Political Competition and the Political Budget Cycle in Canada, 1870-2000: a search across alternative fiscal transmission mechanisms

by

J. Stephen Ferris*
stephen_ferris@carleton.ca

and

Stanley L. Winer**
stan_winer@carleton.ca

Third Draft, May 1 2006

*  Department of Economics
** School of Public Policy and Department of Economics
Carleton University
Ottawa, Ontario, K1S 5B6
Canada
Political Competition and the Political Budget Cycle in Canada, 1870 - 2000:

a search across alternative fiscal instruments

Abstract

In this paper we use Engel-Granger cointegration and error correction methodology to combine I(1) economic variables with I(0) political variables to test the hypothesis that Canadian federal fiscal instruments have been influenced by overtly political factors (elections, party affiliation, minority government etc.)— the hypothesis that there is a “political budget cycle” in Canadian annual data spanning 1870-2000. One reason for believing that such a cycle might exist is the belief both within and outside of politics that political parties have an incentive to manipulate economic outcomes for electoral purposes and so produce a political business cycle. Hence to motivate our work on fiscal instruments, we first ask whether there is any evidence consistent with the predictions of either partisan or opportunistic political theories in Canadian macro data. The finding that there is tentative support for a partisan cycle in real output growth then leads us to consider whether such a cycle could have been transmitted through fiscal policy. Our findings with respect to three fiscal instruments, expenditure, taxation and the overall deficit, give little support to any current political theory of the cycle but do provide support for the hypothesis that the degree of political competition matters in explaining policy time series processes both with respect to long run government size and to shorter run variations in expenditure, taxation and the overall deficit about that long run size. Thus while our findings concur with absence of any significant cyclical connection between fiscal instruments and economic outcomes, as pointed out earlier by Serletis and Afxentiou (1998), our results highlight a different channel by which politics seem to influence economic policy. As such they reinforce the more detailed findings presented earlier by Ferris, Park and Winer (2005) on the role of political competition strictly with respect to the evolution of government size in Canada.

Key Words: expenditure size of government, tax-share, government deficits, political competition, political business cycles, political budget cycles, monetary policy, cointegration and error correction analysis.

JEL Categories: H1, H3, H5
Political competition and the political budget cycle in Canada, 1870 - 2000

a search across alternative fiscal instruments

I. Introduction

In this paper we use Engel-Granger cointegration and error correction methodology to investigate the different ways in which the instruments of fiscal policy (expenditure, taxation, and the deficit) have been influenced by both economic and political factors over the 1870 to 2000 time period in Canada. In doing so we wish to capture two potentially competing sets of concerns. First, we wish to model the extent to which the level and changes in the level of economic policy instruments reflect “economic fundamentals”, that is, reflect the underlying tastes and preferences of the community. In addition, we would like the analysis to be able to indicate the presence of and distinguish among at least three different ways by which distinctly political factors could further shape fiscal policy.

Perhaps the most straightforward reason for expecting a distinct political influence on policy levels is simply because economic policy is developed by agents who compete in political rather than economic markets and hence can be expected to respond to political incentives when they differ from those generated by the market. To test for this dimension, we first use public choice and spatial voting theory (Downs 1957 and Coughlin 1994) to suggest a long run model of government size based on economic fundamentals. Then by adding a set of political variables to the model, we can test for the significance of a distinctly political influence on policy. Second, in relation to the process by which policy choices converge on fundamentals, many authors have emphasized the role of political competition (Stigler 1972 and Becker 1983). Most recently, scholars using cross country data have noted that the political budget cycle is more pronounced
in newer than in older democracies (e.g., Schuknecht, 1996; Block, 2002) and this has been attributed (by Bender and Drazen, 2005) to the inexperience of voters in newer democracies and/or the lack of relevant information needed by voters to evaluate fiscal manipulation. From our perspective, such work suggests that even within a single parliamentary democracy over the long term, changes in the degree of political competition should matter and this prompts our search for such evidence in the time series processes of our fiscal instruments. Thirdly, there remains an ongoing belief both within and outside of politics that political parties have an incentive to manipulate economic policies for electoral or ideological reasons and so can produce a political business cycle in the aggregate macro data. This prompts our search for the effect of explicitly political variables (election timing, party affiliation, etc.) on our policy instruments over the shorter run.

Our approach in analyzing these questions comes from the recognition that government policies have distinctly different long and short run objectives that upon implementation become co-mingled in time series data. Hence any test for the presence of fiscal policy in relation to either the long or the short run must do more than mechanically separate out a deterministic/stochastic trend and use theory to derive an explicit long run - short run separation. In our analysis we use public choice and spatial voting theory to model explicitly the long run level of policy instruments. Formally this involves finding a set of variables that both span the relevant time period and form an essential part of a theory of long run government expenditure/tax size. Because the typical variables suggested in the literature are all I(1), it is natural to test for evidence of that long run equilibrium relationship among the set of I(1) variables by asking whether there is evidence of cointegration among the variables (Engel and Granger, 1987). Given that a cointegrating relationship can be found, the lagged residuals from that equation can be used to form an error correction model of short run adjustment. These two
equations then form our base case representing ‘economic fundamentals’ in relation to the long and short run. By adding a set of explicit political variables to these equations we can test for whether political variables add to the explanatory power of the model and, should they do so, interpret the way in which such variables matter.

The paper proceeds as follows. In Section II we motivate our analysis of policy instruments by asking whether there is any evidence that politics matter in relation to Canada’s aggregate macro data. Our tentative finding that the pattern of real output growth is consistent with partisan political theories of the business cycle leads naturally to a search across fiscal instruments for a mechanism(s) by which political influences could have been transmitted through policy into economic outcomes. In section III we begin that search by building a cointegration model of the long run expenditure and tax size of government. After finding evidence consistent with a long run equilibrium relationship between these two measures of government size and a set of fundamental economic variables, we look for evidence of a transitory effect on size coming either from political competition or any of the other political variables that appeared to be successful in explaining real output growth. Section IV extends this analysis to the error correction model and hence the role of political factors in relation to the short run cycle. Section V reviews the consistency of our major findings for policy with the earlier political business cycle findings of Section II, and Section VI presents our conclusions.

II. Is there evidence of a political cycle in Canadian macroeconomic data?

We begin by asking whether there is any evidence that political factors play an independent role in determining aggregate macroeconomic outcomes in Canada. The macroeconomic time series variables we consider as outcomes here are real output growth (GROWTH), measured as the rate of growth rate of real Gross National Product (GNP), and
inflation rates (INFLATION), measured by the rate of change of the GNP deflator. The
descriptive statistics for these variables, as well as for the political variables to be discussed
below, are found in Table 1a.¹

{Tables 1A and 1B here}

Before we can assess whether political factors can explain the variations in these
measures of macroeconomic performance, we must control for variations in output growth and
inflation that arise for reasons exogenous to domestic electoral politics. Here we are fortunate.
Because Canada is highly integrated economically with the U.S. economy and because its
political choices have little effect on US economic outcomes, USGROWTH, the rate of growth
of the U.S. Index of Industrial Production, and USINFLATION, the rate of growth of the U.S.
GDP price deflator, are useful as controls for the importance of the nonpolitical forces that shape
the Canadian economy.

Traditional political explanations for an independent political effect on economic
outcomes highlight either opportunistic or partisan reasons for why political parties wish to
influence aggregate demand and output.² Hence traditional opportunistic political theories argue
that the incumbent political party will use its control over government to gain votes
opportunistically by increasing aggregate demand in the period immediately prior to each
election (Nordhaus,1975). This is independent of the ideology of the party in power and
becomes observable through faster rates of real output growth and/or higher inflation in the

¹ The unemployment rate is not available prior to the 1920's and may not be measured consistently before and after
1945. Because it does not span our time period, it is not considered.

² See Alesina, Roubini, and Cohen (1997, particularly pages 36 and 62) for a convenient summary of opportunistic
and partisan political theories. Haynes and Stone (1990) suggest that partisan and opportunistic effects may not be
separable, where interdependence can be tested for with interaction terms. Our experimentation produced no
instances where such interaction was significant in our data. The second issue pointed to by Haynes and Stone - that
political cycles may persist over time - is allowed for here and below via the error-correction methodology as we
have pointed out above.
period leading into an election. Rational opportunistic theories, on the other hand, emphasize that such spending would need to be unanticipated and hence highlight asymmetric information and signaling as alternative reasons for the effectiveness of government spending.\(^3\) To test whether the data are consistent with either traditional or rational opportunism theories of the cycle, we look for a positive effect of ELECTIONYEAR lagged on either GROWTH or INFLATION.\(^4\) Descriptive statistics for this opportunistic variable and the other political variables discussed below are found in Table 1a. What is important to note is that all political variables are stationary in levels.

Partisan political theories, following Hibbs (1977) and others, suggest that the ideology of the political party in power will matter. In Canada, the center-left party, the Liberal Party (indicated by the one-zero dummy variable LIBERAL) would be expected to spend more when in power than their more Conservative rival (1-LIBERAL). Hence the test for traditional partisanship is a positive sign on the coefficient for LIBERAL and a negative sign for the conservative alternative (1-LIBERAL). Because any predictable policy would be anticipated and hence incorporated into agent behavior, rational partisan political theories refine the traditional hypothesis by arguing that as long as the electoral outcome is uncertain, the realization of a more liberal (conservative) political party victory can generate an unexpected boost to (contraction in) aggregate output or inflation (Alesina, 1987). The size of that effect will then depend upon: (a) the degree of surprise in the election result; and (b) the passage of time since the election, since the realized outcome will be incorporated in revised expectations.

\(^3\) Such arguments abstract from any effects that might arise from government redistribution from lower spending to higher spending groups. See also Rogoff and Silbert, 1988.

\(^4\) Because the data is annual and most elections take place mid-year, it is not clear exactly in which year the hypothesized boost to aggregate demand should arise. Hence all equations were rerun with ELECTIONYEAR. This typically resulted in only small differences. See, however, footnote 20 below.
To test the rational partisanship hypothesis we must then account for both the ideology of the party winning political power and the degree of surprise in the election result. We assume that the degree of surprise in an election will be inversely related to the ex-post size of the winning majority and measure the degree of surprise as one minus the fraction of seats won by the winning party, (1-SEATS). The direction of the surprise is incorporated by using a dummy variable that distinguishes the party type in power (LIBERAL for a positive boost to aggregate demand and 1- LIBERAL for a negative shock).\(^5\)

Finally, a parliamentary system of government such as Canada’s differs from a congressional system in that the party winning power gains control over government’s policy instruments if it wins a simple majority of the seats in an election.\(^6\) Should the party winning power have less than a majority (and hence govern in coalition with other parties), control over policy is more tenuous. Because the absence of a minimum length of term means that the winning party must moderate its partisan concerns to maintain the “confidence” of the house. It follows that in periods when parliament is controlled by a minority government, both political and policy behavior might well be anomalous.\(^7\) This has two important implications for our work. First, we expect that anomalous minority behaviour will be independent of party affiliation and test for this minority effect directly through the use of the dummy variable, MINORITY. Secondly, we expect that partisan effects will be evident only if the government in

---

\(^5\) We do not test whether the size of the surprise is viewed as biased against the incumbent governing party. See Heckelman (2002) who argues that the Canadian data (1965-1996) is more consistent with symmetry across parties.

\(^6\) Typically there are fewer checks and balances on parliament and greater party discipline than in a congressional system.

power has a majority. Thus using the dummy variable, 1-MINORITY, to indicate those years when the governing party had a strict majority, the interactive composite variable representing traditional partisanship is now defined as

\[
\text{PARTISAN} = (1-\text{MINORITY})*(\text{LIBERAL} - (1- \text{LIBERAL}))
\]

and the variable, SURPRISE, testing rational partisanship, is defined as:

\[
\text{SURPRISE} = (1-\text{MINORITY})*(1-\text{SEATS})*\{\text{LIBERAL} - (1- \text{LIBERAL})\}.
\]

Both are predicted to have a positive sign.

Lastly, because the effect of “rational” partisan electoral surprise should diminish through time, we define the following duration variable:

\[
\text{DURATION} = (1-\text{MINORITY})*\text{ELAPSE}*(\text{LIBERAL} - (1- \text{LIBERAL})),
\]

where ELAPSE is the time (in years) since the last election. Since the size of the stimulative (contractive) effect generated by the election of a Liberal (non Liberal) government is expected to dissipate as time in power elapses, the coefficient of DURATION is predicted to have a negative sign.

The results of our test for the presence of political cycles in Canada’s annual macroeconomic data from 1870 through 2000 are presented in the OLS regression equations in Tables 2 and 3. Here each equation was rerun to allow for two possible measures of political outcomes in Canada, labeled as definitions A and B. Different interpretations of electoral outcomes arise in Canada (especially in the first half of the 20th century) because closely associated, nominally independent candidates often ran unopposed by the winning political party and, once elected, tended to vote with the winning party. Hence judging whether or not they
formed part of the winning majority/minority is often problematic. In Tables 2 and 3, definition A refers to Beck and Campbell’s (1977) judgement about which of the coalitions were durable, while definition B follows the Canadian Parliamentary Guide in using official party titles to measure the number of seats won by any officially designated political party. For both definitions, the first two columns represent alternative partisan hypotheses for the entire 1870-2000 time period, while the third represents the test for rational partisanship over the shorter 1921-2000 sub-period over which the data are somewhat more reliable. In addition, the use of a dummy variable for the periods of fixed exchange rates in Canada - 1870-1914, 1926-1931, 1939-1951, 1960-1972 – did not improve the fit nor was itself significant. Nor were experiments with interacting periods of fixed exchange rates with different political variables.

The results in Table 2 illustrate that despite the importance of economic factors in explaining the growth rate of Canadian output, as reflected in the significance of USGROWTH and its lags, the set of political variables do assist in explaining real growth. A Wald test rejects the hypothesis that the political variables as a group are jointly insignificant (at five percent or better) in five of the six cases, with PARTISAN, SURPRISE and MINORITY significant in all formulations (although more weakly so in the later time period). The two definitions of the size of the winning coalition and periods minority government produce roughly similar findings. In relative terms, the Beck/Campbell measure of the size of the winning coalition produces

---

8 For example, in the election of 1872 the Canadian Parliamentary guide has the Conservative party elected with a minority of 99 out of 200 seats. Beck considers the electoral outcome as a Conservative majority of 99 plus three Independent Conservatives plus one independent for 103 out of 200 seats.

9 The equations were also run over the 1945 to 2000 time period with a) no appreciable change in the pattern of results but b) decreased significance for each political variable (findings available on request). Hence there is evidence in the data for Canada that political cycles are now less prevalent than they were in the past.
coefficient estimates that are typically larger and more significant than does the Parliamentary Guide definition.

Table 3, on the other hand, indicates that the political variables reflecting opportunism and partisanship have much less success in explaining the rate of inflation. The control variable for U.S. economic influence, USINFLATION, is highly significant and responsible for virtually all of the equation’s overall explanatory power and, even though each political coefficient has its expected sign, only two of the political coefficients are marginally significant while the set of political variables as a group are inevitably insignificant. Overall, then, Canada’s macroeconomic data are consistent with the hypothesis of a political influence on annual real growth rate over the 1870 to 2000 time period, but give only very limited support to the hypothesis that the inflation rate exhibits a political cycle.

We turn next to which particular political hypotheses are consistent with cycles in real output. First, the hypothesis that opportunistic pre-election spending results in a significantly positive effect on output growth is not supported by the data. Even though five of the six ELECTIONYEAR(-1) coefficients have their expected positive sign, all are insignificantly different from zero. On the other hand, the data is consistent with the hypothesis that periods of minority government, independent of party affiliation, are anomalous with respect to “normal”

---

10 Further evidence confirming this aspect of the results can be found in Winer (1986b).

11 Use of a dummy variable for the periods of fixed exchange rates in Canada - 1870-1914, 1926-1931, 1939-1951, 1960-1972 – did not improve the fit nor was itself significant. This is consistent with Winer (1986a) who found weak evidence for political cycles only in the higher frequency (quarterly) monetary data of the post 1972 period of exchange rate flexibility.

12 The use of the election year, rather than the year prior to the election, did produce a significantly positive coefficient for the inflation equation of 1921-2000 and hence did give some support to traditional opportunism. This improvement did not spill over into similar better results for the other three hypotheses.
election outcomes. All six MINORITY coefficients are positive with all three Definition A coefficients significantly different from zero.

In times when a majority government was elected, party affiliation does matter. Both the traditional partisan hypothesis, PARTISAN coefficients in columns (1) and (4), and the rational partisan hypothesis, the SURPRISE coefficients in columns (2), (3) (5) and (6), are all significantly positive as predicted by their particular version of the theory. Hence narrow LIBERAL victories are typically associated with larger increases in the output growth, while narrow Conservative victories correspond to periods with a larger fall off in growth rates. Lastly, the political tenure hypothesis - the prediction of rational partisan theory that the effect of a partisan victory will wear off through time - is suggested but not confirmed by the data. In all of the rational partisan equations (columns (2), (3), (5), and (6)) the predicted negative sign does appear, but in all cases the coefficients are insignificantly different from zero.

To illustrate the importance as opposed to the significance of the surprise effect, we ask what would be the predicted effect on the growth rate of a relative surprising Liberal (Conservative) election victory? Using as an example the narrow Liberal victory of 1926 (registering a surprise value of 0.480), we take the difference between actual and mean SURPRISE (0.480 - 0.063 = 0.417) and then multiply the result by the coefficient estimate in column (1) of Table 2. The calculation indicates that real growth would have been 1.62 percentage points higher than the 3.69 mean growth rate over the entire period. That is, our results suggest that the surprise Liberal victory in 1926 added roughly forty percent to the average annual growth rate over the period. On the same basis, the relatively surprising conservative victory in 1980 (a -0.479 surprise) produced a growth rate that was 1.62 percentage

13 Other elections with similar sized 'surprises', as defined here, were the 1976 and 1981 Liberal victories.
points lower than average. In either direction, the results indicate that a close election could affect the expected growth rate by well over a third.

In summary, whether or not the data reject the hypothesis that political variables produce a cycle in inflation, our results are consistent with the hypothesis that there is a distinctly political influence on aggregate real growth in Canada over the long 1870 - 2000 time period. These results are strongest for the period as a whole but fall in significance as the time period shortens towards the present. In terms of individual findings two political features stand out. First, periods of minority government tend to be associated with higher rates of growth and thus are distinctly different from periods of majority government. Second, for time periods with majority governments, partisan effects, particularly those featuring surprise, are more evident in the data than opportunistic effects. The significance of all of this for our work is that it provides a motivation for our search for a transmission mechanism in fiscal public choices that can connect explicit political factors to economic outcomes. Both the presence of a transmission mechanism and the consistent use of that mechanism are needed to support the joint hypothesis of a political cause for observed political cycles in macroeconomic aggregates.

III. Could Fiscal Policy have been used to transmit Political factors into real output?

To ask whether there is evidence that political factors have played an independent role in relation to fiscal policy in Canada over our time period, we first use cointegration and error correction analysis a) to develop a base case model of economic fundamentals and b) to separate

---

14 To be fair, many of the features emphasized by rational opportunistic theories, such as the signaling of insider information (on competence) through spending/taxation (Rogoff and Sibley 1988) would not be regular in timing and hence be hard to capture in time series analysis.

15 Drazen (2000) argues that it is easier both conceptually and empirically to establish a political business cycle or political budget cycle arising in fiscal policy compared to monetary policy.
the long and short run dimensions of policy. Here Engel-Granger cointegration analysis is applied to three specific fiscal policy instruments (all defined as a proportion of GNP): the logarithm of the expenditure and tax size of government, LNGSIZE and LNTAXSIZE, and the difference between these two logs, LNDEFICIT, as our measure of the size of the federal deficit.\textsuperscript{16} These variables graphed in Figure 1, with LNDEFICIT appearing as the difference between the two primary series. Perhaps the first thing that captures one’s attention is the difference in the way the two size measures have grown through time. That is, the time path for LNTAXSIZE appears to increase in two relatively distinct stages, one coinciding with WW1 and the second with WW2, while expenditure size exhibits two distinct peaks for the two world wars and one upward step in the period following WW2.\textsuperscript{17} Unlike the growth in size exhibited by these two variables, LNDEFICIT shows no discernable trend, varying both positively and negatively over the period as a whole. The full descriptive statistics for these variables and their time series properties are given in Table 1b. In terms of their time series properties, the important difference is that while the logarithms of the expenditure (LNGSIZE) and the tax (LNTAXSIZE) size of government are both I(1), the measure of their difference, the federal government deficit (LNDEFICIT) is I(0).

To construct our long run models of level of government expenditure and taxation (relative to GDP), we require a set of variables that span the long time period covered (1870-2000) and reflect the deeper structure of the Canadian economy. The variables we use are

\textsuperscript{16} The measure of government expenditure size used in this paper is inclusive of government transfers and so differs from that used in our earlier companion paper directed at setting out this methodology in more detail exclusively with respect to government expenditure size (Ferris, Park and Winer, 2005). It should be recognized that the three policies cannot be independent but are linked through the government budget constraint (where the long run No Ponzi Game condition implies the I(0) characteristic of LNDEFICIT). See the discussion below linking the deficit to monetary policy through changes in the monetary base.

\textsuperscript{17} This implies a difference in the way that the two world wars were financed: WW1 being financed largely by borrowing, while WW2 was financed to a greater extent out of current taxes.
standard in the literature on the growth of government and have been widely used across different (developed) democratic states. The starting point is almost always Wagner’s Law, the hypothesis that the size and scope of government increases more than in proportion as society grows in scale and complexity. This is interpreted as implying an elasticity of real per capita income (RYP) with respect to size that is positive. Wagner’s Law is then enhanced by a set of public choice and spatial voting hypotheses that suggest variables such as the fraction of the population in agriculture (AGR) and who are young (YOUNG) to proxy changes in the structure of the economy and/or the strength of interest groups. As AGR declines and urbanization increases, and as YOUNG declines and the percentage of older citizens grows, we would expect greater demands on government services. To capture other structural features that may promote more (or less) government involvement, we use the immigration rate (IMRATIO) and the openness of the economy through its reliance on foreign trade (OPEN).

All of these variables are used in log form, as indicated in the tables by the addition of the prefix LN to the variable names. Descriptive statistics for these variables are presented in Table 1b.

---


19 The use of these variables and not their complements - the degree of urbanization and the percent of population that is older than 65 years, is dictated by the availability of data for the entire time period we study.

20 Immigration played a major role in Canadian history, especially before WWI and in the decade following WWII. The use of OPEN follows Cameron (1978), Rodrik (1998) and others. One hypothesis is that more openness leads to more government as a form of insurance against external shocks. A competing view is that openness restrains government growth by imposing balance of payments and other external constraints. We shall see that this later view is more likely to apply in the Canadian case. One should also note that population is often used to test for scale economies in government size. Often scale economies are not found (see, Borcherding, Ferris and Garzoni, 2004) and, in Canada, the population time series is of a different order of integration than the other variables, i.e., I(2). For this reason, population size was not used as part of the convergence model. Finally, we note that in preliminary work the share of transfers in total federal spending (LNGRANT_SHARE) was used as an additional explanatory variable. Although consistently negative in its effect on size (and significantly so), its presence was never consistent with cointegration.

21 GSIZE and many of the other explanatory variables (IMRATIO, AGR, YOUNG, and OPEN) are all confined to lie between zero and one. Hence transforming these variables into logarithms (adopting the prefix LN) avoids restrictions on the domain of the error terms in our estimating equations.
where it is noted that together with LNGSIZE, LNTAXSIZE, the entire set of explanatory variables for the long run economic model of public sector size are nonstationary I(1) in levels but become stationary I(0) in first differences.\(^{22}\)

Table 4 presents the results of our test for cointegration among the set of key economic variables characterizing long run equilibrium in the expenditure size (columns (1) - (3)) and tax size (columns (4) - (6)) of government. Note, however, that while the cointegrating equations in (1), (2), (4) and (5) produce coefficient estimates that are super consistent, the standard errors of these equations are likely biased because of correlations arising among innovations in the I(1) explanatory variables. Hence we used Siakkonen’s 1991 adjustment to correct for this. This implies that when looking for the significance of individual hypotheses, the reader should use the t-statistics of columns (3) and (6).

What that Table 4 makes clear is that the structural variables suggested by the public finance literature work well in explaining both the expenditure and tax size of government. The base case equation in column (1) explains roughly ninety percent of the variation in government expenditure size. Moreover, that equation with six explanatory variables and three shift dummies results in residuals that when tested for stationarity produce an adjusted Dickey Fuller test statistic that exceeds (in absolute value) the adjusted MacKinnon (1996) critical value at one percent.\(^{23}\) Thus while the Durbin-Watson test statistic and other more general considerations suggest that the standard errors of specific regression coefficients will be biased, the residual findings suggest that the equation as a whole is not spurious and hence is consistent with the

\(^{22}\) All unit root tests used four lags.

\(^{23}\) As far as we are aware, there are no tables of critical values for cointegration relationships with structural breaks occurring at known break points. Gregory and Hanson (1996), for example, give approximate critical values for the ADF test of a Engle-Granger type cointegration equation with a single structural break arising at an unknown points. Hence despite the relative high (absolute) values on the ADF statistics of our cointegration residuals, the implied degree of significance may be overstated.
hypothesis of a stable long-run equilibrium relationship among the set of economic variables (Saikkonen, 1991). The corresponding base case test for the determinants of the tax size of government in column (4) similarly passes the MacKinnon test for stationarity at one percent. The key difference between the two measures of size is that the tax equation suggests an additional structural break in the cointegrating equation following WWI. The data are consistent with tax size rising through more discrete steps than the corresponding expenditure measure of size.24

Given that we find evidence of cointegration in our long run theories of LNGSIZE and LNTAXSIZE, we can turn to the hypothesis that because political competition is necessary for actual policy outcomes to converge on the wishes of the electorate, the degree of political competition should matter in the explanation of government size. Here active competition among political parties is argued to be necessary to prevent political and/or bureaucratic agents from dissipating economic rents, perhaps simply by preventing government resources from being diverted to private/party uses. To test the hypothesis that the degree of competition matters, we use the proportion of seats in the House of Commons won by the governing party in each election, SEATS. This or some similar measure is increasingly being used in the literature (see, for example, Levitt and Poterba 1999 and Besley, Persson and Sturm 2005).25 The political competition hypothesis then states that the predicted sign on the coefficient of SEATS will be positive.

24 This helps to reconcile our earlier inability (in Ferris, Park and Winer 2005) to find a structural break in expenditure size following WW1 with earlier evidence of such a break presented by Dudley and Witt (2004).

25 We use the proportion of SEATS rather than the proportion of VOTES won by the governing party (as do Besley et al. In British style parliamentary governments it is the proportion of seats that matters, whatever the size of the popular vote.
The descriptive statics for SEATS can be found with the list of other political variables in Table 1a. The fact that SEATS is an I(0) variable, however, means that some care should be taken interpreting its role in the cointegrating equation of columns (2) and (3) of Table 4. That is, even though it is legitimate to combine SEATS, an I(0) variable, with a group of I(1) variables that form a cointegrating equation (that is itself also I(0)), its presence in the equation cannot be interpreted in the same way as the other I(1) economic variables. Because SEATS is not I(1), a change in political competition cannot be interpreted as implying a permanent change in the level of LNGSIZE. Rather changes in SEATS produce only transitory changes in long run government size (for the duration of one election) that arise from transitory changes in the degree of competition about the mean level of political competition associated with Canada’s system of parliamentary democracy and its associated political institutions. The results presented in columns (2) and (3) are then consistent with the hypothesis that changes in the degree of political competition produce transitory effects on the long run level of government expenditures and in this restricted sense form an integral part of the stochastic process describing the long run evolution of government size.

When the remaining set of I(0) explicit political variables are added to the cointegration equation for LNGSIZE, however, none were found either to enhance the explanatory power of the equation or give evidence of being a transitory part of the cointegrating relation. That is, neither the year prior to an election, ELYEAR(-1), nor the time period when the more liberal political party formed the government, LIBERAL; nor the time period corresponding to minority government, MINORITY; nor the time in power, ELAPSE; nor the partisan weighted time in power, DURATION, enhanced the adjusted $R^2$ or the ADF test statistic on the equation’s residual. Hence among the set of all potential political variables, only the size of the majority of the winning party, SEATS, was found to increase the long run explanatory power of the equation
and produce equation residuals consistent with stationarity. Moreover, because the size of the winning majority is independent of party affiliation, this political competition result is consistent with neither partisan nor opportunistic theories of the cycle. Rather it is consistent with the hypothesis that less political competition weakens the effective constraint on spending and this is reflected in the relative expansion of government services. Thus our results confirm the earlier findings of Ferris, Park, and Winer 2005, for this broader measure of federal government expenditure (inclusive of intergovernment grants).

On the other hand, SEATS, as our measure of political competition, does not enhance the long run explanation of the share of federal taxes in GNP. Rather, it is the period of time in which there was a minority government that is the sole political variable improving the explanatory power of the LNTAXSIZE equation. As the coefficient estimates in columns (5) and (6) suggest, minority governments in Canada reduce temporarily the tax share of government in GNP. Thus while authors such as Kontopolous and Perotti (1999) and Persson, Roland and Tabellini (2004) use a common-pooling argument to motivate the hypothesis of higher than normal spending for coalition governments, our results suggest that, at least for Canada, that tax reductions have been the mechanism of choice for incumbent minority governments (of all persuasions) to attempt to curry favor with the electorate.

Periods of minority government are, of course, time periods when the effective competition among political parties was so close that no political party was able to gain an effective majority. Hence viewed from this perspective, taxation levels are reduced in time periods when political competition is at its most intense. As such the tax equation finding for MINORITY complements our earlier expenditure equation finding for SEATS. That is, the MINORITY finding is consistent with the hypothesis that as the degree of political competition rises, the overall size of government falls. In Canada this appears first in the form of a fall in
government expenditure levels and then, as competition becomes most intense, through a fall in taxation.

IV. Is there a Political Budget Cycle?

In Table 5 we use the residuals from the long run cointegrating equations in Table 4 to develop the corresponding error correction models of short run adjustment about the long run expenditure and tax size of government. Because our political variables are I(0) it is in relation to these stationary short run adjustment processes that we expect to have our best opportunity of finding evidence of explicit political factors. We also include in the table an equation for the deficit as a proportion of GNP. This allows us to assess whether any particular political effect that might be suggested in either the expenditure or tax size equation separately will combine for significance through their aggregate effect on the deficit. Finally, an explicit focus on the deficit allows us to connect fiscal policy directly with monetary policy through changes in the monetary base and thus test whether the different arms of policy have moved in tandem or in contrast over the cycle.

Columns (1) and (2) present the base case error correction models that correspond to the long run cointegration equations found in columns (1) and (4) of Table 4. They form the final stage of a testing procedure that originally added all political variables to the base case error correction model and then dropped successively the least significant political variable until only those political variable(s) that retained significance remained. As was the case in Ferris, Park, and Winer, 2005, the only political variable that retained significance on this basis was SEATS.

Because LNDEFICIT is I(0) there can be no direct correspondence with the level analysis undertaken for expenditure and tax size. However, LNDEFICIT can be combined with the other I(0) variables – the first differences of the model’s “economic fundamentals” and all the political variables – to assess whether short run policy actions are better reflected through the net combination of spending and taxes rather than each separately.
Hence these findings complement the earlier finding of transitory effects in the cointegrating equations and so reinforce the importance of political competition in bringing about the convergence of government policy more closely to the fundamentals – tastes and technology – of the underlying electorate in both the short and the long run. The same result holds when we use error correction models arising from the political version of the cointegrating equation in columns (2) and (5) of Table 4. That is, even though MINORITY produces a transitory effect on the long run tax size of government, there is no evidence that minority governments use short run fiscal policy any differently than do majority governments. SEATS, on the other hand, is consistently positive and significantly so in all four equations. This is consistent with the lack of political competition permitting a larger than usual increase in the growth rate of government size during that particular period of political tenure.

Because of the apparent significance of partisan effects on the political business cycle described earlier in section II, it is important to emphasize that neither LIBERAL nor PARTISAN add to the explanatory power of short run adjustment as represented by either the expenditure or tax error correction equations. For example, the addition of LIBERAL to equations (1) and (3) in Table 5 yields coefficient estimates of 0.020 (0.952) and 0.021 (1.00), respectively (where the associated t-statistics follow in brackets). The corresponding estimates for the tax equations in columns (2) and (4) were 0.001 (0.134) and 0.005 (0.516).27

When we look at the nature of short-run fiscal policy as described by these equations, evidence of a counter-cyclical role in fiscal policy appears most strongly in the two expenditure equations. The short run relationship between government expenditure and per capita income is consistently negative (and significantly so), an effect that is completely opposite to its

---

27 Similar results are found for PARTISAN. For example, the same four coefficient estimates (with t-statistics) are: 0.010 (0.924), 0.011 (0.926), -0.001 (0.111), and 0.0003 (0.067).
significantly positive effect over the long run. There is much less evidence of a counter-cyclical role for taxation. If anything, our findings suggest the tax size of government in GNP is more likely to move with the income cycle and hence represent a slightly pro-cyclical role for taxation.

The equations for the deficit in columns (5) and (6) allow us to examine the net effect of tax and expenditure policy on the cycle. In particular, a look across the coefficients in the second row (corresponding to the coefficients on the short run change in per capita income) indicates that fiscal policy overall has been counter-cyclical. That is, while government expenditure has been strongly counter-cyclical and taxation mildly pro-cyclical, the significant negative coefficient in both columns (5) and (6), confirms that the net effect has been counter-cyclical. Once again, the data is consistent with the hypothesis that political competition adds to the explanatory power of the deficit model implied by economic fundamentals. Thus while a fall in political competition (rise in SEATS) typically leads to an increase in both government spending and taxation, the deficit equation tells us that expenditure will consistently rise by more than taxes so that the size of the deficit increases significantly.

It follows that because the absence of political competition, by raising both the short run rate of growth of government spending and the size of the deficit, mutes the counter-cyclical role of fiscal policy by adding an expansionary asymmetry to the policy instruments used in relation to the cycle. Moreover, the short run asymmetry is reinforced by the fact that equations (5) and (6) show considerably more persistence than do the separate equations for expenditure or taxation. Such persistence in the size of the deficit adds to the overall expansionary impact.

28 Somewhat ironically, the addition of either LIBERAL or PARTISAN to the deficit equation does result in a significant coefficient but of the wrong sign (to explain the variation in output growth outlined in section II). That is, the addition of PARTISAN to (5) and (6) results in coefficients (t-statics) of -0.034 (2.04) for (5) and -0.34 (1.98) for (6).
transmitted by the lack of political competition and thus reinforces the asymmetric nature of fiscal policy in relation to the cycle.

In summary, then, while there is little evidence to confirm the role of overt political opportunism or partisanship in the budget cycle, there is considerable evidence that political competition, as measured inversely by the size of the majority (in seats) won by the governing political party, does matter particularly in relation to the short run adjustment processes about long run policy levels. Moreover, that evidence is consistent with the hypotheses that political competition not only restrains the growth rate of government size (and the deficit) temporarily, but that its absence imparts a bias into short run policy by weakening its counter-cyclical effect. In this sense, a weakening of the degree of effective political competition may help to explain what is often seen as a growing asymmetry in the impact of federal economic policy – greater in promoting expansion than in restraining over-expansion.

Finally, because the government deficit must be financed, the issuance of new government debt to cover the deficit may, in itself, have consequences for the performance of the economy. In this context it is often argued that interest rate crowding out (and hence the offset to the expansionary power of new fiscal spending) will be minimized to the extent that the new debt issue is purchased either explicitly or implicitly by the Bank of Canada. In such a case, the central bank accommodates fiscal policy and this monetization of government debt is reflected through the increase in the stock of high powered money, the money base, in circulation. In equation (6), then, we test for the accommodation of fiscal policy by the Bank of Canada adding the change in the money base as a fraction of GNP as an additional explanatory

---

29 Because the Bank of Canada was created only in 1935, the application of this argument to the Bank of Canada is applicable only from that date onward.
variable to the deficit equation in (5). The result, appearing as the significantly positive coefficient in the last row of column (6), indicates that increases in the money base have been associated with increases in the deficit and thus is consistent with an accommodating role played by monetary policy over this period. Stated alternatively, there is evidence that monetary and fiscal policy worked together (were coordinated) over our time period.

V. Does the political business cycle coincide with the political budget cycle?

While we used the evidence from testing theories of the political business cycle in Canada to motivate our search for the role of politics in relation to the different instruments of fiscal policy, it is useful at this point to review the extent to which the two sets of findings are consistent with each other. When we do so, it seems clear is that there is no direct one-to-one correspondence between the two sets of results. For example, there is no counterpart in the analysis of political business cycle theory for the significant multiple roles found for political competition in relation to fiscal policy and hence no variable that directly tests that hypothesis on output. Moreover, if we add SEATS as an additional explanatory variable into the equations testing for traditional partisanship (equations (1) and (4) of Table 2), SEATS is found to be insignificant (while producing no effect on the significance of PARTISAN or MINORITY). While a positive effect might have been expected from larger government size on output, the finding of insignificance suggests that less political competition (higher SEATS) results more in rent dissipation than in generating a stimulus to aggregate demand and output.

30 The money base ratio had no significant effect on spending or taxation per se, only on the deficit. It is not logged like the rest of the variables because its changes sometimes become negative.

31 The coefficient estimates and associated t-statics (in brackets) when SEATS added to equation (1) and (4) of Table 2 are, respectively, 3.76 (0.955) and 1.54 (0.346).
MINORITY, on the other hand, is the only political variable that appears in a consistent way across the two sets of data. The results from Table 2 suggest that real output growth will be higher in periods of minority government and the Table 4 equivalent suggest that this is because taxation levels fall in periods of minority government. Unlike the role of competition highlighted by SEATS, then, reductions in taxes during periods of minority government do appear to increase aggregate demand and output.

Finally, quite unlike the positive findings for the effect of political partisanship on output in Table 2, we find no stimulative partisan response in any of our three fiscal policy instruments over the short or the long run. This is quite a striking result and suggests either that partisan influences work through another arm or dimension of economic policy or that the results in Table 2 may reflect reverse causation -- more liberal (conservative) governments elected when times are expected to be better (worse). In either case, there is very little evidence in our work on fiscal policy instruments that either partisan or traditional opportunistic factors have mattered.

VI. Conclusion

Much of the recent work seeking to link political and economic outcomes in Canada uses Hodrick-Prescott filtered variables to test time series for the short run relationships implied by various political theories of the cycle. Here the findings have been mixed. For example, Kneebone and McKenzie (1999, 2001) use a Hodrick-Prescott filter to control for the long run factors behind federal and provincial government deficits and find evidence of ‘pronounced’ opportunism and ‘strong evidence’ of partisanship at all levels of government and in all stages of the fiscal structure. This stands in strong contrast to the findings of Serletis and Afxentiou (1998) who, using annual data from 1926 to 1994, find no evidence of any regularity arising between a set of Hodrick-Prescott filtered policy target variables (such as output and unemployment) and a
set of similarly filtered government policy instruments (such as government consumption and government investment).

In this paper we reexamine these questions using Engel-Granger cointegration analysis. In doing so we come closer to Serletis and Afxentiou by adding to the growing evidence that suggests that partisan and opportunistic political theories cannot explain the policy variations needed to explain the observed “political” cycle in Canadian macro data. More positively, our evidence suggests a different set of channels by which political factors can interact with policy and this occurs at all stages of our analysis through political competition. Hence evidence of the role of political competition arises not only in its transitory effect on long run size but also in its more permanent effect on the variance of short run fiscal policy instruments about their long run equilibrium size. Hence what is insightful in our findings is the implication that greater political competition would not only reduce the amount of dissipation in the provision of any level of government service but also make more focused and symmetric the impact of short run fiscal policy – whether considered automatic or discretionary – in response to the cycle. In both of these important senses, then, politics matters.
Data Appendix

The data used in this study come from four basic sources: *Canadian Historical Statistics*, for the structural variables in the earliest time period (1870 through 1921); *Cansim*, the statistical database maintained by Statistics Canada, for these variables in the later time period (1921-2001); Gillespie’s (1991) reworking of the Federal public accounts from 1870 to 1990, updated by Ferris and Winer (2003); and Beck (1968), Campbell (1977), and the *Canadian Parliamentary Guide* (1997, 2002) for the political variables.

1. List of Economic Variable Names and Data Sources:


   **D** = first difference operator


   **OPEN** = openness. Calculated as: \((\text{EXPORTS} + \text{IMPORTS}) / \text{GNP}\).


   **GSIZE** = the relative size of non-interest central government public expenditure, calculated as **GOV** / **GNP**


IMRATIO = IMMIG/POP.

LN = the log operator.

LNDEFICIT = LNGSIZE - LNTAXSIZE


MBRATIO = (MB- MB(-1))/GNP

PRCNTYNG = percentage of the population below 17. 1870-1920 Leacey et al (1983). Interpolated from Census figures Table A28- 45 sum of columns 29, 30, 31, and 32 all divided by 28 (adjusted to make 1921 the same); 1921-2001 Cansim C892547.


ROI = Return on Investment that Irwin subtracted from revenues and receipts.

RGNP = real GNP = GNP/P; RYPC = real income per capita = GNP/(P*POP).


TAXES = TAXSUM + ROI; TAXSIZE = TAXES/GNP

WWI = 1 for 1914 - 1918; = 0 otherwise. WW1after = 1 for 1919-1921; = 0 otherwise.
WWII = 1 for 1939 - 1945; = 0 otherwise. WW2after = 1 for 1946-1949; = 0 otherwise.
WWIIAftermath = 1 from 1946 onward; = 0 otherwise.

2. List of Political Variable Names and Data Sources:
The dating of each election was chosen to reflect the first year that each elected party was in power (when elections concentrate in the early summer and late fall time periods). Thus if an election was held between January and July, the election was viewed as in the actual calendar year of the election. However, if the election was held between August and December, the election was attributed to the following year. On this basis:

DURATION = {(LIBERAL*ELAPSE) - (1- LIBERAL)*ELAPSE}.
ELAPSE = the number of years since the last election.
ELECTIONYEAR = 1 if an election year; = 0 otherwise.
LIBERAL = 1 if governing party was the Liberal Party; = 0 if any other (more conservative) party.
MINORITY = 1 if the governing party was part of a minority government; = 0 otherwise.
PARTISAN = (1-MINORITY)*{LIBERAL - (1- LIBERAL)}
SEATS = percentage of the seats won by the governing party.
SURPRISE = (1-MINORITY)*(1-SEATS)*{LIBERAL - (1- LIBERAL)}

Data Sources for political variables:
Figure 1: Expenditure and Tax Size of Government
### Table 2

The Effect of Political Variables on the Growth Rate in Canada: 1870 - 2000

(NEWY-West HAC t-statistics in brackets).

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>1.17* (2.82)</td>
<td>1.08* (2.63)</td>
<td>1.37* (3.26)</td>
<td>1.15* (2.73)</td>
<td>1.07* (2.59)</td>
<td>1.44* (3.39)</td>
</tr>
<tr>
<td>ELECTION YEAR(-1)</td>
<td>0.135 (0.220)</td>
<td>-0.006 (0.009)</td>
<td>0.080 (0.139)</td>
<td>0.137 (0.228)</td>
<td>0.050 (0.010)</td>
<td>0.212 (0.374)</td>
</tr>
<tr>
<td>PARTISAN</td>
<td>0.983* (3.06)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SURPRISE (definition A)</td>
<td>3.89* (3.82)</td>
<td>3.22** (2.39)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SURPRISE (definition B)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MINORITY (definition A)</td>
<td>2.18** (2.02)</td>
<td>2.41** (2.16)</td>
<td>1.26*** (1.76)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MINORITY (definition B)</td>
<td></td>
<td></td>
<td></td>
<td>1.60*** (1.93)</td>
<td>1.77** (2.01)</td>
<td>0.659 (0.927)</td>
</tr>
<tr>
<td>DURATION</td>
<td>-0.267 (1.33)</td>
<td>-0.177 (0.857)</td>
<td></td>
<td>-0.182 (0.927)</td>
<td>-0.056 (0.271)</td>
<td></td>
</tr>
<tr>
<td>USGROWTH</td>
<td>0.315 (7.01)</td>
<td>0.319* (6.99)</td>
<td>0.340* (7.09)</td>
<td>0.322* (6.60)</td>
<td>0.326* (6.56)</td>
<td>0.350* (6.67)</td>
</tr>
<tr>
<td>USGROWTH(-1)</td>
<td>0.138* (3.01)</td>
<td>0.143* (3.27)</td>
<td>0.123*** (1.82)</td>
<td>0.140* (3.06)</td>
<td>0.144* (3.24)</td>
<td>0.123*** (1.80)</td>
</tr>
<tr>
<td>USGROWTH(-2)</td>
<td>0.071** (2.04)</td>
<td>0.079** (2.29)</td>
<td>0.069*** (1.70)</td>
<td>0.077** (2.12)</td>
<td>0.083** (2.34)</td>
<td>0.073*** (1.71)</td>
</tr>
</tbody>
</table>

**Statistics:**
- No. of Observations: 128
- Adj. R²: 0.485
- D.W.: 2.21
- Akaike info criterion: 5.49
- Wald Prob [c(2) = c(3) = c(4) = c(5) = 0]: .003*

Notes: * (**)(***) significantly different from zero at 1% (5%) (10%).

**PARTISAN** = (1-MINORITY)*{LIBERAL - (1 - LIBERAL)}

**SURPRISE** = [1-MINORITY]{{(1-SEATS)*LIBERAL - (1-SEATS)*(1- LIBERAL}}.

**DURATION** = {{LIBERAL*ELAPSE} - (1 - LIBERAL)*ELAPSE}.


**Note on the dating of elections:** Elections occurring between January 1 and July 30 are considered applicable to the current calendar year; otherwise they are considered to be in the following year. (There was one election in July in 1930).
Table 3
The Effect of Political Variables on the Inflation Rate in Canada: 1870 - 2000
(Newey-West HAC t-statistics in brackets)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>0.572** (2.21)</td>
<td>0.543*** (1.92)</td>
<td>0.320 (0.873)</td>
<td>0.595** (2.22)</td>
<td>0.574*** (1.99)</td>
</tr>
<tr>
<td>ELECTION YEAR(-1)</td>
<td>-0.215 (0.510)</td>
<td>-0.307 (0.742)</td>
<td>0.222 (0.583)</td>
<td>-0.218 (0.512)</td>
<td>-0.278 (0.664)</td>
</tr>
<tr>
<td>PARTISAN</td>
<td>0.39*** (2.02)</td>
<td></td>
<td></td>
<td>0.364*** (1.82)</td>
<td></td>
</tr>
<tr>
<td>SURPRISE (definition A)</td>
<td>2.34** (2.08)</td>
<td>1.75 (1.52)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SURPRISE (definition B)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MINORITY (definition A)</td>
<td>0.731 (0.776)</td>
<td>0.876 (0.974)</td>
<td>-0.318 (0.404)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MINORITY (definition B)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DURATION</td>
<td></td>
<td>-0.274 (1.26)</td>
<td>-0.116 (0.649)</td>
<td>-0.234 (1.10)</td>
<td>-0.062 (0.368)</td>
</tr>
<tr>
<td>USINFLATION</td>
<td>0.785* (12.79)</td>
<td>0.779* (11.94)</td>
<td>0.790* (9.13)</td>
<td>0.799* (12.59)</td>
<td>0.800* (11.48)</td>
</tr>
<tr>
<td>USINFLATION(-1)</td>
<td>0.085 (1.64)</td>
<td>0.089*** (1.79)</td>
<td>0.078 (1.34)</td>
<td>0.071 (1.31)</td>
<td>0.066 (1.21)</td>
</tr>
</tbody>
</table>

Statistics:
| No. of Obs   | 129 | 129 | 80 | 129 | 129 | 80 |
| Adj. R²      | 0.726 | 0.732 | 0.779 | 0.724 | 0.729 | 0.776 |
| D.W.         | 1.73 | 1.77 | 1.00 | 1.73 | 1.77 | 1.01 |
| Akaike Info criterion | 4.68 | 4.67 | 4.36 | 4.82 | 4.68 | 4.37 |
| WALD Prob[c(2)=c(3) = c(4) = c(5)= 0] | .204 | .174 | .383 | .303 | .208 | .647 |

Notes: * (**)(***) significantly different from zero at 1% (5%) (10%).
For definitions, see Table 2.
Table 4
Engle-Granger Cointegrating Equations for LNGSIZE and TAXSIZE: 1870-2000
(Absolute value of t-statistics in brackets)

<table>
<thead>
<tr>
<th></th>
<th>LNGSIZE (1)</th>
<th>LNGSIZE (Political) (2)</th>
<th>LNGSIZE (Saikkonen)* (3)</th>
<th>TAXSIZE (4)</th>
<th>TAXSIZE (Political) (5)</th>
<th>TAXSIZE (Saikkonen)* (6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>-4.327</td>
<td>-5.68</td>
<td>-10.32**</td>
<td>-2.59</td>
<td>-2.99</td>
<td>-4.19**</td>
</tr>
<tr>
<td></td>
<td>(2.99)</td>
<td>(3.85)</td>
<td>(6.71)</td>
<td>(2.77)</td>
<td>(3.14)</td>
<td>(3.42)</td>
</tr>
<tr>
<td>LNRYPC</td>
<td>0.114</td>
<td>0.164</td>
<td>0.488*</td>
<td>0.065</td>
<td>0.070</td>
<td>0.062</td>
</tr>
<tr>
<td></td>
<td>(1.14)</td>
<td>(1.66)</td>
<td>(5.17)</td>
<td>(0.887)</td>
<td>(0.956)</td>
<td>(0.744)</td>
</tr>
<tr>
<td>LNAGRIC</td>
<td>-0.060</td>
<td>-0.084</td>
<td>0.173**</td>
<td>0.104</td>
<td>0.090</td>
<td>-0.006</td>
</tr>
<tr>
<td></td>
<td>(0.824)</td>
<td>(1.19)</td>
<td>(1.98)</td>
<td>(2.31)</td>
<td>(2.00)</td>
<td>(1.02)</td>
</tr>
<tr>
<td>LNIMRATIO</td>
<td>-0.089</td>
<td>-0.091</td>
<td>-0.088*</td>
<td>0.004</td>
<td>0.007</td>
<td>-0.009</td>
</tr>
<tr>
<td></td>
<td>(4.18)</td>
<td>(4.36)</td>
<td>(4.16)</td>
<td>(0.344)</td>
<td>(0.573)</td>
<td>(0.542)</td>
</tr>
<tr>
<td>LNYOUNG</td>
<td>-0.083</td>
<td>0.085</td>
<td>0.539**</td>
<td>-0.157</td>
<td>-0.054</td>
<td>0.227</td>
</tr>
<tr>
<td></td>
<td>(0.330)</td>
<td>(0.338)</td>
<td>(1.96)</td>
<td>(1.17)</td>
<td>(0.370)</td>
<td>(1.12)</td>
</tr>
<tr>
<td>LOPEN</td>
<td>-0.503</td>
<td>-0.465</td>
<td>-0.276**</td>
<td>0.034</td>
<td>0.052</td>
<td>0.018</td>
</tr>
<tr>
<td></td>
<td>(3.78)</td>
<td>(3.59)</td>
<td>(2.00)</td>
<td>(0.506)</td>
<td>(0.774)</td>
<td>(0.208)</td>
</tr>
<tr>
<td>FIXED_EXCH</td>
<td>-0.199</td>
<td>-0.175</td>
<td>-0.132*</td>
<td>-0.088</td>
<td>-0.085</td>
<td>-0.043***</td>
</tr>
<tr>
<td></td>
<td>(4.39)</td>
<td>(3.92)</td>
<td>(3.39)</td>
<td>(3.71)</td>
<td>(3.59)</td>
<td>(1.78)</td>
</tr>
<tr>
<td>WW1</td>
<td>0.725</td>
<td>0.703</td>
<td>0.540*</td>
<td>0.055</td>
<td>0.054</td>
<td>0.138**</td>
</tr>
<tr>
<td></td>
<td>(8.32)</td>
<td>(8.29)</td>
<td>(6.47)</td>
<td>(0.966)</td>
<td>(0.951)</td>
<td>(2.13)</td>
</tr>
<tr>
<td>WW1Aftermath</td>
<td>0.324</td>
<td></td>
<td></td>
<td>0.342</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(7.83)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WW2</td>
<td>1.70</td>
<td>1.62</td>
<td>1.40*</td>
<td>0.945</td>
<td>0.940</td>
<td>0.849*</td>
</tr>
<tr>
<td></td>
<td>(15.26)</td>
<td>(15.52)</td>
<td>(12.35)</td>
<td>(16.75)</td>
<td>(16.77)</td>
<td>(13.25)</td>
</tr>
<tr>
<td>WW2Aftermath</td>
<td>0.764</td>
<td></td>
<td></td>
<td>0.755</td>
<td>0.741</td>
<td>0.623*</td>
</tr>
<tr>
<td></td>
<td>(9.30)</td>
<td>(8.48)</td>
<td>(8.01)</td>
<td>(18.68)</td>
<td>(18.14)</td>
<td>(9.77)</td>
</tr>
<tr>
<td>SEATS</td>
<td>0.542</td>
<td>1.76*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(2.97)</td>
<td>(6.65)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MINORITY</td>
<td></td>
<td></td>
<td></td>
<td>-0.047</td>
<td>-0.157*</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(1.78)</td>
<td>(3.58)</td>
<td></td>
</tr>
<tr>
<td>Statistics:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adj R^2</td>
<td>0.927</td>
<td>0.932</td>
<td></td>
<td>.975</td>
<td>0.976</td>
<td></td>
</tr>
<tr>
<td>D.W.</td>
<td>0.785</td>
<td>0.848</td>
<td></td>
<td>0.944</td>
<td>0.967</td>
<td></td>
</tr>
<tr>
<td>ADF test statistics</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MacKinnon (1996) critical values</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5% for 6 var = -4.51</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5% for 7 var = -4.83</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* (***)[***] significant at 1% (5%) [10%].

# Saikkonen’s (1991) estimator adjusts for inconsistency in the standard errors of the I(1) variables in the cointegrating equation by including the contemporaneous, lagged and led values of the first differences of both left and right hand side variables (with the exception of the dummy variables). Only the coefficients of the level terms are relevant and so presented. In addition, the standard errors and t-statistics were adjusted for the presence of correlation among the innovations of the I(1) variables by a factor formed by the ratio of two standard errors a) the standard error of the augmented equation divided by b) the “long run standard error”. The latter is calculated as the square root of the variance plus two times the weighted sum of the significant autocovariances among the residuals (Saikkonen, 1991). This adjustment led to the originally estimated t-statistics in column (3) being multiplied by the factor .933 and the t-stats in (6) by the factor .874.
Table 5
Error Correction Models of Fiscal Policy
Changes in Federal Government Expenditures/Taxes and Deficit as a Fraction of GDP: 1870 - 2000
(Absolute value of t-statistics in brackets)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Error Correction term</td>
<td>-0.240* (3.80)</td>
<td>-0.238* (3.82)</td>
<td>-0.249* (3.83)</td>
<td>-0.248* (3.93)</td>
<td>-1.31* (3.90)</td>
<td>-1.44* (4.38)</td>
</tr>
<tr>
<td>D(LNRYPC)</td>
<td>-0.742* (3.41)</td>
<td>-0.188 (1.75)</td>
<td>-0.728* (3.36)</td>
<td>-0.179 (1.67)</td>
<td>-0.169 (1.10)</td>
<td>-0.533 (1.11) (0.849)</td>
</tr>
<tr>
<td>D(LNAGRIC)</td>
<td>-0.561*** (1.82)</td>
<td>-0.173 (1.12)</td>
<td>-0.519 (1.67)</td>
<td>-0.169 (1.10)</td>
<td>-0.533 (1.11)</td>
<td>-0.397 (0.849)</td>
</tr>
<tr>
<td>D(LNYOUNG)</td>
<td>-2.92** (2.38)</td>
<td>-1.35** (2.28)</td>
<td>-3.00** (2.44)</td>
<td>-1.32** (2.23)</td>
<td>-6.98* (3.74)</td>
<td>-5.56* (2.97)</td>
</tr>
<tr>
<td>D(LNIMRATIO)</td>
<td>-0.083* (3.15)</td>
<td>0.016 (1.27)</td>
<td>-0.088* (3.31)</td>
<td>0.018 (1.37)</td>
<td>0.004 (0.102)</td>
<td>-0.013 (0.324)</td>
</tr>
<tr>
<td>D(LNOPEN)</td>
<td>-0.085 (0.471)</td>
<td>-0.158*** (1.75)</td>
<td>-0.058 (0.326)</td>
<td>0.159*** (1.78)</td>
<td>0.421 (1.50)</td>
<td>0.350 (1.28)</td>
</tr>
<tr>
<td>Constant</td>
<td>-0.323* (3.92)</td>
<td>-0.133* (3.42)</td>
<td>-0.290* (3.62)</td>
<td>-0.129* (3.32)</td>
<td>-0.129* (3.32)</td>
<td>-0.624* (5.07) (4.59)</td>
</tr>
<tr>
<td>WWI</td>
<td>0.193* (3.94)</td>
<td>0.018 (0.755)</td>
<td>0.192* (3.92)</td>
<td>0.018 (0.763)</td>
<td>0.089* (9.12)</td>
<td>0.528* (5.77)</td>
</tr>
<tr>
<td>WWIAfter</td>
<td>-0.311* (4.45)</td>
<td>0.112* (3.24)</td>
<td>-0.307* (4.38)</td>
<td>0.111* (3.23)</td>
<td>-0.235*** (2.16)</td>
<td>-0.149 (1.37)</td>
</tr>
<tr>
<td>WWII</td>
<td>0.178* (3.61)</td>
<td>0.144* (5.91)</td>
<td>0.175* (5.55)</td>
<td>0.144* (5.92)</td>
<td>0.572* (7.43)</td>
<td>0.344* (3.32)</td>
</tr>
<tr>
<td>WWIIAfter</td>
<td>-0.308* (5.22)</td>
<td>-0.097* (3.26)</td>
<td>-0.281 (4.65)</td>
<td>-0.096* (3.25)</td>
<td>-0.181*** (1.98)</td>
<td>-0.219** (2.45)</td>
</tr>
<tr>
<td>FIXED EXCHANGE RATES</td>
<td>0.053 (2.61)</td>
<td>0.009 (0.954)</td>
<td>0.053** (2.60)</td>
<td>0.009 (0.966)</td>
<td>-0.041 (1.28)</td>
<td>-0.045 (1.47)</td>
</tr>
<tr>
<td>SEATS</td>
<td>0.479* (3.73)</td>
<td>0.203* (3.36)</td>
<td>0.424* (3.40)</td>
<td>0.195** (3.25)</td>
<td>0.833* (4.37)</td>
<td>0.689* (3.62)</td>
</tr>
</tbody>
</table>

Statistics:
- No. of Observations: 130
- Adj. R²: 0.528
- D.W.: 1.65
- Akaike info criterion: -1.58

Notes: * (**) [***] significant at 1% (5%) (10%).
The error correction term used for each equation was the lagged residual from the corresponding column in Table 2.
References


