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How Much of Electoral Politics Is in the District? Measuring District Effects on Party Support

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Abstract

The electoral district is the fundamental unit of representation in single- and multi-member electoral systems, yet most research shows little interest in district effects on election outcomes, focusing instead on national and individual factors. This is problematic as parties and candidates often put a great deal of effort into district-based campaigns. How, then, can we best capture district effects on party support? We propose a new method using official election returns and geospatial techniques. The result is a measure of how much of a party's vote share is explained by district effects. Using data from the 2006–2019 Canadian federal elections, we find that, on average, 6 to 10 per cent of the variation in a party's vote in Canada is explained by district effects. While district effects on party support are trivial for some districts, in others they account for more than 80 per cent of the variance in party vote shares. The effect of districts on party support is composed, in part, of electoral context, province, socio-economic factors and district campaign intensity. Importantly, the size and sources of district effects on party support vary across parties, suggesting heterogeneity. The benefits of our approach are threefold: (1) it is cost-effective, (2) it can be easily replicated in any setting—past or present—where districts are relevant electoral units and where districting is nonpartisan, and (3) it is responsive to differences in district composition and parties' campaign effort.

Résumé

La circonscription électorale est l'unité de représentation fondamentale dans les modes de scrutin pluralitaires. Pourtant, la recherche a démontré jusqu'à maintenant peu d'intérêt pour le sujet se concentrant davantage sur les facteurs agrégés ou individuels. Cela pose un problème car les partis et les candidats fournissent des efforts considérables dans leurs campagnes de circonscription. Comment mesurer l'impact de ces circonscriptions dans l'appui pour les partis? Nous proposons une nouvelle méthode qui mise sur les techniques géo-spatiales et les données électorales des élections fédérales de 2006 à 2019. Nous concluons que l'effet des circonscriptions compte pour entre six et dix pourcents de la variation dans les appuis électoraux. Alors qu'à certains endroits, les circonscriptions ont un impact trivial, dans d'autres, elles expliquent plus de 80% de la variance. Cet effet est dû à

des facteurs électoraux, provinciaux, socio-économiques et d'intensité de campagne. De plus, cet effet varie d'un parti à l'autre. Notre approche apporte trois bénéfices : (1) elle est avantageuse en termes coûts/bénéfices, (2) elle est facilement reproductible dans des contextes–passés ou futurs–où la circonscription électorale est une unité d'analyse pertinente et où le découpage électoral est non-partisan et (3) elle répond bien aux variations dans la composition des circonscriptions et des efforts de campagne.

The electoral district is the fundamental unit of representation in single- and multi-member electoral systems. In these contexts, candidates who hope to join the legislature must win a seat in a given geographically defined district. To form a government, a political party must win more of these seats than its competitors. Thus, while we tend to think of modern general elections as single events, they are better characterized as hundreds of district elections happening simultaneously, under the umbrella of central party campaigns. Even though federal elections in Canada often lead to highly regionalized outcomes, scholars have most often focused their analysis on larger geographical areas, such as provinces (Pruysers et al., 2020; Johnston, 2017). As a result, the importance of district effects on party support tends to be underplayed.

We argue this is likely because the effects of districts on electoral outcomes are difficult to study and not because districts are substantively unimportant. To remedy this, we propose a new method to measure the relative importance of districts on party support. We use this method to estimate how districts explain variation in party support across five Canadian general federal elections from 2006 to 2019. We find that 6 to 10 per cent of parties' vote shares are, on average, accounted for by district effects. The effects of many districts on party support are admittedly quite small, but for others, the effects are more than considerable.

This article makes two meaningful contributions to the literature on parties and campaigns. First, and most importantly, we show how potential sources of district effects on party support—be that electoral context, province, district-level socio-demographic factors or each party's campaign efforts—matter differently across political parties. This strongly suggests that scholars cannot assume the effect of a district on party support is uniform across elections, parties and districts themselves. Second, we provide a cost-effective method to capture these effects. Though we use recent Canadian data, we argue that this method is appropriate in any single-member plurality or mixed electoral system where electoral districting is nonpartisan. A major advantage of this approach is that it allows measures of any past district effects with few costs beyond time and the availability of digital maps.

Below, we first discuss why the effects of districts on electoral outcomes deserve scrutiny. Second, we outline how we measure district effects on party support. We then examine potential sources of district effects on party support to help explain why they are stronger in some districts than in others. We conclude by discussing why we think our approach is useful in any context where elections are, at least in part, based on nonpartisan districting.

1. Why Electoral Districts?

It is reasonable to ask why we should bother addressing how electoral districts affect election outcomes, as political science research already offers compelling explanations based on national, provincial and individual factors. An influential body of comparative research argues that electoral politics have "nationalized" to the point where most of the campaign factors rest with party leaders (Ohr, 2011) and their centralized campaigns (Claggett et al., 1984; Agnew, 1987; Caramani, 2004; but see also Johnston, 1980; Pruysers et al., 2020). Many explanations focus on leaders and national parties, leaving district effects at the margins (see Cunningham, 1971; Irvine, 1982; Blais, Massicote et al., 2003), as voters seem to pay limited attention to local candidates (Blais, Gidengil et al., 2003). Similarly, while classic studies argue that single-member plurality electoral systems incentivize parties to campaign regionally (Cairns, 1968), regions are typically operationalized as provinces or areas that are considerably larger than a single electoral district and its neighbours, such as major cities or rural areas in general. Electoral media coverage is also best described as regionalized (Stephenson et al., 2019).

Other scholarship suggests that regional variations in attitudes do matter (Anderson, 2010; Cochrane and Perrella, 2012) but are matched or dwarfed by variation produced by individually measured socio-demographic characteristics (Héroux-Legault, 2016). The literature investigating individual-level predictors of vote choice is rich and nuanced, highlighting the enduring effects of socio-demographic factors, values and beliefs, partisanship, issues, and leader evaluations on vote choice (Gidengil et al., 2012). Models of individual vote choice either do not include districts in their analysis (Gidengil et al., 2012: 14) or frame districts only in terms of strategic evaluations of a party's chance to win a particular seat (Blais et al., 2002: 84). Given the wealth of explanations already available, it is easy to see why electoral districts may be perceived as marginal or secondary in explaining party support from election to election (see Jackman, 1972; Fox, 1994).

Yet other scholarship forcefully argues that districts matter for election outcomes. Electoral districts "stand at the very core" of political life (Carty and Eagles, 2005: 11) in representative democracies with single-member or multi-member plurality electoral systems. They show considerable diversity across several salient dimensions, including population demographics and partisanship, even when districting processes are nonpartisan; this makes it difficult to justify the assumption that campaign effects are homogenous across districts (Mustillo and Jung, 2016). Districts produce competitive contexts that affect key aspects of the electoral process, including candidate nominations (Sayers, 1999; Thomas and Bodet, 2013). Other studies show consistent and meaningful effects of local candidates on election outcomes, with respect to the types of issues raised (Stevens et al., 2019), the types of voters more likely to react to a strong local candidate (Roy and Alcantara, 2015) and voters' perception of election outcomes on their communities (Daoust and Blais, 2017). Political parties do direct significant resources to districts, and candidates must organize their campaigns within these boundaries (Koop, 2011; Carty, 2002; Cross et al., 2020). District campaigns are integrated in different ways to national party campaigns, with some parties choosing to use leader visits to

shore up existing support, while others attempt to use those visits to increase support in contested areas (Carty and Eagles, 2005; see also Currie-Wood, 2020).

When district effects are part of the discussion, much of the scholarship asks if districts matter or how districts affect individual behaviour or national campaigning (Denver et al., 2003; Cross and Young, 2011). What this work does not do, however, is address how much districts matter to party support and thus to election outcomes overall. Knowing this would offer a more comprehensive explanation of elections that is missed with a national, provincial or individual focus.

2. Measuring the Relative Importance of Districts on Election Outcomes

We argue that the primary barrier to studying the effects of districts on electoral outcomes is not substantive but methodological. Case studies, interviews, and candidate and electoral district association (EDA) president surveys provide important insights into how districts matter, but those methods cannot elucidate quantitatively how *much* districts matter for election outcomes. Gathering survey data with representative samples of voters at the district level would help identify the effect of districts, albeit only for individual voters and their vote choice. However, this is prohibitively expensive, and political scientists will typically lack the resources to measure the importance of district effects on party support using individual-level survey data. Stevens et al. (2019) and Vox Pop Labs/Vote Compass initiatives are innovative exceptions in Canada, though they only cover a more recent period of the Canadian electoral history. This is why most existing studies make use of individual-level surveys and fit a general model across districts using hierarchical modelling or comparable statistical techniques (for example, Blais and Bodet, 2006). The difficulty is that these approaches assume, by necessity, that the same factors work in a similar fashion across all electoral districts. This provides an average picture of voter behaviour but gets us no closer to understanding the sources and relative importance of district context. To overcome these challenges, we use geographic information systems (GIS) technology to identify polling divisions situated at the border between districts. We then focus on the process of drawing the line that sort voters on either side of district boundaries to estimate how it shapes district effects.

A comparison with the logic of natural experiments is illustrative. In the social sciences, a natural experiment is defined as treatment procedure where participants' exposure to the hypothesized cause is not controlled by the researcher. The treatment is instead distributed by someone or something exogenous to the study or by arbitrary (sometimes even random) decisions (Dunning, 2012). We argue that a comparable, though nonexperimental, exogenous treatment happens locally when an electoral commission draws the boundaries that divide a geographic space into several electoral districts (see Courtney, 2001). Thus, district effects on party support are, for us, measured by capturing the difference in party support that stems from being inside one district compared to another, at the boundary between the two.

At this point we should be very clear: we do *not* argue that districting is a natural experiment, as neither the boundaries nor a voter's presence in a district constitutes a random assignment. For boundary commissioners, districting is obviously not an

arbitrary or random process, as they do their best to respect natural and human-made boundaries, as well as socially constructed communities of interest. As such, districting does not meet the requirements of a natural experiment (Sekhon and Titiunik, 2012). However, we argue that we can still use the logic of exogenous treatment because district boundaries are indeed *locally arbitrary*. There are two reasons for this. First, under nonpartisan districting, district boundaries are not connected to or dictated by partisan electoral imperatives. Second, the actual lines of demarcation *between* districts are arbitrary at the granular level, at least in the minds of most voters. These lines could easily be drawn one residential block away in urban settings, a few hundred metres away in suburban neighbourhoods, or at the next crossroads in more rural areas. In other words, those directly at the very limit of a given district may have easily ended up in a neighbouring district, and the decision that places them in one or another is typically not relevant to how voters see or understand politics.

A critical reader may object on two grounds. First, voters will still understand when they are in a given party's stronghold or if they are in a noncompetitive setting (Blais and Bodet, 2006). We agree. While it affects their voting behaviour certainly, it remains distinct from how and why those district boundaries were drawn. That is a key reason to care about how districts matter to party support: potential voters at the boundary between districts may adjust their voting behaviour based on an administrative decision exogenous to partisan politics. This may be less common than voters who are agnostic to the placement of district boundaries, but we do not think it invalidates our argument. Second and perhaps related, some voters may be keenly aware of district boundaries for other nonpartisan reasons. Some boundaries are human-made (a highway for example) and often correspond to real-world social divisions, creating neighbourhoods that vary considerably in terms of class, race, immigration, employment or other socially or politically relevant characteristics. In these cases, our logic holds: when electoral boundaries are drawn to ensure the representation of communities of interest, this does not change the fact that potential voters at the boundary between two districts *will adjust their voting behaviour based on administrative decisions exogenous to electoral politics.* Indeed, we would expect factors such as districts' socio-economic composition or the presence of a party stronghold to be a cause of district effects on party support. Moreover, only one federal electoral district in Canada (Labrador) is bounded entirely by natural or human-made obstacles within a given province.[1]

To illustrate our method, we provide an example from the 2015 election. Figure 1 shows the Canadian federal district of Toronto Centre post-2013 representation order, its polling divisions, and its neighbouring districts. Recall that the crux of our argument is that the boundaries between districts are exogenous and locally arbitrary. It means that for voters, their sorting into one district (versus its neighbour) is not necessarily relevant to their daily lives and certainly *not* dictated by partisan electoral imperatives. This is particularly true with respect to where polling divisions are located, as this is a fundamental feature of nonpartisan districting. A polling division is the administrative section of an electoral district in Canada. Voters cast their ballots physically in a polling division that is assigned to them based on their home address. Polling divisions are of no political consequence per se because a candidate must win a plurality of votes across the whole district.[2]

Figure 1 Toronto Centre and Its Three Neighbours Are among the Densest Districts in Canada

Toronto Centre covers, predictably, the downtown area of Canada's most populous city. It is one of the most densely populated districts in Canada. Its neighbouring districts—Spadina–Fort York, Toronto–Danforth and University–Rosedale—are also among the most densely populated.[3] Each district is divided into a series of polling divisions ranging in size from single buildings to a few city blocks, to larger parts of Lake Ontario's waterfront. All four of the districts featured in Figure 1 elected a Liberal candidate to the House of Commons in 2015. But, as is apparent from Figure 2, the strength of support for Liberal and Conservative candidates varies both across districts and, especially, across poll divisions.

Given that electoral district boundaries are locally arbitrary (that is, not partisan and often irrelevant to voters), how can we use this to assess how much of the difference in each party's support is attributable to the district? To do this, we first collect official data about electoral support for parties at the polling division level. We then merge this data with geographical shapefiles provided by the chief

Figure 2 Support for the Liberal Party (left) and the Conservative Party (right) Varies Both between and within Districts

electoral officer (Elections Canada) to identify, using geospatial techniques, neighbouring polling divisions.

The operational definition of a neighbouring division is important here, as several methods are available. In our case, our data are objects with well-defined borders, located next to each other (polling divisions in districts). We adopt a contiguity-based approach and identify districts that share neighbouring polling divisions. Then we must decide if we define contiguity (which poll divisions border each other) as "queen" or "rook" (see Lloyd, 2010 for further details). Analogous to moving chess pieces, the rook procedure is more exclusive when identifying the number of neighbouring divisions, as it only considers divisions that are horizontally and/or vertically related to the district's boundaries. The queen procedure is more inclusive, as it also considers divisions that are diagonally related. We choose the rook approach to restrict the analysis to fewer neighbours (see Griffith, 1996), as this is the more cautious approach, especially in rural and other geographically large districts.[4] Identifying district effects this way gives us greater confidence in our results.[5]

We have one additional constraint: federal electoral districting in Canada is conducted province by province. This means that boundaries are drawn in each province by a different boundary commission. Voters may not know outside an electoral campaign in which federal district they reside, but they are well aware of which province they live in, as their location has important consequences for their fiscal status, access to public services and politicized regional identities. Given this, we do not consider these provincial boundaries to be locally arbitrary: they are structurally imposed and unavoidable. Consequently, for our purpose, districts on each side of a provincial boundary are not considered neighbours.

Given all of this, we estimate precisely how much of party support can be attributed to the district by running a simple ANOVA model where the data points are the polling divisions—whether inside and just outside of a chosen district—that have direct (rook) contact with the district boundary. For example, in Toronto

Centre, we identify all the polling divisions bordering other districts. We then identify all the polling divisions outside Toronto Centre but in direct contact with it. In the 2015 election, there were 127 polling divisions at the boundary either inside or just outside Toronto Centre and 20 per cent of them within the district.

This exogenous treatment is operationalized for all polling divisions that are located at a district's boundaries. We create a dichotomous variable that takes the value 1 when a polling division is within that chosen district and 0 otherwise. The outcome variable is the vote share for a given party at the polling division level. We are interested in the effect of being inside (versus outside) a given district. The variance explained (R^2) is our estimate of how much district effects can explain party support (expressed as a percentage of the overall vote share). The remaining unexplained variance represents the relative importance of other factors, including the individual characteristics of voters and the national campaign.

In the case of Toronto Centre in 2015, the district effect on the Liberals' vote share is 6.71 per cent, compared to 2.33 per cent for the Conservatives and 0.40 per cent for the New Democratic Party. This district effect for the Liberals is less than its neighbouring Toronto–Danforth (23.05 per cent) but more than in University–Rosedale (1.92 per cent).

3. How Much Do District Effects Matter for Party Support?

To describe this measure of district effects on party support, we use electoral data from all federal elections held in Canada from 2006 to 2019. The 2006, 2008 and 2011 elections were conducted under the 2003 representation order[6] that divided Canada's 10 provinces and three territories into 308 districts. The 2015 and 2019 elections were conducted under the 2013 representation order and its 338 districts. For both electoral maps, we ignore the districts within the territories (Yukon, Northwest Territories and Nunavut), as each territory is composed of a single electoral district without neighbours within their respective jurisdiction. We also drop the district of Labrador, as it does not have within-province neighbours sharing land boundaries. In total, we test our measure on a maximum of 1,580 district-based elections.

Table 1 presents descriptive statistics for our measure of district effects on party support for the Liberal Party (LPC), the Conservative Party (CPC), the New Democratic Party (NDP) and the Bloc Québécois (BQ) during the period under study. District effects matter most, on average, for the Liberals, explaining 9.54 per cent of their support across five elections. They are also similar for the NDP (on average, 9.30 per cent) but lower for the Bloc (7.05 per cent) and the Conservatives (6.22 per cent). These results are of similar magnitude to Stevens et al.'s (2019) estimate using survey data from the 2015 election.

Additional details deserve attention in Table 1. First, the mean district effect is typically— but not always—quite different from the median effect. This is because some districts have remarkably strong effects, while many others exert only a modest influence on the fate of parties on election day. Given that campaign efforts in each district vary considerably across parties, it is not surprising that district effects also fluctuate within and between parties. Figure 3 clearly shows that the distribution of district effects is not normal for any party. Given that, the interquartile range (IQR)

Table 1: Descriptive Statistics of District Effects

Party	Election	# of Obs.	Mean (%)	Median (%)	IQR (%)
LPC	2006	304	9.04	4.25	10.80
	2008	304	11.13	5.37	14.24
	2011	304	6.15	6.25	14.30
	2015	334	8.43	3.48	10.78
	2019	334	7.49	3.18	9.72
	Total	**1,580**	**9.54**	**4.74**	**11.70**
CPC	2006	304	7.14	2.69	7.73
	2008	304	7.15	3.55	9.05
	2011	304	11.92	3.01	7.81
	2015	334	5.13	2.24	6.13
	2019	334	5.70	2.22	7.45
	Total	**1,580**	**6.22**	**2.75**	**7.57**
NDP	2006	304	8.65	3.18	11.17
	2008	304	9.96	4.19	12.48
	2011	304	10.33	5.08	13.84
	2015	334	9.53	4.21	11.79
	2019	334	8.14	3.43	8.54
	Total	**1,580**	**9.30**	**4.01**	**11.54**
BQ	2006	75	7.97	3.92	8.66
	2008	75	6.42	3.13	7.11
	2011	75	8.68	4.78	12.81
	2015	78	5.84	2.49	5.41
	2019	78	6.41	2.98	6.89
	Total	**381**	**7.05**	**3.31**	**7.43**

—that is, the distance between the 25th and 75th percentiles—is helpful in this context. IQR reaches 11.70 per cent for the Liberals, 11.54 per cent for the NDP, 7.57 per cent for the Conservatives and 7.43 per cent for the Bloc. This indicates important variations in terms of district effects on party support, from districts where effects do not differ at all from their neighbours to places where districts matter a great deal. Overall, the effect of districts on party support is above 30 per cent for at least one of the main parties in only a minority of cases (in around 10 per cent of districts).

4. Ascertaining the Validity of Our Measure of District Effects

As stated, a key premise in our argument is that electoral districts' boundaries are locally exogenous and arbitrary—that is, district boundaries are not dictated by partisan electoral considerations—and are irrelevant to a voter's daily life. Therefore, to be confident that this measure truly captures something about district effects on elections, we need to verify that the exogenous treatment—being in the district versus being in its neighbour—is indeed exogenous to electoral dynamics. This balance test is commonly used to test the null hypothesis—that is, that "the assignment to treatment is independent of pre-treatment data" (Mutz et al., 2019: 32).

Our first test assesses if this treatment is balanced at the poll division level. Elections Canada provides two relevant variables at that level: voter turnout and spoiled ballots. Voter turnout is especially interesting, as past studies show, using survey data, that voters who recall being contacted by parties or candidates are
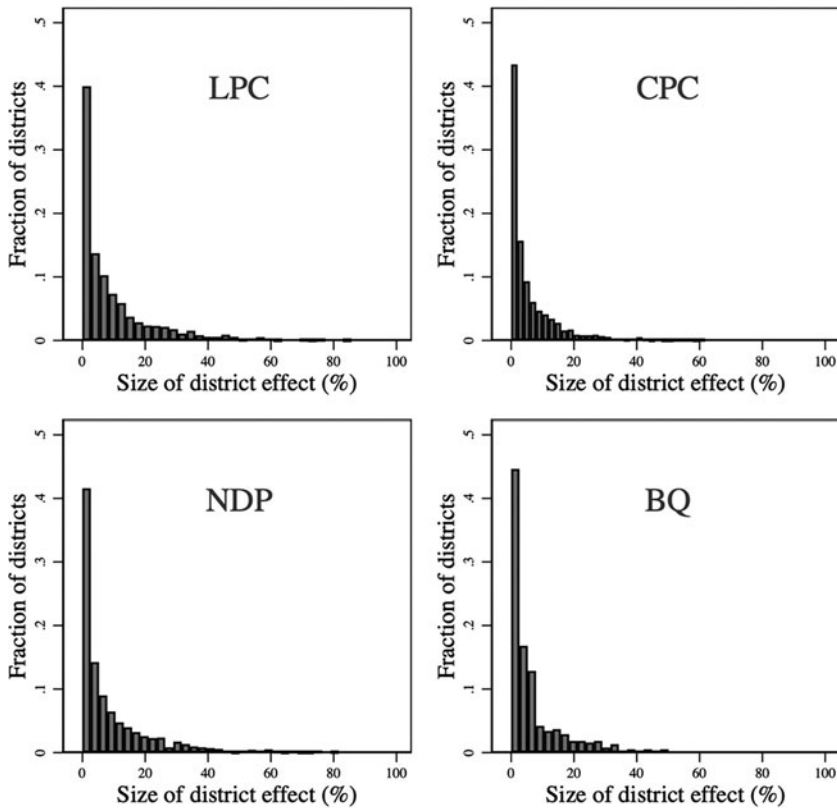
Figure 3 Distribution of District Effects in Canadian Federal Elections, 2006–2019

more likely to vote (Pammett and Leduc, 2003; Cross and Young, 2011). While research on spoiled ballots is sparse, they could logically indicate voter confusion, protest or potential voter suppression. If either is associated with being in the district treatment (versus its neighbour), it would suggest the presence of endogeneity.

We use a linear probability model (LPM) to assess balance on turnout and spoiled ballots across polling divisions, where the outcome variable is a dichotomous variable that considers data points located in the district as part of the treatment group. The results are shown in Table 2. We present two models to account for the 2003 and 2013 representation orders mentioned previously. Model 1 contains estimates from 2006 to 2011, and Model 2 contains the results for the 2015 and 2019 elections. Each polling division in each election is an observation, leading to a total of 106,227 observations for Model 1 and 80,371 observations for Model 2.[7] Standard errors are clustered around those polling divisions. Each model includes our variables of interest—voter turnout and spoiled ballots—as well as a series of fixed effects for election years and districts.

As Table 2 shows, we find no statistically significant differences for the relevant two regressors under study. It is indeed the case for both estimations, individually

Table 2 Balance Tests

Regressors	Model 1	Model 2
% turnout	−.00 (.00)	−.00 (.00)
% rejected ballot	.00 (.00)	.00 (.00)
(Election year FE)	2006, 2008, 2011	2015, 2019
(District FE)	Yes	Yes
# of observations	106,227	80,371
# of clusters	26,885	40,965
R^2	1.95	1.71

Notes: Coefficients from linear probability models. Outcome variable is being part of the treatment group in a district (versus outside of it). Statistically significant coefficients ($p < .05$) are in **bold**.

and together.[8] We can conclude that our data assignment is balanced at least on these two measures. This has a number of implications. First, and most importantly, while it might be reasonable to expect that districts will vary systematically in terms of voter turnout or number of spoiled ballots, these variables are not statistically associated with being on one side of a district boundary or the other. This suggests that district boundaries are locally arbitrary at least when it comes to these two dimensions of voting. Second, the lack of connection between our measure of district effects and voter turnout leads us to question the generalization that more intense district campaigns lead to higher turnout. This association stems from survey self-reports and recall, and the voters most likely to be contacted by parties are already known party supporters. Given that, the relationship between campaign effort and turnout may be better understood at the individual level, rather than at the district level.

The second test we use to validate our measure of district effects examines the stability of district effects across elections. We expect it to be relatively stable from one election to the next, even though Canadian federal elections could be considered as volatile in a comparative perspective (Matland and Studlar, 2004). While some variation is expected and can be reasonably attributed to demographics or campaign events, excessive fluctuations would suggest that our measure captures factors beyond the districts. To test the measure's stability, we pair successive elections: 2006 and 2008; 2008 and 2011; and 2015 and 2019.[9] We then compare the proportion of party support our measure attributes to districts in the earlier elections (2006 for pair 1, 2008 for pair 2, and 2015 for pair 3) to the proportion attributed in later elections (2008 for pair 1, 2011 for pair 2, and 2019 for pair 3). We present this analysis summarized across all pairs of elections for each party in Figure 4, with the proportion of party support attributed to districts for first/earlier election on the *x*-axis (as a proportion of the overall election outcome) and the same measure for the second/later election on the *y*-axis.

Figure 4 shows that our measure of district effects on party support is stable. In any given election, district effects are strongly correlated (always above 0.5) with their lag while still allowing substantial variation, particularly in constituencies with low levels of district effects on party support. In addition to this, the average changes in district effects between successive elections tend to increase (or decrease) consistently across pairs of elections (for example, from 2006/2008 to 2008/2011). This is especially clear for districts that exert strong district effects on party support.
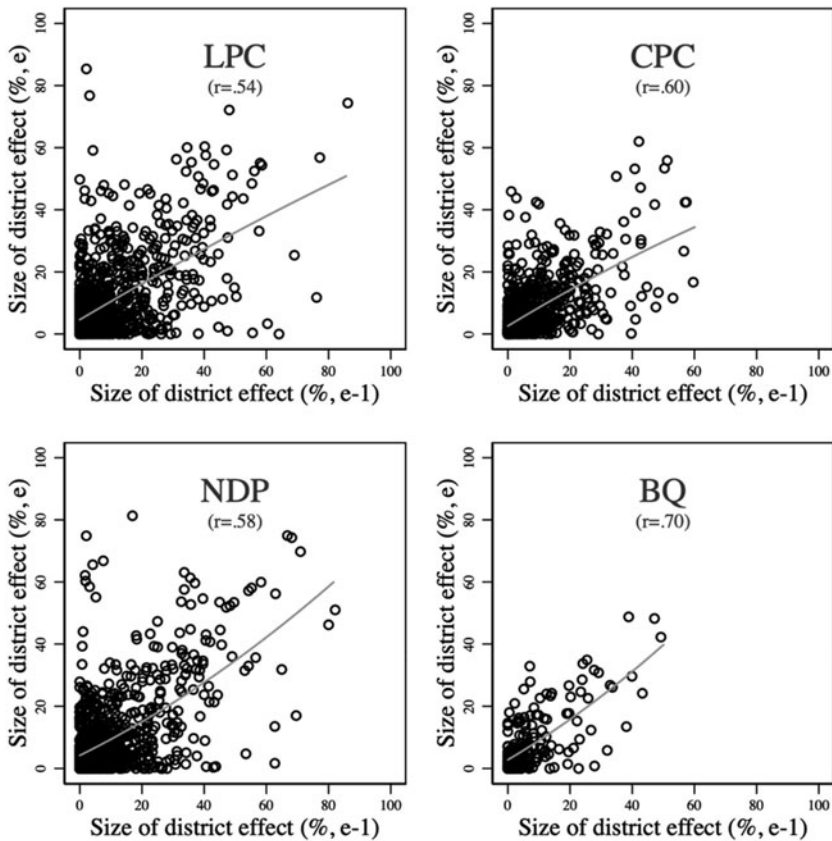
Figure 4 Measure of Correlation, across Elections, by Party

These two tests show that our measure of district effects on party support is solidly anchored in empirical validation. Balance tests are satisfactory, and stability is present.

5. Explaining District Effects

It is one thing to produce a summary measure of district effects on party support; it is quite another to provide a clear explanation of what that measure captures and what it does not. To do this, we investigate structural factors that could explain the magnitude of district effects for each party. We use a series of multivariate models that include election- (and province-) specific fixed effects, as well as a series of socio-economic and political variables. We expect that structural factors will have nontrivial but still limited power to explain district effects on party support. Geography, time and social contexts should be related to these district effects while leaving space for other plausible political factors.

For each party,[10] we first estimate a model that includes election-specific fixed effects (using the 2006 election as the reference category),[11] fixed effects for each

province (using Ontario as the reference category) and a series of variables related to the socio-economic landscape of each district. We have no clear expectations about the magnitude and the size of these estimates. While past research provides compelling arguments as to why each of the factors, described below, might contribute to explain why districts matter to election outcomes, that work is not able to identify how *much* each factor might influence party support in any given district. This is, in our view, one of the most important benefits our analysis of district effects on party support brings to the study of Canadian elections.

Each socio-economic and political factor included here is *relative*, meaning that we focus on how different a district is from its neighbours rather than the absolute magnitude in each location. Each relative measure uses information about each district *and* its neighbours. This allows us to assess differences in neighbouring districts and helps us to distil distinctive district effects from those that might be more regionally bounded. For each relative measure, we are agnostic regarding the amplitude of each factor in districts, as district effects are driven by simply being different from neighbouring districts rather than by the value of coefficients in one direction or another. In other words, our goal is to identify if a district is slightly or very different from its neighbours. This is the case for all the following indicators.

We include three socio-economic variables: relative population density, relative immigrant population and relative unemployment. This approach directly addresses arguments about geographical effects on politics that suggest local effects are driven by the composition of the population rather than by other factors. For example, rural residency has a consistent effect on vote choice in Canada (Gidengil et al., 2012). Moreover, not only race affects vote choice at the individual level (Gidengil et al., 2012), but a district's racial composition also has an impact on candidate nominations (Tolley, 2019). However, measures of race in the Canadian census are heavily critiqued (Thompson, 2020) and have undergone a major revision in advance of the 2021 census (Statistics Canada, 2020). Given this, we use immigration as a proxy.[12] Finally, as relative unemployment could influence party support through economic voting evaluations (see Nadeau et al., 2000), district-level variation in unemployment could have meaningful consequences for district effects on party support.

To measure *relative population density* for each district, we first code each district to 1 if the district is rural[13] or 0 otherwise. For illustrative purposes, let us assume we are building this measure for a rural district. Once the district is identified as rural, we calculate the proportion of neighbouring districts that are also rural. If, for example, a rural district has five neighbours and two of them are rural, then that district's score on *relative population density* is 0.4 (where two districts out of five are rural [2/5] or 40 per cent of them). We then subtract this score from the district original value (of 0 or 1) and consider its absolute value. In this example, this particular rural district's score is |1−0.4|, or 0.6.

The second socio-economic indicator is the *relative proportion of immigrant population* in the district. We start with the proportion of a district's population that identifies as immigrants at the time of the census conducted closest to a given election. From this, we subtract the *average* proportion of the population in neighbouring districts that also identifies as immigrant, and then we consider

the absolute value of that difference. For example, if a district's population at the last census was composed of 5 per cent immigrants and, on average, 9 per cent of the population of neighbouring districts identifies as immigrants, the relative proportion of immigrant population in the district is 4 percentage points ($|5−9|=4$).

The third socio-economic indicator is the *relative proportion of unemployed population* in the district. We again consider the proportion of a district population that is unemployed at the time of the census, subtract the *average* percentage of unemployment in neighbouring districts and take the absolute value of that difference. For example, if 7 per cent of a district's population is unemployed, and its neighbours have, on average, 4 per cent unemployment, this indicator takes the value of 3 percentage points ($|7−4|=3$).

We expect very limited explanatory power from these socio-economic factors for at least two reasons. First, these socio-economic trends are likely to be relevant geographical units that are larger than electoral districts. Given this, it appears more plausible that other factors beyond demographics drive district effects on party support. Second, while we maintain that district boundaries are locally arbitrary, we know that electoral boundary commissions draw districts with communities of interest in mind. Thus, the analysis that follows will help identify districts where those communities of interest are both large and tied to socio-economic factors.

Our final source of explanation of the effect of districts on party support stems directly from constituency campaigns: relative incumbency and relative campaign spending. We build a measure of *relative incumbency* similarly to how we construct our measure of relative population density. We first code each district to 1 if the district has a given party's incumbent and 0 otherwise. For example, imagine a district that does *not* have a Conservative incumbent. We first want to calculate the proportion of this district's five neighbours that *do* have a Conservative incumbent. If 1 of the 4 neighbouring districts has a Conservative incumbent, we get 0.25 (or 25 per cent). We then subtract this score from the district's Conservative incumbent code (0 or 1) and consider the absolute value of that subtraction. In our example, the district's score is 0.75 ($|0−0.25|=0.75$). Again, we are not interested in the direction of this difference. A district effect for a given party will be substantial if that district is very different from its neighbours in terms of that party's vote shares, regardless of whether that difference for a district is positive (the party did much better) or negative (the party did much worse).

Our second political factor is the *relative campaign spending*. It is similar to the measures of relative immigration and unemployment described above. We start with how much each party spent in a given district, computed as a proportion of the total spending limit. From this, we subtract what the party spent in neighbouring districts, also measured as a proportion of the overall spending limit in these districts. For example, if the Conservative Party has spent 68 per cent of the allowed amount in a given district and, on average, 84 per cent of the total allowed in its neighbours, this indicator takes the value of 20 percentage points ($|64−84|=20$). This approach has the benefit of addressing the fact that spending limits vary sometimes considerably by district.

Unlike the socio-economic factors we discussed before, we expect these political factors to have substantial explanatory power on district effects. This could be

Table 3 Predictors of District Effects, by Party

Predictors	Liberals		Conservatives		NDP	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
(2006 Election)						
2008 Election	**2.06** (.79)	**2.22** (.77)	−.01 (.58)	**−1.38** (.65)	1.31 (.70)	−.21 (.69)
2011 Election	**2.76** (.79)	**3.28** (.77)	−1.12 (.58)	**−2.29** (.63)	**1.58** (.70)	−.18 (.70)
2015 Election	−.84 (.92)	.58 (.90)	**−1.96** (.65)	**−3.37** (.73)	1.08 (.92)	−.76 (.93)
(Ontario)						
Nwfndlnd & Lab.	5.46 (3.23)	**6.08** (3.08)	2.34 (2.15)	−1.64 (2.11)	6.21 (3.58)	**8.06** (3.20)
P.E.I	4.94 (4.49)	4.75 (4.25)	−1.84 (2.90)	−1.43 (2.81)	5.97 (5.18)	8.66 (4.57)
Nova Scotia	**13.57** (2.42)	**10.08** (2.33)	.84 (1.61)	1.04 (1.57)	**9.13** (2.68)	**5.80** (2.41)
New Brunswick	**7.27** (2.54)	**5.71** (2.43)	**5.10** (1.70)	**4.47** (1.67)	2.12 (2.78)	4.29 (2.50)
Quebec	−.50 (1.11)	.89 (1.07)	.42 (.74)	1.23 (.75)	.21 (1.23)	1.56 (1.11)
Manitoba	**4.84** (2.14)	**5.53** (2.04)	2.45 (1.42)	1.54 (1.40)	4.20 (2.36)	3.17 (.2.11)
Saskatchewan	**4.37** (2.11)	**5.92** (2.02)	**−3.79** (1.41)	**−4.08** (1.39)	−2.03 (2.32)	−2.80 (2.08)
Alberta	−1.24 (1.51)	1.60 (1.47)	−1.37 (1.01)	−1.44 (.99)	−1.34 (1.66)	.89 (.1.49)
British Columbia	.35 (1.40)	1.71 (1.34)	−.23 (.93)	−.78 (.92)	**4.49** (1.53)	2.14 (.1.38)
Rel. Pop. Density	1.70 (1.73)	2.19 (1.65)	.72 (1.15)	.56 (1.13)	**4.14** (1.90)	**4.80** (1.70)
Rel. Immig. Pop.	**.27** (.08)	**.20** (.07)	.05 (.05)	.06 (.05)	−.02 (.08)	−.06 (.07)
Rel. Unemp. Pop.	.39 (.36)	.40 (.35)	**1.29** (.24)	**1.20** (.24)	**1.32** (.39)	.62 (.35)
Rel. Incumbency		**11.92** (1.21)		**4.73** (.95)		**9.09** (1.35)
Rel. Spend.		−.02 (.02)		.03 (.02)		**.25** (.02)
Intercept	**5.96** (1.08)	**2.86** (1.15)	**5.17** (.74)	**4.65** (.76)	**5.17** (1.15)	2.00 (1.09)
N (panel units)	1,246 (598)	1,246 (598)	1,246 (598)	1,246 (598)	1,246 (598)	1,246 (598)
Within R^2	2.11	7.28	0.04	0.34	0.39	7.81
Between R^2	11.13	18.79	12.11	16.25	8.33	26.05
Overall R^2	9.57	17.76	7.69	10.67	7.05	24.30

Notes: The multivariate models are generalized least squares regressions with random effects. Outcome variable is our measure of district effects. The 2019 election is excluded due to lack of spending data. Statistically significant coefficients ($p < .05$) are in **bold**.

expressed by strong and statistically significant estimates but also by an increase in the variance explained by the models once these political factors are included.

Our analysis of district effects on party support is presented in Table 3. Each multivariate model presented is a generalized least squares regression with random effects accounting for the fact that our data is structured similarly to panel data. We use random-effect models instead of fixed-effect models because we are interested in the explanatory power of election- and province-specific fixed effects.[14] One could expect 638 panel units since we include 304 districts from 2006, 2008 and 2011, and 334 districts from 2015. We instead have 598 panel units since 40 of our districts have not been redrawn in the 2013 representation order. These 40 districts have thus 4 consecutive data points each, while the rest has shorter panels.

For each party, we present two models. Model 1 includes, on the right-hand side, election- and province-specific fixed effects as well as the three socio-economic variables presented above. Model 2 adds the two political variables.

We consider the Liberals in the first two columns of Table 3. Results show significant systematic variation in the effect of districts on Liberal support across elections. If everything else is kept equal, there is on average a significant increase in the district effect for the Liberals as we move from 2006 to 2008 and then 2011.

We also find systematic provincial differences in the effect of districts on Liberal support, notably between Ontario and Atlantic Canada, but also the Prairies.

Perhaps surprisingly, the only provinces that have no meaningful effect on the Liberals' district effects are Quebec, Alberta and British Columbia. Of the socio-economic factors, only the relative proportion of immigrant population shows a substantial and statistically significant correlation with district effects for the Liberals. A 1 per cent difference in the percentage of immigrant population between a district and the average of its neighbours is associated with an increase of 0.2 percentage points in district effect. This suggests that if there is a larger difference in the proportion of immigrants across two districts, the importance of district effects for the Liberals could be quite high.

Incumbency also matters for the Liberals' district effects. When a district with a Liberal incumbent is surrounded by open districts and/or districts with incumbents from other parties, district effects for the Liberals increase, on average, by a staggering 11.9 percentage points. This context is not uncommon for Liberal MPs in Western Canada (for example, Wascana in Saskatchewan). Importantly, this effect holds when a district has no Liberal incumbent and is surrounded by Conservative, New Democrat and/or Bloc Québécois incumbents. As for relative campaign spending, it is not correlated with the Liberals' district effects.

Our analysis of the Conservatives' district effects is found in the middle columns of Table 3. As in the case of the Liberals, there is systematic variation in district effects for Conservatives across elections. On average, and everything else kept equal, there is a substantial and significant decrease in the average district effect for the Conservatives as we move from 2006 to 2008, 2011, and again in 2015. One explanation could be a systemic lift in vote share for the party, both as it consolidated after its 2004 merger and as it generated sufficient support for a majority government in 2011.

Unlike the Liberals, we find few provincial differences in district effects on Conservative support. Few socio-economic factors influence district effects for Conservatives, too, as only the relative proportion of unemployed population is substantially correlated with Conservatives' district effects. A 1 per cent difference between a district's unemployment rate and that of its neighbours is associated with a 1.2 percentage point increase in district effects on Conservative support.

Incumbency also matters for the Conservatives, though this effect is much smaller than what we find for the Liberals. Districts with a Conservative incumbent that are surrounded by open seats and/or districts with incumbents from other parties show higher district effects by 4.7 percentage points in comparison to districts with Conservative incumbents that are also surrounded by districts with Conservative incumbents.

District effects for the Liberals and Conservatives appear to be driven by similar factors: the electoral context in any given election year, some provincial effects, an element of socio-economic context, and incumbency. The results for the NDP, presented in the last two columns of Table 3, are somewhat different. District effects on NDP support are stable across elections; even their watershed 2011 result appears to be best explained by more generalizable political factors—relative incumbency and spending—rather than by district specific dynamics. Like the other parties, incumbency has a great influence on the NDP's district effects. An NDP incumbent surrounded by open seats and/or other parties' incumbents is associated with an average increase of 9.1 percentage points in district effect. Unlike the other parties,

however, spending also affects the NDP's district effects. Spending more or spending less in the district also leads to substantial and statistically significant increases in NDP district effects. A 1 percentage point difference in NDP spending between a district and its neighbours leads to a 0.2 percentage point increase in NDP support. To us, this confirms Carty and Eagles' (1999) finding that campaign intensity has particularly strong effects on NDP support.

Finally, considering election, province, socio-economic factors and political factors explains the effect of districts on party support to some extent but certainly not entirely. We focus on the overall R^2 (or variance explained) in Table 3. It appears that the factors presented in Table 3 can best explain district effects for the NDP, capturing almost 24 per cent of it. Political factors drive much of this, as the difference in the variance explained across Models 1 and 2 for the NDP is the largest of all the parties considered here. Almost 18 per cent of district effects for the Liberals can be explained by the models in Table 3, but for the Conservatives, it falls to approximately 11 per cent. Thus, while all the factors presented in Table 3 matter for at least one party's district effects, it is also clear that these factors, even taken together, cannot fully explain the effect of districts on party support.

6. Discussion

A key feature of nonpartisan districting is that electoral boundaries are drawn *without* party strengths in mind. Similarly, for voters, the electoral district (and especially the polling division) they find themselves in may not be particularly relevant to how they see politics. We leverage this to build a measure of district effects on party support that relies on how different a district is from its neighbours. Through this, we confirm that districts exert a meaningful effect on party support—ranging, on average, from 6 to 10 per cent between 2006 and 2019. While we confirm estimates generated from large-N surveys of individuals (Stevens et al., 2019), our method is both more cost-effective and more replicable across any context where districting is nonpartisan and digital maps and official returns are available. Though this average effect is small, it is enough to shift election outcomes. District effects definitely matter for party support overall. It should be integrated more fully into existing explanations of election outcomes in Canada.

Our analysis also shows that a one-size-fits-all approach is not appropriate for assessing district effects, both across districts and across parties. At its core, our measure captures how different a district is from its neighbours when it comes to party support. This is certainly captured in part by each district's demography, communities of interest and local party campaign efforts, but our measure also shows that the effect of districts relies on more than just these factors. Our measure of district effects on party support also respects how parties differ in their approach to district campaigns (Carty and Eagles, 1999), as well as in their long- standing and often geographically bounded sources of electoral support (Johnston, 2017).

This sparks several exciting avenues for future research. Studies show that electoral districts and their corresponding party associations have clear effects on candidate nomination (Cross and Young, 2004; Sayers, 1999; Thomas and Bodet, 2013; Tolley, 2019). This measure could be used to investigate how candidate characteristics influence district effects on party support in any given election, as well as over

time. Similarly, this measure can help identify districts that exert consistently high effects on party support. This, when paired with other research methods such as surveys and interviews of party officials, could tell us more about why districts and local dynamics are particularly important in some cases and what about it means for Canadian electoral politics.

This measure could also be used to shed light on regionalism in Canadian politics. A perennial challenge in regionalism scholarship is identifying when regionalism is an artifact of socio-demographic composition, in contrast to when living in one place leads someone to think and behave differently in politics. Our measure, when paired with individual-level data, such as those available from the Canadian Election Study, may provide insights into the attitudinal dimensions of regionalism when it comes to party support. This may also help us identify which voters are particularly receptive to more local, district-based campaigns.

In systems with district-based elections, one would expect that an election outcome will notably be driven by voters, the districts where candidates compete and parties' regional and national campaigns. A comprehensive understanding of effects on party support across all these levels is, for us, important if we are to provide comprehensive explanations of election outcomes.

Notes

1 Though it is not possible to systematically identify boundaries that follow human-made infrastructure and/or natural features in our data (we do identify major water areas and take them into account), it is still possible to extrapolate on how these structures might affect our measure of district effects. For example, if we imagine a (highly) theoretical case where one district's boundaries map exactly onto highways or rivers and compare it to another where no human-made or natural features exist anywhere near its district boundaries, we suggest that, ceteris paribus, the district with boundaries that map onto highways and rivers would probably have a stronger district effect on party support. However, we are confident this does not create a systematic bias in our measure, since as we explain in a following section, we mobilize all the polling divisions in contact with neighbouring districts in our analysis. The impact of human-made infrastructure is thus minimized, if not overwhelmed, in the large majority of polling divisions where such barriers do not exist.

2 Parties and candidates may use polling divisions as a means to organize parts of their campaigns (for example, vote pulls). Our point is simply that winning a polling division only helps a candidate win an election insofar as it helps that candidate win a plurality of voters overall across a district.

3 Canada's population density, on average, is 3.9 people/km^2. Toronto Centre's population density is 17,784.0/km^2; the next most densely populated electoral district in Canada is Papineau, in Montreal, with 11,179.4 km^2. Spadina–Fort York is the 6th most densely populated district, University–Rosedale is the 10th and Toronto–Danforth is the 20th (Statistics Canada, 2016).

4 Major bodies of water are also important constraints. This is why we do not consider two districts found on each side of a major river or lake to be neighbours.

5 We could also have opted for proximity instead of contiguity. We would then have looked for the distance between districts' centroid (the central point of a polygon) to identify neighbours. Districts can be classified as neighbours if their centroids are at less than a given threshold distance from each other. Instead of looking at the district in its entirety, only the position of its central point is considered (Jakobi, 2011). Three problems may result from this: (1) the centre of convex districts can be located outside

of their boundaries, (2) it overestimates (underestimates) the number of neighbours in (less) densely populated areas and (3) there is no definition of proximity that could capture both urban areas and rural/northern districts in Canada. With about four inhabitants per square kilometre (by comparison, the United States has over 35; Germany, 237; and the United Kingdom, 274), the Canadian case is ill fitted for the proximity approach. Proximity might be less damaging when applied to more densely populated democratic systems, but we still strongly recommend the contiguity approach.

6 Representation orders are maps that are (re)drawn after each decennial census.

7 In effect, we are performing hundreds of thousands of tests, so it is essential to make use of a systematic and parsimonious tool. This is why the Linear Probability Model is the best choice.

8 In Model 1, the joint F-test for per cent turnout and per cent rejected ballots is not statistically significant with $F(2,26884) = 1.85$ and Prob $> F = 0.15$. For Model 2, $F(2,40964) = 0.34$ and Prob $> F = 0.71$.

9 We cannot pair 2011 and 2015 due to redistricting.

10 We exclude the Bloc in this analysis because it only nominates candidates in districts in Quebec. As a result, it would not be possible to estimate the full model if the Bloc were included.

11 At the time of writing, spending data for the 2019 election is not yet complete; as a result, 2019 cannot be included in this analysis.

12 We do this acknowledging that while we would not be the first to (inappropriately) conflate immigration with race in Canadian political science, scholars should use superior measures to capture race from Statistics Canada as soon as they are available.

13 Statistics Canada defines rural as population density below 400 inhabitants per square kilometre.

14 A fixed-effects GLS regression only allows for within-unit variant variables. Districts remain in the same province for the whole panel, and such specification would have forced us to drop this regressor.

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