

Political Business Cycles and Central Bank Independence

John Maloney^{*}
Andrew Pickering^{**}
Kaddour Hadri^{***}

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This paper develops a dynamic model of Rational Partisan Business Cycles (RPBCs), in which wage contracts overlap elections and wage setters have to make a prediction about the election result. Empirical analysis of 20 OECD countries support the theoretical implication that left wing incumbents increase output, but increased expectation of a left wing regime reduces it. The model is extended to incorporate the effects of alternative measures of Central Bank Independence (CBI). The measure of objective independence outperforms the other measures and it is found that CBI reduces politically induced business cycles.

^{*} Corresponding author, J.Maloney@ex.ac.uk, School of Business and Economics, University of Exeter.

^{**} Department of Economics, University of Bristol. ^{***} Department of Economics and Accounting, University of Liverpool. The research was funded by a grant from the Leverhulme foundation. We would also like to thank participants in seminars at the Universities of Bath, Bristol and Exeter for helpful feedback as well as Iman van Lelyveld and David Mayes for their data on Central Bank Independence. A particular debt of gratitude is owed to Ben Lockwood for initiating this project and to Jon Temple for detailed comments on an earlier version.

1. Introduction

Economists distinguish between two kinds of Political Business Cycle (PBC). *Opportunistic* PBCs are generated by politicians manipulating the business cycle to get themselves re-elected (Nordhaus, 1975). *Partisan* PBCs result from systematic differences between left- and right-wing governments (Alesina, 1987), and wage contracts that overlap elections. Alesina, Roubini and Cohen (1997) find no evidence for opportunistic PBCs. The hypothesis also implies irrational behaviour unless voters are badly informed about the competence of politicians (Rogoff and Sibert, 1988). However, the evidence for rational partisan cycles when applied to a panel of OECD countries was more promising, if never resounding (Alesina, Roubini and Cohen, 1997).

According to the ‘rational partisan’ theory, the economy is affected not just by the timing of elections, but also by the electors’ anticipation of the result. Thus a group of workers may negotiate a year-long wage deal knowing that it will straddle an election, and the contending parties have 2% and 10% monetary growth in mind respectively. Rational workers will go for an intermediate pay rise. Hence, if the more anti-inflationary of the two parties gets in, a rise in unemployment ensues; if the “wetter” alternative wins, it starts its term with a minor boom.

But what the workers go for will depend on who they expect to win. If, for example, they felt certain that an incumbent government was going to be re-elected, they would behave exactly as if there were to be no election, and the election itself (assuming the government *did* get back) would have no effect on output. In general, the more likely a party seems to

get in, the closer workers will pitch their pay claims to matching its expected monetary policy. Post-electoral shocks to output will thus be largest when the election result was least expected.

Similarly, pre-electoral fluctuations will occur given that wage-setters anticipate electoral changes at some time during their wage contract (Cohen, 1993). The fluctuation increases with the likelihood of a change of regime. For instance if the incumbent right-wing party were expected to lose an impending election, there would be a pre-electoral recession as real wages increased. The stronger the expectation, the bigger the wage rise and the bigger the recession.

Most research so far has ignored the question of the degree of ex ante uncertainty associated with the elections, e.g. Paldam (1991), Alesina and Roubini (1992, 1997) and Hadri, Lockwood and Maloney (1998). An exception is Carlsen and Pedersen (1999), who estimate three series of election result probabilities for seven countries over mixed time horizons, all of which require time series of opinion poll data. We extend this work in a number of important directions. Firstly, the estimable equation is formally derived from the incumbent government's loss-minimisation problem. Secondly, because we estimate probabilities for circumstances where opinion poll data are not available, 13 additional countries are analysed and our analysis covers a longer sample period. Third, our theoretically derived output equation is shown to depend on two political variables – the identity of the incumbent, and a measure of the expectation of the election result, whereas Carlsen and Pedersen utilise a single composite term.

Our main aim, however, is to test the hypothesis that Central Bank Independence (CBI) reduces RPBC induced volatility. Indeed the purpose of the innovations described above is to take a comprehensive and accurate look at this issue. Using the recently developed data set of Kilponen, Mayes and Vilmonen (2000) we also identify if and how successful different ‘types’ of independent central banks are at reducing politically induced macroeconomic volatility.

In section 2 the dynamic rational partisan model is developed, culminating in an estimable output equation incorporating both economic and political variables. In section 3 we explain how we estimate the electoral probability series. In section 4 we test the model. In section 5 we test the hypothesis that central bank independence reduces the effects of political variables on output. Section 6 concludes.

2. The Model

The government dislikes deviation in inflation (π_s) from its own (partisan) preferred inflation rate (π^i), and deviation in output from the natural rate (y_s). This can be characterised within a standard loss function,

$$L_s^i = 0.5\alpha(\pi_s - \pi^i)^2 + 0.5y_s^2 \quad (1)$$

for $i = L, R$ depending on the identity of the incumbent and a time subscript s . The government faces a dynamic supply function,

$$y_t = \rho y_{t-1} + \theta(\pi_t - \hat{W}_t) + z_t, \quad (2)$$

where $0 < \rho < 1$, z_t is a supply shock with expected value zero, and \hat{W}_t is average nominal wage growth at time t . At time t the government therefore wants an inflation rate to minimise

$$E_t \left[\sum_{s=t}^{\infty} \delta^{s-t} \mathcal{L}_s^i \right]. \quad (3)$$

Differentiation of (3) with respect to π_t yields

$$\frac{d \left(E_t \left[\sum_{s=t}^{\infty} \delta^{s-t} \mathcal{L}_s^i \right] \right)}{d\pi_t} = \alpha(\pi_t - \pi^i) + \sum_{s=t}^{\infty} \delta^{s-t} (E[y_s]) \frac{dy_s}{d\pi_t}. \quad (4)$$

Given $\frac{dy_s}{d\pi_t} = \frac{dy_s}{dy_t} \frac{dy_t}{d\pi_t} = \rho^{s-t} \theta$, where ρ^{s-t} is the derivative of output in time s with

respect to output in time t from equation (2), then

$$\begin{aligned} \frac{d \left(E_t \left[\sum_{s=t}^{\infty} \delta^{s-t} \mathcal{L}_s^i \right] \right)}{d\pi_t} &= \alpha(\pi_t - \pi^i) + \theta \sum_{s=t}^{\infty} \rho^{s-t} \delta^{s-t} (E[y_s]) \\ &= \alpha(\pi_t - \pi^i) + \theta y_t + \theta \sum_{s=t+1}^{\infty} \rho^{s-t} \delta^{s-t} (E[y_s]) = 0, \end{aligned} \quad (5)$$

This first-order condition gives us the current inflation rate as a function of current and expected future deviations of output from the natural rate. Identifying the condition by which the government expects to set the inflation rate next period¹ eliminates the third term of equation (5). Looking ahead to period $t+1$, the government knows it will face a discounted loss function:

¹ Note that the government does not commit itself to future inflation rates. The condition derived is simply that which would minimise expected future discounted losses based on current information. The government is thus choosing the current inflation rate in the light of, and simultaneously with, identification of the inflation rates it expects itself to choose in the future, if still in power. (We assume that parties care

$$E_t \left[\sum_{s=t+1}^{\infty} \delta^{s-t-1} \mathbb{L}_s^i \right]$$

and differentiation of this with respect to π_{t+1} yields

$$\frac{d \left(E_t \left[\sum_{s=t+1}^{\infty} \delta^{s-t-1} \mathbb{L}_s^i \right] \right)}{d\pi_{t+1}} = \alpha(\pi_{t+1} - \pi^i) + \theta y_{t+1} + \theta \sum_{s=t+2}^{\infty} \rho^{s-t-1} \delta^{s-t-1} (E[y_s]) = 0.$$

Rearranging, multiplying both sides by $\rho\delta$ and taking expectations gives

$$\delta\rho\alpha E(\pi_{t+1} - \pi^i) + \theta \sum_{s=t+1}^{\infty} \rho^{s-t} \delta^{s-t} (E[y_s]) = 0 \quad (6)$$

and substitution of (6) into (5) gives

$$\alpha(\pi_t - \pi^i) + \theta y_t - \delta\rho\alpha E_t(\pi_{t+1} - \pi^i) = 0. \quad (7)$$

We assume that expectations of inflation are formed rationally, i.e. $\pi_{t+1} = E[\pi_{t+1}] + v_{t+1}$

where v_{t+1} is a random error with expectation zero. Solving (7) for inflation gives

$$\pi_t = \delta\rho\pi_{t+1} - \delta\rho v_{t+1} + (1 - \delta\rho)\pi^i - \frac{\theta}{\alpha} y_t, \quad (8)$$

which is substituted into aggregate supply (2),

$$y_t = \rho y_{t-1} + \theta\delta\rho\pi_{t+1} + \theta(1 - \delta\rho)\pi^i - \frac{\theta^2}{\alpha} y_t - \theta\hat{W}_t + z_t - \theta\delta\rho v_{t+1},$$

and then solved for y_t to give

$$y_t = \frac{\alpha}{\alpha + \theta^2} [\rho y_{t-1} - \theta\hat{W}_t + \theta(1 - \delta\rho)\pi^i + \theta\delta\rho\pi_{t+1} + z_t - \theta\delta\rho v_{t+1}]. \quad (9)$$

equally about economic outcomes whether in office or not, and do not adjust policies in the light of what they think successors might do.)

It remains to explain how wage inflation is determined. Given electoral uncertainty, wage inflation lies between the “bliss” inflation rates of the two parties. A wage contract signed at any point in time depends on the identity of the government through the lifetime of that contract. As in Carlsen and Pedersen (1999, equation 4) in any given quarter, the wage inflation rate (W_t) is set at

$$W_t = \pi^R + (\pi^L - \pi^R) \left\{ L_t \left[1 - \sum_{j=t}^{t+N-2} \left(\frac{1 - \delta_p^{j-t+1}}{1 - \delta_p^N} \right) (P_{tj}^L + P_{tj}^R) \right] + \sum_{j=t}^{t+N-2} \left(\frac{1 - \delta_p^{j-t+1}}{1 - \delta_p^N} \right) P_{tj}^L \right\} \quad (10)$$

where L_t is a dummy variable set equal to unity for a left-wing incumbent, j is the (unknown) quarter in which the election takes place, P_{tj}^L (P_{tj}^R) is the probability formed in period t of a left (right) wing victory in that quarter and δ_p is the private sector discount rate. Given a uniform distribution of contracts then at any point in time average wage inflation can be defined as

$$\hat{W}_t = (1 - M_t) \pi^R + M_t \pi^L \quad (11)$$

which is analogous to equation (11) in Alesina (1987). Average wage inflation is a weighted average of the preferred inflation rates of Left and Right governments. In a world of uncertainty concerning the timing and outcome of elections the weight depends on what sort of government was expected to predominate when existing wage contracts were signed, the measure being

$$M_t = \frac{1}{N} \left\{ \sum_{r=t-N+1}^t \left[L_r \left(1 - \sum_{j=r}^{r+N-2} \left(\frac{1 - \delta_p^{j-r+1}}{1 - \delta_p^N} \right) (P_{rj}^L + P_{rj}^R) \right) + \sum_{j=r}^{r+N-2} \left(\frac{1 - \delta_p^{j-r+1}}{1 - \delta_p^N} \right) P_{rj}^L \right] \right\}. \quad (12)$$

M_t , which can take any value between 0 and 1, might be described (inelegantly) as the “discounted average leftness” of the regimes expected during the combined lives of all extant wage contracts, as seen at the time each contract was signed. Clearly the equation

simplifies in cases where the election date is known with certainty. For a full derivation of the private sector's wage expectations, see Maloney, Pickering and Hadri (2001).

Putting (11) into (9) gives us an equation of which the reduced form is

$$y_t = b_0 + b_1 y_{t-1} + b_2 \pi_{t+1} + b_3 L_t + b_4 M_t + u_t \quad (13)$$

where u_t is a composite error term. The reduced form parameters are defined as follows:

$$b_0 = -\frac{\alpha \delta \theta \rho \pi^R}{\alpha + \theta^2}, \quad b_1 = \frac{\alpha \rho}{\alpha + \theta^2}, \quad b_2 = \frac{\alpha \delta \theta \rho}{\alpha + \theta^2},$$

$$b_3 = \frac{\alpha \theta (1 - \delta \rho) (\pi^L - \pi^R)}{\alpha + \theta^2}, \quad b_4 = -\frac{\alpha \theta (\pi^L - \pi^R)}{\alpha + \theta^2}.$$

We define the long run equilibrium level of y_t as that level which occurs when $L_t = M_t$, so that there is and has been no electoral uncertainty throughout the lifetime of every wage contract currently running. The long run equilibrium level of y_t is 0 regardless of who is in power. When $L_t \neq M_t$ then according to the model there is politically induced economic volatility. Tests of the rational political business cycle model under electoral uncertainty can be performed through estimation of the reduced form parameters b_3 and b_4 . These are expected to be positive and negative respectively, wherein b_4 is conjectured to be larger in absolute magnitude than b_3 . Equation (13) is under-identified, with 5 reduced form parameters and 6 structural form parameters. However, it is possible to obtain a measure for π^R and π^L using $-\frac{b_0}{b_2}$ and $\frac{b_3 + b_4 + b_0}{-b_2}$ respectively.

3. Computation of Election Win Probabilities

Construction of the M_t variable requires three ingredients. Firstly, following Alesina and Roubini (1992) we posit alternative values of the wage contract length, N of 4, 6 and 8 quarters². Secondly, the private sector discount rate, δ_p is set at 0.99 following Carlsen and Pedersen (1999) (CP). Finally, M_t requires a means of calculating prior election probabilities for all the $t-N+1$ quarters for which period t lies within the wage contract. CP describe three alternative measures of election result probabilities. We have extended their work to include 20 countries with varying political frameworks and derive probabilities even where there are no opinion poll data, so that a full series for all countries from 1960 onwards is estimated. In this section we concisely describe the methodology for computing these three probability measures. For a more detailed discussion see Maloney and Pickering (2000a).

3.1 Political Issues

The first issue is whom to classify as left or right. Castles and Mair (1984), Huber and Inglehart (1995), the World Values Survey and Eurobarometer all provide numerical scores for political parties on a left/right continuum from 1 to 10. Alesina and Roubini (1997) define actual governments along similar lines as do Hadri, Lockwood and Maloney (1998). We follow the latter for our definitions, and then combine them with our measures of election result probabilities to make probability estimates of whether

² Bruno and Sachs (1985) demonstrate that these lengths cover the majority of contracts in the countries we are studying.

there will be a left wing or right-wing government. In some cases this is straightforward. In others, assumptions have to be made about who is most likely to coalesce with who in the event of no party getting an absolute majority. We explain in more detail in the appendix, but in all 20 cases we take the probability of a right (left) government as the probability that the right-wing parties will win more (fewer) seats than the left-wing ones.

3.2 Computation of Electoral Probabilities

We compare three methods. Type A is the regression based probability series suggested by Chappell and Keech (1988) (CK) for cases where the date of the election, T , is assumed to be known. Where opinion poll data exists we follow Carlsen and Pedersen and regress the incumbent seat shares in our sequence of elections against recent historical opinion polls and macroeconomic data³. This gives us predictions of the seats each party would have picked up in each quarter had there been a general election then ($\hat{S}_{T-\kappa}$). We then use the best predicting regression, on the basis of highest R^2 , for each pre-electoral quarter to compute the probability, estimated from the standpoint of that particular quarter, of the incumbent party or coalition getting more than half the seats at the forthcoming actual election. If we denote this as $P_{T-\kappa}^A$, then:

$$P_{T-\kappa}^A = t\left(\frac{\hat{S}_{T-\kappa} - 0.5}{s_{\kappa}}\right), \quad (14)$$

where $t(\cdot)$ is the standard cumulative t distribution, and $\hat{S}_{T-\kappa}$ the seat share prediction using data available κ quarters prior to the election, and s_{κ} is the standard error of the

regression. Where opinion poll data were not available we regressed the *change* in incumbent seat share against macroeconomic variables. This allowed for the existing size of the majority to be taken into account. We then summed the existing incumbent share and the predicted swing for the government to obtain a fitted seat share and derived probabilities as above.

The second approach follows Cohen (1993). Given that poll data follow a random walk (tested and not rejected by Alesina, Roubini and Cohen (1997)) the probabilities are derived directly and solely from the poll data:

$$P_{T-\kappa}^B = \Phi \left[\frac{\hat{Q}_{T-\kappa-1} - 0.5}{\sigma \sqrt{\kappa + 1}} \right], \quad (15)$$

where Φ is the cumulative standard normal distribution and σ is the standard deviation of the random walk. The poll data have been transformed (monotonically) into projected seat shares ($\hat{Q}_{T-\kappa-1}$) via a preferred Votes Into Seats function estimated by OLS from actual election results (see Maloney, Pearson and Pickering, 2001).

The third probability series is proposed by CP and allows for variability in the date of the election. This applies to most of the countries in the sample. At a future date, j , the incumbent has a probability of winning (P_{ij}^I), given information known at time t modelled using either technique from above, and so this element can easily be estimated. There is also a probability distribution for whether or not the election will actually occur within that particular quarter (P_{ij}^E). Following CP we estimate P_{ij}^E using a probit model

³ The macroeconomic data were output, inflation, unemployment, interest rates and first differences in all of

where the dependent variable is whether or not an election is called. Given the increased constitutional diversity in our sample we augment the CP regressors (length of time since last election and the poll lead) with additional political explanatory variables to account for the cases of minority governments and a proxy for coalition stability. Algebraically, the probability of the incumbent winning at a particular quarter, j , in the future is written as

$$P_{tj}^C = (1 - P_{t,t}^E)(1 - P_{t,t+1}^E) \dots (1 - P_{t,j-1}^E) P_{tj}^E P_{tj}^I. \quad (16)$$

Fitted probability estimates for the sets of P_{tj}^I and P_{tj}^E are substituted into (16) to derive the series for the probability of an election victory, given uncertain election dates. P_{tj}^E comes from the probit model, and P_{tj}^I is estimated from the best performing fixed election probability series ($P_{T-\kappa}^A$ or $P_{T-\kappa}^B$) where the ‘best performer’ is the series, which gets the most predictions ‘right’ in the sense of being the right side of 50-50.

Having computed the three probability series⁴, we can construct our M_t variable using equation (12), hence capturing the essence of electoral uncertainty. The two dimensions of wage contract length (4, 6 or 8) and probability series chosen (types A, B or C) yield nine alternative series for M_t . Pearson correlation coefficients between the series exceed 0.90 in all cases: thus the alternative methods lead to measures that contain similar information.

these. The full output of these regressions is available on request (Maloney and Pickering, 2000a).

⁴ Also available on request.

4. Is there a Rational Partisan Business Cycle?

In this section we investigate whether the identity of the incumbent and the probability of its re-election affect output in the way that the RPBC theory suggests. We test for the presence of rational partisan business cycles as described by our model (equation 13) on a country-by-country basis and within a panel⁵. In the following section we test whether and what type of central bank independence reduces the RPBC.

Our macroeconomic data come from the OECD database and cover 20 countries: Australia, Austria, Belgium Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, The Netherlands, New Zealand, Norway, Spain, Sweden, Switzerland, the United Kingdom and the United States. The logged output data is passed through a Hodrick-Prescott (1997) filter with the smoothing parameter set equal to 1600 and so analysis focuses on deviations from the long-term trend, identified by the filter, that are potentially induced by rational partisan variables. The series is multiplied by 100 to give percentage deviations from the long run trend. As well as the regressors in (13) we employed dummy variables for the high oil price era (1973-1986) (DO) and for the 1990s recession (D90).

There are nine (albeit highly correlated) alternative series of M_t and nineteen individual countries. The M_t series generated by the probability measures proposed by Alesina,

⁵ Alesina, Roubini and Cohen (1997) who study RPBCs within 18 countries (our sample minus Greece and Spain) undertake comparative work for the period 1960-1993. This work does not address the probability of the election result and uses partisan dummies (set equal to one for a right wing incumbent and equal to minus one for a left wing incumbent) to test for the RPBC. Using a fixed effects model they find a significant RPBC in output.

Roubini and Cohen (1997 ch.5) (type B) in general gave less predictive power than the other two measures for all three contract lengths, although this is likely to be largely due to the smaller samples for which we had opinion poll data. The evidence does not provide clear-cut support for one contract length over another, although given the way average explicit and implicit contract length varies from country to country this is to be expected. We select particular M_t series on the basis of explanatory power, although the results are robust to alternative series.

Estimation on a country by country basis yielded results that were by and large insignificant, and are thus not reported. There are a number of possible explanations for this. One is that there really is no rational partisan business cycle, although this contradicts the previous work by Alesina, Roubini and Cohen (1997) and Carlsen and Pedersen (1999). Alternatively the large standard errors may be attributable to collinearity between L_t and M_t . Suppose, for example, that it is 6 quarters before an election, and contracts last 8 quarters. Then for 6/8 of the life of contracts now being signed, M_t will equal L_t . Pearson correlation coefficients between L_t and M_t exceeded 0.8 in almost all cases and so much of the information contained in one variable is contained in the other. Consequently, lower levels of significance are to be expected compared with previous studies that only use one variable to capture PBC type effects.

In order to overcome this problem the model is estimated using data pooled across countries. This enables a much larger sample, and it also provides a platform to analyse the impact of central bank independence which varies substantially between countries but much less within countries across time. A preliminary regression using the pooled data

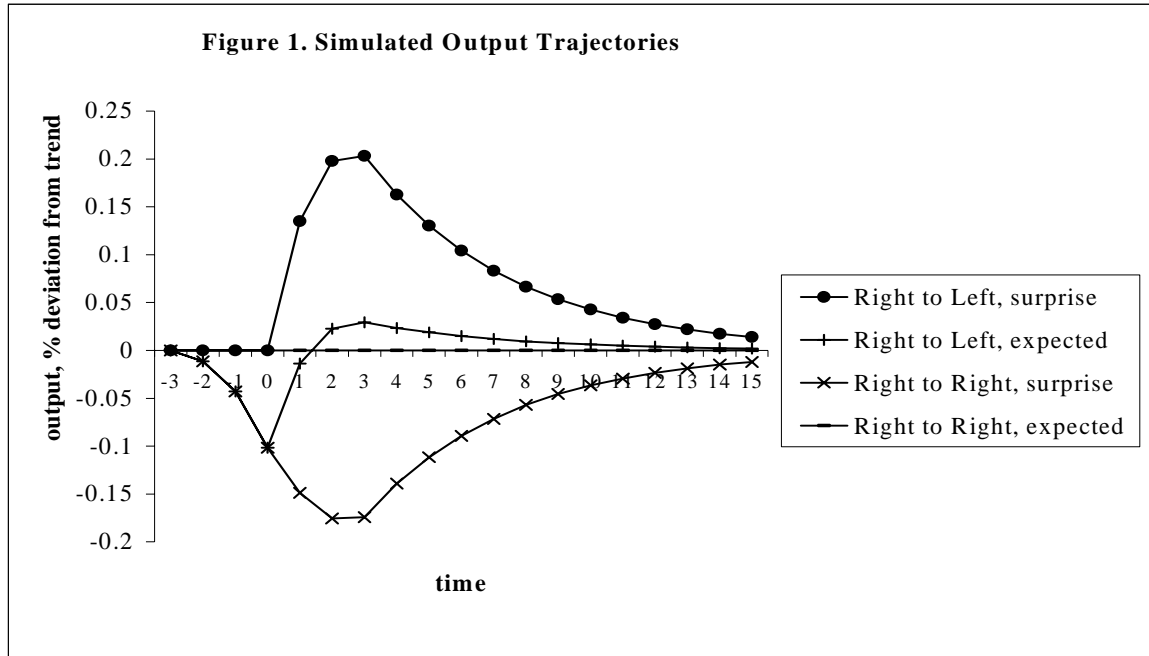
found residuals that exhibited a considerable degree of serial correlation and the presence of ARCH. To correct for the serial correlation we included additional lags of y_t as regressors on the basis of statistical significance. We then estimated the model using the maximum likelihood procedure of Engle (1982) following a correction for ARCH. Estimation initially employed fixed effects, but none of these were found to be significant and so the reported results exclude these variables.

Table 1 Pooled estimation

	Usable observations	\hat{b}_3 (std. error) {p-value}	\hat{b}_4 (std. error) {p-value}	Joint Test χ^2 {p-value}
Full Sample	3120	0.11 (0.02) {0.000}	-0.18 (0.03) {0.000}	18.32 {0.000}
Reduced Sample	2345	0.14 (0.04) {0.000}	-0.15 (0.04) {0.000}	14.16 {0.000}

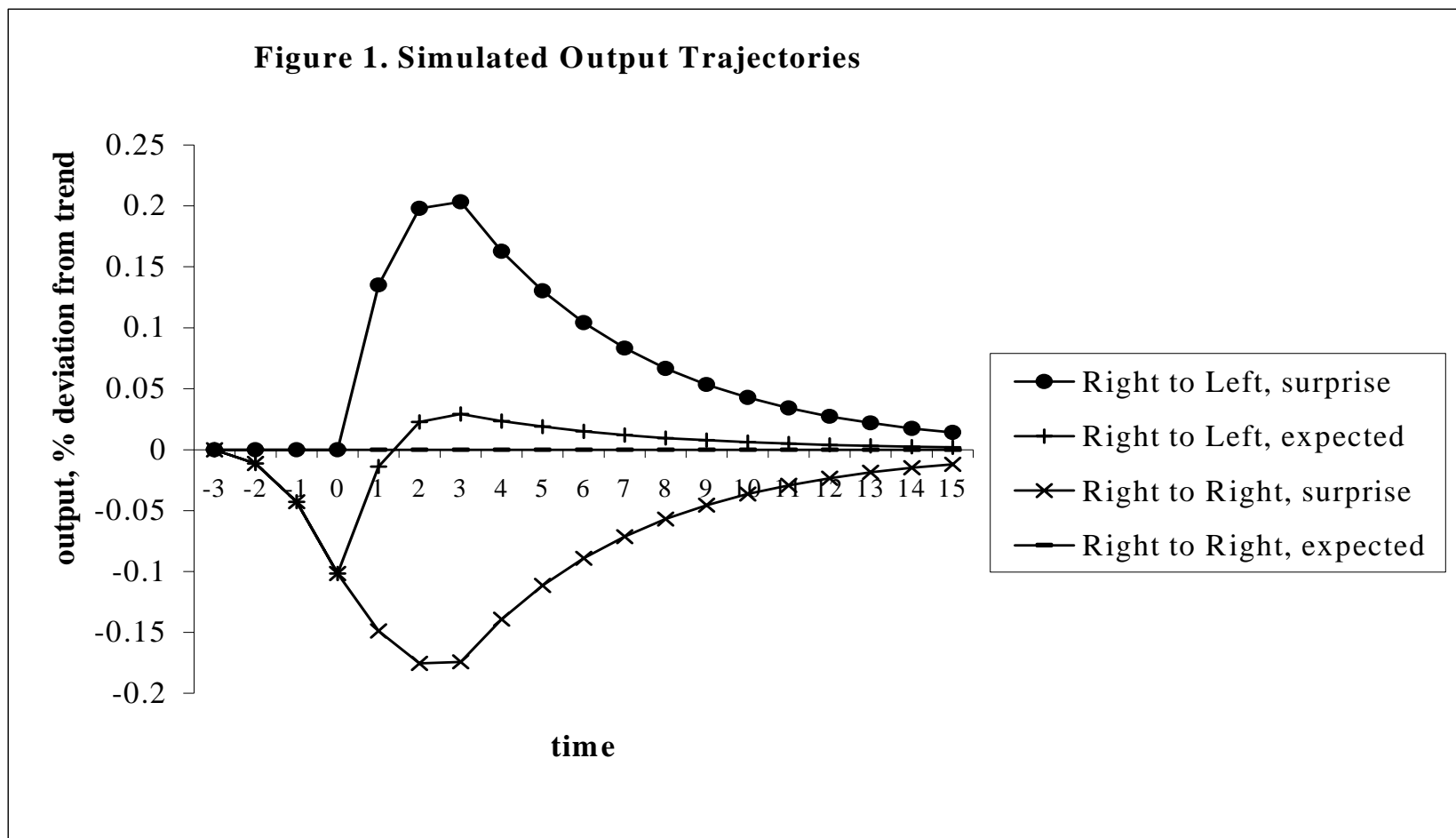
Table 1 shows that estimation of the full sample finds both political parameters correctly signed and significant at the 1% level; furthermore $|b_4| > b_3$ as predicted by the theory. The model is also estimated for a reduced sample of countries where the left-right distinction is arguably less ambiguous. This reduced sample omits Belgium, Finland, Ireland, Italy, Japan, The Netherlands and Switzerland and gives substantively the same results. The joint hypothesis test, $H_0: \hat{b}_3 = \hat{b}_4 = 0$, that both political variables do not influence the macroeconomic variable in question is rejected in both samples. Unfortunately the estimated intercept parameter, b_0 was positive, although insignificant, and so it is difficult to obtain meaningful estimates of the structural parameters π^R and π^L using the method described at the end of section 2.

The findings reported in table 1 suggest that the magnitude of RPBC induced volatility is, on average, quite small. Recall that the dependent variable is measured as percentage deviations in output from trend and thus fluctuates, in the main, between $\pm 2.00\%$. The actual impact of the RPBC induced volatility depends on the parameter estimates b_3 and b_4 , and also the value of the political variables L_t and M_t . To gauge the magnitude of these effects we analyse four stylised cases. Consider a right-wing incumbent who may win or lose and where either of these outcomes may be a complete surprise or completely expected. (For a left-wing incumbent the analogous cases are mirror-images of what follows). Taking our parameter estimates from the full sample and setting $b_l = 0.8^6$ the simulated path of y_t is plotted in figure 1.



⁶ This assumes only one lag in the output process – 0.8 is the average estimated value for b_l from the individual regressions. The results are robust to alternative representations of the dynamic process.

Larger Version of Figure 1.



In the case of the expected re-election (at time 0) of a right-wing incumbent, then there is no RPBC fluctuation. If the re-election was a complete surprise, then output falls to 0.18% below trend before recovering gradually. Following a surprise left-wing victory the economy expands 0.2% above trend in the 2nd and 3rd quarter before reverting to trend. In the case of a correctly predicted left-wing victory the volatility is less pronounced, with a small dip below trend prior to the election as wage setters adjust their expectations to below the existing incumbent's policy. Following this a minor post-election expansion ensues as the new regime takes advantage of contracts agreed during the previous anti-inflationary era. The RPBC effects generated are quite small, but significant, both statistically and economically. The estimated coefficients may be interpreted as *average* measures and are likely to vary across countries, in which for instance central banks of varying degrees of independence conduct monetary policy.

The RPBC theory suggests a number of testable hypotheses. First, following an election output will in general be higher (lower) when a left (right) wing party is elected. In common with previous studies we find this to be true; the presence of a Left-wing incumbent appears to have an expansionary effect on output. Second, following an election this effect is stronger the more surprising that result; and third, before an election, the more expected an incumbent victory the smaller the fluctuation, the more expected an opposition victory the greater the fluctuation. The second and third hypotheses are jointly tested by the reduced form parameter on M_t : they imply that b_4 will be negative. So it is: significantly. This is an important new result and a refinement of the rational partisan political business cycle theory. As a test of the theory, and also as an

important policy issue the focus now switches to the question of whether or not monetary policy constraints, and in particular independent central banks, can reduce the political volatility.

5. Do Independent Central Banks reduce the Rational Partisan Business Cycle?

A government's ability to run the economy in a partisan way depends on its ability to manipulate monetary policy. Economists have looked long and hard at Central Bank Independence (CBI) as a restraint on damaging, politically determined macroeconomic policy⁷. In this section we test whether increased CBI can reduce the RPBC-induced cycle identified in the previous section.

We therefore augment the RPBC model in equation (13) with additional variables for central bank independence and 'interaction terms' where for example the degree of central bank independence influences the effect of political factors upon the macro variables.

For our measures of CBI we use the Cukierman (1992) unweighted legal index (LVAU) and a new data set developed by Kilponen, Mayes and Vilmonen (2000) (KMV). The LVAU index is the most widely known index and was recently updated⁸ by Schrijner and van Lelyveld (2000). The KMV data set contains the component parts of the original

⁷ In a different setting Rogoff (1985) finds that delegation of policy to a credible independent central bank increases economic welfare. Relevant empirical work includes that of Alesina (1988), Alesina and Summers (1993), Grilli et al (1991) and Cukierman (1992). Hadri, Lockwood and Maloney (1998) test for the effects of central bank independence upon inflation and find some evidence in favour of the proposition that independent central banks limit political effects.

Cukierman index, defined as ‘Personnel Independence’ (PERI), ‘Policy Independence’ (POLI), ‘Objective Independence’ (OBJE) and ‘Financial Independence’ (FINI) and extends it throughout the 1990s. These are individually constructed from updated responses to the Cukierman questionnaire⁹. These specific measures of CBI are all in turn used in subsequent analysis in order to overcome one of the objections to measures of independence that the aggregated measures incorrectly weight variables. A final index, which we denote as KMV is constructed as an unweighted average of PERI, POLI, OBJE and FINI. All measures take values between 0 (no independence) and 1 (complete independence).

Some have doubted whether CBI can ever be measured accurately (for example see Forder 1998), but we argue that whilst measurement has its problems, refusal to measure is much worse (Maloney and Pickering, 2000b). Furthermore, our analysis uses several alternative measures and in doing this we can or at least try to establish which ‘types’ of CBI reduce the RPBC (or, if independence is thought to be ambiguous, simply which types of central bank).

The monetary policy constraint augmented model for estimation is written as

$$y_{it} = b_0 + b_{0i} + \sum_{k=1} b_{1,k} y_{it-k} + b_2 \pi_{it-1} + b_3 L_{it} + b_4 M_{it} + b_5 DO_t + b_6 D90_t + b_7 CBI_{it} + b_8 DF_{it} + b_9 L_{it} CBI_{it} + b_{10} M_{it} CBI_{it} + b_{11} L_{it} DF_{it} + b_{12} M_{it} DF_{it} + u_t, \quad (17)$$

⁸ Cukierman’s original index ends in 1992.

⁹ See Appendix A in Cukierman (1992) for more details on the coding procedure, and Kilponen, Mayes and Vilmonen for details on their specific measures.

where the i subscript refers to individual countries, CBI_{it} is the degree to which a central bank is independent and DF_{it} is a dummy variable set equal to one when there is a fixed exchange rate¹⁰. The country specific intercept terms, b_{0i} capture the fixed effects. There are k lags for output in order to capture dynamic effects and to reduce serial correlation. The CBI measure and the fixed exchange rate dummy are used as regressors in their own right. There are four interaction terms, which are the products of the two political variables and the two monetary policy constraints.

If the theory is correct, and if the measures of CBI are sufficiently accurate, then the estimated coefficients of these interaction terms ought to be the opposite sign of the estimated parameter of the relevant political variable. That is, given $b_3 > 0$ and $b_4 < 0$ then, if increasingly independent central banks and fixed exchange rates reduce these political effects, $b_9, b_{11} < 0$, and $b_{10}, b_{12} > 0$. Equation (17) was estimated using maximum likelihood following a correction for fourth order ARCH using the alternative measures of Central Bank Independence, omitting Ireland for which the CBI data set was incomplete. Table 2 presents the estimation results for the parameters corresponding to the political and institutional variables.

¹⁰ The Mundell-Fleming model suggests that monetary policy is ineffective under fixed exchange rates. However, it is possible that fiscal policy (particularly effective under fixed exchange rates) undermines the exchange rate regime as a constraint on partisan policy.

Table 2 Estimation of equation (17), full sample excepting Ireland

	Regression coefficients (standard errors) {p-values}								likelihood function value
CBI Measure	b_3	b_4	b_7	b_8	b_9	b_{10}	b_{11}	b_{12}	
LVAU	0.46 (0.056) {0.000}	-0.20 (0.048) {0.000}	0.33 (0.065) {0.000}	-0.025 (0.025) {0.324}	-0.97 (0.17) {0.000}	0.19 (0.18) {0.299}	-0.090 (0.074) {0.227}	0.004 (0.09) {0.966}	9895.35
PERI	0.27 (0.083) {0.001}	-0.13 (0.068) {0.05}	0.12 (0.09) {0.163}	-0.052 (0.031) {0.095}	-0.41 (0.16) {0.010}	0.18 (0.17) {0.290}	0.006 (0.09) {0.951}	-0.07 (0.11) {0.541}	9885.15
POLI	0.16 (0.05) {0.002}	-0.15 (0.05) {0.002}	0.26 (0.13) {0.040}	-0.076 (0.026) {0.4}	-1.04 (0.50) {0.039}	1.33 (0.58) {0.022}	-0.007 (0.08) {0.935}	-0.05 (0.10) {0.597}	9887.94
OBJE	0.40 (0.042) {0.000}	-0.24 (0.042) {0.000}	0.20 (0.033) {0.000}	0.02 (0.03) {0.356}	-0.56 (0.097) {0.000}	0.056 (0.11) {0.604}	-0.17 (0.12) {0.181}	-0.002 (0.07) {0.968}	9909.54
FINI	0.24 (0.05) {0.000}	-0.14 (0.054) {0.009}	0.045 (0.036) {0.216}	-0.028 (0.030) {0.361}	-0.41 (0.11) {0.000}	0.26 (0.13) {0.05}	-0.055 (0.084) {0.517}	-0.056 (0.10) {0.576}	9890.93
KMV	0.42 (0.052) {0.000}	-0.16 (0.046) {0.000}	0.30 (0.066) {0.000}	-0.023 (0.025) {0.365}	-0.91 (0.16) {0.000}	0.11 (0.18) {0.514}	-0.12 (0.07) {0.109}	0.004 (0.09) {0.966}	9900.45

Table 3 p-values of Joint Hypothesis Tests

CBI Measure	<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	<i>F</i>	<i>G</i>
LVAU	0.000	0.000	0.000	0.000	0.000	0.170	0.000
PERI	0.032	0.017	0.013	0.078	0.005	0.556	0.037
POLI	0.000	0.004	0.000	0.000	0.001	0.059	0.000
OBJE	0.000	0.000	0.000	0.000	0.000	0.025	0.000
FINI	0.000	0.000	0.001	0.032	0.000	0.095	0.090
KMV	0.000	0.000	0.000	0.000	0.000	0.161	0.000
Hypothesis Tests							
<i>A</i>	$H_0: b_7 = b_8 = b_9 = b_{10} = b_{11} = b_{12} = 0$						
<i>B</i>	$H_0: b_9 = b_{10} = b_{11} = b_{12} = 0$						
<i>C</i>	$H_0: b_7 = b_8 = b_9 = b_{10} = 0$						
<i>D</i>	$H_0: b_7 = b_8 = b_{11} = b_{12} = 0$						
<i>E</i>	$H_0: b_9 = b_{10} = 0$						
<i>F</i>	$H_0: b_{11} = b_{12} = 0$						
<i>G</i>	$H_0: b_7 = b_8 = 0$						

The original political parameters (b_3 and b_4) retain their sign and increase their significance; both are significant at the 1% level for all CBI measures except personnel independence (PERI). Hypothesis tests of joint significance reported in table 3 confirm this finding. Furthermore, the magnitude of the estimates has increased in most cases, suggesting that RPBC volatility is stronger in countries without independent central banks. Estimation using the reduced sample led to similar results.

A considerable result is that in every case the CBI interactive terms exhibit the ‘correct’ sign, offsetting the expansionary effects of a left wing incumbent and contracting effect of the M_t variable, and in many cases significantly. The parameter estimate for b_9 (corresponding to the L-CBI interactive term) was negative and significant¹¹ at the 5% level for all measures of CBI. This provides significant evidence that independent central banks offset the expansionary tendency of left wing governments. This effect was most pronounced in the cases of the two composite CBI terms, LVAU and KMV, and the objective independence measure (OBJE), although was present for all measures. The evidence was less strong that independent central banks dampen the political effects as captured by the M_t variable, although b_{10} exhibits the correct sign in all cases. In contrast, the exchange rate constraint was not found to mitigate any of the political effects.

The likelihood function values supported the use of the objective independence measure. The composite measures, LVAU, and KMV also scored quite well, although this could be on account of their inclusion of the factors represented by objective independence. Personnel independence, policy independence and financial independence, whilst still individually apparently mitigating the PBC¹², fare less successfully. Objective independence might be expected to be the best measure of the effects of CBI, as the delegation type arguments rely upon Central Banks having precisely this characteristic. Ability to appoint your own board of governors, for example, is useless if inflation objectives are still set by politicians. Instrument (policy) independence too may have

¹¹ The estimated coefficients for b_9 are often greater in magnitude than those for b_3 . This does not mean that central banks over-compensate against the PBC effects because in most cases the CBI measures are substantially less than unity.

¹² That these measures reduce the PBC by themselves may be a spurious inference. Increases in personnel, policy and financial independence tend to accompany increases in objective independence.

little stabilising effect if politicians have set the target inflation rate. On the other hand, if the central bank is allowed to choose macroeconomic objectives, then there is a real potential for reduced political macroeconomic volatility.

6. Conclusions

In this paper a model of rational partisan political business cycles was derived and estimated for 20 OECD democracies. With a RPBC, output depends not just on who wins an election, but on how surprising its victory was – wage-setters’ political expectations will affect output both before and after the election. The more inflation-averse the actual government, the lower the output after an election. But the more inflation averse the *expected* government is, the higher the output on *both* sides of the election. We estimate all these predicted effects and find all the relevant parameters significant and correctly signed. We also find central bank independence significantly reduces each one of these effects. The exact result depended on the exact measure of CBI – of which we tried out six. As might have been expected, the measure of CBI that gave the best likelihood was that measure which captured objective independence.

Appendix: Estimating the Probabilities of Left- and Right-Wing Governments

The most common political system, characterising 15 of our 20 countries, is one where two large parties, or coalitions of parties, alternate in office, with one party or coalition unambiguously to the left of the other. Here successive governments are easy to classify as Left or Right. Centre governments come about only when the two big players unite in a grand coalition (e.g. Germany from 1966-9). Parties which have only held office as part of the left (right) coalition we classify as left (right). Parties which have been part of both left-wing and right-wing coalitions we classify as centre. Parties which have never been in office we classify as Centre unless there is evidence to the effect that they would contemplate joining one, but only one, of the major parties/blocs. Thus, e.g. the UK Liberals (latterly Liberal Democrats) are counted as centre until after the 1992 election, at which point they made it clear that in a hung parliament they would not keep the Conservatives in power. One rather paradoxical result of this is that parties so extreme that all other parties would shun or be shunned by them count as Centre! But Centre, here, merely means neutral, for *practical* purposes, between the main Left and Right groupings. We assume that voters in these countries always expect either a left or right government (i.e. centre governments are a complete surprise.) The probability of a left (right) government is thus simply the probability that the parties classified left will have more (fewer) seats than those classified right. When Centre governments do occur, we give the L dummy a value of 0.5.

Of the five other countries, Belgium and the Netherlands have a large Centrist party, which spends all or most of the time in power, either by itself, or in coalition with a left-

or a right-wing party or grouping. Each of the three remaining countries (Italy, Ireland and Switzerland) has, in our terms, an idiosyncratic political system. For a full account of how we derive election probabilities in these five countries, see Maloney and Pickering (2000a).

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