# Playing the synthesizer with Canadian data: Adding polls to a structural forecasting model

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**Abstract.** Election forecasting has become a fixture of election campaigns in a number of democracies. Structural modeling, the major approach to forecast election results, relies on 'fundamental' economic and political variables to predict the incumbent's vote share usually a few months in advance. Some political scientists contend that adding vote intention polls to these models—i.e., synthetizing 'fundamental' variables and polling information—can lead to important accuracy gains. In this paper, we look at the efficiency of different model specifications to predict Canadian federal elections from 1953 to 2015. We find that vote intention polls only allow modest accuracy gains late in the campaign. With this backdrop in mind, we then use different model specifications to make ex ante forecasts of the 2019 federal election. Our findings have a number of important implications for the forecasting discipline in Canada as it addresses the benefits of combining polls and 'fundamental' variables to predict election results, the efficiency of varying lag structures, and the issue of translating votes into seats.

**Keywords.** Canada; election forecasting; polls; structural model; synthetic model

**Introduction**

For some time now, political scientists have tried to forecast election results using different modelling strategies (for a review, see Arzheimer, Evans & Lewis-Beck 2017). According to Lewis-Beck & Tien (1999), most forecasting methods and approaches can be classified in two broad categories, that is macro-modelling and micro-modelling. ‘Structuralists’ are the most common type of macro-modellers (Bélanger & Trotter 2017; Lewis-Beck 2005). Most structural models are founded on the theory of retrospective voting (Fiorina 1981; Key 1966): they consider elections as referenda on the performance of the incumbents in terms of economic growth and issue management (see, for example, Jérôme, Jérôme-Speziari & Lewis-Beck 2017; Lewis-Beck & Tien 2016a; Mongrain forthcoming). Hence, structural models rely heavily on ‘fundamental’ variables reflecting how well the overall political and economic situation evolved during the incumbent’s time in office. Simply stated, if citizens believe their current officials have done a bad job at governing the country, they will vote against them; if they believe the opposite, they will support their re-election bid (Lewis-Beck & Paldam 2000; Lewis-Beck & Stegmaier 2013). For their part, micro-modellers work with individual-level data such as vote intentions or vote expectations. By mobilizing a variety of methods and techniques that range from simple averaging to more complex Bayesian modelling procedures, many researchers now aggregate poll results in order to offset the biases associated with individual surveys (Jackson 2018; Pasek 2015; Pickup & Johnston 2007).

Synthetic models blend multiple prediction approaches (Pasek 2015, p.603). ‘Synthesizers’ usually combine poll data with a number of political and/or economic indicators in the same forecasting equation (see, for example, Campbell 2016; Campbell & Wink 1990; DeSart & Holbrook 2003; Holbrook & DeSart 1999; Erikson & Wlezien 2016; Lewis-Beck & Dassonneville 2015a, 2015b; Lewis-Beck, Nadeau & Bélanger 2016). Synthetic modelling also includes meta-forecasts, such as the PollyVote (Cuzán, Armstrong & Jones 2005; Graefe et al. 2016) which makes forecasts by merging together the estimates of multiple prediction methods, namely polls, prediction markets, expert judgment, citizen forecasts, econometric models, and index models. Some aggregators (including FiveThirtyEight and the HuffPost Pollster in the United States) also rely on a mix of vote intention polls and fundamental variables. Note that, contrarily to Structuralists, Aggregators and Synthesizers can afford to update their models as new polling data become available.[1] Hence, synthetic models usually have a structural 'core' and a dynamic polling component.

Despite the fact that forecasting models have spread to a wide variety of democracies, the lion's share of the literature on election forecasting is still mostly divided among four countries, that is the United States, France, Great Britain, and Germany. Election forecasting has been a somewhat neglected discipline in Canada. Although election polling and poll aggregation for federal (and provincial) races have greatly expanded in the last few years, this is not the case for fundamental-based models. In the last 30 years, only four such models were applied to Canadian federal elections (i.e., Bélanger & Godbout 2010; Mongrain 2019; Nadeau & Blais 1993; 1995).[2] It goes without saying that synthetic models are also a rare commodity in Canada. This is unfortunate since synthetic models are particularly well-suited to inform us on significant campaign dynamics such as (1) the crystallization of voter preferences and (2) the importance of fundamental variables relative to more proximate and non-measurable factors of vote choice (as captured by vote intention polls).

Consequently, this paper mobilizes Mongrain's (2019) structural model in an effort to assess the gains that can be derived from a synthetic approach in the context of Canadian federal elections. Mongrain's (2019) model is, to date, the only *fully* structural model predicting the incumbent's vote share in

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[1] Since Aggregators constantly add new polling data to their models, their final forecasts usually suffer from a very short lead time. As stated by Lewis-Beck (2005, p.151), "[w]hen the lead time is short, say a month or less, the forecasting exercise itself risks being trivial. Little is gained from a model that forecasts a few days before the election. Such models may be theoretically tautological, not to say empty, and lack the anticipatory feel expected from a true forecast."

[2] Nadeau et al. (forthcoming) have also applied a simple forecasting model of incumbent vote share using vote intentions and GDP growth to a number of countries including Canada. Although GDP growth is an efficient predictor of incumbent support in some countries, this does not appear to be the case in Canada.

Canada. We complement this model by adding vote intention data gathered at various points before the election from the mid-1950s to the 2015 election. Not only are we interested in seeing if polls can contribute to better and more accurate forecasts of Canadian federal elections, but also in uncovering the most efficient lag structure that would allow achieving a satisfactory balance between accuracy and lead time. Furthermore, we take advantage of the last federal election that took place on October 21, 2019 to test the forecasting efficiency of different model specifications *before the fact* (that is, using only data available before the vote).

The paper proceeds as follows. The first section reviews existing models to forecast Canadian election outcomes and briefly presents the theoretical arguments behind these models. The second section describes the data and method used to construct a synthetic forecasting equation for Canadian federal elections. The third section presents the results of the empirical analyses. In the fourth section, vote share forecasts for the 2019 federal election are generated by exclusively using information available before election day. This section also discusses the problems of translating vote share forecasts into seat projections in Canada.[3] A final section summarizes the main results and discusses potential avenues of research for future studies.

**1. Election forecasting in Canada**

To our knowledge, Nadeau & Blais (1993) were the first political scientists to propose a structural forecasting model for Canadian federal elections. This model aimed at predicting the Liberal Party's vote share by using two variables, namely "the average difference, over the 10 quarters immediately preceding

[3] The work on electoral forecasting in Canada has focused so far on predicting vote shares rather than seat shares (Bélanger & Godbout 2010; Mongrain 2019; Nadeau & Blais 1993; 1995; see also Carmichael 1990). Though this paper belongs to this tradition, we discuss the problem of translating votes into seats in Canada in the section presenting the results of our forecasting models.

the quarter of the election, between the rate of unemployment […] in a given quarter and the average rate of unemployment […] in the previous five years" (Nadeau & Blais 1993, p.779) and the provincial (Quebec) origin of Liberal leaders. Nadeau & Blais (1995) later dropped the provincial origin variable and replaced it with the proportion of citizens who said the Liberal leader would make the best prime minister. Bélanger & Godbout (2010) were the second team of forecasters to create a predictive vote function for Canadian federal contests. Their forecasting model is a classic economy-popularity equation including the national unemployment rate and the popularity rating of the incumbent government three months before the election as well as the natural logarithm of the number of consecutive months the incumbent party has been in power. Bélanger & Godbout's (2010) model would qualify as a structural equation if it were not for the fact that incumbent popularity is measured through vote intentions. Since government approval was only available for a handful of elections, Bélanger & Godbout (2010, pp.692–693) had to rely on declared vote intentions as a proxy measure for popularity. Thus, their model is of the synthetic kind.

By relying in part on Bélanger & Godbout's (2010) as well as Nadeau & Blais' (1993) models, Mongrain (2019) has recently proposed a new structural equation to predict the vote share of incumbent parties in Canada. This model, which explicitly underlines its structural nature, is composed of five variables, that is (1) the difference between the unemployment rates in Canada and the United States three months before the vote, (2) the natural logarithm of the number of consecutive months the incumbent party has been in office, (3) a dichotomous variable related to the substitution of the prime minister near an election, (4) the number of years of political experience gained by the prime minister in relation to his/her main opponent, and (5) a variable related to the province of origin of party leaders.

Mongrain's (2019) model integrates the economic voting theory as well as the notion of benchmarking (see Kayser & Peress 2012): Canadians are believed to react to the economic well-being of their country *in relation* to that of the United States, their neighbour to the south and most important trading partner. More precisely, if the American job market is doing better in comparison to that of Canada, Canadians voters should be more inclined to punish the incumbent party at the polls (see Carmichael 1990, p.719).[4] Mongrain's forecasting equation, like Bélanger & Godbout's (2010), also takes into account voters' fatigue. Those who are in power are usually said to benefit from an incumbency advantage; however, the longer a party stays in office, the more citizens tend to express a sense of psychological weariness with their current leaders and a taste for change (Abramowitz 1988; Cuzán 2019; Lewis-Beck, Nadeau & Bélanger 2004). Since a number of prime ministers have retired from office a couple of months before the end of their term, and have thus been replaced as head of government near election campaigns, Mongrain's model also considers the possibility that 'new blood' can act to attenuate the cost-of-ruling effect. Furthermore, the model is sensitive to the idea that leaders' characteristics can influence parties' electoral fortunes: long years of public service may be a double-edged sword (Blais 2013, p.7), but it seems reasonable to think that candidates with more political experience should have the upper-hand, all else being equal, on their more novice opponents—competence is, perhaps unsurprisingly, an important element of candidates' assessment by voters (Bean 1993; Bittner 2010). Not only is experience a valued asset in politics, but it should also act as a proxy for public notoriety and name recognition. This is not to say that newcomers are inevitably condemned to fight an uphill battle; simply, their claims to statesmanship cannot draw from a vast reservoir of legislative or executive actions as it is the case for their more experienced competitors. This would potentially explain why rookie and non-career politicians sometimes resort to anti-establishment rhetoric or underline their outsider status in order to make a case for their election. Finally, a special feature of Canadian politics is the somewhat special place of Quebec, Canada's only predominantly French-speaking province, in the federation. Leaders from Quebec have been particularly successful in

[4] Strong arguments support the relevance of the benchmark model. A comparison with the United Sates is almost always present in journalists' or experts' assessments of the performance of the Canadian economy or the record of the federal government (see, for instance, Dodge & Dion's (2016) evaluations of the performance of the Canadian economy during the Harper years). Furthermore, scholars have shown that this natural comparison between Canada and the USA extends to other public policies like the health care systems in both countries (see Nadeau et al. 2015; Thomas & Biette 2014). This 'Canada-USA framing' is also present in electoral debates. Former prime minister Stephen Harper for instance argued during the 2008 campaign that Canada was unlikely to face a crisis similar to the United States because his government had made "different choices" (CBC News 2008).

federal politics (Johnston 2019; Nadeau & Blais 1993). Of the 23 races that took place after 1945 (that is, including the 2019 election), 13 led to the election of a government headed by a candidate from Quebec. The reasons behind Quebeckers' success are not crystal clear. Part of it could be attributable to a 'favourite-son effect'—Quebec voters massively supporting the leader from their province when they have the chance—although Johnston (2019, p.439) appears unconvinced by this argument. It is also possible that Quebec leaders are seen as somewhat better-equipped to deal with Canada's national unity issue: this explanation, however, would probably apply less to current times since constitutional grievances as well as support for sovereignty in Quebec have greatly receded since the failed 1995 Quebec independence referendum, although the national question has certainly not disappeared from Canadian politics (Newbold 2019). The fact that one of the major parties—the Liberal Party—has followed a tradition of alternating between Francophone and Anglophone leaders—and, in reality, between Quebeckers and non-Quebeckers—since the end of the 19th century might provide part of the answer to the apparent success of Quebec candidates (Courtney 1995, p.9; Johnston 2019).

## 2. Data and methods

We borrow Mongrain's (2019) model specification and extend it by inserting vote intention data with varying lag structures in order to assess the relative contribution of polls compared with political and economic variables. In other words, we adopt a synthetic approach to predict the incumbent's vote shares for the 21 Canadian federal elections that took place between 1953 and 2015. Synthetic models normally take the following form:

$$\text{Incumbent vote} = \text{Structural component}_{(t-n)} + \text{Polling component}_{(t-n)} + \text{error} \quad (1)$$

where $t - n$ is the particular lag structure used by the forecaster.

The structural component might include economic performance indicators, government or leader approval ratings, time spent in office or any other variable that can have an impact on voters' evaluation of the incumbents. The polling component usually includes the mean or median vote intentions for the governing party collected over a certain period of time. The lead time for structural forecasts rarely exceeds six months and, according to Nadeau, Lewis-Beck & Bélanger (2009, p.336), lag structures of two or three months before the election now appear to be the norm for American elections. In most cases, this allows for a forecast to be generated before the official campaign begins.

As we have said, the structural component of the synthetic model we propose is identical to Mongrain's (2019). As such, it includes (1) the difference between the unemployment rates in Canada and the United States (that is, the benchmark indicator), (2) the natural logarithm of the number of consecutive months spent in power by the incumbent party, (3) a dichotomous variable for prime minister substitution coded 1 when the incumbent resigns in the months preceding an election and 0 otherwise, (4) provincial origin,[5] and (5) the gap in federal and provincial political experience between the incumbent prime minister and his or her main opponent.[6] Vote share data were retrieved from the official returns published by the Library of Parliament and Elections Canada. Canadian and American unemployment rates to compute

[5] Provincial original can take either one of five values: +1 if the leader of the incumbent party is from Quebec and no other leader is from that province; +0.5 if the leader of the incumbent party is from Quebec and the leader of a minor party (i.e., Social Credit, Bloc Québécois) is also from that province *or* the leader of a minor party *and* the leader of a major party (i.e., the Conservative Party, the Liberal Party, the CCF-NDP) are also from Quebec; 0 if no leader is from Quebec; –0.5 if the leader of the incumbent party is not from Quebec, but the leader of a minor party is from that province *or* the leader of a minor party *and* the leader of a major party are from Quebec; and –1 if the leader of the incumbent party is not from Quebec, but the leader of a major party (and no other leader) is from that province.

[6] When the incumbent prime minister is Liberal, his or her main opponent is considered to be the (Progressive-)Conservative leader and vice versa.

benchmark values were obtained from Statistics Canada and the U.S. Bureau of Labor Statistics. The necessary data for prime minister substitution, provincial origin, and political experience were all gathered from party leaders' profiles on the Parlinfo platform and prime minister's portraits provided by Library and Archives Canada. Election dates were sufficient to compute the logged number of months spent in power by the incumbents.

Our contribution lies in the inclusion of polls conducted at different points in time before the elections. These polls were collected from every publicly available vote intention repository and compilation. The main dataset from which vote intentions were obtained is that of Pickup (2018) which includes federal vote intentions from May 1945 to April 2011. We added polls that seemed to be missing from Pickup's dataset and extended it by adding every available poll conducted between the May 2011 election and the October 2019 election. This extended dataset contains data on close to 2,500 vote intention polls (this dataset can be found on [XXX] Harvard Dataverse). The polling component of the proposed synthetic model is the average vote intentions in favour of the incumbent party with varying lead times, more precisely between one and six months before the month of the election (for example, for an election held in October, we would look successively at the average vote intentions of polls fielded in April, May, June, July, August, and September). Hence, the complete synthetic model we propose reads as follows (with the polling component in bold):

$$\text{Incumbent vote} = ß_0 + ß_1\text{Economic benchmark}_{(t-3)} + ß_2\text{Months in power} + ß_3\text{Prime minister substitution} + ß_4\text{Provincial origin} + ß_5\text{Political experience} + \boldsymbol{ß_6}\textbf{Vote intentions}_{(\boldsymbol{t-n})} + \text{error} \quad (2)$$

Note that the lag structure of the economic variable is kept constant at three months before the election (i.e., $t-3$), while the lead time of vote intentions is set to vary (more precisely, $n = [1 .. 6]$). There was no need to lag the other variables since their values are usually known long before the election and do not normally change.

Despite the high number of polls we were able to assemble, vote intentions were missing for a number of months, particularly for the less recent elections (from the 1988 election onwards, vote intentions were collected during each of the six months preceding the vote). The number of missing values differs depending on the lag structure. We were able to compute average vote intentions one month before the vote for every election between 1953 and 2015, except the 1958 election (which represents a missingness rate of about 4.8 per cent). Poll results two months before the vote were missing for seven elections (33.3 per cent), for four elections three months before (19.0 per cent), for seven elections four months before (33.3 per cent), for six elections five months before (28.6 per cent), and for seven elections six months before (33.3 per cent). Missing values for vote intentions gathered between one and six months before the elections were estimated using a single linear interpolation of vote intentions on the number of months preceding the month of the election (interpolated data can be found in Table A1 in the appendices). According to Wlezien, Jennings & Erikson (2017, p.46), "[f]or dealing with missing data, basic linear interpolation works about as well as complicated and highly computationally intensive alternatives, like multiple imputation." The formula used to generate the estimate at a distance of *t* months is shown in Equation 3 below (see Wlezien, Jennings & Erikson 2017, p.48).[7]

[7] Obviously, single linear interpolation is only one of the many methods that can be mobilized to deal with missing values. Although Wlezien, Jennings & Erikson's (2017, p.46) previous comment says otherwise, Rubin (2000, p.6) states that "even doing multiple imputation relatively crudely, using simple methods, is very likely to be inferentially far superior to any other equally easy method to implement (e.g., complete-cases, available cases, single imputation, LVCF) because the multiple copies of the dataset allow the uncertainty about the values of the missing data to be incorporated to the final inferences." Consequently, in an alternative analysis of the data, missing vote intention values for each lag structure were generated using multiple imputation. Multiple imputation involves producing several imputed datasets, each of these datasets containing slightly different values for the missing data. The multiple values reflect the uncertainty around the true value. As explained by Schafer (1999, p.3; see also van Ginkel et al. 2019), once the missing data have been imputed, "each of the simulated complete datasets is analysed by standard methods, and the results are later combined to produce estimates and confidence intervals that incorporate missing-data uncertainty." Using multiple imputation instead of linear interpolation, the main conclusion (discussed in the next section) remains that adding vote intentions marginally increases the quality of the model not until very late in the campaign. In fact, the coefficient for vote intentions becomes statistically significant only with a lag structure of one month. Interpolation is preferred to multiple

$$V'_t = \frac{\delta \times (V_{t-\delta}) + \theta \times (V_{t+\theta})}{\delta + \theta} \quad (3)$$

where $V'_t$ is the estimated vote intention at a distance of $t$ months before the election, $V_t - \delta$ is the registered vote intention at time $t - \delta$ and $V_t + \theta$ is the registered vote intention at time $t + \theta$.

The examination of the lag structure is particularly important since it helps in determining when exactly voters' preferences stabilize (at least, in the aggregate). It has been argued that electoral preferences tend to crystallize earlier in parliamentary systems like Canada and the United Kingdom than in presidential regimes such as the United States. Earlier crystallization is expected in parliamentary systems due, in great part, to the lesser role played by candidates in relation to parties in influencing voters' decisions—although there are clear signs of party polarization in American politics (Jacobson 2017). Dispositions towards parties are less susceptible to change than those towards the leaders, which should produce less volatility in voters' electoral preferences (Wlezien 2014, pp.89–92). However, as stated by Wlezien (2014, p.92), "this depends on the level of voter alignments with parties. Where party alignments are weak, after all, we expect more 'undecideds,' later decision-making, and greater susceptibility to campaign effects." There has been, and still is, considerable debate over the stability of partisan identification among voters in Canada (for a brief overview, see Bélanger & Stephenson 2010). According to Marland, Giasson & Esselment (2017, p.18), "[i]n Canada, a decline in durable partisanship began in earnest in the 1960s and 1970s, and today this country has a comparatively greater number of flexible partisans than its US counterpart." Hence, it is unclear whether we should expect to find a pattern of early or late crystallization across Canadian federal elections. Since our focus is on forecasting, the goal of this paper is not to understand why crystallization or conversion (i.e., vote switching) takes place—others have

imputation however since jackknife forecasts can be much more easily computed using the first method. Results from these alternatives analyses can be found in Table B2 in the appendices.

already explored this question at length (e.g., Finkel 1993; Geers, Bos & de Vrees 2019; Gelman & King 1993)—but *when* the crystallization process becomes manifest in measures of public opinion.

## 3. Adding polls: Any benefits?

Forecasting models can be judged on a number of criteria (Lewis-Beck 2005), the most important being lead time and accuracy. Excluding the first two federal elections of 1867 and 1872, in which voting was spread over a period of several weeks, the average length of election campaigns in Canada is around 50 days.[8] The shortest election campaign in Canadian history took place in 1874 and lasted less than three weeks, while the longest campaign (excluding those of 1867 and 1872) was fought over a 78-day period in 2015. With a three-month lead,[9] Mongrain's (2019) equation (see Table 1, panel (a)) produces a forecast well before the beginning of the official campaign. In terms of accuracy, the model explains 86 per cent of the variance in incumbent vote shares and renders a mean absolute error (MAE) of 2.95 percentage points for jackknife out-of-sample forecasts over the 1953–2015 period (and of 2.04 percentage points for within-sample forecasts).[10] Jackknife forecasts involve estimating a regression for each observation by dropping the election year for which we want to forecast the outcome (thus, the MAE from jackknife forecasts is obtained from the estimates of $N - 1$ regressions).

[8] According to the most recent version of the *Canada Elections Act* (section 57), federal campaigns now have to last a minimum of 36 days and can last a maximum of 50 days.

[9] Since unemployment data are those from the third month before the month of the election, in reality, the lag time of the model is, on average, between two and two and a half months.

[10] One peculiarity of Mongrain's (2019) model is the use of a benchmark indicator. Such indicators are uncommon in forecasting models. Perhaps, using the level of unemployment in Canada three months before the election as Bélanger & Godbout (2010) or the relative unemployment measure of Nadeau & Blais (1993) would make more sense. We tested these alternatives and found them to be less satisfying than Mongrain's original specification (see Table B1 in the appendices). Furthermore, as stated earlier, the comparison with the United States appears to be justified in the case of Canada.

**Table 1.** Different model specifications to forecast Canadian federal elections, 1953–2015

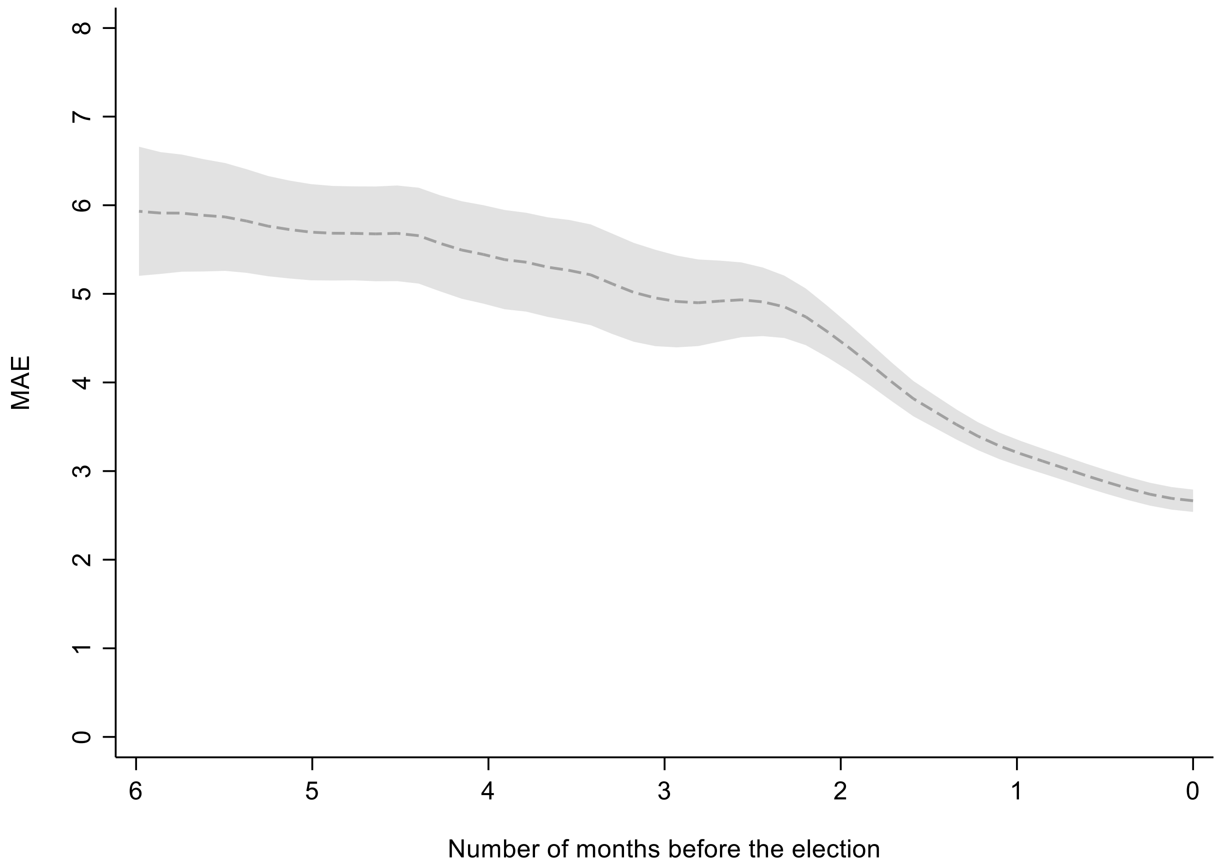
| **Parameters** | **(a)**<br>**Structural model** | **(b)**<br>**Poll-only model** | **(c)**<br>**Synthetic model** |
|---|---|---|---|
| Economic benchmark | –3.522***<br>(0.526) | – | –3.288***<br>(0.480) |
| Months in power (log) | –4.277***<br>(0.846) | – | –3.897***<br>(0.772) |
| Prime minister substitution | 6.441*<br>(2.258) | – | 4.964*<br>(2.116) |
| Provincial origin | 12.814***<br>(1.396) | – | 11.249***<br>(1.428) |
| Political experience | 0.325***<br>(0.069) | – | 0.274***<br>(0.066) |
| Vote intentions | – | 0.548*<br>(0.202) | 0.199*<br>(0.089) |
| Constant | 59.826***<br>(3.695) | 15.231°<br>(8.532) | 49.888***<br>(5.548) |
| $R^2$ | 0.894 | 0.280 | 0.922 |
| Adj. $R^2$ | 0.859 | 0.242 | 0.888 |
| RMSE | 3.002 | 6.961 | 2.671 |
| MAE (jackknife) | 2.955 | 5.447 | 2.738 |
| N | 21 | 21 | 21 |

Note: Unstandardized coefficients and standard errors (in parentheses) are reported. Significance levels: ° $p < 0.10$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$ (two-tailed). The data used to make these analyses can be found in Table A2 in the appendices.

Mongrain's model is devoid of any public opinion polls. Some forecasters have found it useful to add vote intention data to their models. As we have seen, synthetic models are basically a mix of fundamental-based structural equations and polling data. According to Lewis-Beck & Dassonneville (2015b, p.277), polling information "offers a correction to the prediction of the structural part" of synthetic equations as it helps solve the omitted variables problem. Since a structural model composed of only a few variables cannot reasonably account for *every* possible influence on election results, vote intention polls can help to capture omitted and unexpected determinants of vote choice. Just as in many other democracies, polls have become a mainstay of election campaigns in Canada (Turcotte 2011). The number of polling firms in Canada has grown quickly in the 1970s and 1980s, ending the dominance of the now defunct Canadian Institute of Public Opinion (Gallup's Canadian branch). Furthermore, technological innovations in the later part of the twentieth century and the early 2000s, such as computer-assisted telephone interviewing and online surveys, have greatly reduced the costs of conducting polls. As a consequence, the number of public opinion surveys has increased drastically in the last three or four decades (Hillygus 2011; see also Pickup 2010, pp.249–251). Around 360 vote intentions polls were conducted between the 2011 and 2015 federal elections in comparison to about 60 polls for the 1980–1984 election cycle, that is a growth rate of 600 per cent in thirty years. The mean absolute error of final election polls for Canadian federal elections between 1953 and 2015 is a little over 2.5 percentage points. Quite naturally, we observe that as we move away from the election, polls lose in accuracy (see Jennings & Wlezien 2016). This is graphically demonstrated in Figure 1 which presents the trend in MAE for the incumbent party over the six months preceding the federal elections held between 1953 and 2015—this trend was estimated using a kernel-weighted local polynomial regression.[11]

[11] Around 860 polls were conducted in the six months preceding the 21 elections held between 1953 and 2015. Vote intentions of polls conducted on the same day were averaged. For polls for which only the month of polling was known (which is the case for the vast majority of CIPO/Gallup polls conducted between 1945 and 2000), the poll date was fixed to the 15 of the month.

**Figure 1.** Trend in MAE for the incumbent party over the six months preceding the elections, 1953–2015




Note: The grey area represents 95 per cent confidence intervals.

Sources: COMPAS (2011); EKOS Politics (2019); Election Almanac (2016); Forsythe et al. (1995, p.785); Frizzell (1989, p.95); Frizzell & Westell (1985, p.82; 1994, p.101); Heard (n.d.); Ipsos (n.d.); Johnston et al. (1992, p.121); Pickup (2018); SES Research (n.d.); Wikipedia (2019a; 2019b; 2019c; 2019d; 2019e).

It is important to remember that polls are not actual forecasts but represent rather snapshots of the public opinion at certain points in time. As noted by Bean (1969, p.91), “[t]he pollster does not, as a rule, predict an election result. He reports on what would happen on the day the poll is taken.” In order to form actual forecasts, poll figures taken at one point or another before election day must therefore be transformed into poll-based projections (Erikson & Wlezien 2008, p.193). This is easily achieved by regressing a party’s vote share on its share of vote intentions. Panel (b) in Table 1 shows that polls conducted in the third month before the election month[12] are not, by themselves, a particularly good predictor of the incumbent's vote share: the mean absolute error of jackknife forecasts from this poll-only model is a whopping 5.45 percentage points (while within-sample forecasts produce an MAE of 4.88 percentage points) for the 21 federal elections that took place between 1953 and 2015. Thus, the structural model clearly outperforms the poll-only model—which is consistent with Lewis-Beck & Dassonneville's (2015a) results for other countries (i.e., Germany, the United Kingdom, and Ireland).

As we have seen, structural modellers use aggregate-level data to make their forecasts. However, each election has its own set of unique features, something most macro-structural models cannot really take into account. Because they work with individual-level data, micro-modellers and 'synthesizers' are better equipped to capture the peculiarities as well as the twists and turns of election-year politics. Adding polls to Mongrain's (2019) structural model (see Table 1, panel (c)) does indeed improve the model's fit and its global level of accuracy (the MAE from jackknife forecasts goes down from 2.95 percentage points to 2.74 percentage points), but these improvements are extremely small and are obtained at the price of a less parsimonious model. This is in line with Lewis-Beck & Dassonneville's (2015a, p.1) finding according to which "polls do not add much to the predictive value of sound structural models of vote choice." The data used for Table 1 regression models can be found in Table A2 in the appendices.

Since polls are usually found to gain in accuracy as election day approaches, their weight in the model should be adjusted accordingly. In order to take into account the varying importance of the structural and polling components, Lewis-Beck & Dassonneville (2015b) apply 'dynamic weights' to their synthetic equations over the six months preceding the vote. Stated as a simple rule, the closer we get to election day,

[12] For each election, the average value of polls conducted in the third month before the election month was taken, except for 1962 (first month before), 1965 (second month before), 1968 (fourth month before), and 1974 (second month before). We prefer to use real vote intention values for the 1965, 1968, and 1974 elections rather than imputed ones. Interpolated values are used in Table 3 when we look specifically at the effect of different lag structures.

the more important the polling weight and the less important the structural weight. We reproduce Lewis-Beck & Dassonneville's (2015b, p.278) weighting scheme in Table 2.

**Table 2.** Importance of structural and polling weights over time

| Time to election | Structural weight | Polling weight |
|---|---|---|
| –6 months | 6/6 | 0/6 |
| –5 months | 5/6 | 1/6 |
| –4 months | 4/6 | 2/6 |
| –3 months | 3/6 | 3/6 |
| –2 months | 2/6 | 4/6 |
| –1 month | 1/6 | 5/6 |

Note that this weighting procedure first involves producing a structural forecast and a poll-only forecast by using distinct models (one limited to structural variables and one limited to incumbent vote intentions) and then multiplying each forecast by its weight and summing these weighted forecasts together. The synthetic model in Table 1 (panel (c)) is lagged three months. Hence, following Lewis-Beck & Dassonneville's (2015b) methodology, we applied an equal weight (i.e., 3/6 or 0.50) to the structural equation (panel (a)) and the polling equation (panel (b)). However, this leads to a general loss in accuracy as the jackknife forecasts obtained from this estimation strategy have a mean absolute error of 3.24 percentage points for the 21 elections held between 1953 and 2015 (compared to 2.74 percentage points for the unweighted synthetic model).

What if we look at different lag structures (i.e., between one and six months before the election) for the polling variable, keeping the lag of all other variables in the synthetic model constant at –3 months? As already mentioned, since poll results are somewhat scarce at the beginning of the period under study (with no polling results for many months up until the mid-1970s), we handled missing values by using data interpolation. By doing so, we were able to establish complete time-series for the elections between 1957 and 2019 for the six months preceding the vote (interpolated vote intentions could not be computed for the fourth, fifth, and sixth months before the 1953 election). The synthetic model with varying lag structures for the polling component is presented in Table 3. As can be seen, between four and six months before the election, vote intentions do not reach conventional levels of statistical significance. Only polls taken in the month immediately before the election month produce a noteworthy accuracy gain.

Limiting Mongrain's (2019) structural model to the 1957–2015 period (for the sake of comparison), we obtain an MAE from jackknife forecasts of 3.03 percentage points. As can be seen in Table 3, very similar results are obtained by adding polls between six and two months before the election. Only the addition of polls conducted in the month previous to the election month generates a respectable reduction in error (of almost 0.7 percentage points).

**Table 3.** Synthetic model with varying lag structures, 1957–2015

| Parameters | –6 months | –5 months | –4 months | –3 months | –2 months | –1 month |
|---|---|---|---|---|---|---|
| Economic benchmark | –3.192*** (0.554) | –3.080*** (0.529) | –3.254*** (0.534) | –3.214*** (0.497) | –3.233*** (0.495) | –2.579*** (0.419) |
| Months in power (log) | –4.141*** (0.848) | –3.080*** (0.833) | –3.656** (0.931) | –3.939*** (0.793) | –3.802*** (0.809) | –3.481*** (0.617) |
| Prime minister substitution | 5.031° (2.376) | 4.547° (2.261) | 4.820° (2.373) | 4.683* (2.170) | 4.531° (2.193) | 3.950* (1.640) |
| Provincial origin | 11.221*** (1.680) | 10.486*** (1.682) | 10.786*** (1.777) | 10.904*** (1.510) | 10.536*** (1.596) | 7.747*** (1.496) |
| Political experience | 0.263** (0.078) | 0.237** (0.076) | 0.273** (0.073) | 0.266** (0.067) | 0.277*** (0.066) | 0.250*** (0.050) |
| Vote intentions (–6 months) | 0.147 (0.098) | – | – | – | – | – |
| Vote intentions (–5 months) | – | 0.220° (0.108) | – | – | – | – |
| Vote intentions (–4 months) | – | – | 0.193 (0.119) | – | – | – |
| Vote intentions (–3 months) | – | – | – | 0.211* (0.095) | – | – |
| Vote intentions (–2 months) | – | – | – | – | 0.214* (0.096) | – |
| Vote intentions (–1 month) | – | – | – | – | – | 0.403*** (0.094) |
| Constant | 52.920*** (5.939) | 48.275*** (6.668) | 49.007*** (7.636) | 49.433*** (5.787) | 49.766*** (6.033) | 39.094*** (5.478) |
| $R^2$ | 0.901 | 0.912 | 0.903 | 0.916 | 0.916 | 0.952 |
| Adj. $R^2$ | 0.855 | 0.871 | 0.858 | 0.877 | 0.877 | 0.930 |
| RMSE | 2.938 | 2.768 | 2.900 | 2.706 | 2.706 | 2.046 |
| MAE (jackknife) | 3.131 | 2.965 | 2.878 | 2.853 | 2.972 | 2.361 |
| N | 20 | 20 | 20 | 20 | 20 | 20 |

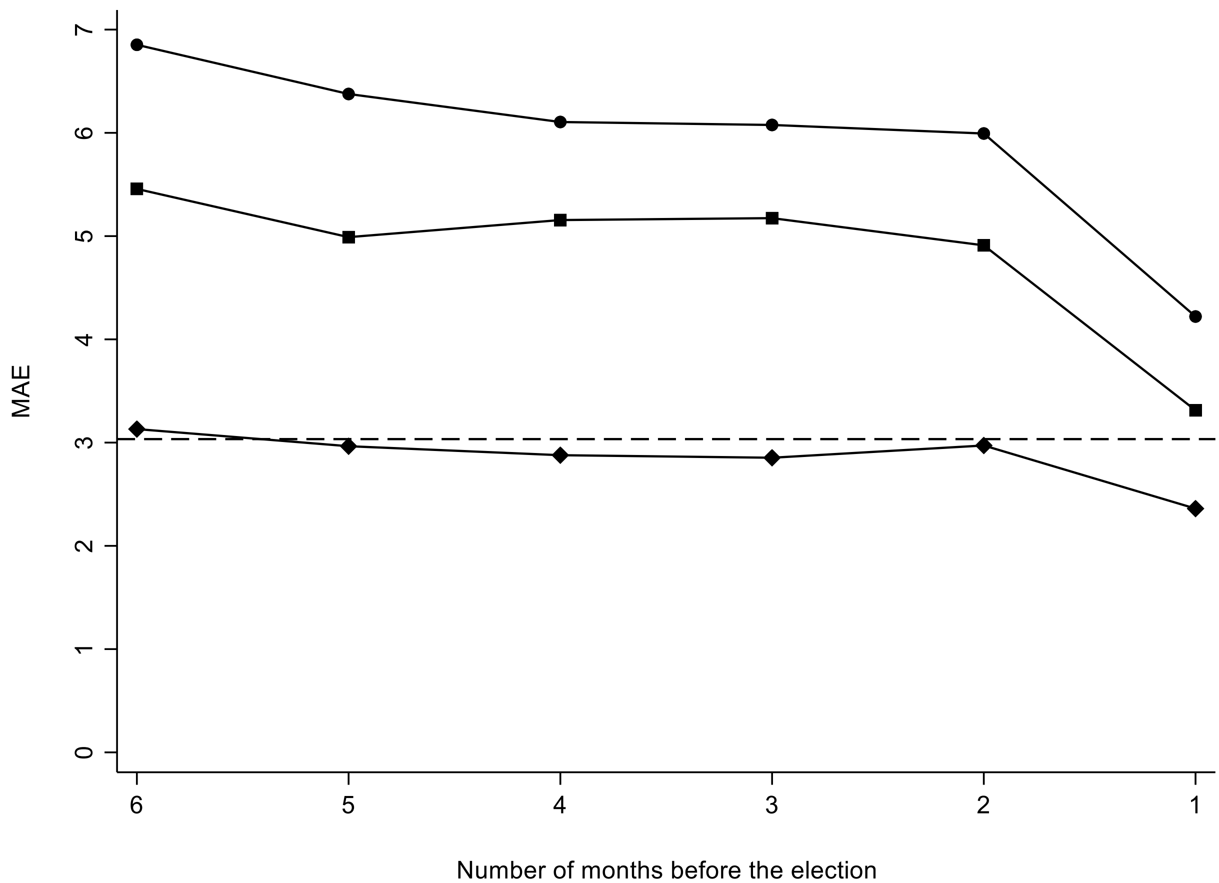
Note: Unstandardized coefficients and standard errors (in parentheses) are reported. Significance levels: ° $p < 0.10$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$ (two-tailed). The data used to make these analyses can be found in Table A1 and Table A2 in the appendices.

Figure 2 graphically shows the differences in mean absolute errors during the six months preceding the election for raw poll results, the poll-only model, and the synthetic model during the 1957–2015 period.[13] The dashed line indicates the MAE of the structural model and is used here as a benchmark. Quite clearly,

[13] Interpolation was used to obtain missing values. As already noted, interpolated vote intentions could not be computed for the fourth, fifth, and sixth months before the 1953 election. Hence, MAEs for the fourth, fifth, and sixth months before the election rest on 20 cases instead of 21. The MAEs of the poll-only and synthetic models were computed from jackknife forecasts.

the synthetic approach does not add much to the structural model in terms of accuracy until the very last month before the vote. Furthermore, the sharp drops in forecasting errors between the second and first months before the election seem to point toward a somewhat late crystallization of voter preferences in Canadian election campaigns.

**Figure 2.** MAEs for polls and different model specifications over the six months preceding the elections, 1957–2015




Note: Circle: raw polls. Square: poll-only model. Diamond: synthetic model. The dashed line indicates the out-of-sample MAE of the structural model for the 21 elections held between 1957 and 2015 (i.e., 3.03 percentage points).

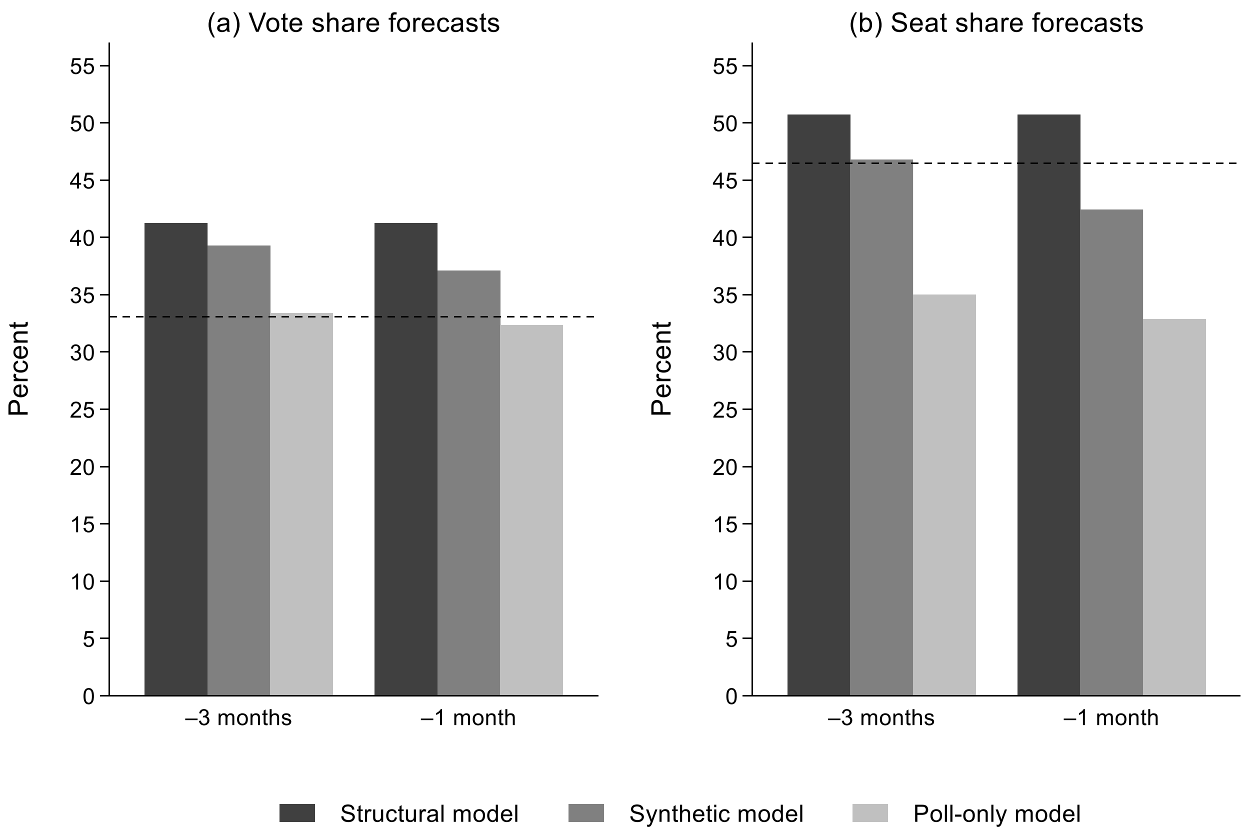
## 4. Forecasts for the 2019 Canadian federal election

In the previous section, we have considered three different model specifications to forecast the incumbent's vote share in Canadian federal elections held between 1953 and 2015: a structural model, a poll-only model, and a synthetic model. Overall, the poll-only model performed worst, while the synthetic model added little to the structural approach in terms of global accuracy, except when vote intentions were collected very close to the election. In this section, we generate before-the-fact forecasts (that is, forecasts based entirely on information available before the vote) for the October 2019 Canadian federal election using these different specifications.

Recall that the structural model (and the structural component of the synthetic model) includes five variables, namely (1) the difference between the unemployment rates in Canada and the United States three months before the vote, (2) the natural logarithm of the number of consecutive months the incumbent party has been in office, (3) a dichotomous variable related to the substitution of the prime minister near an election, (4) the number of years of political experience gained by the prime minister in relation to his/her main opponent, and (5) a variable related to the province of origin of party leaders.

The difference between the unemployment rates in Canada (5.70 per cent) and the United States (3.70 per cent) in July 2019 (that is, the third month before the month of the election) is two percentage points. On the day of the election, the Liberal Party of Canada had spent 48 months in power which means that the value of the time variable is equal to 3.87 (i.e., ln[48]). The dichotomous variable related to the substitution of the prime minister is coded 0 (since the incumbent prime minister—Justin Trudeau—did not resign from office close to the election). When it comes to the political experience variable, Trudeau is less experienced by about 4.30 years in comparison to his main opponent Andrew Scheer, the leader of the Conservative Party. Finally, because the prime minister is from Quebec, no other major party leader is from that province, and two minor party leaders are from Quebec (i.e., the leader of the Bloc Québécois and the leader of the People's Party of Canada[14]), the provincial origin variable takes a value of 0.50—for more details on variable coding, see Mongrain (2019). By retrieving the incumbent's share of vote intentions in July 2019, we can also produce forecasts for the poll-only and synthetic models. Plot (a) in Figure 3 shows our final forecasts for each of the three model specifications three months before the election and in the last month before the election.

**Figure 3.** Vote share and seat share forecasts for the 2019 Canadian federal election




Note: Vote share forecasts were estimated using Table 1 regressions. At $t - 1$, the vote intention value for the 1958 election (which was missing) is the interpolated one. Seat shares were estimated using a swing ratio. The dashed line indicates the actual results of the 2019 election for the incumbent Liberal Party (vote share = 33.1 per cent, seat share = 46.4 per cent). Since the structural model does not include vote intentions as a predictor, the forecasts at $t - 3$ and $t - 1$ are the same. Note also that the

[14] It is unclear whether the recently created People's Party of Canada will compete in future elections considering its poor showing in 2019. Since its leader, Maxime Bernier, was a relatively high-profiled figure in the Conservative Party before his departure, we still consider the People's Party has a minor party worth mentioning. However, there is no difference in the coding of the provincial origin variable for situations in which one or more minor party leaders are from Quebec (with no major party leader from that province).

lag structure for the synthetic model is the lag structure *of the polling component*. The benchmark indicator has a three-month lag both at $t-3$ and $t-1$. The raw data used to create Figure 3 can be found in Table C1 in the appendices.

The 2019 election led to the formation of a minority government by the Liberal Party which won 46.4 per cent of the seats in the House of Commons (i.e., 157 out of 338) with 33.1 per cent of the popular vote (that is, 1.3 percentage points *less* than the Conservative Party). Compared to the actual outcome of the election, the poll-only model did remarkably well both three months (33.4 per cent vs 33.1 per cent) and one month (32.3 per cent) before the election. The structural model performs rather poorly with a forecast of 41.2 per cent of the popular vote for the incumbent Liberal Party. Note that the structural model's forecast is the same both at $t-3$ and $t-1$ since there are no vote intention data involved in the prediction. Three months before the election, the synthetic model does a little better than the structural one (39.3 per cent). Using polls in the last month before the election produces a clear gain in accuracy (as could be expected from Table 3 results) with the synthetic approach now giving 37.1 per cent of the vote to the Liberals—admittedly, this forecast remains nevertheless inferior in terms of accuracy to the corresponding forecast of the poll-only model.

These outcomes stand in sharp contrast with the performance of these models up to the 2019 election. As the results in Table 1 show, the mean absolute error of jackknife out-of-sample forecasts over the 1953–2015 period was significantly lower for the structural model (2.95 percentage points) compared to the poll-only model (5.45 percentage points). How can we account for this seemingly deviant outcome and what are the implications of the 2019 election for the forecasting modelling efforts in Canada?

A first explanation might be that Canadian elections have become more unpredictable which suggests that poll-only models should perform increasingly well in the future. Of course, only time will tell if this conjecture is right. But despite its apparent attractiveness, this explanation should be greeted with caution. First, scholars are still debating the question whether elections have really become more unpredictable recently (Jennings & Wlezien 2018; Nadeau et al. forthcoming). Second, and most importantly, no indications of the superiority of the poll-only model were visible until the last election. Since the factors usually linked to electoral volatility were already present by the time of the 2015 election (decreased party loyalties, implementation of marketing strategies, changing media system, etc.), it is hard to believe that the electoral dynamics in Canada have changed so much in the last few years to undermine the foundations of structural forecasting modelling.

A second explanation would stress the peculiar conditions under which the 2019 election was fought. Every indication suggested that the Liberal Party would be easily re-elected until the SNC-Lavalin scandal broke out in February 2019. The government mismanagement of this scandal changed the game entirely. The occurring of such types of events represents an inherent limitation for electoral forecasting modelling. In this respect, we concur with Holbrook (2012, p.642) stating that “forecasting models have no way of incorporating significant, unexpected events—either from inside or outside the campaigns—that could significantly sway the outcome.”

The particular circumstances of the 2019 election suggest that it might be wise to wait before revising substantially the structural part of our forecasting model. In this regard, we share Lewis-Beck & Tien’s (1996, p.486) view that “forecasting requires more than curve fitting. It wants good theory.” The decision to stick to the structural part of our model seems also justified on empirical grounds: including the results of the 2019 election in the models presented in Table 1 shows that the structural and synthetic models still neatly outperform the poll-only model with significantly lower mean absolute errors for jackknife out-of-sample forecasts (3.15 and 2.91 percentage points respectively vs 5.19 percentage points).[15] These results suggest that the structural and synthetic models, though less successful at predicting the outcome of

[15] See Table B3 in the appendices for detailed results showing among other things that all the explanatory variables of the structural model remain significant after the inclusion of the 2019 election in the sample. Table B4 in the appendices reproduces the analyses from Table 3 by adding the 2019 election in the models. Once again, only vote intentions from the last month before the election month make a real difference in terms of accuracy.

the 2019 election, still remain, on the whole, more performing than the poll-only model in forecasting the results of Canadian federal elections.

Evidently, the previous lines should not underplay that the 2019 election has been problematic for Canadian forecasters and that two important tasks remain on their plate in the years to come. The large error produced by the structural model in the 2019 election, and inversely the good performance of the poll-only model in that case, suggests that improved synthetic models, more efficient at combining fundamental variables and polling information, may represent a breakthrough in predicting electoral outcomes in Canada and elsewhere.

The second task would be to devise a model able to efficiently translate vote share forecasts into seat predictions. This represents a demanding challenge in Canada due to the geographical concentration of party support, a situation that has produced important distortions in vote-seat translation in the past (Massicotte 2005). The results obtained from a conventional swing ratio model illustrate this difficulty.[16]

Plot (b) of Table 4 shows the predicted seat shares from this swing ratio for the Liberal Party using plot (a)'s vote share forecasts. The poorest performance of the structural model stand out as it predicted a parliamentary majority for the Liberal Party (50.7 per cent of the seats). On the other hand, both the synthetic and poll-only models (at $t$ – 3 and $t$ – 1) predicted that the Liberal Party would lose its majority in

[16] The swing ratio is obtained by regressing the seat shares collected by the incumbent party on its vote shares. The predicted vote value can then be plugged into that equation in order to get a seat share forecast. The swing ratio equation (using data from the 1953 to 2015 elections) is as follows: $S' = -31.896 + 2.003 \times V'$, where $S'$ is the predicted seat share of the incumbent party and $V'$ is the predicted vote share of the incumbent party. The data used to estimate the swing ratio equation can be found in Table A3 in the appendices. A number of past election results illustrate particularly well the difficulty of translating votes into seats. The party who won the popular vote was defeated on three occasions (1957, 1979, and 2019) during the period under study. The 1972 election almost produced the same type of distortion (the Liberals got 109 seats with 38.5 per cent of the vote while the Conservatives got 107 seats with only 35.0 per cent of the vote). Plugging *actual* incumbent vote shares in the swing ratio equation for the 1957, 1979, and 2019 elections, we get the following seat share forecasts: 52.8 per cent of the seats in 1957, 48.4 per cent in 1979, and 34.3 per cent in 2019. Knowing that the actual incumbent seat shares in these elections were of 39.6 per cent, 40.4 per cent, and 46.4 per cent respectively, it is clear that the swing ratio method can be highly problematic. The difficulty of translating votes into seats can also be illustrated by comparing the 1958 and 2019 elections: in 1958, the Liberal Party almost won the same share of the popular vote as it did in 2019 (i.e., 33.6 per cent vs 33.1 per cent), but got way less seats than it did in 2019 (18.1 per cent vs 46.4 per cent). Note that Appendix I in the supplementary materials of Mongrain (forthcoming) discusses the difficulty of predicting seats from vote share forecasts in first-past-the-post (FPTP) systems and some of the methods that have been proposed in order to do so.

the new Parliament (and perhaps even return to the opposition benches). The fact that the synthetic model overestimated the Liberal vote and nevertheless produced the most accurate seat prediction three months before the election (i.e., 46.8 per cent or 158 seats) underlines again the challenges waiting ahead Canadian electoral forecasters in the future.

**Conclusion**

By the early 2000s, the intense forecasting efforts that were undertaken in the 1980s for American elections had trickle down to other democracies. However, the forecasting literature spread unevenly among democratic states. Without a doubt, this is in part due to the lack of extended time series data on economic conditions and political issues in many countries, including a number of established democracies. Although Canadian political science is heavily influenced by developments in the discipline south of the border, this is perhaps not as true for election forecasting.

As we have seen, there were only a few attempts to create predictive models for Canadian federal contests in the last decades. Mongrain's (2019) structural model is the most recent attempt to date and relies exclusively on structural variables. These types of models have merits. First, they offer a clear alternative to vote intention polls: decreasing response rates and the associated threat of nonresponse bias as well as the problem of cellphone non-coverage represent major challenges for the polling industry. Second, and perhaps more importantly, structural equations are grounded in a solid and parsimonious theory of vote choice. Although vote intentions and approval ratings might be formidable forecasting tools near polling day, they do not go a long way in explaining why citizens might (or might not) vote for the incumbents. Nonetheless, this paper set out to test the claims put forward by the advocates of the synthetic approach. In doing so, we showed that adding polls to Mongrain's structural model produces noteworthy (but still somewhat moderate) accuracy gains only very late in the campaign. To be clear, the main takeaway message of this paper is that forecasting models should be first and foremost theoretically sound and that these types of structural models can perform fairly well on their own. This claim does not mean that synthetic models constitute a worthless avenue of research: to the contrary, we believe this approach should be applied every time the available data allow it.

The poorer performance of the structural model in the 2019 Canadian federal election obviously raises questions about the relative contributions of the various approaches to election forecasting. Only time will tell if the 2019 election marks a turning point signalling a significant decrease in structural models' ability to forecast election results in Canada. Meanwhile, we would argue that it would be neither wise to downplay the contribution of the structural approach to election forecasting in Canada, nor sound to overplay the contribution of the less theoretically-grounded poll-only model on the basis of one election.[17] If it appears premature to discard one approach to the benefit of the other (see Lewis-Beck & Tien 2008), perhaps it is time to think of better ways to take advantage of both methods to develop more performing synthetic models (see Lewis-Beck & Tien 2016b). This task and the development of an adequate model to translate vote share forecasts into seats, a question that has received insufficient attention so far, should be running high on Canadian political forecasters' agenda in the years to come.

[17] This perspective appears consistent with the notion that "election forecasting allows political scientists to better understand the structure at work behind individual and aggregate vote choices in democracies" and that "it also enhances an appreciation of the impact of dynamic or uncertain factors, such as campaign characteristics and seemingly random events, which can explain why an outcome deviates from an otherwise well-grounded forecast" (Lewis-Beck & Bélanger 2012, p.767; see also Campbell & Garand 2000, p.11).

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