback rules characterised explicitly, let alone investigated empirically.

5 It is worth noting that characterisation of a political equilibrium in an infinite-horizon model with stochastic re-election probabilities is non-trivial in itself. As Persson and Svensson say of their model: ‘it is clearly desirable to extend the analysis to one with several periods, and to one where there is uncertainty about the nature of succeeding governments.’

6 Our analysis in this paper is also relevant to the empirical literature on policy feedback rules. Traditionally, only monetary policy was thought to react to state variables such as output employment or debt, and consequently, studies have tended to look for monetary, rather than fiscal, feedback rules (see e.g. Branson, 1977; Masson et al. 1994). Our theoretical results, which are not rejected by the data, suggest that in the United Kingdom, fiscal policies are used to help stabilise debt around a ‘target’ level.

7 As described in more detail below, the strategic effects in Persson and Tabellini are first order, in the sense that the incumbent party takes into account the effects of its debt policy on the spending and taxation decisions of its successor. By contrast, in our paper, the strategic effects are second-order, in that the incumbent takes into account the effects of its debt policy on its successor only insofar as the tax and spending decisions of the successor influence the debt that the incumbent party will inherit, should it be re-elected in future.

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The rest of the paper is organised as follows. Section I presents the theoretical model, Section II defines and analyses political equilibrium, Section III presents econometric estimates for the United Kingdom, and Section IV concludes.

I. THE MODEL

Since the model will guide us in the empirical investigation, we keep it as simple as possible. In particular, the model is 'macroeconomic', that is, the objectives of the political parties are not derived from explicit micro-foundations and the private sector is not explicitly modelled. However, it is possible to construct 'approximate' micro-foundations for these objectives as we show in Appendix B. The economy evolves over an infinite number of time-periods \( t = 1, 2 \ldots \infty \). At any time \( t \), government expenditure can be financed by one-period public debt and tax revenues. The government budget constraint at time \( t \) can be written

\[ B_t = G_t - T_t + R_t B_{t-1} \quad (1) \]

where \( B_t, G_t \) and \( T_t \) denote respectively the public debt/GDP ratio, the government expenditure/GDP ratio and the tax revenue/GDP ratio, and \( R_t = (1 + r_t)/(1 + g_t) \), where \( r_t \) = rate of interest on one-period bonds, and \( g_t \) = growth rate of real income.\(^8\) We assume\(^9\) that \( r_t \) and \( g_t \) are constant.

There are two political parties, Conservatives (denoted by the subscript \( c \)) and Socialists (denoted by the subscript \( s \)). Each party \( (i = c, s) \) has the following per period loss functions of government expenditure and tax revenue:

\[ L_i = \begin{cases} \mu_i (G_t - \bar{G}_i)^2 + (T_t - \bar{T}_i)^2 & \text{when party } i \text{ is in power} \\ 0 & \text{otherwise} \end{cases} \quad (2) \]

where \( \bar{G}_i \) and \( \bar{T}_i \) are party-specific targets for expenditures and tax revenues respectively, and \( \mu_i \) is the relative weight that party \( i \) places on attainment of the expenditure target. The form of loss function \( \mu_i (G_t - \bar{G}_i)^2 + (T_t - \bar{T}_i)^2 \) is not arbitrary; it can be given a microeconomic justification.\(^10\) In Appendix B, a microeconomic model of the type analysed by Alesina and Tabellini (1990) or Persson and Svensson (1989) is presented. It is shown there that the indirect utility of an infinitely lived household over pairs \( G_t, T_t \) can be approximately expressed as \( \mu (G_t - \bar{G})^2 + T_t^2 \) where \( \mu, \bar{G} \) are preference parameters, which may differ across households. So, party \( i \) can be thought of as representing households with preferences close to \( \mu_i, \bar{G}_i, \bar{T}_i \).

We now make an assumption on these parameters \( \mu_i, \bar{G}_i, \bar{T}_i \) which is sufficient to ensure that the predictions of our model are consistent with the stylised facts mentioned in the introduction;

\[ (I) \quad \bar{G}_s > \bar{G}_c, \quad \bar{T}_s > \bar{T}_c, \quad \mu_s > \mu_c. \]

\(^8\) In an earlier version of this paper we showed that money, and therefore seignorage revenues could be introduced into the analysis without changing the results (Lockwood et al. 1994).

\(^9\) The assumption that \( R \) is independent of \( B_t \) is a strong one, and is made to keep the model tractable. If \( R \) is not too sensitive to \( B_t \), the qualitative results obtained below will continue to be valid.

\(^10\) The assumption of quadratic loss functions is standard in the literature on monetary policy design (e.g. Barro and Gordon's model of inflation bias).
So, the assumption is that socialist governments have higher expenditure and tax targets, and also place a greater weight on attainment of the expenditure target. (We test these assumptions directly for the United Kingdom in Section III below.)

Returning now to the loss functions in (2), the key assumption\textsuperscript{11} embodied in (2) is that when out of power, political parties do not care about economic policy outcomes.\textsuperscript{12} As we shall see below, this assumption (together with the assumption of exogenous re-election probabilities) drives our results on electoral effects in Proposition 2; namely, near to elections, the party in power faces a 'quasi-finite horizon' and hence accumulates more debt. This assumption is at variance with the 'rational partisan' approach of Alesina and Tabellini and others, which assumes that parties care about policy outcomes equally whether in or out of power. So, it requires some justification. Some evidence is available from the political science literature; Laver and Hunt (1992) recently conducted a comprehensive survey of political 'expert opinion' in 25 parliamentary democracies; 1,228 experts were surveyed of whom 355 responded. Two of the questions asked were; (i) 'Assess how far into the future members of each section of each party look when making important decisions about the membership of the government'; (2) Forced to make a choice, would party leaders give up policy objectives in order to get into government or would they sacrifice a place in government in order to maintain policy objectives? The average score given to the main UK parties for (1) was 3.07 (1 - does not look to the future, 5 - looks many years to the future) and for (2) was 12.63 (1 - would give up office, 20 - would give up policy). Scores for other OECD countries were similar.

This indicates that: (i) there is some evidence for myopia of the party in power; (ii) there is some evidence that parties are not as strongly attached to policies as the partisan model would suggest. The correct way to model (i) would be to give parties 'short' finite time-horizons - for example to postulate that they do not look beyond the end of their term of office. However, under this assumption, parties would behave profligately by taxing and spending so as to hit the targets in equation (2) in every period. If $G_t > \tilde{T}_t$, as seems reasonable, then debt would explode rapidly - i.e. myopia is not consistent with a stabilisation motive. The formulation in equation (2) avoids this problem. The answers to question (2) suggest that parties are willing to sacrifice policy objectives to (re)gain power. As we do not allow re-election probabilities to be endogenous (for a justification of this, see below), we cannot model this trade-off directly. However, our specification in equation (2) attempts to capture the flavour of this trade-off in an indirect way.

It remains to specify the electoral process. We assume that elections take place in the beginning of every second period, so the elected party is in office for two periods, and the incumbent party has an exogenous probability

\textsuperscript{11} For an analysis of political equilibrium in monetary policy with a loss function similar to equation (2), see Alogoskoufis et al. (1992).

\textsuperscript{12} The main results of our paper would go through if parties care sufficiently less about policy outcomes when out of power than in power.

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0 ≤ q ≤ 1 of winning the election. In the period following an election (which we call election period and denote by the superscript e), there is no electoral uncertainty because the elected party knows that it will remain in office next period (which we call non-election period and denote by the superscript n). In non-election periods, there is electoral uncertainty since there is only a probability q of being reappointed in the next period.

The assumption that re-election probabilities are exogenous obviously rules out the manipulation of policy instruments to increase the chances of re-election. Such a manipulation has been modelled as the outcome of a signalling game by Rogoff and Sibert (1988) and Rogoff (1990). This is deliberate; as we shall see below, one of the points of the paper is that our assumption that parties do not care (or care less) about policy outcomes when out of power yields an electoral cycle which is very similar to the one generated by Rogoff-type electoral manipulation.

II. POLITICAL EQUILIBRIUM

We model the interaction between the two parties as a two-player dynamic game; the dynamic game then provides us with a natural definition of political equilibrium. The structure of the game is simplified by defining variables in terms of deviations from targets. Let $G_t, T_t$ be the expenditure and tax targets of the party in power at time $t$ – given the electoral process, these are obviously random variables. Defining $g_t = G_t - G_{t-1}, b_t = B_t - B_{t-1}$ and $\tau_t = T_t - T_{t-1}$, we rewrite (i) and (2) as:

$$L_i = \begin{cases} g_t^2 + \tau_t^2 & \text{when in power} \\ 0 & \text{otherwise} \end{cases}$$

$$b_t = g_t - \tau_t + Rb_{t-1},$$

where $\{B_t\}_{t=0}^\infty$ is the sequence that solves the stochastic difference equation $B_t = G_t - T_t + RB_{t-1}$ with $B_0$ given. We also 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, political equilibrium is trivial, with $g_t = \tau_t = 0$ in every period. The loss function in the entire game for party $i$ is $L_i = E_0 \left[ \sum_{t=1}^\infty \delta_t^{-1} L_t I_t \right]$ where $L_t$ is a stochastic indicator function that takes on the value 1 when party $i$ is in power and zero otherwise, and $\delta_t$ is the discount factor of party $i$. For simplicity we assume $\delta_0 = \delta, i = c, s$. Also, we assume

(II) $R^2 \delta > 1.$

The role of (II) is to ensure that the future cost of debt accumulation is positive; it is sometimes known as a ‘no Ponzi game’ condition.

For any party $i$, the state at any time $t$ is a triple comprising $b_{t-1}$, and two binary variables recording which party is in power ($i = c, s$) and whether it is an election or a non-election period ($j = e, n$). The state equation is given by (4) plus the obvious rules that election years follow non-election years, and that the incumbent party stays in office with probability $1$ (resp. $q$) in non-election (resp. election) years. A strategy for party $i$ is a sequence of mappings from the history of the game to a policy choice $(g_t, \tau_t, b_t)$ if that party is in power. We will
focus on equilibrium in Markov strategies, that is where \((g_t, \tau_t, b_t)\) are constrained to depend on past history only through dependence on the current value of the state variable \(b_{t-1}\).

For two such strategies to be mutual best responses, it must be the case that \(i\)'s strategy minimises \(L^i\) taking the other party's strategy as given, \(i = c, s\). This is a dynamic optimisation problem for party \(i\), which is characterised by the following recursive, or Bellman, equations when party \(i\) is in power:

\[
\begin{align*}
\beta^e_i b_{t-1}^2 &= \min \{ \mu g_t^2 + \tau_t^2 + \delta \beta^e_i b_t^2 \text{ s.t. (4)} \} \quad \text{in an election year (5a)} \\
\beta^e_n b_{t-1}^2 &= \min \{ \mu g_t^2 + \tau_t^2 + \delta \beta^e_n b_t^2 \text{ s.t. (4)} \} \quad \text{in a non-election year (5b)}
\end{align*}
\]

where, \(\beta^e_i b_{t-1}^2\) and \(\beta^e_n b_{t-1}^2\) are respectively the expected present value of the future losses to party \(i\) in election years and non-election years and where \(\beta^e_0 = q \beta^e + (1 - q) \lambda^e_i\), where \(\lambda^e_i b_{t-1}^2\) is the expected present value of the future losses to party \(i\) when it has just lost power in an election year and is defined in (8) below. Note that these expected present values depend on the square of \(b_{t-1}\) as the loss function (3) is quadratic in \(g_t, \tau_t\).

The first-order conditions to the minimisation problems, combined with the budget constraint, imply the following linear Markov strategies:

\[
\begin{align*}
g_t &= g^e_t b_{t-1}, \quad g^e_t = -\gamma t^e R & i = c, s \text{ and } j = e, n (6a) \\
\tau_t &= \tau^e_t b_{t-1}, \quad \tau^e_t = \mu^e \gamma^e R & i = c, s \text{ and } j = e, n (6b) \\
b_t &= b^e_t b_{t-1}, \quad b^e_t = [1 - \gamma^e_t (1 + \mu_t)] R & i = c, s \text{ and } j = e, n (6c)
\end{align*}
\]

where

\[
o \leq \gamma^e_t = \frac{\delta \beta^e_{t-1}}{\mu_t + \delta \beta^e_{t-1}(1 + \mu_t)} < 1, \quad o \leq \gamma^e_n = \frac{\delta \beta^e_{t-1}}{\mu_t + \delta \beta^e_{t-1}(1 + \mu_t)} < 1. (7)
\]

These Markov strategies can be interpreted as debt-contingent feedback rules. When \(\gamma^e_t > 0\), expenditures \(g_t\) are negative functions of the level of inherited debt \(b_{t-1}\), while taxes \(\tau_t\) are positive functions of \(b_{t-1}\), so fiscal policy is being used to help stabilise public debt.

Both the Bellman equations and the strategies depend on \(\lambda^e_i\) where \(\lambda^e_i b_{t-1}^2\) is the present values of losses to party \(i\), when \(i\) has just lost power to party \(h \neq i\) in an election year. This must satisfy the recursion equation:

\[
\lambda^e_i b_{t-1}^2 = o + \delta (o + \delta[q \lambda^e_i + (1 - q) \beta^e_i] (q b_{t-1}^2)) & i \neq h, (8)
\]

where \(\phi^h = b^h b^h e\). This recursion equation reflects the facts that: (i) when out of power, party \(i\) gets zero payoffs, hence the zeros; (ii) after two periods with party \(h\) in power, the initial debt \(b_{t-1}\) will have changed to \(q b_{t-1}^2\), at which point party \(i\) may regain power with probability \(1 - q\) or stay out of power with probability \(q\).

Equation (8) shows clearly that there is a strategic interaction between the parties since \(i\)'s action in (6) depends on \(h\)'s action (in particular, it depends on \(\phi^h = b^h b^h e\) through \(\lambda^e_i\)). This strategic interaction is, however, different from
that in the model of Persson and Svensson (1989). There, the strategic interaction is first-order; before an election, the incumbent rationally anticipates that it will lose the election with some probability and so directly tries to influence the tax and spending decisions of its successor by strategic choice of debt. In our model, the strategic interaction is second-order. That is, before an election (in a non-election year in our terminology), the incumbent rationally anticipates that it will, with probability \( 1 - q \), lose the current election (hence the weight of \( (1 - q) \) on \( \lambda_e^t \) in (5b)) and will subsequently win the next election with probability \( 1 - q \). So, before an election, the incumbent has an incentive to use debt strategically in order to affect its successor’s tax and spending decisions only insofar as these tax and spending decisions affect the debt that the present incumbent will inherit if he loses the current election and wins the next, an event which occurs with probability \( (1 - q)^2 \).

Substitution of (8) into (5b) gives

\[
\Pi_e = q \beta_e + \delta^2 (1 - q)^2 \frac{q \phi^h \beta_e}{(1 - q)^2}. 
\]

So, the second term in \( \Pi_e \) measures the loss associated with losing and then regaining power. Note that this term is increasing in \( \phi^h \) (as long as \( \phi^h \delta^2 q < 1 \), which is the case in equilibrium).

Conditions (5)–(8) are sufficient for political equilibrium if the transversality conditions for the minimisation problems of the two parties are satisfied. A necessary and sufficient condition for these transversality conditions is that

\[
\lim_{t \to \infty} \delta^t b_t^2 = 0 \tag{9}
\]

is satisfied. The condition (9) ensures that growth in debt is not ‘too fast’: i.e. less than \( 1/\sqrt{\delta} \). So, we redefine a political equilibrium to be a pair of triples \( (\beta_e^t, \beta_n^t, \lambda_e^t) \) \( i = s, c \) which solve (6), (7), (8) and (9).

Due to the strategic interaction between parties, the existence and uniqueness of political equilibrium is not guaranteed. Nevertheless for a range of values of \( q \), it can be shown that a unique political equilibrium exists.

**Proposition 1:** If (II) holds and \( 1/R^4 \delta^2 > q \) then a unique political equilibrium exists. In equilibrium, \( \beta_e^t, \beta_n^t, \lambda_e^t > 0 \), \( i = s, c \).

**Proof:** See Appendix A.

Note that in equilibrium, the marginal future costs of debt accumulation, \( 2b_t \beta_e^t \), \( 2b_t \beta_n^t \) are strictly positive as long as \( b_t > 0 \). Also note that if \( R^2 \delta \approx 1 \), the condition on \( q \) is very weak.

We now investigate the properties of the political equilibrium, assuming that (I), (II) and the condition on \( q \) in Proposition 1 hold. These properties can first be presented as properties of the feedback rules on the deviation of debt from its target value, \( b_{t-1} = B_{t-1} - \bar{B}_{t-1} \).

**Proposition 2 (Pre-election behaviour):** For both parties, before elections, government spending and debt accumulation are higher, and taxation lower, per unit of inherited debt, \( b_{t-1} \). That is, \( g_{t}^e < g_{t}^n < 0, 0 < \tau_{t}^e < \tau_{t}^n \) and \( 0 < b_{t}^e < b_{t}^n \) for \( i = c, s \).

\[13\] The actual transversality conditions are \( \lim_{t \to \infty} \delta^t b_t^2 = 0 \) \( i = c, s, j = e, n \).
Proof: See Appendix A.

This is the main theoretical result of the paper and deserves some comment. First, the intuition for the result is that as the probability of losing office comes closer, the government cares less about the future cost of public debt. This is demonstrated formally in the course of the proof, where it is shown that \( \lambda_i^* < \beta_e \), i.e. the marginal cost of a given level of inherited debt is lower when \( i \) is in power than out of power in election years. As a result, stabilisation policy is weaker in pre-election periods. Using the term introduced above, it is convenient to call it the quasi-finite horizon effect. This effect obviously follows from the assumption that parties do not care about policy outcomes when out of power.

Second, although there is an incentive for strategic choice of debt as described above, such incentives are dominated by the quasi-finite horizon effect. That is, although party \( i \) knows that it will regain power in the next election with some non-zero probability and so has a strategic incentive to reduce the debt accumulated by party \( h \), this strategic effect is dominated by the quasi-finite horizon effect.

Third, our model generates the same pattern of pre-election expansion in debt as in Alesina and Tabellini (1990), but for different reasons. In Alesina and Tabellini (1990), the overaccumulation is strategic; party \( i \) knows that when party \( h \) is in power it will spend on the ‘wrong’ kind of public good from party \( i \)’s view; to prevent this, party \( i \) overaccumulates debt. In our model, it is due to the quasi-finite horizon effect.

Fourth, our model generates the same pre-election expansion in government spending and reduction in taxation as in Rogoff and Sibert (1988) and Rogoff (1990). However, as remarked in the Introduction, these papers rely on a different mechanism to generate these effects: the government tries to signal its competence to the electorate by manipulating expenditure and taxation in pre-election periods in an attempt to increase its re-election probability. Instead, in our paper, it is the ‘quasi-finite horizon’ effect that leads an electoral cycle in expenditure and taxation.

Finally, we confirm that the expected partisan effects are present, but that, surprisingly, the Socialists’ higher propensity to tax exactly offsets their greater incentive to spend, so that the rate of accumulation of debt does not depend on the party in power.

**Proposition 3 (Partisan behaviour):** Per unit of inherited debt, both spending and taxes are always higher under Socialists, i.e. \( g^s_j > g^f_j \) and \( \tau^s_j > \tau^f_j \) for \( j = e, n \). However, debt accumulation per unit of inherited debt, \( b_{t-1} \), is the same for both Socialists and Conservatives, i.e. \( b^e = b^c, b^s = b^c \).

Proof: See Appendix A.

This result is due to the fact that in equilibrium, the debt accumulation coefficients \( q^f \) are equal; \( q^e = q^s \). This does not mean that over a term of office, both parties will accumulate equal amounts of debt. This is because the model is specified in deviation form (recall (3) and (4) above); consequently, the
results of Propositions 2 and 3 are not in terms of observables, and so cannot be directly compared to the 'stylised facts' identified in the Introduction.

However, it is obviously important to make this comparison. To do this, we first express variables in actual values. Using the transformations $g_t \equiv G_t - \bar{G}_t$, $\tau_t = T_t - \bar{T}_t$, $b_t = B_t - \bar{B}_t$ in (6a)-(6c), we get formulae for actual values of $G_t$, $T_t$, $B_t$ in terms of the feedback coefficients:

$$G_t = G_t + g_j(B_{t-1} - \bar{B}_{t-1}) \text{ if party } i \text{ is in power at } t, j = e, n \quad (10a)$$

$$T_t = T_t + \tau_j(B_{t-1} - \bar{B}_{t-1}) \text{ if party } i \text{ is in power at } t, j = e, n \quad (10b)$$

$$B_t = B_t + b(B_{t-1} - \bar{B}_{t-1}) \text{ if party } i \text{ is in power at } t, j = e, n \quad (10c)$$

Now suppose, as before, that $b_0 = B_0 - \bar{B}_0 > 0$, i.e. the initial debt condition for a non-trivial political equilibrium holds. Then from (10c), $B_{t-1} - \bar{B}_{t-1} > 0$, as $b_j > 0, i = c, s, j = e, n$. Then, inspection of (10a)-(10c), using Propositions 2 and 3 and (I) reveals that, conditional on lagged debt $B_{t-1}$, at time $t$: (i) actual government expenditure and debt are higher, and taxes lower, before elections; (ii) actual government expenditure and taxes are both higher under socialist than conservative governments. Note that the assumption in (I) of $\mu_s > \mu_c$ is necessary to obtain these predictions; without it, the partisan effect through feedback on lagged debt may go the other way from the partisan effects through targets $\bar{G}_t$, $\bar{T}_t$, and moreover may dominate the latter.

It is worth noting the degree to which statements (i) and (ii) are consistent with the empirical 'stylised facts' identified in the Introduction; the only conflict is that Proposition 3 predicts no partisan effect on debt accumulation, whereas Alesina et al. (1993) have found evidence of such an effect. Note, however, that (10a)-(10c) have additional testable implications over and above those considered in the empirical literature cited in the Introduction. This literature looks for electoral and partisan effects in the levels of $G_t$, $T_t$, $B_t$. By contrast, Propositions 2 and 3 plus (10a)-(10c) also predict electoral and partisan effects in the feedback of $G_t$, $T_t$, $B_t$ on $B_{t-1}$. These additional predictions are tested in the next section.

III. ECONOMETRIC ESTIMATES AND TESTS

In this section we estimate $\mu_o, \mu_p, \bar{G}_c, \bar{G}_s, \bar{T}_c, \bar{T}_s$ and test some of the model's predictions using annual data from the United Kingdom on government debt, taxes and expenditure. We shall not attempt to impose all the restrictions implied by the model nor shall we derive estimates of all the deep parameters. The theory relies on too many abstractions to justify imposing its very precise empirical implications for $G$, $T$ and $B$. Indeed, it is not obvious that such an approach would yield reliable estimates of parameters such as $\gamma, \bar{\gamma}$ and $\delta$. Instead we focus on the implications of partisan and opportunistic behaviour for the sign and relative magnitude of estimated coefficients and test some of the theory's overidentifying restrictions. Explicitly, we use estimates of $\mu_o, \mu_p$ and $\gamma_j$ in (1), (10a), (10b), and (10c) to examine the validity of Propositions 2 and 3 and test the overidentifying restrictions implied by these relationships alone.

As they stand, (I) and (10a)-(10c) are deterministic. Throughout, we treat © Royal Economic Society 1996
(1) as an identity. To introduce a stochastic error to (10a)-(10c), we could proceed in one of two ways. The first is to think of government actions as being subject to a ‘trembling hand’ error and simply add noise terms to (10a)-(10c). This is arbitrary and somewhat unsatisfactory in terms of the previous theory. The alternative is to suppose that the targets $\bar{G}_t$ and $\bar{T}_t$ are subject to stochastic shocks, which is the approach we take. We suppose, further, that they are subject to stabilising feedback from $B_{t-1}$ of the form

\begin{align*}
\bar{G}_t &= \bar{G}_t - \lambda_1 \bar{B}_{t-1} + u_t \quad \text{if } i = c, s \text{ is in power} \\
\bar{T}_t &= \bar{T}_t + \lambda_2 \bar{B}_{t-1} + v_t \quad \text{if } i = c, s \text{ is in power} \\
B_t &= \bar{G}_t - \bar{T}_t + R^* \bar{B}_{t-1} = (R - \lambda_1 + \lambda_2) \bar{B}_{t-1} + u_t - v_t, \tag{11c}
\end{align*}

where $u_t, v_t$ are i.i.d. shocks. Now, if the government can observe $u_t, v_t$ prior to choosing $G_t, T_t$, then the formal analysis of Section II is unchanged by the addition of these shocks. If the government can only observe $u_t, v_t$ after choosing $G_t, T_t$, then by defining $g_t = G_t - E(\bar{G}_t), T_t = T_t - E(\bar{T}_t)$, the per-period loss function in (2) becomes $L_t^* = E\left[\mu^2 (g_t + u_t)^2 + (\tau_t + v_t)^2\right] = \mu_0^2 + \tau_t^2 + \mu_0 \sigma_u^2 + \sigma_v^2$ which is just the original loss function transformed by a constant. Again, the formal analysis of Section II is unchanged. So, our system to be estimated is the identity (1) the feedback rules (10a)-(10c) together with our specification of the targets (11a)-(11c). However, estimation of the full system is inappropriate because (1) is an identity and so one of the equations is redundant. We shall see below that using the equation for debt involves estimating an extra parameter $R$. For reasons of parsimony therefore it is this equation that we drop.

We now transform (10a), (10b), (11a), and (11b) into an estimable form. First, we can replace the $\gamma_i$ and $\mu_i$ in (6a)-(6c) with variables $\gamma_t$ and $\mu_t$ by using the following partisan and election dummies:

\begin{align*}
\gamma_t &= \gamma_0 + \gamma_1 d_{pt} + \gamma_2 d_{et} \tag{12a} \\
\mu_t &= \mu_0 + (\mu_c - \mu_s) d_{pt} \tag{12b}
\end{align*}

where $d_{pt}$ is unity if the Conservatives are in power but zero otherwise, and where $d_{et}$ is unity in a pre-election year but zero otherwise. Next, substituting (11a), (11b) and (12a), (12b) into (10a), (10b), and using $B_t = (u_t - v_t)/(1 - R^* L), R^* = R - \lambda_1 - \lambda_2$ from (11c), we get expressions for $G_t, T_t$:

\begin{align*}
G_t^* &= k_0 + k_1 d_{pt} + k_2 B_{t-1} + k_3 (d_{pt} B_{t-1})^* + k_4 (d_{et} B_{t-1})^* + \xi_t + \theta_{t-1} \\
T_t^* &= k_5 + k_6 d_{pt}^* - \mu_k k_2 B_{t-1}^* - \left[\mu_0 k_3 + (\mu_c - \mu_s) (k_2 + k_3)\right] (d_{pt} B_{t-1})^* \\
&\quad - \mu_0 k_4 (d_{et} B_{t-1})^* - (\mu_c - \mu_s) k_4 (d_{pt} d_{et} B_{t-1})^* + \epsilon_t + \varphi_{t-1}, \tag{13b}
\end{align*}

In practice of course, measurement errors make (1) a regression also so that choice of the redundant equation may not be trivial. However, changing the dropped equation or even estimating all three together makes little qualitative difference to the results.

Note that the specification (11a) and (11b) allows for stabilising feedback from $B_{t-1}$ to $G_t$ and $T_t$. This ensures that $G_t, T_t$ and $B_t$ are stationary, and hence that $G_t, T_t$ are stationary, if $R - \lambda_1 - \lambda_2 < 0$, even if $R = (1 + r)/(1 + g) > 1$. 

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where a superscript * to a variable denotes that it has been transformed by the lag polynomial \( 1 - R^*L \), and 
\[ k_0 = \bar{G}^* (1 - R^*) \], \[ k_1 = (\bar{G}^* - \bar{G}) \], \[ k_2 = -\gamma^*_R \], \[ k_3 = -\gamma^*_1R \], \[ k_4 = -\gamma^*_2R \], \[ k_5 = T^*(1 - R^*) \] and 
\[ k_6 = \frac{(G_c - G_s)}{(1 - R^*)} \]. Also, the MA(1) errors are defined by 
\[ \xi_t + \theta \xi_{t-1} = \varepsilon_t^* + \left[ (\gamma_0 + \gamma_1 dp_t + \gamma_2 de_t) R - \lambda_1 \right] (\mu_{t-1} - \mu_t) \] and 
\[ e_t + \theta e_{t-1} = v_t^* + \left[ (\mu^*_s + (\mu^*_e - \mu_s) dp_t) R + \lambda_2 \right] (\mu_{t-1} - \mu_t) \]. Our estimating equations are thus (13a) and (13b). Our theory suggests that \( k_2 < 0 \) (from the fact that \( \beta^2_R, \beta^1_e > 0 \)), \( k_3 < 0 \) (from Proposition 4), \( k_4 > 0 \) (from Proposition 3) and that \( k_5, k_6 > 0 \), \( \mu_s > \mu_e > 0 \) (by the assumption that expenditure and tax revenue targets, and the weights on these targets, will be positive). We would also expect \( k_1 \leq 0 \) i.e. that Socialists have a steady-state spending target at least as high as that of Conservatives.

We chose to estimate (13a) and (13b) on UK data, because, of all the OECD democracies, the United Kingdom probably has a political party structure that comes closest to the model of this paper.\(^{16}\) There are only two major parties, and the two parties differ significantly in their beliefs about the appropriate levels of spending and taxation.\(^{17}\) Our data set for the United Kingdom consists of 38 annual observations from 1956 to 1993 on debt, GDP, taxes and government expenditure.\(^{18}\) Total taxes, total government spending and GDP at factor cost were taken from the 1993 edition of Economic Trends Annual Supplement (CSO) and net national debt from the Annual Abstract of Statistics (CSO).

Equations (13a) and (13b) contain heteroscedastic MA(1) errors. In such circumstances the GMM using instrumental variables and a heteroscedastic and autocorrelation consistent (HAC) covariance matrix (see Hansen, 1982) is a natural choice of estimator. Because of the small size of our data sample, it is unlikely that asymptotic critical values will yield the correct size of 5% in significance tests. To get estimates of 5% critical values for the parameters, we run Monte Carlo simulations as follows. We took the model and its estimates given in Table 1 below as the ‘true’ data generating process. We set each parameter in turn to zero and generated 400 sets of data in each case. The 5% critical value in each case was taken as that number which gave a proportion of rejections equal to 5%. For example, to get an estimate of the 5% critical value for the t-ratio on \( k_2 \), we set \( k_2 = 0 \) and all other parameters at the values given in Table 1. The model was simulated 400 times giving 400 t-ratios for \( k_2 \). We wish to test for significance in the left tail in this case, so the critical value for \( k_2 \) was taken as the 5th percentile of the generated t-ratio. The results of this

---

\(^{16}\) In an earlier version of this paper, we estimated the model for the United States also. The results were not very supportive of our theory. However, although the United States is a two-party system like the United Kingdom, power is split between presidencies and congress which are elected at different times. Legislation on tax and spending is therefore often the result of a compromise between a Republican (Democrat) president and a Democrat (Republican) congress. This was the case after 1982 under Reagan’s presidency (see Palmer and Sawhill, 1984).

\(^{17}\) This is very clear from the survey of experts conducted by Laver and Hunt (1992). A panel of experts ranked UK parties (amongst others) on a scale from 1 – promote raising taxes to increase public services, to 20 – promote cutting public services to cut taxes. In the United Kingdom, the two main parties scored an average ranking of: Conservatives – 17.21, Labour – 5.35. Given the standard deviations of these rankings across experts (recorded in Laver and Hunt) it is easy to check that these differences are significant at conventional significance levels.

\(^{18}\) After allowing for four lags the number of observations is reduced to 34.
Table 1

Model Estimates and Tests for the United Kingdom

<table>
<thead>
<tr>
<th>$k_0$</th>
<th>$k_1$</th>
<th>$k_2$</th>
<th>$k_3$</th>
<th>$k_4$</th>
<th>$k_5$</th>
<th>$\mu_c$</th>
<th>$\mu_s$</th>
<th>$R^*$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.041</td>
<td>0.0374</td>
<td>-0.243</td>
<td>-0.052</td>
<td>0.0047</td>
<td>0.012</td>
<td>-0.142</td>
<td>0.490</td>
<td>0.521</td>
</tr>
<tr>
<td>6.55</td>
<td>2.26</td>
<td>-3.75</td>
<td>-2.36</td>
<td>2.23</td>
<td>8.61</td>
<td>-0.57</td>
<td>2.65</td>
<td>2.44</td>
</tr>
<tr>
<td>3.87</td>
<td>-2.10</td>
<td>-3.18</td>
<td>-2.12</td>
<td>2.08</td>
<td>2.67</td>
<td>2.15</td>
<td>2.22</td>
<td>2.14</td>
</tr>
</tbody>
</table>

Notes: The second row in the Table gives parameter estimates, the third row gives asymptotic t-ratios and the fourth row gives estimated 5% critical values. Estimates were derived using GMM with $d p_t, d p_{t-1}, d e_t, d e_{t-1}$ and $B_{t-i}, G_{t-i}$ and $T_{t-i} (i = 2, 3, 4)$ as instruments. The covariance matrix of the orthogonality conditions was estimated using a HAC with lag length 1 and Bartlett weights. The results were not qualitatively sensitive to either the choice of HAC estimation method or to the Bartlett lag length. Dropping one or two observations from either the beginning or the end of the sample alters the p-values slightly but does not qualitatively change the results.

procedure for each of the parameters are given in Table 1 below the estimates. Critical values for the $\chi^2_2$ joint tests of significance of $(k_1, k_6)$ and $[k_3, (\mu_s - \mu_c)]$ respectively were computed in a similar fashion and are discussed below, in the text. GMM estimates of the parameters in (16a) and (16b) are given in Table 1.

All coefficients except $k_1$ have the right sign and are significant. Recall that $k_1$ and $k_5$ measure differences in the parties’ long-run spending and taxation targets $G$ and $T$, respectively. A joint test of their significance gives a $\chi^2_2$ value of 6.98 which is insignificant when compared with its estimated critical value of 9.63. Our estimates, therefore, indicate that there is no strong evidence in favour of partisan differences in the long-run targets for spending and taxation. The evidence of partisan effects in weights is also weak; the estimate of $\mu_s$ is only marginally above that of $\mu_c$. However, a joint test of the restrictions $\mu_c = \mu_s$ and $k_3 = 0$ yields a $\chi^2_2$ value of 11.82 which is significant when compared with an estimated critical value of 5.99. The significance and positivity of $k_4$ indicates the importance of opportunistic effects in the sample.

The $\chi^2_{20}$ statistic for the model's twenty overidentifying restrictions is 14.97 which is well below its nominal, asymptotic 5% critical value of 31.41.\(^{19}\) One check on these estimates is to calculate $\bar{G}$ and $\bar{T}$ from Table 1. Doing this, we find $\bar{G} = 0.53$, $\bar{T} = 0.36$. These are sensible estimates, and $\bar{G}$ is in line with the UK estimate of the spending/output target of Roubini and Sachs (1989).

IV. CONCLUSIONS

This paper has presented a two-party model of fiscal and debt policy where the partisan and stabilisation motives (and to some extent the survival, or opportunistic, motive) of politicians are explicitly modelled. The predictions of

\(^{19}\) Our simulations did not yield an estimate of the critical value for this test. This was because perfect collinearity between $B_{t-3}, B_{t-4}$ and the other instruments in the generated data meant that the former had to be dropped as instruments resulting in only 14 overidentifying restrictions rather than the 18 of the actual estimation. Nevertheless, the simulation did indicate that a critical value equal to the number of degrees of freedom would ensure that the test had size no greater than 5%.

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the model are largely consistent with existing empirical findings about partisan and electoral effects on the levels of government expenditure, tax revenues, and public debt. The model also generates some new predictions about partisan and electoral effects on feedback rules on lagged debt. These predictions are not rejected when the model is estimated on UK data, and partisan and opportunistic effects were found to be significant. One obvious extension would be to test the existing model on data sets from other countries, or on a panel of OECD countries, following Alesina et al. (1992, 1993). Another would be to endogenise re-election probabilities, so that they depend on policy performance while in office.

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REFERENCES


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APPENDIX A: Proofs of Propositions

Proof of Proposition 1

(i) We begin by reducing the conditions for political equilibrium to a set of simultaneous equations. Using the first-order conditions from (5) to get optimal levels of $g_t$ and $r_t$, substituting back into (5) and equating coefficients on the right and left of the resulting equation given, after some rearrangements, we get

\begin{equation}
\beta_e^i = \frac{R^2 \mu_i \delta \beta_n^i}{\mu_i + \delta \beta_n^i (1 + \mu_i)} \quad i = c, s
\end{equation}

(A1)

\begin{equation}
\beta_n^i = \frac{R^2 \mu_i \delta \beta_e^i}{\mu_i + \delta \beta_e^i (1 + \mu_i)} \quad i = c, s
\end{equation}

(A2)

Next, solving (8) for $\lambda_e^i$, we get

\begin{equation}
\lambda_e^i = (1 - qD^i)^{-1}D^i (1 - q) \beta_e^i \quad i = c, s
\end{equation}

(A3)

where $D^i = \delta^2 (b_e^i b_n^i)^2$, $h \neq i$. Combining (A3) with the identity $\beta_e^i = q \beta_e^i + (1 - q) \lambda_e^i$, we get

\begin{equation}
\beta_e^i = \Psi^i \beta_e^i, \quad \Psi^i = q + \frac{(1 - q)^2 D^i}{1 - qD^i}, \quad i = c, s.
\end{equation}

(A4)

Combining (A4) and (A1), we get

\begin{equation}
\beta_e^i = \frac{\Psi^i R^2 \mu_i \delta \beta_n^i}{\mu_i + \delta \beta_n^i (1 + \mu_i)}, \quad i = c, s.
\end{equation}

(A5)

So, (A2) and (A5) are two simultaneous equations in $(\beta_n^i, \beta_e^i)$ for $\Psi^i$ fixed. Equations (A2) and (A5) can be solved to yield

\begin{equation}
\beta_e^i = \frac{\mu_i (\Psi^i R^4 \delta^2 - 1)}{1 + \mu_i \delta (R^2 \delta + 1)}, \quad i = c, s.
\end{equation}

(A6)

\begin{equation}
\beta_n^i = \frac{\mu_i (\Psi^i R^4 \delta^2 - 1)}{1 + \mu_i \delta (R^2 \delta + 1)}, \quad i = c, s.
\end{equation}

(A7)

Then, using (A6), (A7) and the definition of the $b_j^i$ in (6c), we can write $D^i$ as a function of $\Psi^j$;

\begin{equation}
D^i (\Psi^j) = \delta^2 (b_e^i b_n^i)^2
\end{equation}

\begin{equation}
= \delta^2 \left[ \frac{R \mu_i}{\mu_i + \delta \beta_n^i (1 + \mu_i)} \left[ \frac{R \mu_j}{\mu_j + \delta \beta_e^j (1 + \mu_j)} \right] \right]^2
\end{equation}

\begin{equation}
= \delta^2 \left[ \frac{R^2 (\Psi^j R^2 \delta + 1) (R^2 \delta + 1)}{(R^2 \delta + \Psi^j R^4 \delta^2) (R^2 \delta + \Psi^j R^4 \delta^2)} \right]^2
\end{equation}

\begin{equation}
= \frac{1}{R^4 \delta^2 (\Psi^j)^2}.
\end{equation}

(A8)

So, combining (A8) and (A4) we then have a pair of simultaneous equations in $(\Psi^i, \Psi^j)$ which depend only on parameters $q, R, \delta$:

\begin{equation}
\Psi^i = f^i (\Psi^j) = q + \frac{(1 - q)^2}{R^4 \delta^2 (\Psi^j)^2 - q}, \quad i, j = c, s, \quad i \neq j.
\end{equation}

(A9)

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The political equilibrium is then characterised by (A 3), (A 6), (A 7), and (A 9) and the transversality condition (9). Note that the structure is recursive; a solution to (A 9) then implies solutions to (A 6), (A 7) which then imply solutions to (A 3). We also impose the inequality constraints \( \lambda_i^t \geq 0, \beta_e^s \geq 0, \beta_n^i \geq 0, i = c, s \); these follow directly from (5) and (8). Call the solution to (A 3), (A 6), (A 7), (A 9) that respects these constraints a non-negative solution. So, from (A 6), (A 7), \( \Psi^t \geq 1/R^4\delta^2 \) at the non-negative solution.

(ii) We now establish that there exists a unique non-negative solution \( (\Psi^{t*}, \Psi^{s*}) \), as defined above, to the pair of equations (A 9). First, note that for the solution to be non-negative, we can restrict our attention to solutions \( (\Psi^{t*}, \Psi^{s*}) \) in the subset \( S = [1/R^4\delta^2, \infty)^2 \) of \( \mathbb{R}^2 \). Next, note from (A 9) that on \( [1/R^4\delta^2, \infty) \), \( f^t \) is a continuous, decreasing function of \( \Psi^t \) with \( \lim f^t = 0, \Psi^t \rightarrow \infty \). So, all solution(s) to (A 9) that lie in \( S \) will also lie in \( T^2 = [1/R^4\delta^2, \Psi^t]^2 \), where \( \Psi^t \) solves \( f^t(\Psi^t) = 1/R^4\delta^2 \).

Now define the map \( \varphi : T \rightarrow \Psi \) as \( \varphi = g^{-1} \), where \( g(\Psi^t) = f^t(\Psi^t) \). We will show that if \( q < 1/R^4\delta^2 \), \( \varphi \) is a contraction mapping and hence there will be a unique solution \( \Psi^{t*} \) to the equation \( \varphi(\Psi^t) = \Psi^t \). It follows immediately that there must be a unique solution \( (\Psi^{t*}, \Psi^{s*}) \) of the pair of equations in (A 9), and that \( \Psi^{t*} = \Psi^{s*} = \Psi^{t*} \).

To prove that \( \varphi(.) \) is a contraction, we show that \( \left| \frac{dg(\Psi^t)}{d\Psi^t} \right| < 1, \) all \( \Psi \in T \). To prove this, it is sufficient to prove that \( \left| \frac{dg(\Psi^t)}{d\Psi^t} \right| > 1, \) \( \Psi \in T \), as \( \varphi = g^{-1} \). Now

\[
\frac{dg(\Psi^t)}{d\Psi^t} = \frac{df^t}{df^c} \frac{df^c}{d\Psi^s}
= \left( f^t - q \right) 2R^4\delta^2 f^c (\Psi^c - q) 2R^4\delta^2 \Psi^c
\left[ R^4\delta^2 f^c)^2 - q \right] \left[ R^4\delta^2 (\Psi^c)^2 - q \right].
\tag{A 10}
\]

Now, from (A 10), it is clear that a sufficient condition for \( \left| \frac{dg(\Psi^t)}{d\Psi^t} \right| > 1, \) all \( \Psi \in T \), is

\[
[(x - q) 2R^4\delta^2 x]/(R^4\delta^2 x^2 - q) > 1, \) all \( x \in T \). But the condition for this last inequality to hold is that \( (x - q) 2R^4\delta^2 x > (R^4\delta^2 x^2 - q) \), or that \( h(x) = R^4\delta^2 x^2 - 2qR^4\delta^2 x + q > 0 \). Now \( h(x) \) is minimised at \( x = q \), so \( h(x) > 0, x \in T \) if \( h(q) = q(1 - qR^4\delta^2) > 0 \), which requires \( q < 1/R^4\delta^2 \). This completes the proof of Proposition 1. \( \square \)

Proof of Proposition 2
From the proof of Proposition 1 (ii), the equilibrium \( 0 < \Psi^{t*} < 1 \). But then from (A 6) and (A 7), \( \beta_e^s < \beta_n^i ; i = c, s \). From (5)-(7) we see that \( \beta_e^s < \beta_n^i \) implies \( b_n^t > b_n^s, g_n^t > g_n^s, \tau_n^t > \tau_n^s \). \( \square \)

Proof of Proposition 3
(i) Proof that \( b_n^t = b_n^s, b_e^c = b_e^s \).

From (6c) and (7), we get

\[
b_n^t = \frac{\mu_t}{\mu_c + \delta \beta_n^t (1 + \mu_c)} = \frac{1}{1 + (\Psi^t R^4\delta^2 - 1)}.
\]

But in equilibrium, \( \Psi^t = \Psi^c \). So, \( b_n^t = b_n^s \). The proof of \( b_e^c = b_e^s \) is similar.

(ii) Proof that \( \tau_n^t > \tau_n^s, \tau_e^t > \tau_e^s \)

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Consider the \( \tau^* \) first. From (6b) and (7);

\[
\tau^* = \frac{\mu_i \delta (1 + \mu_i)^{-1} (1 + \mu_i) \delta \beta^g_e}{\mu_i + \delta (1 + \mu_i) \delta \beta^g_e} = \frac{\mu_i (1 + \mu_i)^{-1} a}{1 + a},
\]

where \( a = (\Psi^* R^2 \delta^2 - 1)/\delta (R^2 \delta + 1) > 0 \). So, it is clear that as \( \mu^s > \mu^c \), \( \tau^* > \tau^c \). A similar argument shows that \( \tau^e > \tau^e \). (iii) **Proof that** \( g^s > g^e \), \( g^s > g^e \)

Consider the \( g^s \) first. From (6a) and (7), we get

\[
g^s = \frac{(1 + \mu_i)^{-1} (1 + \mu_i) \delta \beta^g_e}{\mu_i + (1 + \mu_i) \delta \beta^g_e} = \frac{(1 + \mu_i)^{-1} a}{1 + a},
\]

where \( a \) is defined as in (ii) above. Then, as \( \mu^s > \mu^c \), it follows that \( g^s > g^s \). A similar argument shows that \( g^e > g^e \). 

**Appendix B: Microfoundations for the Objectives of Political Parties**

We present an infinite-horizon version of the model used by Alesina and Tabellini (1990), Persson and Svensson (1989), Persson and Tabellini (1990), amongst others, and solve for the indirect utility of households as functions of an exogenous expenditure/tax revenue sequence \( \{G_t, T_t\}_{t=1}^{\infty} \). The per-period indirect utility of households over pairs \( G_t, T_t \) can then be shown to be approximately of the form (2) in the paper. Consider a small open economy inhabited by a ‘large’ number (a continuum of measure 1) of infinitely lived agents (households) who supply labour and consume a private and public good in every period. On the production side, one unit of labour supplied produces one unit of the consumption good or the public good, so the pre-tax wage is unity. The party in power intervenes in the economy by supplying a public good financed by a distortionary wage tax and the issue of new debt. There is no physical capital, so agents can only save by accumulating government debt which pays the world rate of interest, \( r \).

All households have preferences over present and future consumption goods, leisure, and the public good of the form

\[
U = \sum_{t=1}^{\infty} R^{-(t-1)} [c_t + \ell_t - \ell_t^2/2 + G_t - \mu (G_t - \bar{G})^2],
\]

where \( c_t, \ell_t, G_t \) denote consumption of the private good, leisure and the public good at time \( t \), respectively, and \( R = 1 + r \). Note that the pair \( (\mu, G) \) parameterises the preference for the public good relative to the private. We allow \( \mu, \bar{G} \) to vary across households. All households face a present-value budget constraint:

\[
\sum_{t=1}^{\infty} R^{-(t-1)} [c_t + \ell_t (1 - \tau_t)] = \sum_{t=1}^{\infty} R^{-(t-1)} (1 - \tau_t) + RB_0,
\]

where the right-hand side comprises the present value of full labour income (assuming per period time endowment of 1), plus the value of inherited debt, and \( \tau_t \) is an ad valorem wage tax. The household chooses \( \{c_t, \ell_t\}_{t=1}^{\infty} \) to maximise (B 1) subject to (B 2), which implies labour supply and indirect utility of

\[
L_t = 1 - \tau_t, t = 1, \ldots, \infty
\]

\[
V = \sum_{t=1}^{\infty} R^{-(t-1)} [(1 - \tau_t)^2/2 + G_t - \mu (G_t - \bar{G})^2] + RB_0.
\]

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We now eliminate $RB_0$ from (B 4) using the government budget constraint which is:

$$RB_0 = \sum_{t=1}^{\infty} R^{-(t-1)}(T_t - G_t), \quad (B 5)$$

where $T_t = \tau_t L_t = \tau_t(1 - \tau_t)$ is tax revenue. Then, substituting (B 5) into (B 4);

$$V = -\sum_{t=1}^{\infty} R^{-(t-1)}[\tau^2_t/2 + \mu (G_t - \bar{G})^2]. \quad (B 6)$$

This is a Ricardian equivalence result; outstanding government debt is not perceived as part of wealth, and taxes only affect utility insofar as they impose a deadweight loss. Note also that $-\mu (G_t - \bar{G})^2$ is the utility net of the resource cost of the public good, which is maximised at $\bar{G}$, so $\bar{G}$ is the first-best level of public good provision for a $\mu, \bar{G}$ household.

However, the per period indirect utility in (B 6), $\tau^2_t/2 + \mu (G_t - \bar{G})^2$, differs from (2) in the text in that it is defined over tax rates rather than tax revenue. To go from tax rates to tax revenue, note that the lowest tax rate required to achieve revenue $T$ is $\tau(T) = \frac{1}{2}[(1 - (1 - 4T)^{1/2})$ if $T \leq 1/4$. Then, we can write the deadweight loss of $\tau$ as a function of tax revenue $d(T) = -[\tau(T)]^2/2$. To a second-order approximation around $T = 0$, $d(T) \approx -T^2$. Substituting this in (B 6) we get

$$V = -\sum_{t=1}^{\infty} R^{-(t-1)}[T_t^2 + \mu (G_t - \bar{G})^2]. \quad (B 7)$$

So, from (B 7), the per-period utility of a $\mu, \bar{G}$ household over $G_t, T_t$ is $T_t^2 + \mu (G_t - \bar{G})^2$. This is now very similar to the loss of party $i$ when in power as given in equation (2). The key differences are: (i) we allow the political party to have a non-zero revenue target; (ii) in (B 7), $G_t, T_t$ are levels of expenditure and tax revenue, but in (2), $G_t, T_t$ are ratios of expenditure and tax revenue to GDP. The first difference is not important; indeed, it implies a testable restriction that both parties have zero tax revenue targets. The second difference is more serious, as GNP in this model is simply aggregate labour supply $L_t = 1 - \tau_t$, and hence is endogenous to the choice of $\tau_t$ and hence $T_t$. Thus, the per period loss functions of the parties when in power must be interpreted as no more than approximations to (B 7).