Measuring Electoral Competitiveness: The Parliamentary System of Canada, 1867 - 2011

J. Stephen Ferris[a], Stanley L. Winer[b], Bernard Grofman[c]

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Abstract

We consider the meaning and measurement of electoral competitiveness in a mature, parliamentary democracy. Devising a useful measure of the competitiveness of an economic market is not an easy task, and doing so for an election contest is equally challenging. Our analysis highlights both differences and similarities among the major types of indexes that can be used to measure the competitiveness of economic markets and those that can be used to measure the competitiveness of electoral contests. Working at both the constituency and the national party level, we employ the indexes we design to measure the competitiveness of Canadian federal elections using the complete record of regular constituency level contests from Confederation in 1867 to the 41st election in 2011. We conclude by posing key questions that need to be addressed in order to reconcile the differing patterns of competitiveness revealed by our measures.
This preliminary paper is a part of a larger project on the meaning, measurement and consequences of electoral competitiveness in mature democracies.

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[a] Carleton University, Ottawa (steve.ferris@carleton.ca)
[b] Carleton University, Ottawa. Corresponding author (stanley.winer@carleton.ca)
[c] U.C. Irvine, CA (bgrofman@uci.edu)

1. Introduction

In this paper we consider both the meaning and measurement of electoral competitiveness in a mature, parliamentary democracy. Devising a practical and operational measure of the competitiveness of an economic market is not an easy task, and doing so for an election contest in a political system is no less challenging. This is despite the common use of indexes, such as the effective number of parties and first versus second place vote margin, to measure political competition. Our analysis highlights the differences and similarities that arise among a small but representative sample of indexes used to measure the degree of competitiveness of electoral contests. Working at the constituency and national party level, we construct these measures of electoral competitiveness for Canada's federal elections, using the complete record of regular constituency level elections from Confederation in 1867 to the 41st election in 2011. From graphical exploration of the resulting indexes (in this preliminary version) we draw tentative conclusions about the historical evolution of electoral competitiveness in Canada, and suggest directions for future theoretical and applied work. Throughout the paper, we attempt to draw from both political and economic models of competition. We note that, In this preliminary version, the analysis is mainly graphical and some references are omitted.

This paper is a part of a larger project on the meaning, measurement and consequences of electoral competitiveness in mature democracies.

1.1 Why is the study of political competitiveness in a mature democracy important?

The First Theorem of Welfare Economics explains why economic competition in private markets is worthy of attention. Competition drives the price paid for goods people value most to its marginal cost, and allocation on this basis leads to greater economic well-being than non-competitive market structures. Competition works best in markets where private or excludable goods are produced without externalities. Competition is usually associated with a large number of firms, none of which have any market power, though strictly speaking economic theory is agnostic as to the number of firms in a competitive equilibrium. The idea that competition increases with the number of firms, or, alternatively, as the market share of each existing firm shrinks, has had a substantial influence on the measurement of the competitiveness of elections. If a market is contestable (Baumol 1982) - i.e., under serious threat that new firms may enter - the welfare benefits of a classically competitive market may still be provided even if the number of firms remains very small. This intuition may also be relevant for political markets; but here too we must specify what we mean by contestability.

There is no grand theorem linking competition to social welfare in political science which, we hasten to add, does not mean that economics has the upper hand in the present discussion. Liberal democracy (henceforth just democracy), a form of regularized competition for control of the state under stable rules on conduct before and after elections that binds citizens, incumbent governments and political challengers, is generally viewed as desirable for at least three reasons: (i) Democracy, as opposed to political systems without regular elections and associated constraints on power, is a desirable end in itself because it is conducive to individual liberty; (ii) Democracy is socially beneficial on procedural or constructive grounds because it generates the discussion required to form and reveal individual preferences for goods that cannot be privately supplied (including redistribution); and, finally, (iii) Democracy is instrumental at least in the sense that the contest for office that is a critical part of it forces opposition parties and governments to be

responsive to the electorate. (See, for example, Sen 1999, Przeworski 2010, and Golden and Min 2013 among many others).[1]

We infer from this perspective on why democracy is desirable that a lessening of political competitiveness in a mature democracy is bad from all of libertarian, procedural and instrumental perspectives.[2] Exactly what ' a lessening of competitiveness' in elections means, however, remains to be defined.

1.2 Why does electoral competitiveness vary in mature democracies like Canada or the U.S?

If political competitiveness did not vary within a given mature democracies, the role of political competition could be addressed and analyzed only by comparing competitiveness across political systems. Comparing the political process in democracies versus that in autocracies, or in countries with a Westminster parliamentary system compared to those with proportional or mixed member electoral systems has provided much insight into the nature of political competition and about electoral systems in general.[3] However, the need to compare distinctly different forms of political organization carries with it the difficulty of in separating the role of political institutions from wider differences in society.

Political competitiveness may also vary within a mature democracy across space and time. Evidence of such variation in the United States, for example, can be seen in the work of Winer, Kenny and Grofman (2014) on contests for the U.S. Senate and Besley, Persson and Sturm (2010) on elections for U.S. state-wide offices generally. One reason for such variation is that the basic rules governing that system may change over time, such as when the franchise is formally or effectively extended. (Women received the unrestricted right to vote in 1917 in Canada, and voted for the first time in large numbers in the 14th general election of 1921.) But even when the rules remain unchanged, variations in competitiveness can arise for other reasons. In many of these cases**,** variation occurs because the logic of party formation and behavior is different from the logic required for competition in specific, local electoral contests. Austen-Smith (1987), Roemer (2001), Callander (2005) and Winer et al (2014) among others explore this tension in various ways. Political parties form as coalitions of vote maximizers and activists who together solve the free rider problems that arise in political organizations and their finance. The requirements for solving collective action problems including party financing**,** is often at odds with the requirements of platform positioning for maximum flexibility in a specific electoral contest because parties must contest over multiple district, facing quite different constituency characteristics in each. Also, voter preferences in specific elections change over time. Both parties and their individual candidates must adjust to remain highly competitive. Factors such as these can produce periods in which the level of competition

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[1] The constitutional perspective of Buchanan (see Congleton 2014 for a nice exposition) lies between or, perhaps, can be said to blend the economic and political perspectives . In Buchanan's view, preferences are essentially unknown, and liberty is an end in itself. Political competition over a constitutionally limited range of activities in a democracy is a useful way of implementing consensual and efficient policies that are responsive to individual preferences.

[2] We should ask here if its only democracy (as opposed to nondemocratic politics) that is important, or if competitiveness in mature democracies also matters? In any event, we proceed here as if variation within democracies matters too.

[3] References to be added.

within any particular electoral district or election is weak and, thus, periods when one particular candidate or party may be dominant in the district. We suspect that this situation may persist for considerable periods of time or across large parts of an electoral space.[4]

In this paper we eschew the big picture that characterizes the evolution of democratic institutions in the West, or the contrast of democratic with autocratic political systems. We focus on the measurement of changes in the degree of political competition within the single member district, Westminster parliamentary system in Canada.[5] Apart from the introduction of suffrage for women in 1917, the extension of the franchise to 18 year olds in 1968, and the gradual disappearance, by 1968, of a small number of two-seat constituencies, this system has remained essentially unchanged from Confederation in 1867 until the 41st election in 2011. Because electoral institutions have remained so remarkably frozen in Canada at the parliamentary level, variations in political competition become even more interesting, since they must arise endogenously.

1.3 Four Aspects of Political Competition

It seems sensible to suppose that the intensity of political competition as it is conceived of in political science is increased with (i) *entry* of new candidates and of new parties (entry and contestability in the economic competition literature); (ii) greater rivalry among existing candidates and parties *in elections*; (iii) more intense rivalry among parties in the legislature *between elections*; and (iv) greater competition among the levels of government and between bureaus. Historically, the long period over which the *franchise* was gradually extended changed the 'domain' over which electoral competition applied and thus influenced the nature of political competition.

Moreover, there likely are important connections among these four dimensions of competition. The possibility of party entry increases competition among existing parties compared to a situation in which such entry is not possible. Similarly, competition among different levels of government in a federation may counter the lack of competition among politicians at any one level.[6]

1.4 Narrowing the Focus

Despite the connections that arise among the various dimensions of competition, there is much to be learned from analyzing any one of them in greater depth. In this paper we examine competition arising among existing candidates and parties and the resulting longer and shorter run trends in competitiveness. We do so by constructing a selected set of competitiveness indexes that make use of using constituency and parliamentary level data for the history of the modern Canadian state

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[4] We note that empirically linking trends in competitiveness to specific causes is not accomplished in this paper.

[5] There were in fact 123 two-seat constituency elections in Canada in a total of 10247 constituency level elections from the first parliament in 1867 until the 41st in 2011. Calculations not tabulated here show that at least the measures of competitiveness based on average vote shares or average margins that we introduce and discuss in sections two and three are not affected significantly by taking the presence of such a small number of two-seat constituencies explicitly into account.

[6] This hardly exhausts the topic. Cox (2005) for example points to three additional dimensions of competition that will vary with the nature of the electoral system: coordination of candidates , how voters are persuaded, and how they are mobilized. In this paper we are concerned with measuring the variation in the degree of competitiveness rather than on how competition is carried out.

from 1867 to 2011. (This period includes 41 general elections.) Even with this narrowing of focus, however, there remain many issues to consider including: competition between candidates at the constituency level; competition between parties (on one or another definition of a political party) at the constituency level; national party competition in elections considered as a whole; as well as the separation of longer run trends from shorter run variation in competitiveness indexes.

In section two we consider the measurement of competitiveness using the Effective Number of Parties (ENP) and related measures. This index has been extensively used in studies of electoral competition. In part three we look at simple vote margins and vote margins adjusted for volatility of the vote, including the party-based volatility adjusted margins suggested by Przeworski and Sprague (1971) that have not been computed for Canada before. In section four we move from the constituency level to the system as whole, in order to consider measures based on the concept of a safe, versus a marginal, parliamentary seat, along with asymmetry across parties in safe seats. A final section concludes with some general observations and suggestions for future research.

2. The Effective number of parties and other Hirschman-Herfindahl variations

Economists argue that in markets with private goods, more firms and smaller market shares for each mean more competition, which will in turn produces less of a divergence between price and marginal cost. The Hirschman-Herfindahl (HH) index is designed to reflect such tendencies and is calculated as the sum of the squared market shares of all firms. It is 1 if one firm supplies the entire market, and declines towards 0 as more firms enter and market shares decline. This approach has influenced political scientists, who have often used its inverse as a measure of the effective number of political parties in an election (ENP). ENP is defined following Laasko and Taagepera (1979) as:

$$ENP_t = \sum_{j=1}^{J}(ENP_{jt}) \,/\, J \qquad (1)$$

where $ENP_{jt} = 1/\sum_{i=1}^{I} v_{ijt}^2$ with v_{ijt} = the vote share of candidate *i* in constituency *j* in election *t*.[7] Alternatively, we may employ vote or seat shares of parties in the legislature.

ENP = 2 if there are two parties with equal vote shares. ENP can increase above 2 if the number of parties rises above 2. Following the use of the HH index in economics, an increase in ENP above 2 can be regarded as a signal that the competitiveness of the electoral system has increased. There are numerous papers exploring the role of competitiveness in the determination of public policy in which such an interpretation of ENP is employed.[8]

Arguments in political science over the meaning of ENP for competition begin with Duverger (1951/54). He argued that competition in a single member district (SMD) plurality rule parliamentary system would lead to an equilibrium with two large parties formed before the

[7] The maximum number of candidates in any one constituency election from 1867 to 2011 (general elections 1 to 41) is 13. The maximum number of parties (taking self-named parties as a party without judgement of its success), independent candidates and candidates of unknown affiliation is 27, in the 19th election in 1940. The definition of a party is considered further below.

[8] References to be added here.

election. This is in contrast to the tendency for coalition governments to form after an election in systems with some form of proportional representation.

It is interesting that while the number of firms is indeterminate in the economic theory of competition, 'Duverger's Law' for majoritarian electoral systems is concrete with respect to the number of competitors in a long run electoral equilibrium. Strictly speaking, when one analyses the logic of Duverger's claim, it is a statement about two party competition within individual districts. The two parties at the local constituency level may differ across different regions, thus leading to more than two at the center, and it is widely agreed that 'Duverger's Law' applies most forcefully among at the local constituency level. (See for example Riker 1982, Cox 1997, Gaines 1999, Chibber and Kolman 2004, Taagepera 2007 and others).[9] To go from such localized two-party competition to national competition between the same two parties requires many additional assumptions.

This interpretation of Duverger's Law suggests that 2 is the long run competitive equilibrium at the constituency level in SMD plurality rule system in Canada. But, if so, a rise in ENP at the constituency level could be taken as evidence not of more competition in the longer run, as is often argued, but of less. The latter interpretation of the implications of Duverger's Law coincides with Demsetz's (1968) interpretation of equilibrium in markets served by natural monopolies if governance in the political process can be considered as a public good, so that the governing party is seen as analogous to the manager of a public utility. That is, if providing governance in a collective has the same characteristic as the management of a natural monopoly—i.e., a single governing party/management team is the low cost provider—then net benefits can be maximized only with one producer (or government). However, to avoid the reduction of services and, implicitly, the higher price that follows from the incentives faced by a single producer, there must be a credible alternative that could step in and perform if promised performance was either reneged upon or not offered.

In this view, contestability - the ability of a credible alternative to replace the incumbent producer - is the mechanism by which the benefits of competition can be most effectively realized by the community. In the political arena, competition in an election arises across a set of policies that can be provided by credible alternatives. But the greater is the extent of party fragmentation, the less do second or third placed parties become a constraint on the performance of the governing party because they are less likely to be able to offer a credible alternative. Thus, in a fragmented electorate, the pressures on a party to make and keep its election promises diminishes, so that It follows from Demsetz's perspective as well as from Duverger's, that a rise in ENP above 2 signals a decline in electoral competiveness.[10]

In Figure 1 we illustrate the historical evolution of ENP across Canadian federal elections, where ENP is measured both on a constituency and a national party basis using vote shares in each case.[11]

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[9] Moreover, even within a single district, Cox (1997) has identified circumstances in which non-Duvergerian equilibria can occur.

[10] Reference to some work on competitive equilibria with ENP >2.

[11] There were many acclamations in elections 1 (1867: 46/181), 2(1872:51/200), 3(1874:54/206) and 13(1917:31/235). In these cases, we set $v_1 = 1$ in a constituency with an acclamation. The presence of 2-seat constituencies (123 before the 28th election in 1968) makes little difference to the averages over all constituencies

This index has of course been computed and studied before for Canada. See especially Johnston and Cutler (2009), Chhibber and Kolman (2004) and Gaines (1999).

[Figure 1 here]

The ENP candidate measure can be seen to rise continuously through a series of stages over the period since Confederation. The ENP party measure - using party shares of the national vote in a general election and a narrow definition of political parties, one that has apparently not been used before[12], is always above the candidate measure (as expected), because a variety of parties other than the Liberals and the Conservatives have strength in different regions) and mirrors the movement of the candidate measure after about the seventh or eighth election.

In the early part of the history, from roughly 1867 – 1898, the movement of ENP seems to describe a process of convergence towards 2 as the party system developed. This formation of the two major political parties is reflected both in the effective number of *candidates* increasing from below towards 2 and the effective number of political *parties* falling from above towards 2.[13] On the other hand, from the Great Depression onward through WW2 and the Korean War and the immediate post-war period, the average constituency level ENP varied widely as it grew before stabilizing in the post 1960 period about a much higher level (2.6-2.7).[14]

Whether the evolving nature of the ENP time series is consistent with stationarity about a rising trend or whether the data is more consistent with upward shifts in an otherwise stationary time series, ENP has undoubtedly risen over the 140 years since Confederation.[15]

The upward trend in ENP has been noted before, by Riker (1982) and Gaines (1999) for shorter periods, and by Chhibber and Kolman (2004) Johnston and Cutler (2009) for almost the same period as is studied here. So too has the nature of Canadian exceptionalism, as it is called - the fact that ENP is greater than 2 and rising even when measured at the constituency level - and, we can add here, even when a narrow definition of political parties is adopted. We can also note, as do

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that form the basis for the measures discussed in this section. We note that there are 10247 regular individual constituency elections in the 1st through the 41st election (excluding by-elections which we do not make use of).

[12] The narrow definition of parties we employ here is this: a party must have contested at least 4% of seats in at least one election, and have received at least 1% of the national vote in at least one election. There are 23 such parties in Canadian electoral history, to which we add an 'Other' category that includes numerous independents and self-declared smaller parties. In most studies we are aware of, parties that vote together in the House of Commons are considered to be part of the same party. But that may be regarded as an equilibrium outcome, rather than as the basis for a definition.

[13] The initial rise in the candidate measure of ENP reflects a gradual fall-off in the number of acclamations that were characteristic of the first three elections. On the development of the party system in Canada up to 1908, see recently Godbout and Hyland (2013).

[14] We may also note that the distribution across constituencies of the ENP numbers presented in Table 2, which is introduced and discussed further below, indicates that the frequency as well as the average size of departures from 2 is becoming progressively larger over time.

[15] A unit root test of ENP defined at the constituency level using a constant and time trend results in an ADF statistic of -5.44 which allows rejection of the hypothesis of a unit root at the 1% level (the MacKinnon critical value is -4.21). ENP defined over votes at the parliament level also allows rejection of a unit root on the same basis at 1 percent (ADF = -4.30).

Johnston and Cutler (2009), that the rise in ENP does not appear to be an example of Cox's (1994) non-Duvergerian equilibrium, where the third place candidate is so close to the first two that strategic defection to them makes no sense, as is suggested by the vote margins shown in Figure 2.

[Figure 2 here]

From either the perspective of Duverger's Law, or from Demsetz's contestability perspective, it appears that the evolution of ENP suggests that competitiveness declined in Canada over the 144 year period from 1867 to 2011. This interpretation is contrary to the many studies in which an upward trending ENP measure is taken as an indication of *increasing* competitiveness.

2.1 Alternative, HH related measures

Figure 1 also includes a number of newer measures that have been proposed as alternatives to ENP. Two indexes have been recently proposed by Gaines and Taagepera (2013) to better measure the role of third and other parties in producing departures from the long run equilibrium of 2.

The T-partyness index incorporates information on the votes received by parties other than the top two, while discarding all information about the distribution of these votes. This avoids the problems that ENP = 2 can result from patterns suggesting one party dominance and that it can also exaggerate departures from 2 that, nonetheless, look more or less like 2 party dominance (Gaines and Taagepera 2013, 2). The T-partyness index is defined by

$$Tparty_{jt} = (v_{2jt} - v_{3jt})(v_{1jt} + v_{2jt})/v_{1jt}. \quad (2)$$

It has a maximum of 1 with exactly 2 parties having equal vote shares, and decreases as the share captured by third or other parties rises.

Gaines and Taagepera also propose another measure that does not discard the distribution of third and other party's vote shares. This is the Euclidean distance of vote shares from (1/2, 1/2), again normalized to lie between 1 and 0 :

$$D2_{jt} = 1 - \sqrt{2}\, d_2 \quad (3)$$

where $d_2 = \sqrt{(0.5 - v_1)^2 + (0.5 - v_2)^2 + (0 - v_3)^2 \ldots . + (0 - v_J)^2}$.

Figure 1 presents these measures for the electoral history of Canada. As can be seen from the figure, both measures reflect much the same pattern as does ENP over the 1st through 41st elections, though D2 is less correlated with the candidate based ENP index than is Tparty. In particular, both exhibit increased competitiveness through the first twelve elections or so before indicating a fall-off in competitiveness (in conformity with our interpretation of ENP above). Table 1 presents the simple correlations among these and other indexes discussed in this section, confirming the co-movement of these series as discussed.

[Table 1 here]

Table 2 presents a breakdown by selected intervals suggested by Gaines and Taagepera of the ENP candidate based measure, Tparty and D2. This table shows informally that, in addition to revealing similar longer run trends in averages and the increasing frequency of departures from 2, that the judgment one can make about substantial breaks in Canadian electoral history using each of these indexes is also similar.[16]

[Table 2 here]

Additional HH related measures of competitiveness include the fragmentation index of Rae (1968) and the closeness index of Endersby, Galatas and Rackaway (2002). In Figure 3 we show Fragmentation of vote shares measured as 1 – HH at the constituency level. Not surprisingly, this index shows the same pattern of movement across time as does ENP.

[Figure 3 here]

Endersby, Galatas and Rackaway (2002) propose a different but related measure of competitiveness, based on the closeness that arises among any k candidates or parties. They argue that ENP mistakenly treats the outcome (.5, .5; ENP =2) as inherently different than (.33, .33, .33; ENP = 3) while both cases can be said to be examples of 'close' or highly competitive elections. Their index of the closeness of an election, *CL,* is defined as

$$CL_{jt} = K *^{K*} \prod_{i=1}^{K} v_{it} \qquad (4)$$

where K is taken by Endersby et al to be equal to the integer value of ENP_{jt}. $CL_{jt} = 0$ if there is an acclamation ($v_1 = 1$) ; and is = *1* if *K* candidates have equal vote shares.

Two measures of closeness among candidates are provided in Figure 3, with *K = 2* and *K = 3*, choices which we find to be more revealing than using constituency specific ENP as a cutoff. Here two different stories can be told. If the appropriate comparison is the top two candidates (as we have argued above) then the Closeness2 index shows decreasing closeness and falling competitiveness. On the other hand, if one argues that greater fragmentation represents more competition rather than less, then the Closeness3 index represents rising competitiveness through 1960. What is also indicated, however, is that in the most recent period, particularly from the 28th election in 1968 onward, the two measures have both moved downward.[17]

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[16] This table requires further analysis using structural break analysis in a subsequent version of the paper

[17] We also explored the Grofman-Selb index adapted to SMD plurality systems, defined as $GS_{jt} = 1 - \{v_{1jt}\left(v_{1jt} - v_{2jt}\right) + \sum_{k=2}^{K} v_{kjt}(v_{1jt} - v_{kjt})\}$. GS goes from 0 (as with an acclamation) to 1 (with equal vote shares.). The $v_{1jt}\left(v_{1jt} - v_{2jt}\right)$ can be thought of as reflecting the 1st candidate's concern with losing. The last term is about others (*k>1*) hoping to gain the seat. No allowance for the 123 2-seat constituencies is made here. So this approach is about losing a seat you have, or winning a seat you don't have. Note that this measure differentiates between (.5, .5, 0; GS = 1, CL = 1) and (.4, .4, .2; GS =0.96, CL(3 parties only) = .86). Note, too, that both (.5, .5, 0) and (.33, .33, .33) give us 1 for both the GS and CL. The GS index turns out to rise towards one by the 12th election, dips substantially in the 13th election in 1917, and then stabilizes at slightly less than one with little variability (std. dev. = 0.05 approx.) for the rest of Canadian electoral history.

We conclude our discussion of the ENP related indexes for Canada by stating that If the standard of reference for a highly competitive election is an equilibrium with 2 candidates at the constituency level, following Duverger and Demsetz, then apart from an initial period during which political parties were maturing (see Godbout and Hyland 2013 on the development of the Canadian party system before 1910), the degree of competitiveness in Canadian federal elections has trended downwards from the early 20th century until the present.

A final point before moving on to other classes of measures of competitiveness. While we have focused primarily on the common trend that arises across most of the ENP related measures of competitiveness, what is at least as important is the variation these indexes show across time. A cursory look across the figures does indicate that co-movement is common. Again, more definitive statistical analysis is required (in a subsequent version of the paper).[18]

3. Electoral contestability and uncertainty or unpredictability as bases for measuring competitiveness

In this section we consider measures of competitiveness that hinge on an understanding of why electoral outcomes are difficult to predict. In the political science literature the uncertainty of an election contest is widely used as definition of competitiveness. Blas and Lago (2009), Grofman and Selb (2009), and the earlier U.S. literature on vanishing marginals originating with Mayhew (1974) all suggest that in SMD parliamentary elections, a highly competitive election is one in which the winning vote margin $v_1 - v_2$ is 'small'.[19] From this perspective, a highly uncertain election outcome - one where the margin of victory is small - is (or was) a highly competitive election.

We begin our discussion of the uncertainty approach to electoral competitiveness by noting that, at first glance, an appeal to the uncertainty of election outcomes adds a different dimension to the evaluation of competitiveness than does the idea of the contestability of the political marketplace. From the contestability perspective, an election is competitive if the candidate or party that doesn't do what voters wish is replaced by an alternative candidate or party. This in turn requires a credible replacement. What is important in that case is that the threat of replacement must be real and the alternative must be credible. This reasoning suggests that to focus on the contestability of an electoral contest we need to measure the credibility of the threat to the governing party. An election is then more highly competitive the more credible ex ante is the threat to the incumbent candidate or party.

Is a contestable election also highly uncertain? Viewed from the perspective of why contestability is desired, uncertainty itself is not a necessarily ingredient. That is, while contestability restrains the options of the incumbent, replacement would arise only when incumbent behaves 'badly' and/or miscalculates the nature and distribution of voter preferences.

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[18] In later work, it will be both longer run trends and shorter run or transitory variations in competitiveness that we will investigate for their effects on government policies and economic outcomes.

[19] It is not clear from the cited whether this vote margin is to be measured ex ante or ex post. We consider this matter further.

More insight about uncertainty as a measure of competition may come from defining the closeness of a credible alternative. We could say that the more credible is an alternative, the closer the election should be to having an expected outcome that is unpredictable in the sense that the distribution of possible outcomes is not biased in favor of the incumbent party. A strong version of this hypothesis could be formulated as: ex ante there is no available information that can be used to better predict the outcome of the next election. In that case, the contestability hypothesis as just stated is politically analogous to the efficient markets hypothesis. A weaker, but perhaps more sensible version of this hypothesis would be that: outcomes across successive elections are statistically independent so that past election outcomes cannot be used to predict the current one.

Whether or not we can link economic and political understandings of uncertainty in relation to competitiveness, the idea that a competitive election is one that is 'too close to call' has a long tradition in the political science literature. In pursuing this idea further, we note that while the logic of 'closeness' applies to competition ex ante, that is, before the election itself, winning vote margins or other measures of closeness are most often measured ex post. The difference this makes is that while the expected winning margin could be zero, the actual outcome need not be zero and could be quite far from zero. This generates a problem for interpretation when current electoral conditions or outcomes are used to measure competition in current elections. To use only one extreme example, it is possible that the 35th election in 1993 in which the incumbent Progressive Conservative Party went from 169 to 2 of 295 seats was, ex ante, a highly competitive election. (We shall return to this example to see how it is categorized by the measures presented in what follows.)

If, in operationalizing 'too close to call', we simply replace the ex ante concept with its ex post outcome (plus a random term), we are implicitly invoking rational expectations and hence adopting the strongest version of the contestability hypothesis stated earlier. We guess that most social scientists would find the information requirements in such a hypothesis too strong. Hence in most of the measures presented below, other methods have been used to proxy expected closeness. Nevertheless no matter what information is used, all measures must deal with the ex ante - ex post distinction.

3.1 Unpredictability of outcomes in individual electoral contests at the constituency level

We begin our consideration of measures of the degree of electoral unpredictability in Canada at the constituency level by looking again at Figure 2, where three ex post average national measures are presented: the vote share received by the winning candidate (*v1*), the first place winning margin (*v1 – v2*), and the margin by which the second place candidate defeated the third placed candidate (*v2 – v3*).[20] What is interesting about this diagram is that the winning margin is itself very highly correlated with the vote share won by the first place candidate. The average vote share of the first place candidate exhibits a slight overall downward trend with the majority of the fall taking place by the 15th election and varying about 50 percent thereafter. The first place average winning margin varies directly with the first place vote share, remaining fairly constant at the 20 percent level with a very slight upward overall trend.

[20] Note that the large jump in both *v1* and *v1 – v2* in the 13th election of 1917 is due to the formation of a coalition government during WW1 which won over seventy percent of the vote and faced relatively little opposition.

What is less apparent from the diagram is that the vote share of the winning candidate is also highly correlated with a number of the earlier HH related measures of competitiveness. As Table 1 shows, *v1* is inversely correlated with ENP (-.886), Fragmentation (-.955), Closeness3 with 3 parties (-.747) and positively correlated with $v_1 - v_2$ (.732). In general, then, variation in the winner's winning margins is largely explained by variation in the winner's vote share which in turn is highly correlated with many of our other measures of competitiveness discussed in the previous section. However, in terms of indicating little overall trend, the simple winning margin (after abstracting from the anomaly of the 13th election in 1917) indicates little overall change in competitiveness across time, unlike the trending decline indicated by ENP and ENP related measures of competitiveness.

One difficulty with using the simple winning vote margin v_1-v_2 as a measure of competition is that constituencies are not equal in size in terms of actual votes. However if we account for this form of heterogeneity simply by using the share of votes cast to weigh constituency margin in the national average, the seats that were acclaimed in early elections and thus had had no constituency votes will drop from the calculus. This would result in the overweighing of ridings without acclamations in the total, and thus lower the perception of the winning margin. Because we wish to capture the lack of competition represented by acclamations in our national average, we treat those constituencies that had acclamations as if they would have experienced the same average vote share as non-acclaimed ridings and hence construct a set of revised vote shares scaled upwards on this projected national vote basis. The result is presented in Figure 4 as the weighted average of v_1- v_2. As can be seen in the both part of the figure, weighting makes little difference when the entire history is viewed as a whole.[21]

[Figures 4]

If we leave to one side the anomaly of the very large margin representing the coalition government of WWI, the time pattern indicated by the two winning margins shows two distinct phases. The first is one where the winning margin exhibits rapid fall from about 40 to 20 percent over the first four elections followed by a much slower decline through WWI. The post WWI period, however, is one long period of fluctuation about 20 percent, with more or less random variation between 15 and 25 percent of the vote. One can perhaps see a slight trend towards larger average winning margins, but this trend suggesting less competitiveness is minor compared to the trends exhibited by the earlier ENP and related measures.

An important weakness with the use of winning margins as an indicator of election closeness is that the size of any particular winning margin can be safe or unsafe depending on the volatility of the vote in that constituency. This point has been recognized for some time. See, for example Przeworski and Sprague (1971), Elkins (1974) who also discusses a few elections in Canada, and Bartolini and Mair (1990), among others.[22] A relatively small margin can be quite 'safe' (a concept to which we return later) if the vote in that riding varies little across elections while even a large

[21] One may also note that even though vote weighting makes little difference in the period following WW1, the adjustment does indicate a difference in the early time period when the numbers of acclamations in federal elections were more frequent.

[22] References to this issue in the context of the vanishing marginals debate in the U.S.

margin may be unsafe in a constituency that turns over its representation from election to election. For this reason constituency vote margins and their averages are often adjusted for volatility.

Adjusting vote margins for volatility is not easy to do over long periods of time because of redistricting. For a country like Canada that has had consistent growth in the number, and frequent changes in the size of individual constituencies, new ridings appear in many elections. Without a past, then, a constituency can have no history of vote variability and thus cannot be included in the construction of a volatility adjusted vote margin. To circumvent the loss of information on these winning margins through redistricting, we construct a large number of regional super-constituencies (80 in total) based on geographic regions that persist throughout Canada's election history and that can be used to establish small area vote volatility in the period when a new constituency is created.[23] The vote volatility of each constituency within the super-constituency is assumed to be the average volatility of the political party vote within the whole super-constituency, adjusted for growth in the number of registered voters and turnout.[24]

More specifically, the volatility measure used to scale the weighted winning margin for each constituency within a super-constituency *s*, is

$$volatility_{st} = \frac{\sum_{p=1}^{10} |v_{pst} - v_{pst-1}|}{2} * EAF_{st} * TAF_{st}, \qquad (5.1)$$

where v_{pst} is the vote share of party *p* in super-constituency *s* in election *t*, the sum (in this version of the paper) is over ten broadly defined political parties (including a residual 'Other' category), EAF_{st} is the proportional increase in electors election over election, and TAF_{st} is the similarly defined adjustment factor that allows for the change in voter turnout (= ballots cast /registered electors).[25]

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[23] To use one example, the area around Ottawa was used as the base for one of Ontario's 29 super-consistencies. Electorally it consisted of one 1 riding in 1867 and rose to include 7 ridings by 2011. Note that the use of one past period to construct our volatility measure means that the index can begin only in the second election. This also implies the unavoidable loss of some margin information in the first election following the introduction of a new territory into Canada—e.g., following Newfoundland's entry into Canada in 1949. To test the effects of defining superconstitutencies, we compare average ENP for superconstitutencies (using averages within each to represent a superconstitutencies) with constituency based average ENP. We also compare the national standard deviations across (the averages within) superconstitutencies with that across the individual constituencies. The resulting graphs are provided in an Appendix, and show that the averages and standard deviations for the two constructs track each other well. Also, vote volatility calculations based on superconstitutencies tally well with volatility calculated using the minimum vote required to turn a current election outcome into that of the previous election (Johnston 2010). These comparisons give us confidence in the use of superconstitutencies as a way of dealing with redistricting.

[24] It turns out that volatility is more or less unaffected by incorporating adjustments to allow for changes in the franchise and turnout.

[25] The definition of a party used here is: a party has 4% of the popular vote in at least one election, at least 1% of the seats in at least one election (there are 23 parties satisfying these two criteria), plus it must have won more than 1 seat in at least two elections. There are 10 parties satisfying these criteria, but we have included one of them, the Labour party, having a few seats in elections between 1920 and 1930) in the residual 'Other' category in this paper (by mistake). The parties are: the Bloc Quebecois, Social Credit, Liberals, Conservatives, Reform-Alliance, CCF_NDP, Raillement Creditiste, Progressives, United Farmers of Alberta, and Other (includes unknown). Other can be as much as 20 percent of the vote in some elections. Alternative definitions of party remain to be explored

The national average volatility adjusted margin *VAM* can then be defined as

$$VAM_t = \sum_{j=1}^{J} \frac{(v_{1jt} - v_{2jt}) * adj\_vw_{jt}}{volatility_{st}}, \qquad (5.2)$$

where the adjusted vote-weight for each constituency adj_vw_{jt} takes account of the absence of votes where there are acclamations by imputing an average vote to these ridings, and then consistently weighting non-acclaimed constituencies (less highly than otherwise) using the corresponding total synthetic national vote.

The winning 1-2 vote margin adjusted for volatility and averaged (using the constituency specific vote share weights) is shown in the top part of Figure 4. A value of say 2 for this measure of competitiveness means that the winning margin is approximately twice the number of 'floating' voters 'available' to the candidates. The first striking feature to note about the behavior of the volatility adjusted margin in Figure 4 is that it shows little in common with either the simple or the vote-weighted average of $v_1 - v_2$. The simple correlation of the volatility adjusted, weighted average and the weighted average vote margin is – 0.054. Clearly volatility adjustment is important. Second, the figure shows that Figure 4a shows that volatility does not dominate in producing the pattern of volatility adjusted vote margins over time. The simple correlation between volatility and the volatility adjusted margin is only -0.52.

[Figure 4a here]

Third, we can see in Figure 4 (or 4a) that in comparison to the ENP related measures, there is no trend in the volatility adjusted margin. Competitiveness here appears to be stationary over the entire electoral history. Fourth and finally, unlike the ENP related measures of competitiveness, this one suggest there are two periods in electoral history, not three, with the period before WWII (the 19th and 20th elections in 1940 and 45) having a larger variance.[26]

Evidently the volatility adjusted vote margin and the divergence of ENP from 2 (and related measures) tell quite different stories about the evolution of competitiveness in the Canadian electoral system. Which is correct? Or do both tell us something useful about different dimensions of electoral competition?

3.2 The Przeworski-Sprague (1971) party and constituency based indexes of competitiveness

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in future work. The definition of party hinges on how one treats differently named parties whose elected members that almost always tended to vote together in the House of Commons.

[26] Since the vote margins (shown in the lower part of Figure 4) are smaller before 1917, the reason for the larger and more volatile adjusted vote margins must stem from lower and less stable vote volatility then occurs after WWII – that is, it appears that volatility has both increased and become more stable after WWII, if not somewhat before. In fact, the coefficient of variation of volatility (adjusting for changes in the franchise and in turnout) is, for elections 1-12 (1867 – 1911) = .109/.142 = .768; and for elections 28-41 (1968 – 2011) = .096/.152 = .632.

The Przeworski and Sprague (1971) indexes (hereafter the PS indexes) are an interesting variation on the volatility adjusted measure shown in Figure 4. These are based in part on a view about the objective of political parties or candidates: namely that the primary objective of each party or candidate is to overcome the winner. Hence for each constituency the numerator in the measure is a weighted average over the parties (or over candidates) of the differences between the incumbent's vote share and each party's or candidate's vote share.

To define the party-based PS measure, we first compute the leading vote deficit h_{pj}^{t+1} for each party p in constituency j and election t+1:

$$h_{pj}^{t+1} = \frac{(v_{1jt} - v_{pjt})}{Volatility_{sti}} \quad (6)$$

where volatility is as defined above.

Note that PS tackle the ex ante-ex post issue raised earlier by using lags. The vote margin in the numerator of (6) refers to the previous election, while volatility depends on the previous election relative to the one two elections prior.

We then compute the following competitiveness index by party and constituency:

$$c_{pj}^{t+1} = \begin{cases} 1 \; if \; 0 \leq h_{pj}^{t} \leq 1 \\ \frac{1}{h_j^t} \; if \; h_{pj}^{t} > 1 \end{cases} \quad (7.1)$$

For a highly competitive party, *c = 1* because the vote deficit for that party is less than the floating vote or portion of the electorate that switched parties last time.

We then aggregate across all the parties in each constituency *j*:

$$C_j^{t+1} = \sum_{p=1}^{P} c_{pj}^{t+1} \, v_{pjt} \, . \quad (7.2)$$

A $C_j = 0$ indicates no competition in the constituency (and, accordingly, for ridings where there was an acclamations we set $C_j = 0$).

National average competitiveness *across all constituencies* is then defined as

$$C_{NJ}^{t+1} = \sum_{j=1}^{J} C_j^{t+1} \;\; adj\_vw_{jt+1}, \quad (7.3)$$

where adj_vw_{jt+1} is the adjusted (for acclamations) vote weight of each constituency previously defined.

We can also define a version of (7.3) using all candidates rather than all parties in each constituency, which avoids the problem of picking a definition of a party. As a further variation on (7.3), we may aggregate across parties rather than within the constituency, and then aggregate over parties at the national level.

Figure 5 shows all three of these PS-type volatility adjusted national indexes of competitiveness for Canadian electoral history. The strictly party based version has a much larger, high frequency component than the (party and candidate) constituency based versions. It appears to exhibit a negative trend, indicating a long run decline in competitiveness. The strictly candidate based version, which utilizes all available information and does not require us to define parties, suggests, on the other hand, that competitiveness is low and without trend from about WWI (the 13th election in 1917) on. Whether the party based versions look different when the definition of a party is altered remains to be determined by future work.

[Figure 5 here]

4. Competition for government: electoral uncertainty at the level of the country as a whole

So far the measures of competitiveness we have considered result from aggregating up from the constituency level. The last type of competitiveness index we investigate in this paper concerns competition for the government in the country as a whole. It is the party with the largest number of seats that almost always gets the first chance to win the confidence of the House and become the government. It is well known that a good electoral strategy in a SMD parliamentary system is to target marginal constituencies in any election campaign (see for example, Persson and Tabellini (2000, chap 8 among others.) This suggests that the number of marginal constituencies, where the outcome is highly uncertain, on some definition of uncertainty, will be a useful measure of the competitiveness of an electoral contest in the country as a whole. [27] An interesting variation on this is to consider the asymmetry of safe (or, non-marginal) seats among the main political parties, on the grounds that parties with relatively many safe seats have an advantage in the current election campaign.

To operationalize the idea that electoral competitiveness depends on the total number of marginal seats in an election, we obviously need to define what marginal means. Hartle (1985), an economist, suggested that a marginal constituency may be defined as one that cannot be ignored by the party in power in the sense that it is a district from which economic rents cannot be redistributed to other places without serious risk of electoral defeat. This is attractive as a definition of an electoral margin, but it is impossible to apply without actual measurement of the distribution of rents across constituencies, data which are currently unavailable.

Previous work in Canada on safe seats includes Lovinck (1973) and most recently Bodet (2014). Bodet essentially defines a safe seat as one that lies in the tail of a distribution of vote margins. He use a one standard deviation above the mean cutoff based on the distribution of vote margins in the previous election (and some ancillary criteria), above which a given margin in a particular constituency is sufficiently large to provide a substantial cushion of safeness to the incumbent party in that constituency.

[27] When asked some years ago, Richard Katz immediately suggested such a measure (personal communication)

To measure safe or alternatively marginal seats by party, we utilize the distribution of two types of volatility adjusted vote margins (as defined below) over *three previous elections* to define 1 standard deviation, 2 standard deviation and 95% tails, above which a constituency in the current election is considered to be safe for the incumbent party. These margins are defined on a party basis, because this is what matters for control of the House. Our definition of parties is the same as that used above (see fn 24).

The *historical* volatility adjusted margin for incumbent party *p* (which won at time t-1) in constituency *j* within super constituency *s* in election *t* is defined as

$$IPmargin1_{pjst} = \frac{(v_{1pjst-1} - v_{2jst-1})}{Volatility_{st-1}}. \quad (8.1)$$

Here the information used is all in the past at the time of the election. Any constituency that does not have an incumbent, for any reason, is considered to be marginal or not safe.

The second adjusted margin uses the idea that parties may have some information on the present. To formalize this we use the idea behind adaptive expectations: that what matters is a blend (here with equal weights) of the past and the present:

$$IPmargin2_{pjst} = a\left[\frac{v_{pjst} - v_{2jst}}{volatility_{st}}\right] + (1-a)\left[\frac{v_{1pjst-1} - v_{2jst-1}}{volatility_{st-1}}\right] \quad (8.2)$$

We call this the *adaptive* adjusted *margin.* This formulation allows safeness to account for the fact that the incumbent party may not win the current election at time t. If it does win, then the formula allows the *IPmargin* to be enhanced relative to the historical margin. However, should the incumbent come in second, there is no enhancement, and if the current outcome for *p* is third or worse, the measure is reduced.

In the formulas above we may adopt varying definitions of volatility. But we do not do so in this paper, using only the measure that allows for changes in the franchise and in turnout.

Forming a distribution of constituencies by the size of their *IPmargins* across a rolling average of three consecutive elections and applying the three cutoff rules leads to the proportion of seats considered to be safe in each election ψ_t. We then compute the proportion of marginal seats (in the total to be elected) in each election *t,*

$$MS_t = 1 - \psi_t, \quad (9)$$

as a measure of the competitiveness of the election as a whole. In this case, *MS = 1* indicates that 100% of the seats in Parliament are marginal, and correspondingly, that the election is highly competitive.

Figure 6 shows *MS* for the various critical values used to define a safe seat, using the adaptive definition of margins (8.2). The weaker criterion of 1 standard deviation leads to the conclusion that there are more safe seats and, thus, fewer marginal ones. Note the 35th election of 1993 in which

the incumbent government went from 169 to 2 seats out of 295. MS_{35} is close to 1 so that by this measure, the election was, whatever the outcome, highly competitive ex ante.

As for competitiveness across Canadian electoral history, as with volatility adjusted margins in Figure 4, the calculation of marginal seats suggest that there are two important periods within which competitiveness is stationary, again divided by WWII (the 20th election was held in 1945). The second period exhibits greater variability and a lower average degree of competitiveness, to a degree that not surprisingly depends on the critical value adopted.

Finally, we may adjust MS_t by the degree of asymmetry among parties in their numbers of safe seats to produce another measure (as if we did not have enough of them already). The idea here is that an election in which one party has most of the safe seats is not as competitive as one in which safe seats are equally spread, for any given number of marginal seats. To do so, we use the idea behind the *D2* measure of Gaines and Taagepera, and define the adjusted marginal seat statistic, AMS_t as:

$$AMS_t = MS_t * \left(1 - \sqrt{3/2} * \sqrt{\left(1/3 - S_{p1t}\right)^2 + \left(1/3 - S_{p2t}\right)^2 + \left(1/3 - S_{p3t}\right)^2}\right) \quad (10)$$

where S_{pk} is the number of safe seats for the *kth* party in an election. In (10) in this paper, we use a simple three 'party', broadly defined classification: Liberals, Conservatives and All Other parties and independents. Here Liberal and Conservative is defined traditionally to include all parties that tended to vote alike with the main party in Parliament. *AMS* = *MS* if all safe seats are equally distributed. *AMS = 0* if one party has all the safe seats.

Figure 7 presents the resulting calculations. Asymmetry in safe seats shrinks the size of the *MS* index. The picture is now more complex, as the distribution of the volatility adjusted margins (over the previous three elections) above 1 standard deviation appears to change over time. Again there appears to be two periods - before and after WWII - though it is not obvious how variability over time is evolving.

5. Conclusions and Suggestions for Further Work

We conclude this preliminary paper with a list of questions that require further thought:

> i) What do the measures we have defined and calculated tell us about the trend and shorter run variation in competitiveness in Canada?

Looking across the indexes as a set one may ask (based on using ENP and related measures) if there are three regimes in Canadian electoral competitiveness - before WWI, the interwar period, and post WWII, or (based on using volatility adjusted margins) just two - before and after WWII. If electoral competitiveness is less volatile before WWI (using volatility adjusted margins), or alternatively (using marginal seats judged by a 2 standard deviation test), more volatile after WWII? We may ask if electoral competitiveness is stationary over almost the entire post WWII period (again using volatility adjusted margins)? We may also ask if competitiveness has tended to

deteriorate after WWII as the ENP related indexes and the party-based PS version of adjusted margins appear to indicate?

To sort out these apparently conflicting results, we need to deal with the following questions:

ii) Which of these measures is best? By what standard?[28]

iii) Or do they all tell us something different and useful?

iv) Also, are there other measures we should consider?[29]

Finally, we must ask:

v) Does competition matter for policy outcomes? And how should we judge those effects?

With respect to this last question, we note finally that some of the measures we have discussed appear to be stationary, which raises the question of how a stationary factor could have longer run effects on trending economic or social phenomena (via transitional gains traps and/or loss aversion?) or whether electoral competitiveness matters only in the shorter run.

[28] Could we use the approach of Friedman to choosing among alternative definitions of money here? Friedman chooses the definition that gives the most stable relationship between monetary growth and inflation. We have some ideas about how to adopt this idea for use in the present context, but that is for another time.

[29] We may include here the ratio of decided to undecided voters based on Gallup poll data available in Canada from 1947 or so (see Besley et al 2010 for the role of such a measure on a spatial voting model); and the probability of the interelection vote swing required for defeat of the incumbent (see for example, Kayser and Lindstädt 2014).

References

Austen-Smith, David (1987). Parties, districts and the spatial theory of elections. *Social Choice and Welfare*, 4(1): 9-23.

Bartolini, Stefano and Peter Mair (1990). *Identity, Competition and Electoral Availability*. Cambridge University Press.

Baumol, William J. (1982). Contestable Markets: An Uprising in the Theory of Industry Structure. *American Economic Review* 72(1): 1-15.

Besley, T. Persson, T. & Sturm, D. M. (2010). Political competition, policy and growth: theory and evidence from the united states. *Review of Economic Studies*, 77: 1329–1352.

Blais, André and Ignacio Lago (2009). A general measure of district competitiveness. Electoral Studies 28: 94-100.

Bodet, Marc André (2014). Strongholds and Battlegrounds: Measuring Party Support Stability in Canada. *Canadian Journal of Political Science* 46(3): 575-596.

Callander, S. (2005). Electoral competition in heterogeneous districts. *Journal of Political Economy*, 13: 1116-1145

Chhibber, P., & Kollman, K. (1998). Party aggregation and the number of parties in India and the United States. American Political Science Review, 92(2): 329–342.

Cox, Gary W. (2005). Electoral Institutions and Political Competition. In C. Menard and M.M. Shirley (eds.) *Handbook of New Institutional Economics*, Springer: 69-89.

Cox, Gary W. (1997). Making Votes Count: Strategic Coordination in the World`s Electoral Systems. Cambridge University Press.

Cox, Gary W. (1994). Strategic Voting Under the Single Nontransferable Vote. *American Political Science Review* 88(3), 608-621.

Congleton, Roger D. (2014). The contractarian constitutional political economy of James Buchanan. *Constitutional Political Economy* 25(1):39-67 .

Congleton, Roger (2011). Perfecting Parliament. Cambridge University Press.

Demsetz, H. (1968). Why Regulate Utilities? *Journal of Law and Economics*, 11(1): 55-65.

Duverger, M. (1954). *Political Parties: Their Organization and Activity in the Modern State.* London: Methuen.

Elkins, David J. (1974). The Measurement of Party Competition. *American Political Science Review* 68(2): 682-700.

Endersby, James W., Steven E. Galatas and Chapman B. Rackaway (2002). Closeness Counts in Canada: Voter Participation in the 1993 and 1997 Federal Elections. *Journal of Politics* 64(2): 610-631.

Ferris, J. S, Park, S. B. & Winer, S. L. (2008). Studying the role of political competition in the evolution of government size over long horizons. *Public Choice*, 137: 369-401.

Gaines, B. J. (1999). Duverger's law and the meaning of Canadian exceptionalism. *Comparative Political Studies,* 32(7): 835–861.

Gaines, B.J. & Taagepera, R. (2013). How to operationalize two-partyness. *Journal of Elections, Public Opinion & Parties* 10: 1-18.

Godbout, Jean_Francois and Bjorn Hoyland (2013). The Emergence of Parties in the Canadian House of Commons (1867 - 1908). *Canadian Journal of Political Science* 46(4): 773-797.

Golden, Miriam and Brian Min (2013). Distributive Politics Around the World. Annual Reviews of Political Science 16: 73-99.

Grofman, Bernard and Peter Selb (2009). A fully general index of political competition. *Electoral Studies* 28: 291–296.

Hartle, D. (1985). Achieving Electoral Success in a Multi-Constituency System Through Discriminatory Parties. Unpublished, Economic Council of Canada.

Jacobson, G. (2006). *The politics of Congressional elections, 7th edition.* New York NY: Longman.

Johnston, Richard and Fred Cutler (2009). The Puzzle of Local Three-Party Competition. In B. Grofman, A. Blais and S. Bowler. *Duverger's Law and Plurality Voting*. Springer 2009: 83-96.

Johnston, Richard, J. Scott Mathews and Amanda Bittner (2007). Turnout and the Party System in Canada, 1988 - 2004. *Electoral Studies* 26: 735-745

Johnston, Richard (2010). Political Parties and the Electoral System. In John C. Courtney and David E. Smith. T*he Oxford Handbook of Canadian Politics Online*.
http://www.oxfordhandbooks.com/view/10.1093/oxfordhb/9780195335354.001.0001/oxfordhb-9780195335354-e-12

Kayser, Mark Andreas and René Lindstädt (20114). A cross-national measure of electoral risk. Unpublished, January.

Laasko, M. & Taagepera, Rein (1979). Effective number of parties: a measure with application to West Europe. *Comparative Political Studies*, 12: 3–27.

Lovink, J. (1973). Is Canadian Politics Too Competitive?. *Canadian Journal of Political Science*, 6: 342-379

Mayhew, D. R. (1974). Congressional elections: the case of the vanishing marginals. *Polity*, 6(3), 295-317.

Persson, Torsten and Guido Tabellini (2000). *Political Economics: Explaining Economic Policy*. MIT Press.

Pedersen, Mogens (1979). The dynamics of European party systems: Changing patterns of electoral volatility. *European Journal of Political Research* 7: 1-26.

Przeworski, Adam and John Sprague (1971). Concepts in Search of an Explicit Formulation: A Study in Measurement. *Midwest Journal of Political Science* 15(2): 183-218.

Przeworski, Adam. (2010). *Democracy and the Limits of Self-Government*. Cambridge University Press.

Rae, Duncan W. (1967).*The Political Consequences of Electoral Laws*. Yale University Press

Riker, William H. (1982). The Two-Party System and Duverger`s Law: An Essay on the History of Political Science. *American Political Science Revie*w 76(4): 753-766.

Roemer, John E. (2001). *Political Competition*: *Theory and Applications*. Cambridge: Harvard University Press.

Sen, Amartya (1999). *Development As Freedom*. New York: Alfred A. Knopf

Singh, S., I. Lago and André Blais (2011) Winning and competitiveness as determinants of political support. *Social Science Quarterly* 92(3): 695-709.

Taagepera, R. (2007). *Predicting Party Sizes: The Logic of Simple Electoral Systems*. Oxford: Oxford University Press.

Winer, Stanley L. , Lawrence W. Kenny and Bernard Grofman (2014). Explaining variation in the competitiveness of U.S. Senate elections, 1922–2004. *Public Choice*. DOI 10.1007/s11127-014-0176-0.

Figure 1
Expected Number of Candidates and National Parties, TPartyness and D2 (Gaines/Taagepera 2013)

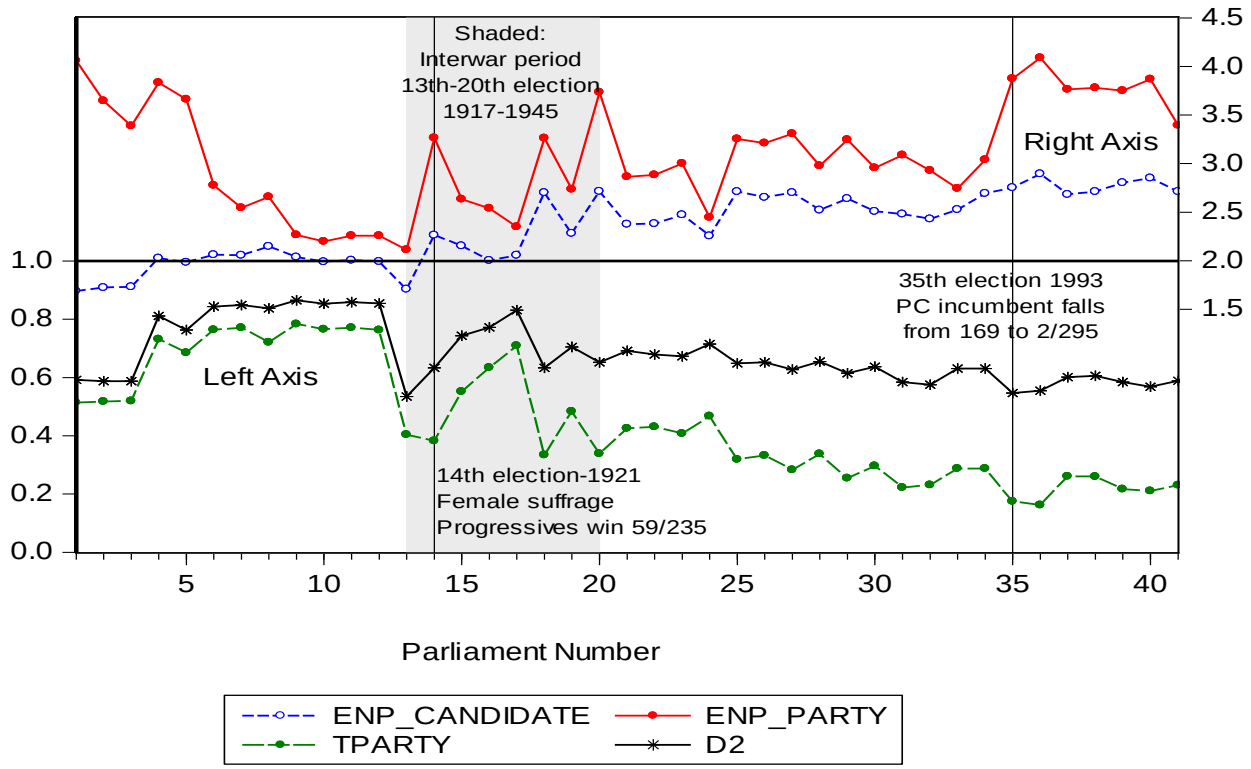


Figure 2
Winning voteshare (v1) and first (v1-v2) and second place (v2-v3) margins

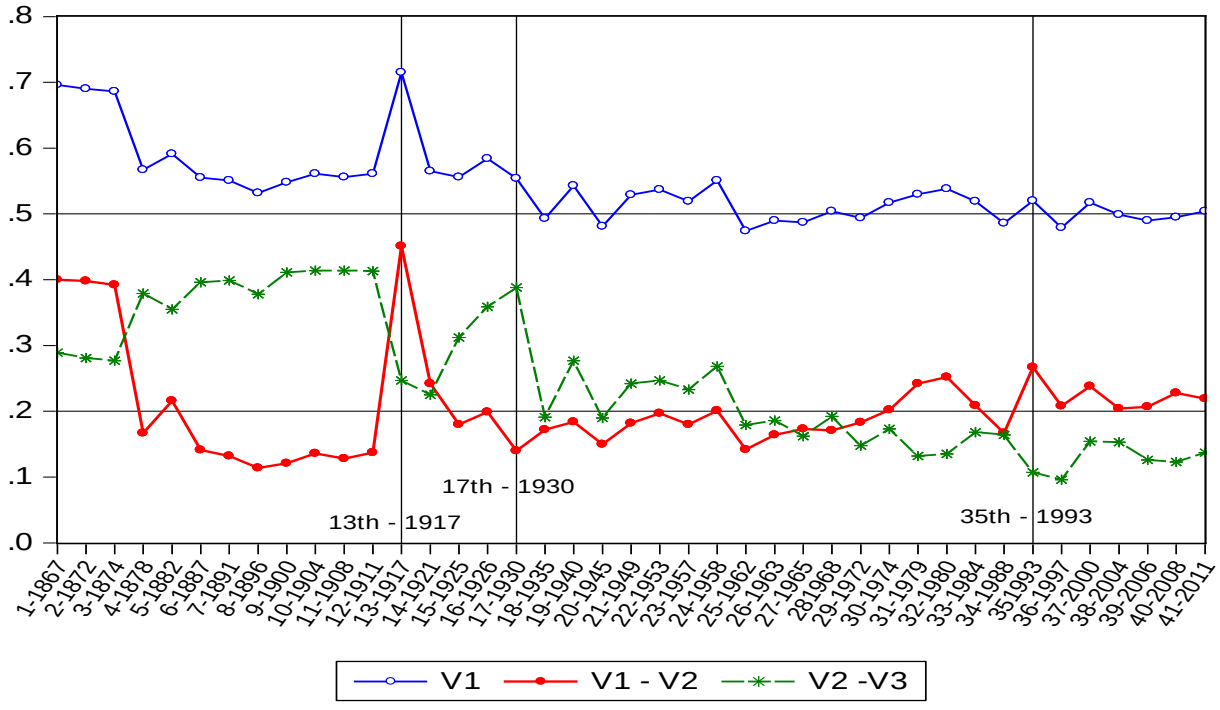


Table 1
Correlations among ENP Related Competitiveness Measures
(|ρ| > .5 highlighted in yellow)

	V1	ENP_Cand	ENP_Party	Fragment	V1_V2	D2	Tparty	Close2	Close3
V1	1	-0.886099	-0.456335	-0.954509	0.732196	0.04354	0.4435	0.299426	-0.7466
ENP_Cand	-0.8861	1	0.76153	0.970952	-0.33762	-0.4888	-0.789	-0.697181	0.914491
ENP_Party	-0.45634	0.76153	1	0.617375	0.177573	-0.7502	-0.821	-0.866721	0.704203
Fragment	-0.95451	0.970952	0.617375	1	-0.51126	-0.3105	-0.673	-0.535329	0.880909
V1-V2	0.732196	-0.337623	0.177573	-0.51126	1	-0.6433	-0.276	-0.425973	-0.143087
D2	0.043538	-0.488834	-0.750201	-0.31049	-0.64328	1	0.9079	0.954822	-0.645812
Tparty	0.443464	-0.789866	-0.821529	-0.67380	-0.27684	0.90793	1	0.96324	-0.895955
Close2	0.299426	-0.697181	-0.866721	-0.53532	-0.42597	0.95482	0.9632	1	-0.785093
Close3	-0.7466	0.914491	0.704203	0.880909	-0.14309	-0.6458	-0.896	-0.785093	1

Figure 3
Fragmentation (Rae 1968) and Closeness (Endersby et al 2002)

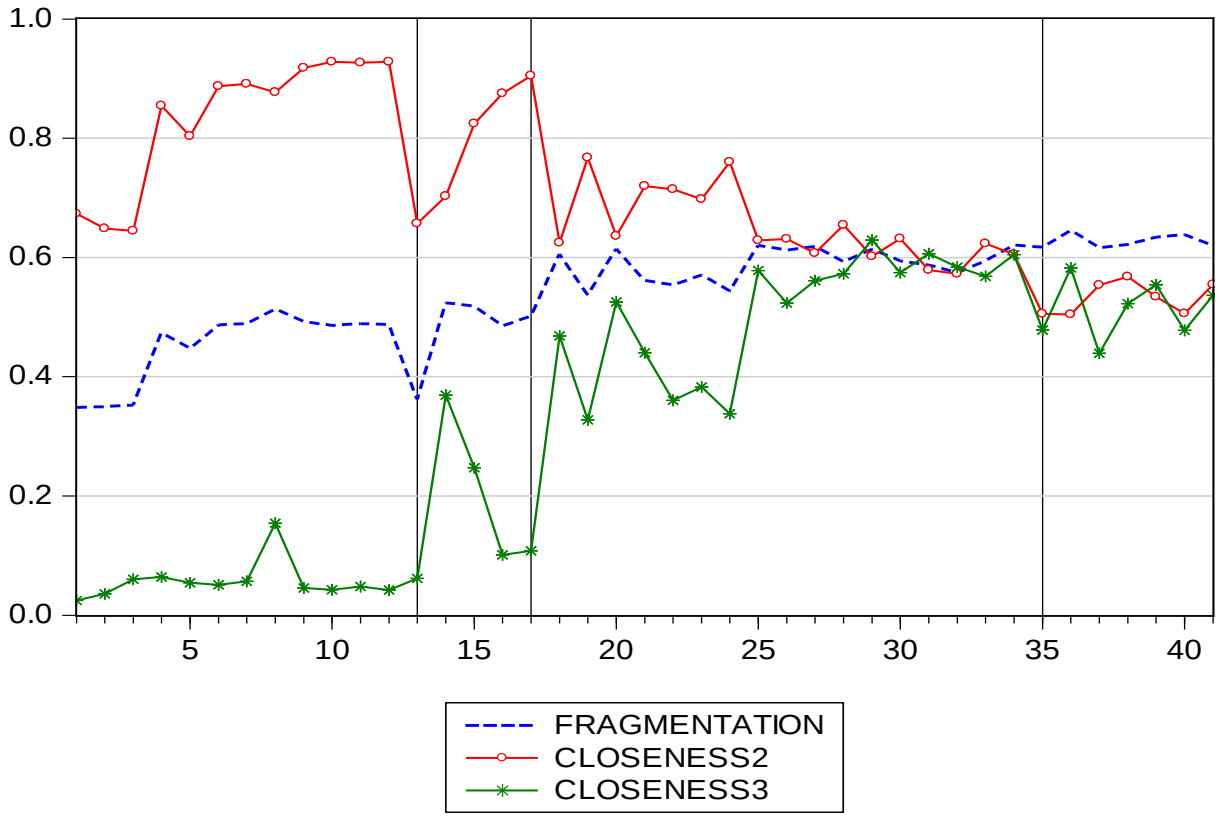


Table 2: Proportions of observations of ENP Tparty and D2 within stated intervals.

Shaded areas suggest regimes in Canadian electoral history
(Intervals as suggested by Gaines and Taagepera, 2013)

Parliament - Year of Election	1.5≤ENP≤2.5	1.75≤ENP≤2.25	T≥0.5	D2≥0.7
1 - 1867	0.6685	0.5856	0.5922	0.5531
2 - 1872	0.6050	0.5600	0.6290	0.6129
3 - 1874	0.5922	0.5388	0.6237	0.6183
4 - 1878	0.7864	0.7524	0.8763	0.8817
5 - 1882	0.7536	0.7204	0.8482	0.8220
6 - 1887	0.8419	0.7907	0.9026	0.9128
7 - 1891	0.8372	0.8140	0.9333	0.9179
8 - 1896	0.7793	0.7183	0.8492	0.8593
9 - 1900	0.8826	0.8638	0.9447	0.9397
10 - 1904	0.9252	0.8738	0.8942	0.8990
11 - 1908	0.9186	0.8643	0.9070	0.8930
12 - 1911	0.9412	0.8914	0.8977	0.8837
13 - 1917	0.6426	0.4809	0.4133	0.3911
14 - 1921	0.5830	0.3957	0.3422	0.3422
15 - 1925	0.7306	0.5837	0.6034	0.6245
16 - 1926	0.8204	0.7143	0.7384	0.7173
17 - 1930	0.8857	0.8041	0.8270	0.8270
18 - 1935	0.4082	0.2490	0.2448	0.3402
19 - 1940	0.6408	0.4694	0.5021	0.5394
20 - 1945	0.4122	0.2449	0.2946	0.3859
21 - 1949	0.6298	0.3931	0.4031	0.4651
22 - 1953	0.5849	0.4075	0.4061	0.4521
23 - 1957	0.5623	0.4415	0.3640	0.4330
24 - 1958	0.7585	0.5811	0.4713	0.5364
25 - 1962	0.3396	0.1623	0.2490	0.3257
26 - 1963	0.3660	0.1887	0.2720	0.3602
27 - 1965	0.3585	0.1698	0.2146	0.2720
28 - 1968	0.4773	0.2045	0.2424	0.4053
29 - 1972	0.3561	0.1364	0.0947	0.2159
30 - 1974	0.5227	0.1856	0.1970	0.3333
31 - 1979	0.4823	0.2340	0.0887	0.1702
32 - 1980	0.4787	0.2411	0.0816	0.1986
33 - 1984	0.4504	0.1560	0.1738	0.3156
34 - 1988	0.3254	0.1017	0.1525	0.2814
35 - 1993	0.3661	0.1864	0.0712	0.0949
36 - 1997	0.1794	0.0797	0.0365	0.0797
37 - 2000	0.3189	0.1561	0.1429	0.2292
38 - 2004	0.3214	0.1104	0.1104	0.1981
39 - 2006	0.1851	0.0779	0.0812	0.1558
40 - 2008	0.1851	0.0844	0.0942	0.1526
41 - 2011	0.2825	0.0942	0.0779	0.1461

Figure 4
Simple, Weighted and Volatility Adjusted Vote Margins

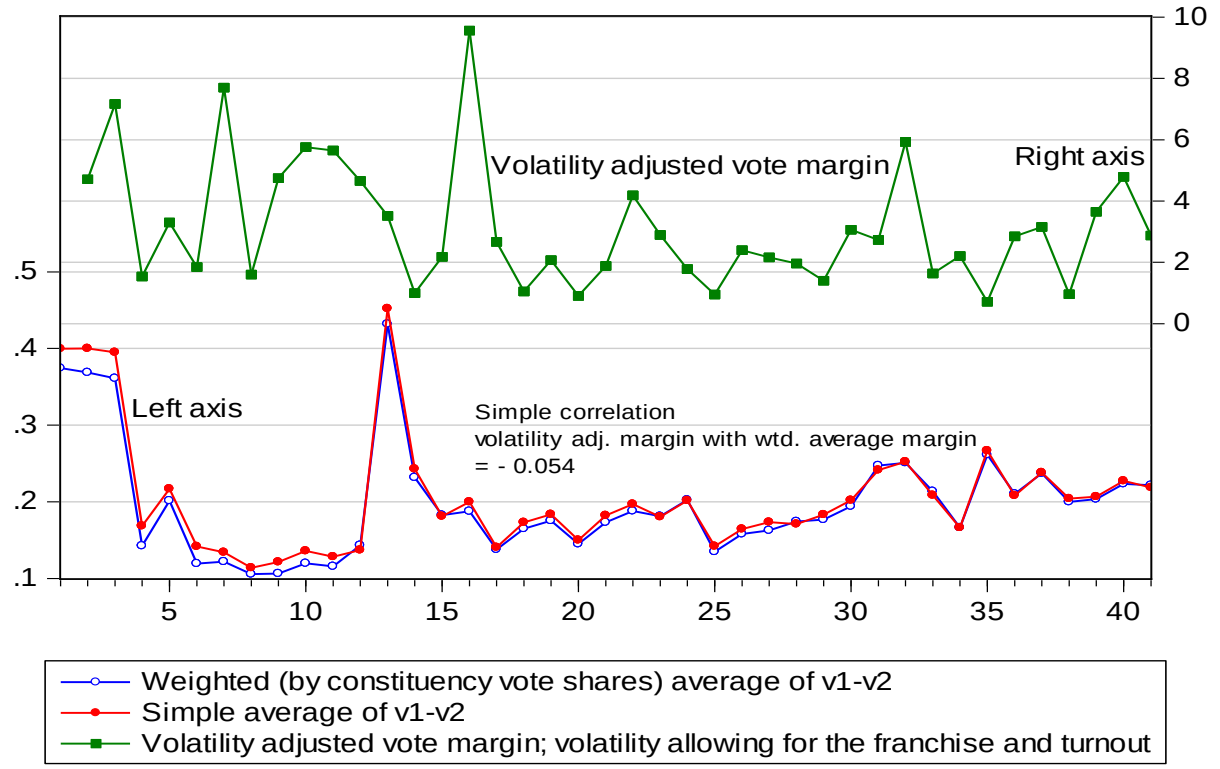


Figure 4a
Volatility versus the Volatility Adjusted Vote Margin

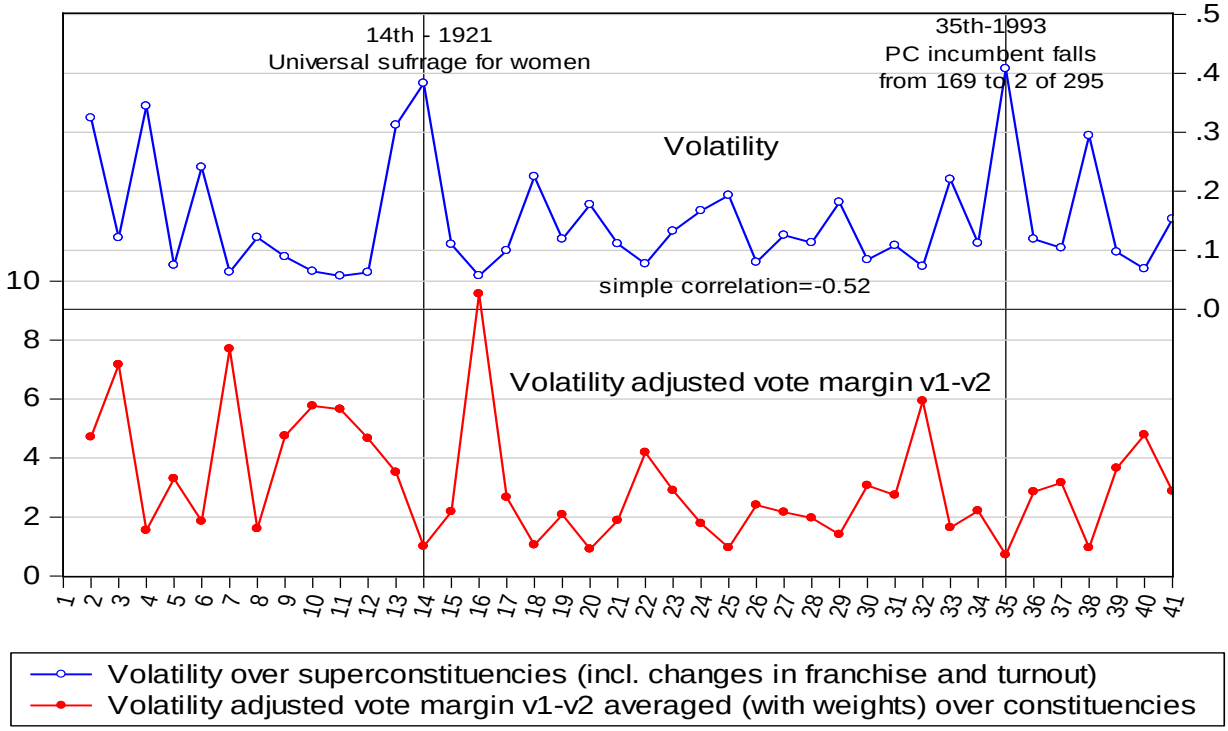


Figure 5
Three Przeworski-Sprague Measures of Competitiveness
(With volatility adjusted for changes in the franchise and in tunrout)

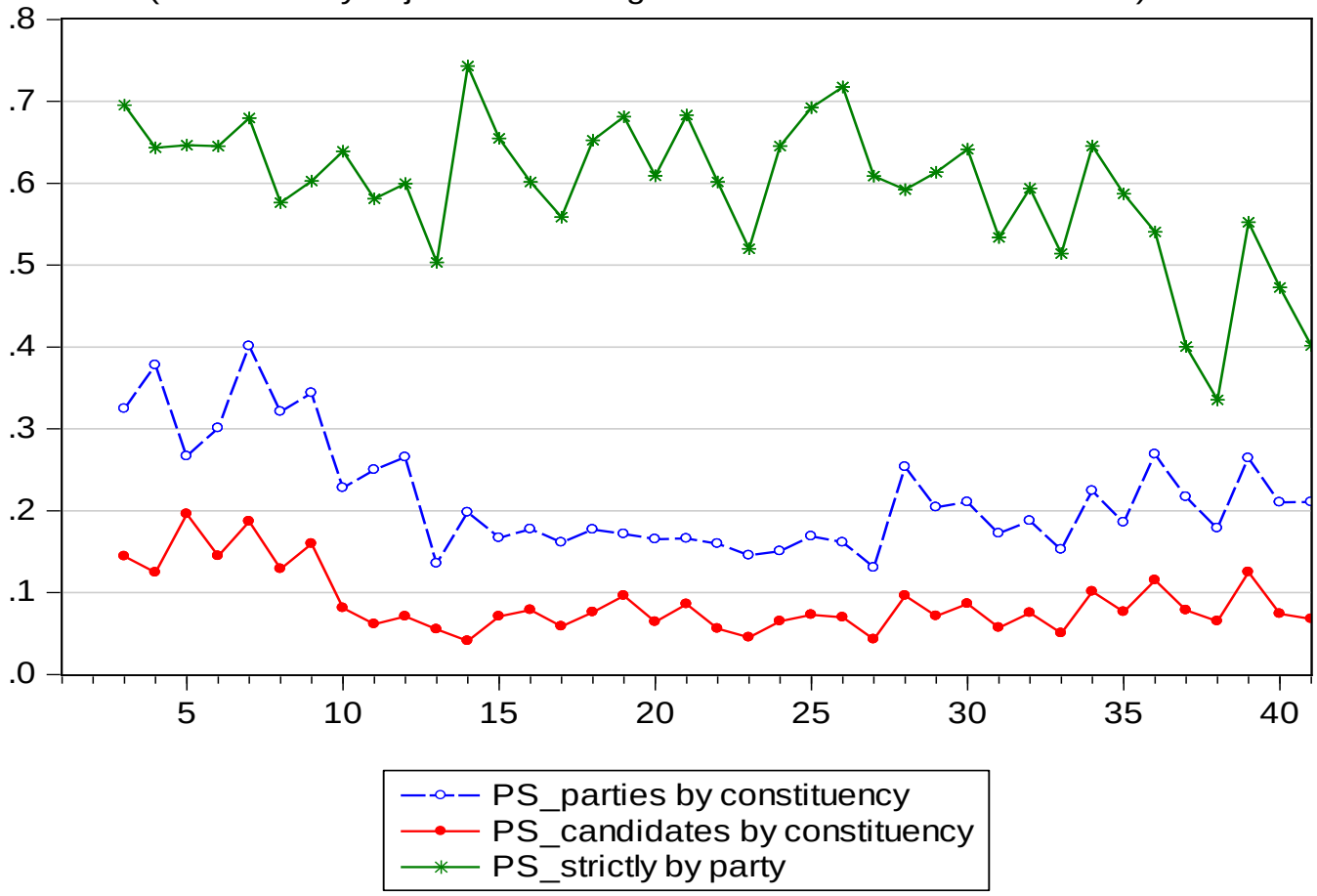


Figure 6
Proportion of Marginal Seats, Defined Using Adaptive Definition of Volatility Adjusted Margins.
(1 indicates all seats are marginal)

Both past and current adjusted margins matter equally in deciding what is 'safe'.
Past three elections used to form distribution of adjusted margins with which safeness is judged.

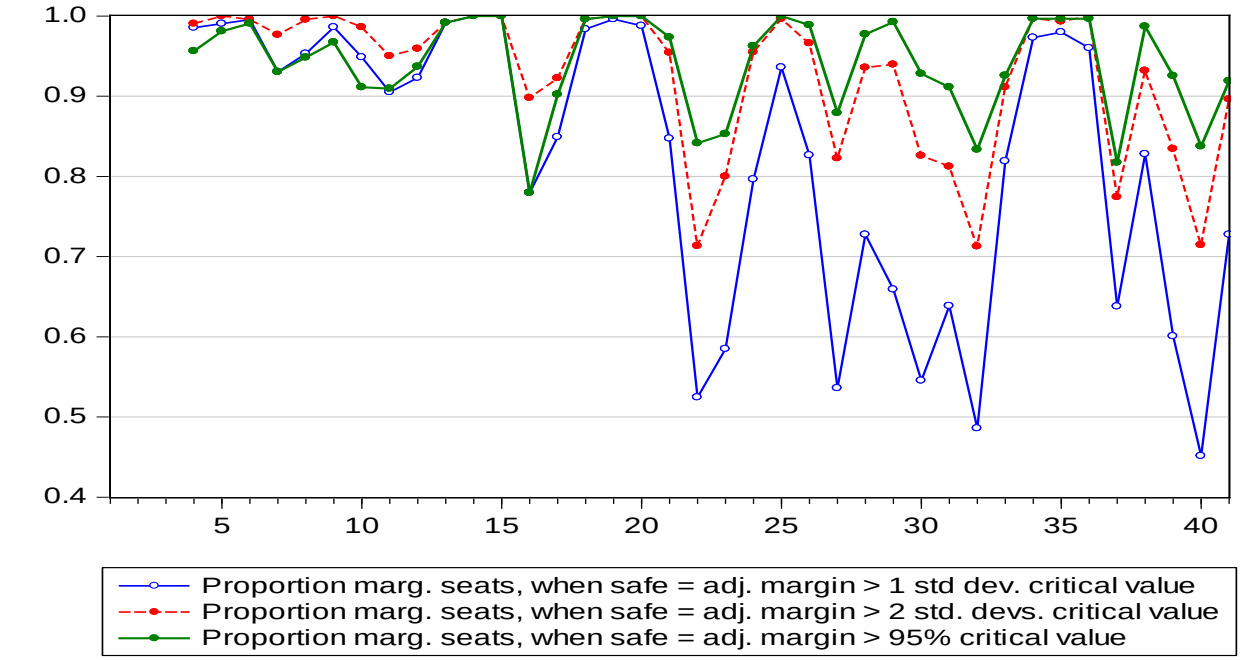
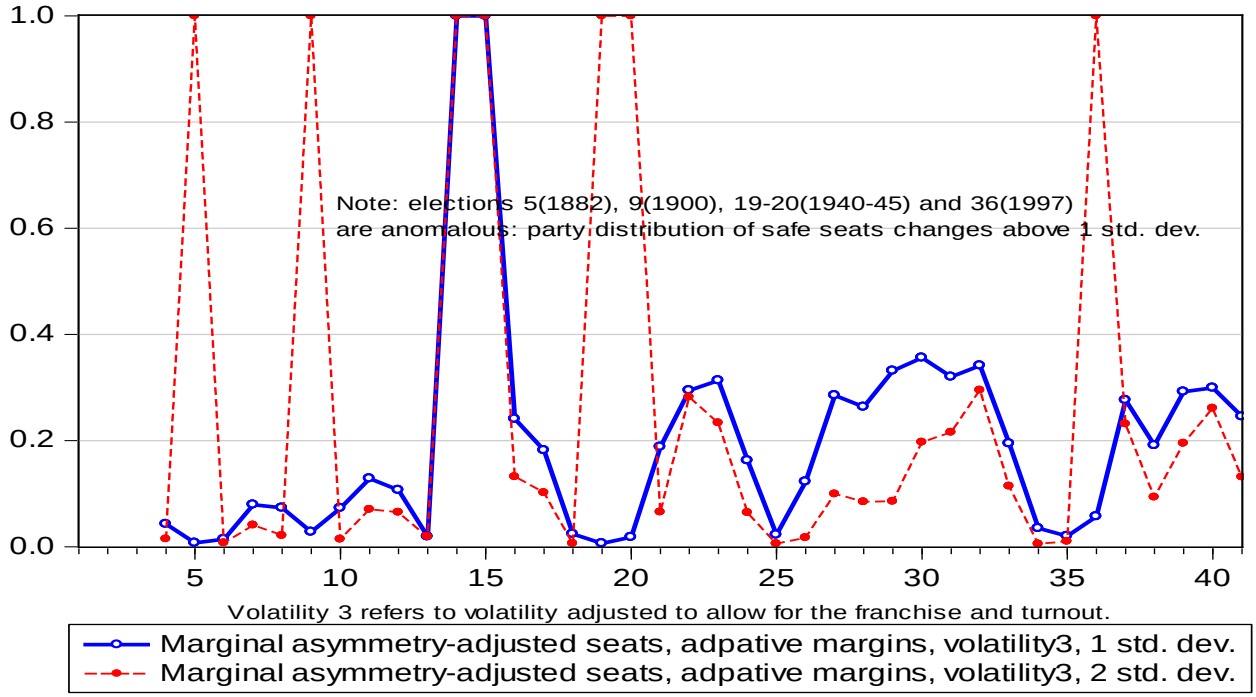
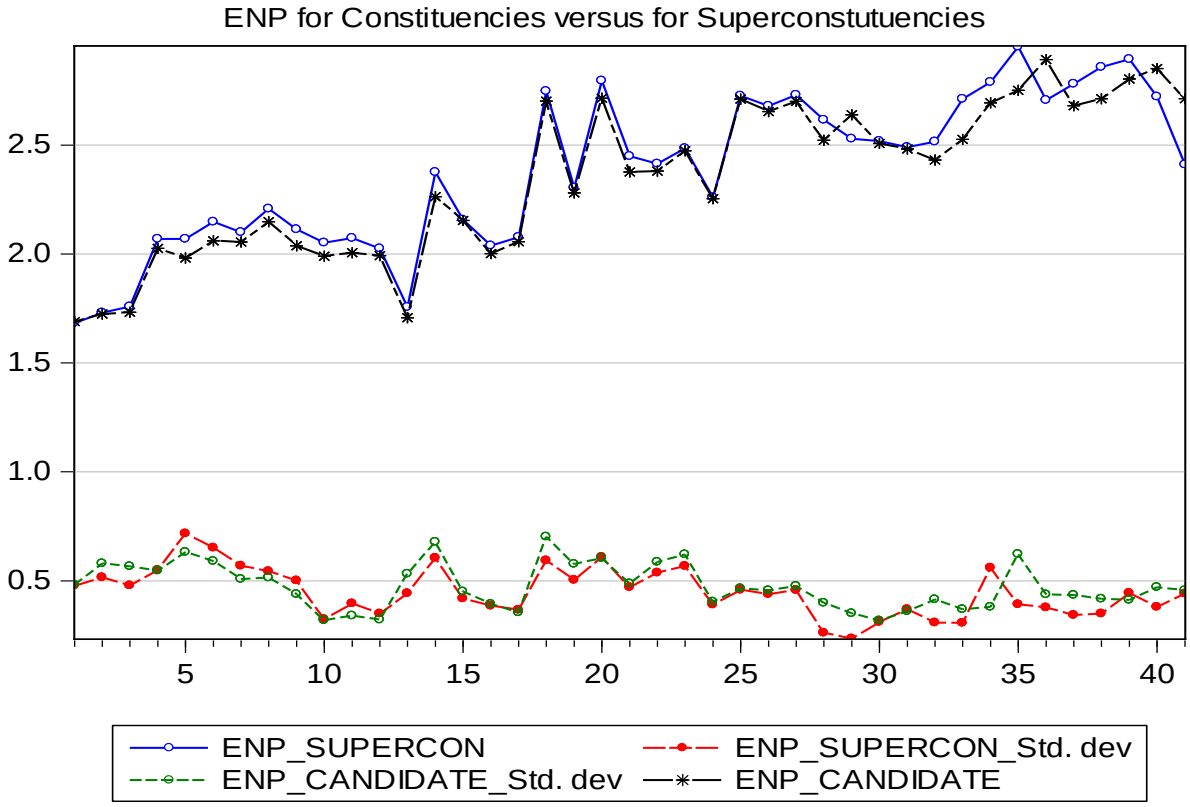


Figure 7
Marginal Seats Adjusted for Asymmetry Among Parties in Safe Seats
Parties: Liberal, Conservative and All Other
(Critical values for defining safe seats = 1 and 2 std. devs.)



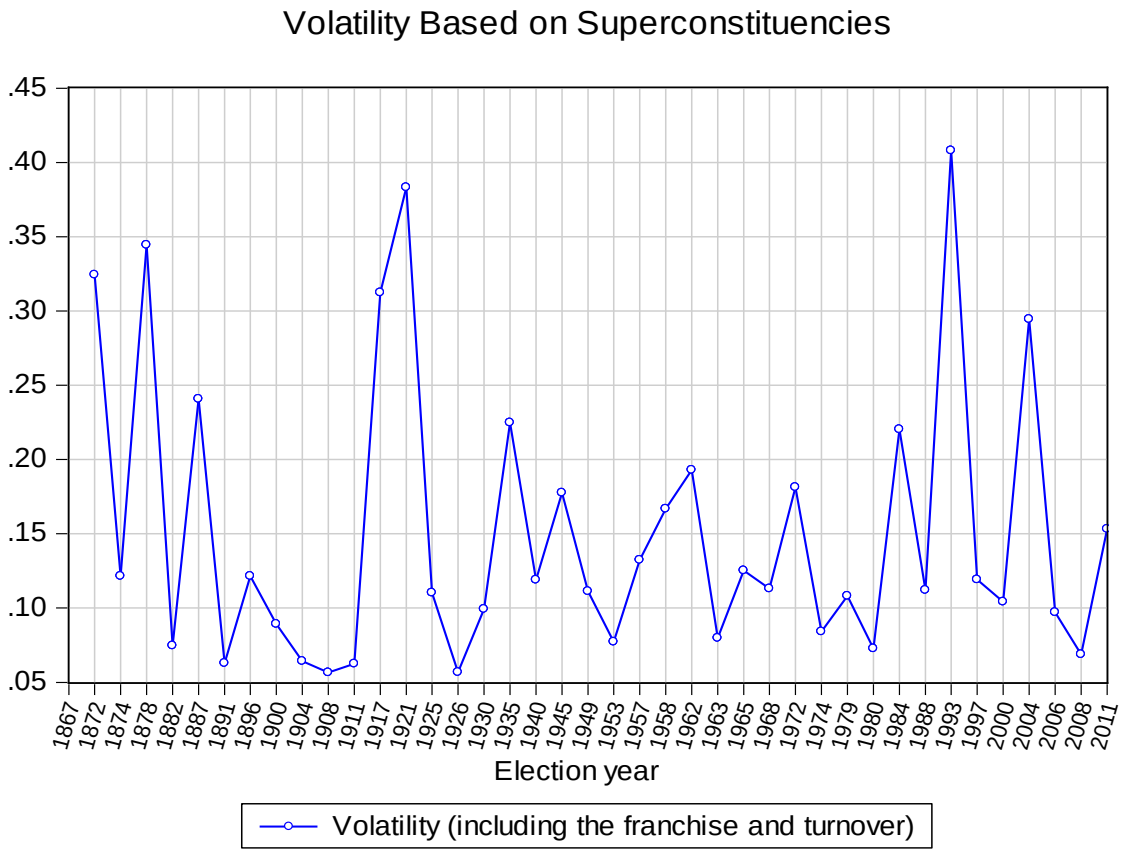
Appendix: Using Superconstituencies to Deal With Redistricting

1. ENP by election for constituencies versus ENP by election for superconstituencies



This graph shows ENP and its standard deviation for reach election, calculated as an average of candidate vote shares by constituency and by superconstituency. For ENP, the correlation of the two series is 0.968. For the standard deviations, the correlation is 0.779.

2. Volatility using superconstituencies



This peaks from here are the same as those calculated by Johnston (2010) in his Figure 12.1 (p3 of 36). His measure of volatility is based on Pedersen (1979) and measures the minimum reallocation of votes required to turn the current distribution of vote shares by party into that of the previous election. Our volatility measure, which is given in the text, after the 10th election in 1904 has, peaks in 1921, 1935, 1945, 1962, 1984, 1993 and 2004. These match Johnston's calculations.

The peaks in 1878, 1887 and 1896 do not appear in Johnston's figure. which instead shows a peak in 1900. It is possible that the differnces before 1900 stem in part from the treatment of elections with acclamations, of which there were many in the first 3 elections. We assign a vote share of 1 to a candidate who is acclaimed.