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Do Rival Political Parties Enforce Government Efficiency? Evidence from Canada, 1867-2021*

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Evidence from Canada, 1867 - 2021*

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Abstract

This paper investigates the role of inter-party rivalry in enhancing federal government efficiency in post-Confederation Canada. It tests and finds confirmation in the data for two hypotheses. The first is that the ex post size of the first versus second seat share margin is a useful metric for the ineffectiveness of political parties in policing the incumbent's spending behaviour over its period of tenure. The second is the hypothesis that shirking by the incumbent governing party is decreased by greater expected electoral contestability and expected contestability is related to the effective number of competing parties (ENPSeats) nonmonotonically. In this regard the results suggest that contestability in Canada reaches a maximum when the incumbent faces a value of ENPSeats that is closer to 2.5 than Duverger's 2.

1. Introduction

In democratic political systems the overriding importance of elections for bringing about the convergence of what governments do with what its electorate wants has led the analysis of political competition to focus primarily on what might more accurately be called electoral competition (Winer and Ferris, 2022). That is, the more competitive is an election, the more incentivized are political parties to promise programs that respond to the wishes of voters (Downs, 1957; Dahl, 1971; Alvarez and Nagler, 2004), the more accountable will political parties be for full-filling their program and performance promises (Ferejohn, 1986; Persson et al, 1997; Dash and Ferris, 2021), the higher will be the quality of representatives and decision makers within government (Buchler, 2011), and the more likely that special interest politics will result in policies that benefit, rather than opportunistically disadvantage, the overall electorate (Becker, 1983; Hillman and Ursprung, 2016). To test these hypotheses, different measures of government responsiveness, accountability, size and composition have been related to measures of electoral outcome used to proxy electoral competitiveness ex ante (Rogers and Rogers, 2000; Skilling and Zeckhauser, 2002; Ferris et al, 2008; Besley et al, 2010; Dash et al, 2019; Winer et al 2021).

This paper is concerned not with electoral competition nor with the size of government per se but with the economic performance of governments between elections and the role of political parties and expected electoral contestability in monitoring the degree of shirking that arises in government behaviour and is reflected in excessive spending (Alchian and Demsetz, 1972; Jensen and Meckling, 1976; Persson and Tabellini, 2000 chp. 4). Here shirking is interpreted broadly as the use of government resources to further personal and party interests that are in addition to those valued by voters. To test these hypotheses we use the ex post closeness of an election as a metric of the extent to which political party rivals in the legislature can monitor the behaviour of the incumbent party effectively and so minimize the ongoing dissipation of governance rents coming through higher levels of spending.[1] While narrow electoral outcomes increase the opportunity for rivals to monitor incumbent behaviour, the effectiveness of that monitoring will depend on the degree to which rival criticism is accepted being meaningful by the electorate, that is, on the degree to which the upcoming election is contestable. Duverger's view that electoral competition in winner-take-all elections will lead the effective number of parties (ENP) to converge on two also implies an increase in the credibility of the rival party as a feasible

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[1] The outcome of an election can be highly uncertain ex ante and hence competitive but result in an ex post outcome that is one-sided because of the realization of influences that were unanticipated.

alternative to the incumbent (Demsetz, 1968; Dash et al, 2019)). On the other hand, as the number of viable competitors fall the remaining few have greater opportunity to collude at the expense of the electorate. Together these considerations raise the possibility of a nonmonotonic relationship arising between excessive government size and ENP.

The idea that the effect of political competition on economic performance through government policy may be nonmonotonic is not new and has been argued by Acemoglu and Robinson (2006) and tested for (and confirmed) by authors such as Leonida et al (2015) and Alfano and Baraldi (2015). In these cases, the relationship between the number and/or effective number of political parties and economic growth is found to be U shaped; that is, political competition is less effective in its effect on growth when it is either too limited or too intense. In our case an inverted U shaped relationship is expected to be found in the relationship between the effective number of political parties (ENPSEats) and election contestability.

The paper proceeds in section2 by outlining in more detail the hypotheses to be tested on 155 years of Canadian annual data covering the 44 post-Confederation federal elections held between 1867 and 2021. Section 3 describes the variables used to model the fundamentals underlying federal government expenditure size, their time series characteristics and then outlines how these measures will be used to test the between-election role that political competition plays in minimizing political shirking. Section 4 presents the regression model results of these tests using both election year and annual data. Section 5 examines the robustness of the two regression model findings by first examining in Section 5a whether the U shaped relationship revealed between government size and ENPSeats is symmetric. Using a fractional polynomial model on election data we show that the best fitting ENPSeats and government size relationship is neither monotonic nor symmetric. That is, the effect of ENPSeats on government size slowly falls before rising more rapidly as it passes its minimum estimated value of 2.7. In Section 5b we look for more insight from the greater number of observations in annual data and find that the distribution of government expenditure sizes is bimodal. By using a finite mixture model with two classes, the analysis reveals the presence of two classes of behaviour: a dominant class of behaviour that encompasses over seventy percent of the data and a second class associated with behaviour a smaller percentage of the data focused on the upper end of the size distribution. The estimated model of the dominant class is consistent with a strong U shaped ENPSeats relationship and this finding helps to explain why the U shaped effect is obscured when only a single behavioural class is assumed and

estimated. A plotting of the finite mixture's predicted marginal effects yields a U shaped relationship with a minimum of about 2.4. Section 6 summarizes the results and presents our conclusions.

2. Hypotheses to be Tested

If government size can be viewed as being excessive, in relation to what measure of size is it excessive? Following Ferris et al (2008), the political system of a long established democracy such as Canada's can be viewed as embodying a level of competitiveness sufficient to produce the convergence of government size onto an equilibrium time path reflective of the country's underlying fundamentals (the tastes of its voters, its resources, and underlying technology). Such an equilibrium will incorporate a level of political and administrative shirking that is consistent with voters' expectation of 'typical' government behaviour. However, in any particular governing interval, political and economic shocks along with unexpected changes in a country's fundamentals will result in period specific variations to both the degree of competitiveness and the level of government spending. For example, the timely revelation of political scandal, the unexpected performance of a new party leader, the unanticipated arrival of a fiscal crisis or a pandemic can all be expected to produce an election outcome and/or government size that differs from what was expected. The hypothesis that is tested below is that these two sets of departures will be related such that ex post closeness, measured as the size of the elected party's seat share winning margin (WinMargin), will be related positively to the size of the discrepancy between actual and expected long run government size. The larger is the winning margin, the smaller will be the opposition's representation on parliamentary committees, the less loud will its opposition be in question period and the fewer opportunities will there be for opposition to present their alternatives to the voters.[2] Because the meaning of any winning margin depends upon how easily that margin can be overcome, the history of party seat share volatility (Volatility) is used as a control on the meaning of the winning margin and, perhaps, as its own independent measure of intertemporal political competition (Ashworth et al, 2014; Dash and Ferris, 2021). Hence the larger is the volatility of party representation and the smaller is the winning margin, the greater will be the ability of the opposition to monitor the government effectively and hence the smaller the deviation of actual from long run government size is expected to be over the upcoming administration.

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[2] One of our referees has suggested the competing hypothesis that larger winning margins may lead winning parties to be more confident of re-election and hence less constrained in their program spending. In Canada's case this possibility seems unlikely; that is, the likelihood of the governing party winning re-election in Canada has been inversely related to the size of its winning margin ($\rho = -.180$).

The degree to which inter-party criticism of current governing practices can affect the behaviour of the current government depends on how credible rival parties are as viable challengers and hence on how contestable the upcoming election will be. That is, a rival party's criticism will be less meaningful to voters if its proposed alternatives are unlikely to be implemented. Because of the winner-take-all nature of plurality elections and the associated unwillingness of voters to waste their vote on an unlikely winner, political competition works to winnow the expected number of party numbers towards 2 (Duverger, 1954). This implies that the more fragmented is the opposition (the larger is the expected number of political parties, ENPSeats), the less effective will be inter-party monitoring and the larger will be incumbent shirking and government size. On the other hand, as the number of effective competitors falls towards 2, the smaller number of remaining competitors enables the dominant parties (often rotating) to collude, facilitating greater partisan spending in areas that are less visible to voters.[3] This will be reflected in the mutual acceptance of certain accepted institutionalized perks that can be enjoyed to a greater extent when in office. That is, as ENPSeats converges upon 2, the less intensely will the dominant parties choose to police incumbent shirking. Combining these reasons, the relationship between (excessive) government size and ENPSeats is expected to be nonmonotonic, initially falling as ENPSeats rises above two before rising again as party fragmentation increases.

3. The Data and its Characteristics

The data used in this paper is annual, collected for the 155 years of post-Confederation Canadian democracy and include the 44 federal government elections that took place between 1867 and 2021. The dependent variable, the expenditure size of the Canadian federal government, is measured as the proportion of federal government expenditure in gross domestic product (GovSize). To model its long run size, explanatory variables that can proxy its underlying economic, sectoral, demographic, and political fundamentals and span the entire post-Confederation time period are required and reliable measures that meet these criteria and are comprehensive enough to be meaningful are limited.[4] In our analysis, we represent the evolving scale and sectoral composition of the Canadian economy by the time paths of real GDP per capita (Rgdppc) and the proportion of the labour force in agriculture (Agric).[5] The

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[3] As Adam Smith has written, "[p]eople of the same trade seldom meet together, even for merriment or diversion, but the conversation ends in a conspiracy against the public…" (*The Wealth of Nations*, Vol 1 Book 1 Ch. 10 Part 2).

[4] For example, one variable that is often used, the unemployment rate, is available for Canada only from the 1920s onward.

[5] The use of real GDP is suggested by Wagner's Law together with increasing industrial complexity (as also implied by the decline in the importance of agriculture). The implied sign of Rgdppc is complicated, however, by the expected presence of economies of scale in federal spending associated with larger population size. One of our

variable used to represent the demands on government arising through demographic change is the proportion of the population seventy and older (Old70).[6] To overcome the issues created by proportions being bounded between 0 and 1, logarithms were used (represented by the prefix Ln). To better distinguish the role of inter-party rivalry from other forms of political influence we controlled for the possibility of a partisan spending bias by including a dummy variable for the years in which the more liberal of the two dominant political parties in Canada (the Liberal Party) was in power (Liberal = 1; conservative = 0).[7] Finally, three time periods featured exogenous events that produced anomalous changes in federal government spending: the extraordinary expenditures associated with the two World Wars (WW1, WW2) as reflected in the years between 1914-1918 and 1940-1945 and the large spending response to covid-19 in the recent 2020-2021 time period (Pandemic).[8] Dummy variables for elections arising in these years were used to keep the response to these events from distorting the underlying relationships.

-- insert Table 1 and Figure 1 about here --

The descriptive statistics of these variables are presented in Table 1 and graphs showing the variation in GovSize, ENPSeats and WinMargin across Canada's 44 federal elections are shown in the two graphs of Figure 1.[9] In the tests that follow one of the most important statistics characterizing the data is the Adjusted Dickey Fuller statistic (ADF), used to indicate the time series property of each variable. It will be noted that all of the variables used to represent government size and its economic and demographic fundamentals are nonstationary or integrated of order one, I(1).[10] This means that observations of their variation through time cannot be considered to be random drawings from a stationary distribution and imply that inferences made using classical statistical theory cannot be applied. Because Canadian federal

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referee's directed us to a revision of Canadian GDP numbers between 1870 and 1899 (Geloso and Hilton, 2020). Using these revisions did not substantially affect our results (for example, the coefficient of Rgdppc changed from -.168 to -.173).

[6] In earlier versions of this paper that focused only on election years we also used the proportion of the population registered to vote (rising 11 to 78 percent over the post-Confederation time period, with its biggest jump arising between the 13th federal election in 1917 and the 14th federal election in 1921 when women acquired the right to vote) and the immigration rate. In the annual regressions neither of these variables was found to be significant.

[7] Preliminary work also included a dummy variable for years of minority government. When doing so, the coefficient estimate was found to be negative and insignificantly different from zero. That is, in Canada minority governments typically did not spend more than majoritarian governments.

[8] We also tested for the effect of other pandemic experiences (the Spanish flu in the 1917 or 1921 general election and the other smaller pandemic scares of 1957, 1958 or 1968). None were associated significantly with increases in federal government spending.

[9] The dataset used is available online at Carleton University's Dataverse site. See Ferris (2022).

[10] The order of integration refers to the number of times that variables need to be differenced before becoming stationary.

government size and its proposed covariates vary stochastically, a linear regression of these variables will not generate a meaningful long run model of federal government size unless that combination of variables is cointegrated. If the residuals of the OLS regression are found to be stationary, however, that will indicate that that combination of I(1) variables move together through time and hence provide evidence of the existence of a long run equilibrium relationship. While the coefficients of the individual covariates cannot be interpreted as implying causality, the set of covariates is itself stationary over and evidence of a long run equilibrium relationship.

Finding the existence of cointegration among the variables used to represent government size and its long run fundamentals is important for our analysis because the political variables used to represent different dimensions of political competition—WinMargin, Volatility and ENPSeats-- are all stationary and cannot otherwise be related meaningfully to nonstationary variables like government size.[11] With cointegration, however, the political competition variables can be related to the cointegrated set to produce a meaningful test of whether or not their presence increases the explanatory power of the cointegrated relationship. Conformity of the sign and significance of the two variables chosen to proxy the monitoring ability of party rivals on government size then provides evidence on whether the data are consistent with the hypotheses relating inter party competition and government efficiency.

With this background, our test of the hypothesis of the effectiveness rival party monitoring on party shirking and hence on government size can be expressed as

$$Federal\ GovSize\ =\ f(economic\ and\ demographic\ fundamentals, partisan\ party\ type,$$

$$past\ seat\ volatility;\ current\ winning\ margin, expected\ ENPseats), \qquad (1)$$

where after controlling for economic and demographic fundamentals, partisan party type and past party seat volatility, the effect on expenditures of an increase the size of the incumbent's winning margin is predicted to be positive while the size of ENPSeats expected in the upcoming election is predicted to have a U shaped effect on government spending. As can be seen from this general statement of the hypothesis, one problem in establishing a test is to ensure that the timing of the covariates captures the information structure implicit in the hypotheses. This is a matching problem in that the election data is periodic (roughly every four years) while the economic and demographic data are typically annual. For

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[11] This is often called the issue of balance. See Pickup and Kellstedt (2022).

this reason, we have set up the test of these hypotheses in two forms: first in terms of election period data and second in terms of the full set of annual data.

If the test is setup as a linear regression model using only data from each election, n, the timing of the covariates in the regression allows a straightforward form of the test. In this case, a test of the effectiveness of between-election party monitoring can be setup as

$$LnGovSize_n = \alpha_0 + \alpha_1 Rgdppc_n + \alpha_2 LnAgric_n + \alpha_3 LnOld70_n + \alpha_4 Liberal_n + \alpha_5 Volatility_{n-1}$$

$$+\alpha_6 WinMargin_{n-1} + \alpha_7 EnpSeats_n + \alpha_8 ENPSeats_n^2 + e_n, \quad n = 1 \dots 44, \quad (2)$$

where e_n is a white noise random variable. In (2) note that WinMargin and Volatility are lagged one election period relative to current government size to reflect ex post electoral closeness while the role of expected contestability is incorporated by using ENPSeats contemporaneously. The latter assumes implicitly that the incumbent governing party has an unbiased expectation of how contestable the upcoming election will be when determining its current spending plans. LnGovSize, in turn, refers to the expenditure size of government achieved at the end of the incumbent's governing period. The hypotheses outlined in section 2 assert that between-election monitoring generates the following predicted coefficient signs: $\alpha_5 < 0$, $\alpha_6 > 0$ and then $\alpha_7 < 0$ and $\alpha_8 > 0$. All tests include the dummy variables WW1, WW2 and Pandemic.

The use of annual rather than election year data allows for many more observations on government size and the control variables. On the other hand, it adds a new challenge in how to align appropriately the annual effect on government size with the periodicity of the political election data. After some experimentation to best capture the information provided by ENPSeats when forming an expectation of the degree of contestability that will arise in the coming election, we settled on the following test using annual data, that is

$$LnGovSize_t = \alpha_0 + \alpha_1 Rgdppc_t + \alpha_2 LnAgric_t + \alpha_3 LnOld70_t + \alpha_4 Liberal_t + \alpha_5 Volatility(n-1)$$

$$+ \alpha_6 WinMargin_t + \alpha_7 EnpSeats(n+1) + \alpha_8 ENPSeats^2(n+1) + \varepsilon_t, \quad (3)$$

where $n = 1..44$; $t = 1 \dots 155$ and ε_t is a white noise random variable.[12] In (3) the $Volatility(n-1)$ refers to the level of party seat volatility existing prior to the election of the current party government

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[12] The use of lagged volatility reduces the number of observations in each regression to 150. Alternatives for expected ENPSeats included interpolating ENPSeats between elections and using ENPSeats(n+1) for the last half of the governing period and current ENPSeats(n) for the first half.

(derived from the changes in party seats shares arising in the previous election). The terms in $ENPSeats$ $(n + 1)$ refer to the effective number of parties in the upcoming election. Once again this implies that the incumbent party has unbiased expectations over the contestability of the upcoming election.

4. Results

We begin our discussion of the results by presenting in columns (1) and (3) of Table 2 the results of a linear regression model of Canadian federal government size as determined solely by its non-political fundamentals. Column (1) uses only election year data while column (3) repeats the regression on all annual observations between 1867 and 2021. As can be seen, the linear regression model performs well in both versions of the test consistent with the model's fundamentals explaining over eighty five percent of the annual variation in government size over time and with ADF statistics that indicate that the equation's residuals are stationary or I(0). The data then imply that the set of four I(1) covariates in model are cointegrated and provide evidence of a long run equilibrium relationship arising among these variables. It also means that the stationary political variables can be meaningfully incorporated into the analysis.

-- insert Table 2 about here --

Viewed as a determinant of government size, the expected sign of Rgdppc is ambiguous. Wagner's Law (1893), the hypothesis that public expenditure will expand with income growth and societal complexity, suggests that the relationship should be positive while the hypothesis that population scale economies exist in the provision of public goods suggests that it could be negative. While its sign is indeterminant a priori, all models in Table 2 find a significant negative coefficient suggesting that over this time period, the scale effect of rising population on the publicness of public expenditure in Canada has overcome the income effect.[13] As is true of most developed economies, the relative decline in the employment size of agriculture reflects the growth of in size and complexity of Canada's industrial and service sectors. Consistent with this dimension of Wagner's Law, then, the coefficient estimate on LnAgric is found to be consistently negative and significantly different from zero. The gradual aging of Canada's population is

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[13] One of our referees has suggested the use of well-being as developed by Higgs (1992) rather than real GDP per capital. We note that the reworking of Higg's adjustments to GDP for Canada is currently being done by C. Pender and V. Geloso. While still in the working paper stage, it would be interesting to assess what differences arise in models based on well-being versus income.

expected to increase the demand for government services and its coefficient estimate is found to be positive, $a_3 > 0$ and significantly different from zero at the 1 percent level.[14]

Our tests of the explanatory power of the hypothesis of the role of between election party rivalry are presented as the models appearing in Columns (2) and (4). Column (2) presents the election year test set out in equation (2) by introducing the two competition measures—WinMargin and ENPSeats—together with the two political controls for seat volatility and partisan party type (Liberal).[15] Doing so can be seen to increase the explanatory power of the regression (the adjusted R^2 rises from .892 to .932) indicating a reduction in the unexplained deviation of government size from its expected level and the Akaike information criteria (AIC) falls indicating that the enhanced model provides a better overall fit with the data. In terms of the the political competition hypotheses, ex post competitiveness (as proxied by Lagged_WinMargin) is found to be significantly positive in its effect on government size as expected, indicating that the larger the size of a party's electoral victory, the larger has been government size in the following election. On the other hand, while Volatility's presence is necessary for an appropriate interpretation of the winning margin, its coefficient estimate is found to be insignificantly different from zero. In terms of the contestability hypothesis, however, the introduction of ENPSeats quadratically to test the hypothesis of a U shaped relationship between electoral contestability on government size works well. The sign ordering of the significant ENPSeats coefficients--ENPSeats (negative) and ENPSeat_squared (positive)--indicates the presence of a U shaped relationship that falls to a minimum at an ENPSeats value of 2.69 before rising again. A Wald test of the contribution of the four competition variables to an explanation of federal government size confirms that their addition to the model does add significant explanatory power ($F(4,31) = 7.53$ with prob = .0002).[16]

Column (4) presents the quadratic form of the competition test using annual data. With more observations the control variables are found to be even more significant, the coefficient estimate on LnOld70 is now significantly positive while the control for partisan spending differences (Liberal) is found

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[14] We have not in this paper controlled for the possible effect of changes in the relative power of provincial versus federal governments. Our experimentation with the data presented in Boadway and Watts (2000) on fiscal federalism over the 14 elections arising between 1962 and 1999 suggests that while the growing role of provincial governments has reduced federal government spending, it has not reduced the effectiveness of inter-party competition.

[15] We also experimented with the use of a dummy for elections won by minority governments. In these cases, the coefficient estimate was typically found to be negative but insignificantly different from zero.

[16] The results also find no significant partisan effect. While this will be seen to be reversed in the annual model, the data remains inconsistent with the hypotheses that in Canada government size is larger under the more liberal of the two dominant parties.

to be significantly negative. That is, in an interesting reversal of expectation, more liberal governments in Canada are found to have spent typically less than did their more conservative rivals.[17] The data also confirm the hypothesized role of party rivalry in fostering the reduction of political shirking. The coefficient estimates of the competition proxies replicate exhibit the overall pattern found in the election period regression of column (2): the coefficient estimate on WinMargin is again found to be both positive and significantly different from zero at the 1 percent level and the ENPSeats coefficients exhibit the same negative/positive ordering at the ten percent. The annual results, despite having a lower level of significance than the election year results, do continue to imply a U shaped relationship between ENPSeats and LnGovSize, with the effect on government size reaching a minimum at a ENPSeat value of 2.62. This is essentially the same minimum as in the election year minimum finding of 2.69.

Before turning to look closer at the distribution of government size data to help explain why the annual regression results have fallen in overall significance relative to the election year results, we first present an alternative test of the contestability hypothesis by focusing not on the expected contestability of the upcoming election but on the fragmentation of rival parties. In this case, instead of looking at ENPSeats and predicting a U shaped effect on government size, we now look at the expected number of rival parties (ENP_rivals) and test for an inverted U shape. That is, as the expected number of party rivals to the incumbent increases, the policing of incumbent party shirking would be expected to become increasing ineffective, leading to excessive government size increasing at a decreasing rate.

A test of this hypothesis is presented in column (5) of Table 2. In this case the expected inverted U shape for the effect of ENP_rivals on LnGovSize is strongly present in the data. While a focus on the fragmentation of party rivals also results in a diminishing of the measured role played by the winning margin, the inverted U shaped effect represented by the significant quadratic terms is found to be highly significant.

5. Extensions and the bimodal finite mixture models
    a. The form of the relationship between ENPSeats and LnGovSize on Election Data

The quadratic form found in column (2) of Table 2 for the election year data is consistent with the hypothesized U-shaped effect of ENPSeats on government size, but the assumption that the nonlinear relationship is quadratic also imposes a parametric shape that is symmetric about its minimum point.

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[17] We also tested for a spending effect arising from minority governments and an election spending cycle. Neither was found to be statistically significant.

The quadratic form then restricts the ability of the model from capturing the actual shape if the underlying relationship is not symmetric. To allow greater flexibility in the shapes of the relationships that can be estimated, we used Stata's fractional polynomial (fp) regression package that tests among 44 possible representations of a second-degree fractional polynomial and selects the best fit for ENPSeats. The results of this test are presented in Table 3 and the shape of the best fitting ENPSeats relationship is shown in Figure 2.

-- Insert Table 3 and Figure 2 about here --

The successive rows in Table 3 indicate that the search for the best fitting form rejects equations that: omit ENPSeats entirely, include it either linearly or quadratically relative to a second-degree polynomial whose best fitting shape can be plotted from the equation (presented immediately below the table). As Figure 2 illustrates, the optimal fractional polynomial has the hypothesized U shaped relationship between contestability (as proxied by ENPSeats) and government size and can be seen to be asymmetric. GovSize falls more slowly as ENPSeats rises beyond 2 to approach its minimum point (at about 2.7) than it rises as ENPSeats increases beyond the minimum. Expressed in terms of the hypothesized effect of contestability on incumbent shirking and excessive government size, the empirics suggest that contestability is lowest when the opportunity for collusion is highest and rises as the effective number of rivals increase. The rise in contestability from greater competition does peak, however, with further increases in ENPSeats reflecting the rapid loss in contestability as party structure continues to fragment. The results also imply that contestability is at its highest at a level of ENPSeats somewhat larger than Duverger's 2 (i.e., 2.7). As the effective number of parties continues to rise, party fragmentation rapidly reduces the credibility of rival party challengers and through this their ability to effectively police incumbent spending.

b.   Insight into the relationship between ENPSeats and LnGovSize revealed by Annual Data

While the results in column (4) of Table 2 are consistent with two hypothesis predictions, the linear model testing the rival party monitoring hypothesis appears to fit the data better when run against the election year data than when all annual years are included. That is, the three coefficient estimates in column (4) are consistent with their predicted sign and significant in their own right, but the addition of the political variables to the equation of fundamentals does not significantly increase the explanatory power of the model nor is the quadratic relationship estimated in (4) found to be as significant as that

found in the election year case of column (2).[18] This led us to look more closely at the annual data for a clue as to why this might happen.

-- insert Figure 3 about here --

In Figure 3 we present the density plot of the annual values of LnGovSize over our time period. As can be seen from that figure, the plot reveals an overall distribution of outcomes that is most likely a mixture of two normal distributions, one centered lower in the portion of the distribution, the other centered much higher. This suggests a likelihood that the overall set of annual outcomes result from a mixture of two different classes of behaviour, one more applicable when government size is in the lower range of the distribution, the other when government size is found in the upper range. To allow for such a possibility, we used a finite mixture model (fmm) to estimate the distinct parameters of each of the two grouping, to infer the expected proportion of the outcomes in each class and to consider how the different covariates affect the outcomes considering all classes and membership probabilities.[19]

The results of using fmm for 2 categories are presented in Table 4 where column (1) presents the parameter estimates for larger proportion of the data in mixture 1 and column (2) presents the parameter estimates for mixture 2. From column (1) it can be seen that the first mixture has a mean size of LnGovSize of 2.46 and represents 71 percent of the data while the second mixture has a mean of 2.81 and represents 29 percent of the data. The first mixture clearly identifies the convex shape hypothesized for ENPSeats_future, the positive coefficient estimate predicted for WinMargin and the predicted negative effect of Volatility, whereas the second mixture does not. However, when we compute the model's predicted marginal effects for different values of ENPSeats_future (from the first to the 99th percentile), we still get the hypothesized U shaped effect overall with a minimum at about 2.4. This can be seen in Figure 4 where the predicted marginal effects are graphed. This implies that the first mixture that accounts for 71 percent of the data and covers most the lower support of the data dominates the overall results. The second mixture whose mean is at the 95th percentile of the data covers the upper tail of the distribution and does not have a major impact on the overall marginal effect.

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[18] We note that when the fractional polynomial model is run on annual data, a U shaped relationship is also found but one that reaches a minimum at 2.6 but is quite flat relative to when the election data is used (in Figure 2). This again reflects the lack of overall model significance when the data is modelled as the incumbent party in power having a single behavioural response to both 'normal' and 'exceptional' circumstances.

[19] Because of its flexibility, fmm has been used extensively to classify observations, to adjust for clustering, and to model unobserved heterogeneity, features that makes fmm a popular tool when modelling multimodal, skewed, or asymmetrical data.

-- inset Table 4 about here --

The results suggest that the use of annual data has allowed for the revelation of a second distinct type of political behaviour driving federal government expenditure that remained hidden when individual dummy variables were used to remove the effect of the abnormally large expenditures of WW1, WW2 and the Covid pandemic in the smaller number of election observations. With the addition of inter-election annual data, the fmm results show the presence of two different expenditure responses: one corresponding to what might be called a typical rivalry-constrained spending response under normal circumstances and one corresponding to spending responses that arise when the economy faces more extraordinary challenges. That is, the data suggest that in times of crisis when high levels of spending response are required, the more normal concerns with operational efficiency and its consequences for future electoral contestability are either put to one side or greatly minimized. This can be seen in falling levels of significance and sign reversals for Liberal, Volatility, WinMargin and ENPSeats in the case of class 2 relative to class 1. In class 1 with the larger proportion of outcomes, extraordinary demands are not being placed upon the party in power and the model's outcomes are consistent with the rivalry hypotheses set out in this paper. The larger is the winning margin (and the lower is election seat volatility) the larger is excessive government size as measured by the relationship with underlying fundamentals. Similarly, excessive government spending is found to have a nonmonotonic relationship with ENPSeats, consistent with the hypothesis that electoral competition increases as ENPSeats rises above 2 before falling as rising party fragmentation provides less effective policing.

-- insert Figure 4 about here –

6.   Conclusion

In this paper we have presented tests of two interrelated hypotheses relating political party competition in the between election period to government efficiency. The first is that in a plurality parliamentary system like Canada's, the larger is the size of the governing party's seat majority in the legislature (controlling for the volatility of party representation) the less effectively can rival parties police incumbent shirking and hence the larger will be government expenditure size. The second hypothesis is that for rival party monitoring to be effective, a political rival must be seen to present a credible alternative to the incumbent, requiring the upcoming election contestable. Using the effective number of seats (ENPSeats) as a measure of party fragmentation, larger values of ENPSeats imply greater party fragmentation and thus less of a constraint on incumbent party shirking. Duverger's Law argues that the winner-take-all nature of plurality electoral systems leads competition to drive effective party

representation towards 2. Our hypothesis, however, argues that as ENPSeats falls towards 2, the smaller effective number of contending parties encourages inter-party collusion at a cost to the electorate. This loosens the incentive of dominant rivals to actively police each other's spending behaviour in areas that are less observable to the electorate. Controlling for the economic and demographic fundamentals determining long run government size, the combination of these two effects is hypothesized to produce a convex shaped relationship between ENPSeats and government size.

These two hypotheses were tested first against data arising from the 44 federal elections held in Canada between 1867 and 2021 before being rerun on annual data. The results in both cases were found to be consistent with ex-post electoral closeness as represented inversely by the first versus second place winning margin being a significant indicator of the effectiveness of rival party monitoring of excessive government spending over the duration of that governing interval. The data are also found to be consistent with the electoral contestability implying a U shaped relationship between ENPSeats and excessive government size and reaching a minimum somewhat above Duverger's 2 (ranging from 2.4 to 2.7). That is, as ENPSeats rises above 1, elections become more contestable before falling again as ENPSeats continue to rise and party fragmentation increases.

The use of two forms of the test has been particularly useful because the results suggest that while a focus solely on election periods can expose 'normal' political behaviour when extraordinary election periods (in our case WW1, WW2 and the recent Covid) are dummied out of the regression model test, the use of the additional data in annual observations allows for the possibility that multiple different behavioural responses can be exposed by the data as the governing political party responds to different circumstances. In our case, closer exploration of the Canadian annual data revealed a distribution of government expenditure sizes that is bimodal. This suggested the use of the finite mixture model to capture the possibility of two classes of behaviour co-determining observed incumbent party spending choices. Doing so confirmed the two rival-party competition hypotheses for the first mixture that accounts for 71 percent of the data covering the lower to mid support of the data. The set of political hypotheses was not confirmed in the second mixture that covered 29 percent of the data and with its mean in the upper tail of the size distribution. However, when the overall predicted marginal effects of ENPSeats on government size were calculated, the first class was seen to dominate the data and to yield the expected convex shape with a minimum arising at a value of 2.4.

In their different ways, then, the two tests of hypotheses of the role of between election inter-party rivalry are found to be consistent with the data and each other: larger party winning majorities lead to

increases in government spending and increases in the level of ENPSeats signal first a rise and then a fall in the effective rival party monitoring of incumbent party shirking.

Table 1
Descriptive Annual Statistics Canada: 1867 – 2021

Variable name	Definition	Obs.	Mean	Standard Deviation	Min.	Max.	Adjusted Dickey Fuller Statistic 1% critical (-3.492)
LnGovSize	Ln(Federal government expenditure/GDP)	155	2.28	.610	1.25	3.77	I(0) -1.556 I(1) -7.48***
Rgdppc	Real GDP per capita (1000's)	155	10.59	.009	1.627	29.17	I(0) 2.88 I(1) -9.39***
LnAgric	Ln(Proportion of the Labour Force in Agriculture)	155	-1.95	1.27	-4.20	-.536	I(0) 1.97 I(1) -12.2***
LnOld70	Ln(Percentage of the population 70 or over)	155	1.47	.49	.683	2.54	I(0) 5.16 I(1) -3.77***
Win_margin	difference in seat proportions won by the first versus second place finisher	155	.273	.154	.008	.606	I(0) -4.897***
Volatility	Sum of changes in party vote shares across adjacent elections divided by 2 (lagged one election)	150	.186	.125	.002	.681	I(0) -5.31**
ENPSeats	1 divided by the sum of party seat shares squared	155	2.33	.427	1.539	3.22	I(0) -4.24***

**(***) significant at 5% (1%)

Figure 1a
Canadian Federal Government Size by Election: 1867 - 2021
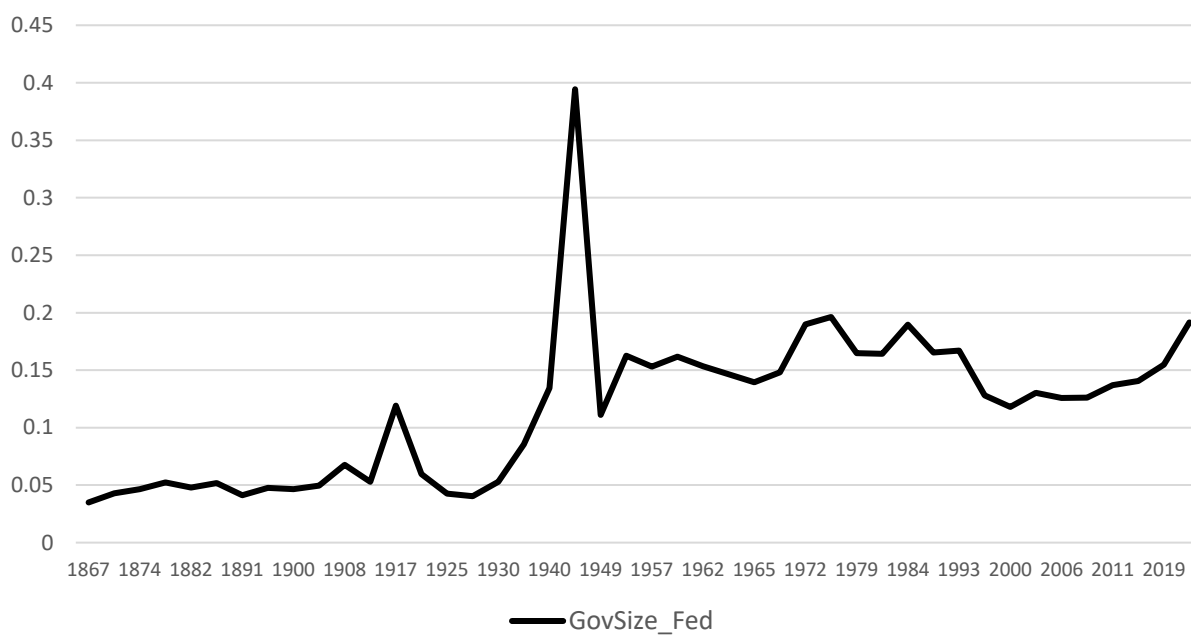

Figure 1b
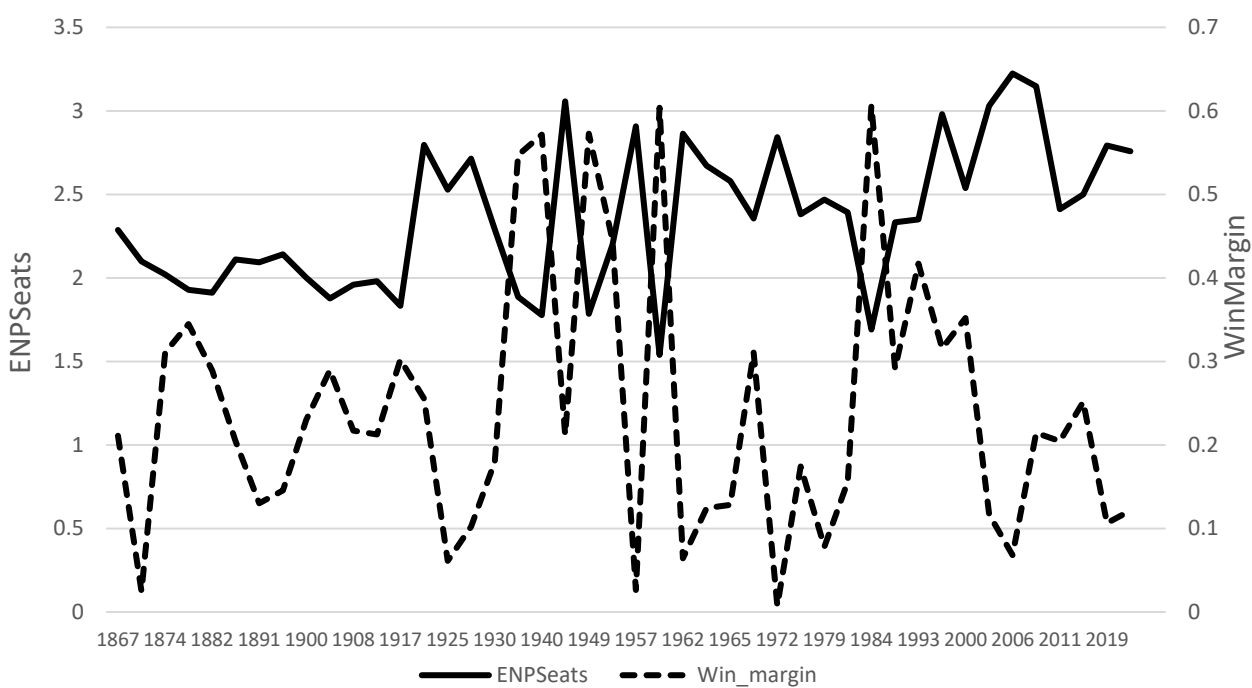ENPSeats and WinMargin by Election: Canada 1867 - 2021

Table 2

OLS Regressions of Canadian Federal Government Size:

Annual and Election Specific Data,13. 1867 – 2021

(Absolute value of t-statistics in brackets)

	LNGovSize Election Year Linear (1)	LnGovSize Election year Quadratic (2)	LnGovSize Annual Linear (3)	LnGovSize Annual Quadratic (4)	LnGovSize Annual Quadratic (5)
Rgdppc (in thousands)	-0.171*** (8.71)	-0.164*** (10.26)	-0.170*** (13.65)	-0.168*** (12.49)	-0.165*** (12.43)
LnAgric	-1.151*** (7.81)	-1.361*** (11.08)	-1.141*** (12.40)	-1.216*** (13.20)	-1.169*** (13.24)
LnOld70	1.065*** (3.72)	0.473 (1.69)	1.082*** (6.02)	0.876*** (4.11)	0.848*** (3.83)
WW1	0.834*** (4.08)	0.701*** (4.26)	0.737*** (7.14)	0.668*** (6.41)	0.670*** (6.71)
WW2	1.652*** (7.87)	1.627*** (8.87)	1.358*** (13.84)	1.33*** (12.30)	1.310*** (13.21)
Pandemic (2021-22)	0.220 (1.00)	0.463** (2.53)	0.256 (1.54)	0.403** (2.42)	0.449*** (2.76)
Liberal		0.051 (0.93)		-0.092** (2.31)	-0.079** (2.10)
WinMargin		0.657*** (3.89)		0.402*** (3.01)	0.148 (0.84)
Volatility		0.035 (0.20)		0.043 (0.27)	-0.107 (0.75)
ENPSeats		-2.265*** (3.18)		-1.043* (1.81)	
ENPSeats_squared		0.420*** (2.83)		0.199* (1.66)	
ENP_rivals					0.05347*** (3.69)
ENP_rivals_squared					-0.0013*** (3.76)
Constant	-4.425*** (18.28)	-1.312 (1.42)	0.18 (1.18)	1.564** (2.19)	0.546 (0.41)
Equation Statistics: Observations	44	43	155	150	150
AdjR^2	.892	.932	.867	.868	.875
AIC	-11.09	-29.20	-19.85	-24.05	-32.81
ADF of residuals	-4.23[S]	-5.19	-5.56[S]	-5.83	-5.97
Minimizing value of ENPSeats		2.69		2.62	

* (**) [***] signifies significance at 10% (5%) and [1%].

[S] Significant at 5% using MacKinnon (2010) Critical Values for unit root test with no constant and four covariates.
The values of WinMargin, Volatility and ENPSeats (ENPSeats_squared) used in columns (1) and (2) correspond to those indicated in equation (2) while columns (3) and (4) correspond to those indicated in equation (3).

Table 3

Fractional Polynomial Comparisons

ENPSeats	Test degrees of freedom	Deviance	Residual Standard Deviation	Deviance Difference	P > F F(df, 30)	Powers
Omitted	4	-30.89	0.190	22.92	0.001	
Linear	3	-43.29	0.167	10.52	0.042	1
m=1	2	-48.07	0.158	5.74	0.11	-2
m=2	0	-53.81	0.150	0.000	--	3 3

Best fitting equation (absolute value of t statistics)

$$LnGovSize = \frac{-3.46^{***}}{(13.17)} - \frac{.173^{***}}{(11.28)}Rgdppc - \frac{1.388^{***}}{(11.81)}LnAgric + \frac{.567^{**}}{(2.34)}LnOld70$$

$$+ \frac{.630^{***}}{(3.10)}Lag\_WinMargin + \frac{.053}{(0.31)}Volatility - \frac{.196^{***}}{(4.03)}ENPSeats_{-1} + \frac{.146^{***}}{(3.82)}ENPSeats_{-2}$$

$$+ \frac{.688^{***}}{(11.58)}WW1 + \frac{1.647^{***}}{(14.16)}WW2 + \frac{496^{***}}{(5.94)}Pandemic$$

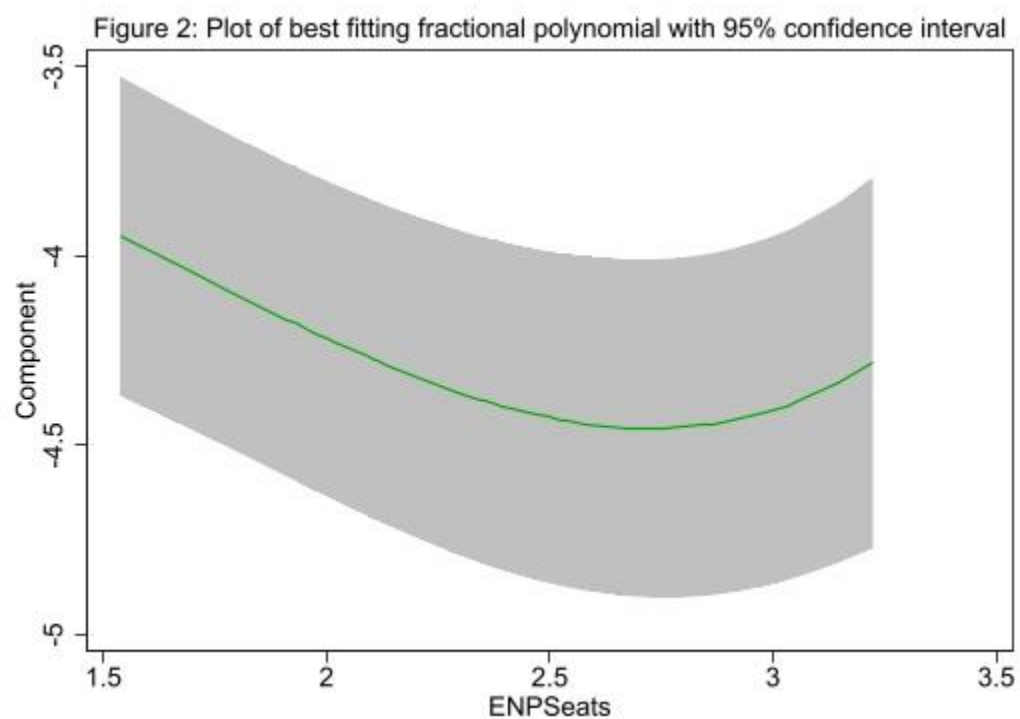Figure 2: Plot of best fitting fractional polynomial with 95% confidence interval

Figure 3: Kernel density estimate

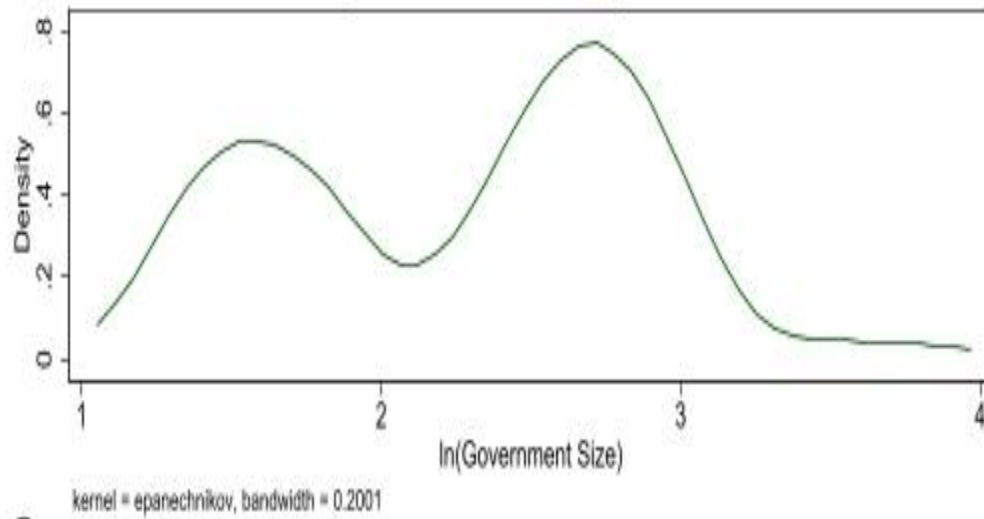kernel = epanechnikov, bandwidth = 0.2001

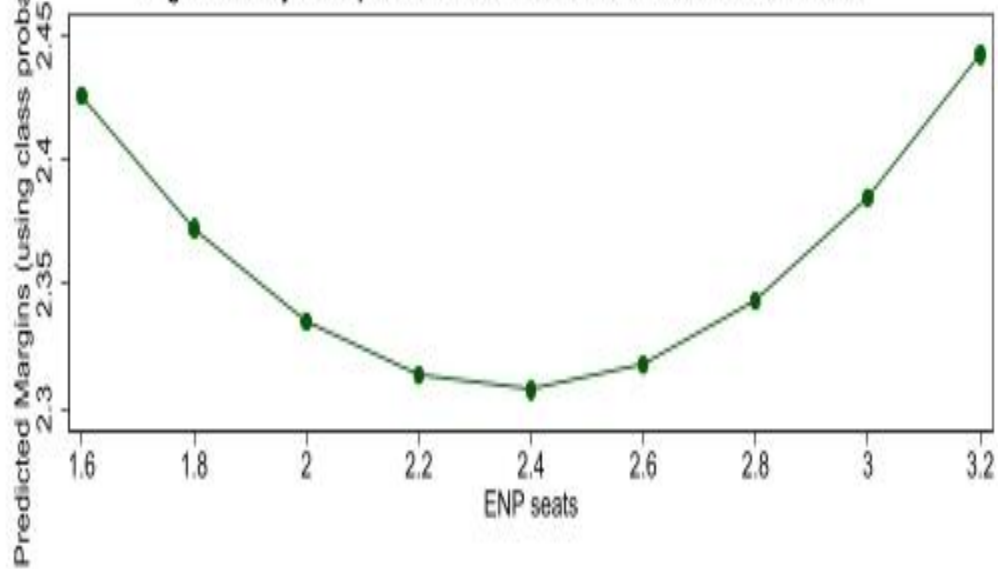## Figure 4: Adjusted predictions of the Effect on Government Size

Table 4

Finite Mixture Regression Model with two behavioral categories: Canada 18676 – 2021

(absolute value of z statistic in brackets)

	Class 1 LNGovSize (1)	**Class 2** LnGovSize (2)
Rgdppc (in thousands)	-.169*** (8.88)	.135*** (10.65)
Ln Agric	-1.343*** (10.67)	.498*** (7.25)
LnOld70	.467** (2.11)	-2.378*** (11.76)
Liberal	-.174*** (4.02)	.037 (1.58)
WinMargin	1.022*** (6.98)	-.015 (0.22)
Volatility (lagged)	-0.563*** (2.80)	.810*** (10.44)
ENPSeats_Future	-7.502*** (8.37)	.748*** (3.00)
ENPSeats_Future_squared	1.727*** (8.67)	-.161*** (3.18)
Constant	8.62*** (8.16)	5.30*** (13.80)
Observations	150	
Log Likelihood	-7.92	
Latent Class Marginal Means	2.456	2.808
Latent Class Marginal Probabilities	.71	.29
Minimum of ENPSeats_Future	2.2	2.3

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