Identifying Ridings' Profiles. A Typology of Political Competition Configurations in Canadian Federal Elections

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Paper prepared for the 83rd Annual Meeting of the *Canadian Political Science Association*,
May 16-18, 2011, Wilfrid Laurier University, Waterloo, ON

WORKING PAPER
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Abstract: This paper proposes a thorough exploratory account of political competition at the federal riding level that culminates in a typology of ridings' electoral profiles. More specifically it seeks to answer three questions: what empirical profiles can be drawn from measures of electoral competition at the federal district level? Are they stable over time? Are they spatially clustered?
I expect that electoral competition can be captured by a parsimonious typology, that stability over time is the rule, and that spatial clustering is the most likely geographical arrangement of ridings with regard to political competition.
Three federal elections are considered in this paper (2004, 2006, and 2008). Variables included in the dataset are the vote shares of major parties as well as non-voting in each of the 308 ridings. In order to delineate empirically ridings' profiles with regard to electoral competition, I resort to Hierarchical Ascending Classification.

Introduction

This paper deals with electoral competition at the federal level. While the topic has been abundantly covered elsewhere, most of the scholarly enterprise touching the subject has explanation in mind. The approach taken here is descriptive, and as such it is primarily intended to help future research doing better use of electoral competition either as a dependent or independent variable. In order to do so, I resort to one of the most basic, though fundamental, aspect level of scientific activities: classification. I aim at proposing an empirical typology (also referred to as a "taxonomy") of electoral competition in Canada based on vote shares of federal parties and nonvoting at the federal electoral district (FED) level for the 2004, 2006, and 2008 elections. Concretely, the typology will comprise categories of ridings with regard to electoral competition. The approach followed here is somewhat of a middle ground between the impressive and exhaustive description of each federal riding done by Hill (2002), and a useful though one-dimensional view of electoral competition (e.g. Teyssier, 2010). The objectives are both to achieve parsimony and to account for the multidimensionality of electoral competition.
More specifically the paper aims at answering three questions: what empirical typology (or taxonomy) can we derive from the data? Are categories of the typology geographically clustered? Finally, are the categories stable over elections?
The paper unfolds as follows: the first section states the research problem. In the second section, I set forth a solution to this problem. The third section deals with data and software issues. The fourth and fifth sections are devoted to the presentation and discussion of the results.

The research problem: portraying electoral competition at the federal riding level

Electoral competition is doubtless one of the most central and studied subject of political science. As far as political science in Canada is concerned, the study of electoral competition at the riding level has been significantly marked by the work of Munroe Eagles (1992, 2002, and 2004, see also Carty and Eagles, 2005). This line of research has yielded an impressive body of knowledge in terms of explaining how and why federal parties' vote shares vary at the riding level.
Another approach to explaining electoral competition has used a single measure of electoral competitiveness. While many works use measures of electoral competitiveness as an independent variable explaining turnout (see e.g. Endersby, Galatas, and Rackaway, 2002; Johnston, Matthews, and Bittner, 2007), I am not aware of any study that uses competitiveness as a dependent variable at the federal level. Nonetheless, one such work has been done in the case of Ontario provincial elections (Teyssier, 2010). The focus in this study of Ontario elections is on explaining variation in three different yet one-dimensional measures of electoral competitiveness.
Studying electoral competition either by using as a dependent variable each party vote share or a measure of electoral competition (that weights each party vote share) is important for it allows synthesis and aims at explanation. Yet this produces knowledge more oriented toward variables than ridings. Either each party vote share or a single

measure of competitiveness is predicted but ridings are not compared strictly speaking to one another.

An impressive book by Tony Hill (2002) detailing electoral competition for each federal riding remedies this situation. However useful as a primary source of data and thorough knowledge about each federal riding, it does not yield a synthetic typology of ridings with regard to electoral competition.

In short, the goal of this paper is to supplement previous research by presenting a typology that has few categories and that is made directly from each federal party vote shares. The rationale for the typology forwarded in this paper is to add a concern for ridings to the study of electoral competition.

To sum up, I contend that a descriptive account of electoral competition is useful for it could be used either as a dependent or independent variable in further research. Description is indeed a valuable part of any scientific enterprise (King, Keohane and Verba, 1994). In my view, there is no satisfactory descriptive account of electoral competition at the federal level (nor at the provincial level by the way). Having said that, we are still facing the following basic question: what does electoral competition looks like in the federal ridings? In the next section, I set forth an answer to this question. Since this paper is descriptive, it does not rely on a theory to be tested rather it uses data to elaborate an empirical typology.[1]

The solution: an empirical typology of ridings with regard to electoral competition obtained through Hierarchical Ascending Classification

In my opinion, the best way to answer the question asked above, and its corollaries (which are: are the categories of ridings geographically clustered with regard to electoral competition? Are these categories stable over elections?) is to go back to one of the most basic conceptual activity: classification. According to Bailey (1994: 1):

> *"in its simplest form, classification is merely defined as the ordering of entities into groups or classes on the basis of their similarity. Statistically speaking, we generally seek to minimize within-group variance, while maximizing between-group variance. This means that we arrange a set of entities into groups, so that each group is as different as possible from all other groups, but each group is internally as homogeneous as possible."*

How does classification work in practice? Classification is basically achieved by resorting to one form or another of cluster analysis that is the "generic name for a wide variety of procedures that can be used to create a classification. These procedures empirically form 'clusters' or groups of highly similar entities. More specifically, a clustering method is a multivariate statistical procedure that starts with a data set

[1] Bailey (1994: 6) explains that "typology" and "taxonomy" are often used interchangeably even though a stricter use of both terms would lead one to consider "typology" as being primarily conceptual and "taxonomy" as being empirical. While I acknowledge Bailey's point, for the sake of simplicity, I prefer to use the term "empirical typology" to designate a "taxonomy."

containing information about a sample of entities and attempts to reorganize these entities into relatively homogeneous groups" (Aldenderfer and Blashfield, 1984: 7).
While classical ways of building typologies such as the weberian ideal-type or the "constructed type" (Becker, 1940; McKinney, 1966) are primarily deductive with data coming late in the process, classifications based on cluster analysis use data early in the process (Bailey, 1994: 34). Here we seek to form our classification empirically.
The general principle of cluster analysis may be straightforward but there are nonetheless many specific methods to achieve a classification (Aldenderfer and Blashfield, 1984: 35). Here I rely on Hierarchical Ascending (or agglomerative) Classification (HAC). This method has traditionally been the most resorted to. The principle of HAC is quite straightforward: initially we consider that each individual in the database (in our case, individuals are ridings) represents a cluster. We then successively group (hence the term "agglomerative" or "ascending") individuals according to their degree of similarity. So the first step is to group the two individuals (the two ridings) that are the closest with regard to their values on our set of electoral variables. We thus obtain *n–1* clusters. We then group the cluster containing our two observations with the singleton the closest to it and thus obtain *n–2* clusters. We go on like this until obtaining a single cluster containing all *n* observations (Sanders, 1990: 180). The sequence of successive mergers of clusters can be represented visually by a tree diagram called a dendogram (Aldenderfer and Blashfield, 1984: 36). Using HAC raised two issues that need to be addressed: first, the researcher must define a criterion to measure the similarity between individuals; second, the researcher must define a measure of the distance between clusters (the criterion of aggregation).
In this paper I use Euclidean distance as a measure of similarity between individuals. The criterion of aggregation used here is that of the second moment. Doing so basically amounts to look for a partition (that is a cluster solution) that is such that intraclass variance is minimized while interclass variance is maximized (Sanders, 1990: 191). In order to decide on a number of clusters, one must define a threshold. In this paper, I set the threshold at 5%. This means that I only retain clusters that "explain" 5% or more of the between-group variance.
To sum up, the aim is to elaborate an empirical typology resorting to the technique of HAC for each of three federal elections. Once this typology is obtained, we will look at the spatial distribution of categories as well as their distribution over successive elections. By doing so we will be able to answer the three research questions previously asked (which are: 1/ what categories of federal ridings can be drawn with regard to electoral competition? 2/ How are they geographically distributed? 3/ Are these categories stable over time?)

Data and software

I have collected data from Elections Canada for the 2004, 2006, and 2008 elections on each of the 308 FEDs. Forty among them have changed names between 2004 and 2006 but boundaries have remained the same everywhere. Variables included in the data set are:

LPCYY: it refers to the share of valid votes that went to the Liberal Party of Canada. YY stands for the election year considered (e.g. LPC08 designates the share of Liberal voting in the 2008 election).
CPCYY: it refers to the share of valid votes that went to the Conservative Party of Canada. Here again, YY stands for the election year considered.
NDPYY: it refers to the share of valid votes that went to the New Democratic Party of Canada. Here again, YY stands for the election year considered.
BQYY: it refers to the share of valid votes that went to the Bloc Québécois. Here again, YY stands for the election year considered.
GPCYY: it refers to the share of valid votes that went to the Green Party of Canada. Here again, YY stands for the election year considered.
OthersYY: it refers to the share of valid votes that went to other candidates. Here again, YY stands for the election year considered.
ABSYY: it refers to nonvoting (abstention). This is the ratio of registered voters who did not cast a ballot to the total number of registered voters. Here again, YY stands for the election year considered.
I used Philcarto (Waniez, 2010)[2], a free software that performs several descriptive statistics tasks among which HAC. Maps presented in the next section were also drawn with Philcarto.
I performed HAC on ranks transformed data because distributions of vote shares of BQ, GPC and independents were highly skewed to the right.

Results

Since this paper aims at providing an answer to three research questions, let us consider them in order. I start by answering the following two questions: what typology can we draw from the data? Are the categories of ridings geographically clustered? Once an answer is brought to each question, I will move to the third question (is the typology stable across elections?)
In the following paragraphs, I treat each election separately. Each time, there are three relevant and interconnected pieces of information: a graph, a table, and a map.

2004: The HAC performed on the 2004 election data yields an acceptable typology with five classes (clusters). As stated above, the criterion for stopping the HAC is 5%. In other words, I only include new clusters that explain at least 5% of between-group variance. A five-cluster solution is the one for which each cluster satisfies this criterion. 52.1% of inter-group differences are captured by this solution.
Graph 1 synthesizes the make-up of each cluster with regard to party vote shares and nonvoting. Table 1 complements this piece of information by displaying the number of FEDs in each category. Map 1 identifies each category on a map of Canada's electoral districts.
In order to answer research question 1 (what are the categories of the typology?) and research question 2 (how are the categories geographically distributed?), let us consider

[2] Philcarto is a free software created by Philippe Waniez, a French geographer. This software can be downloaded along with its companion software Phildigit at http://philcarto.free.fr/Philcarto.html.

Graph 1 in connection with Table 1 and Map 1. The first category (in red on map 1) is made up of ridings where LPC voting as well as nonvoting were well above their national average. The opposite situation holds for CPC and NDP voting. This pattern is mostly observable in Newfoundland and Labrador and in two specific locations in Quebec (West Montreal and the Outaouais region). The second cluster has ridings only in Quebec. These are ridings where the BQ is strong. This is the dominant feature of this category. The third category represents ridings where the three major national parties are slightly above their respective national average while nonvoting is somewhat below its own national average. This category is quite widespread across the country. In any case, this is the modal category of the typology. The fourth category clearly indicates ridings where NDP candidates receive scores significantly above their national average. This category is also widespread across the country with clusters in the Maritimes, parts of Southern Ontario, Northern Ontario/Manitoba/Saskatchewan, as well as in British Columbia. The fifth category is the counterpart of what class 2 is for the BQ. Category 5 is clearly dominated by CPC scores well above their national average and LPC scores well below their national average. Ridings characterized by this category are heavily concentrated in Alberta.

To sum up, a five-cluster solution is a reasonable result with regard to describing the outcome of the 2004 federal election. We really have several geographical clusters of FEDs for categories 1, 3, and 4. Conversely, categories 2 and 5 are very concentrated in one province (Quebec and Alberta respectively).

Graph 1 – Five-cluster solution of an HAC performed on the 2004 federal election results

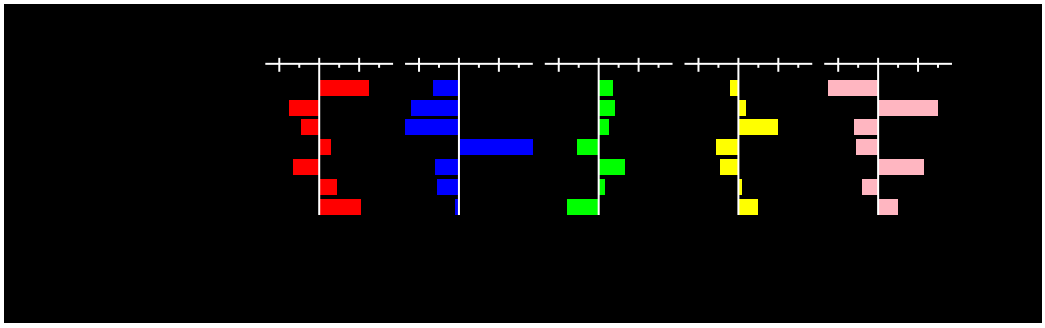
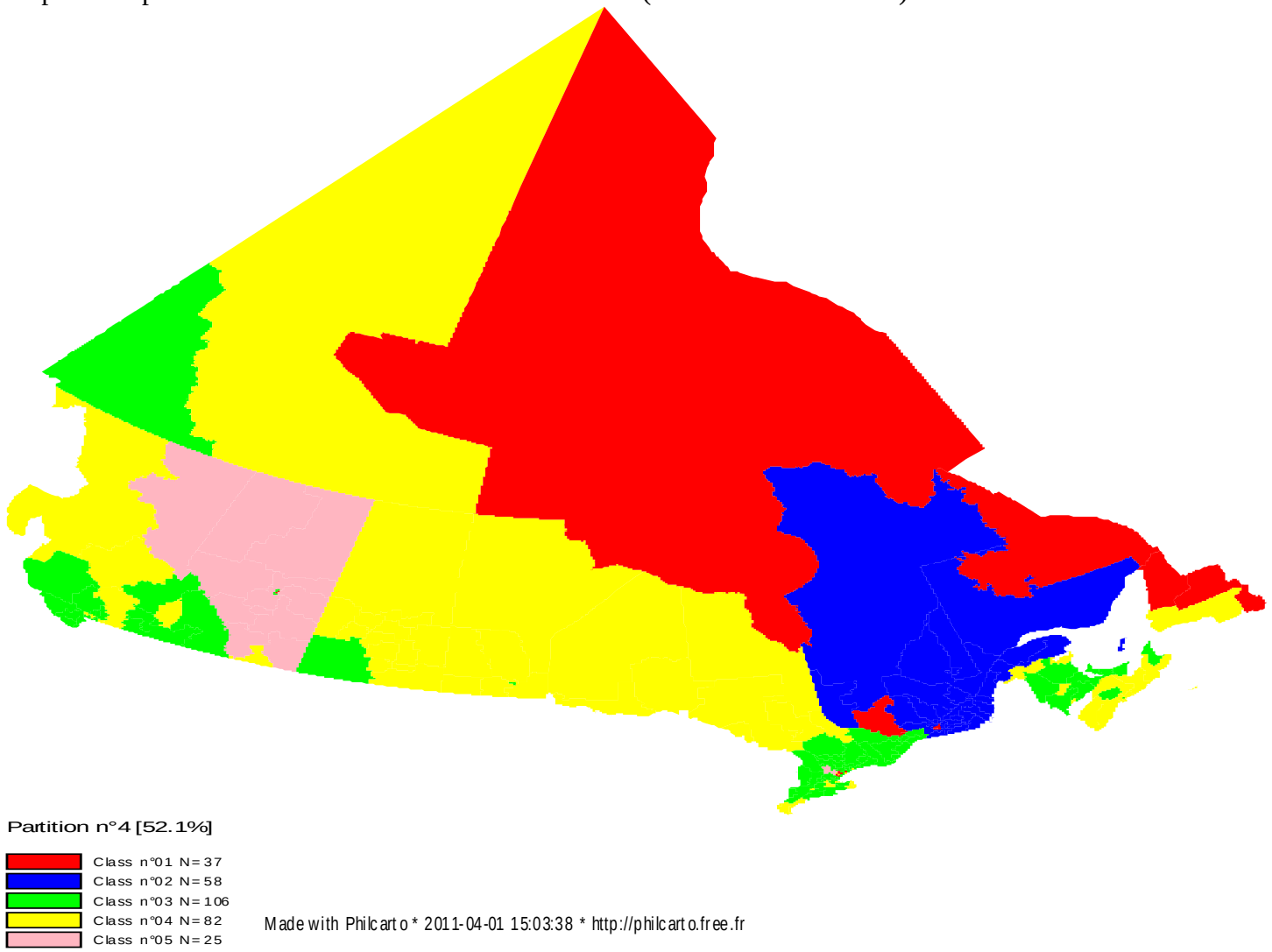


Table 1 – Summary of relevant information about the HAC (2004 federal election results)

CLUSTERS	# of FEDs*	Spatial distribution of clusters
1	37	4 FEDs in NFL; several FEDs in West Montreal and Outaouais region; several FEDs in the GTA; one isolated riding in Edmonton; Nunavut
2	58	The 58 Quebec's FEDs that are not in Cluster 1
3	106	Several FEDs in NS, NB, PEI; 2/3 of Southern ON FEDs; several FEDs in Winnipeg and Edmonton; an isolated FED in SK, 21 out 36 BC FEDs
4	82	Parts of NFL, NS, NB; industrial locations in Southern ON; Northern ON, most of MB and SK, BC FEDs that are not in cluster 3
5	25	Almost all of AB, one FED in BC and ON

* FED stands for "Federal Electoral District". There are 308 FEDs altogether.

Map 1 – Map of Canada's FEDs for a Five-cluster HAC (2004 Federal Election)



2006: For the 2006 election, a five-cluster solution is again an acceptable solution accounting for about 50% of inter-group variance. The first category is characterized by a much above average performance of the CPC and GPC and a below average performance of the LPC. This category does not correspond to a single province, even if most of Alberta's FEDs fall within this category. The second category is made up of 61 (out of 75) Quebec ridings. Here again this category is described by BQ voting and below average scores for the three major federal parties. The third category captures NDP high scores and is quite widespread across Canada. The fourth category denotes high LPC voting and nonvoting. This category is made up of pockets of ridings in several parts of the country. Yet it is primarily seen in West Montreal and in Toronto. The last category refers to ridings where the LPC is somewhat above its own national average, while nonvoting is a little bit below its national average. There is no special pattern of geographical concentration.
To sum up, in 2006 a five-cluster solution works well. Two categories are really identifiable by their geographical pattern (categories 2 and 4) whereas the other categories are spread across the country.

Graph 2 – Five-cluster solution of an HAC performed on the 2006 federal election results

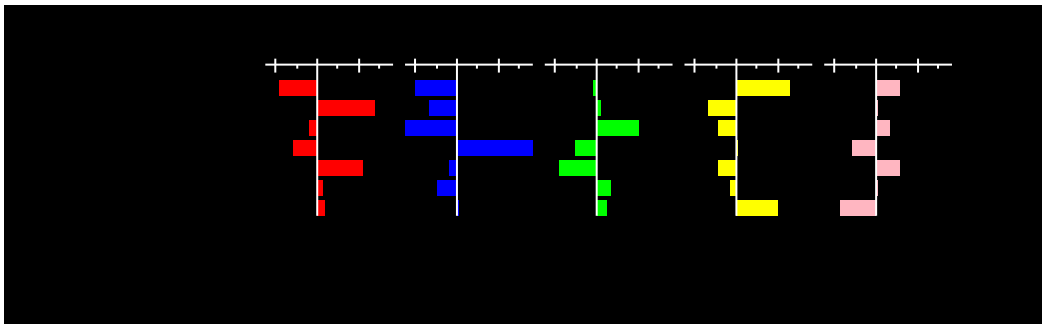
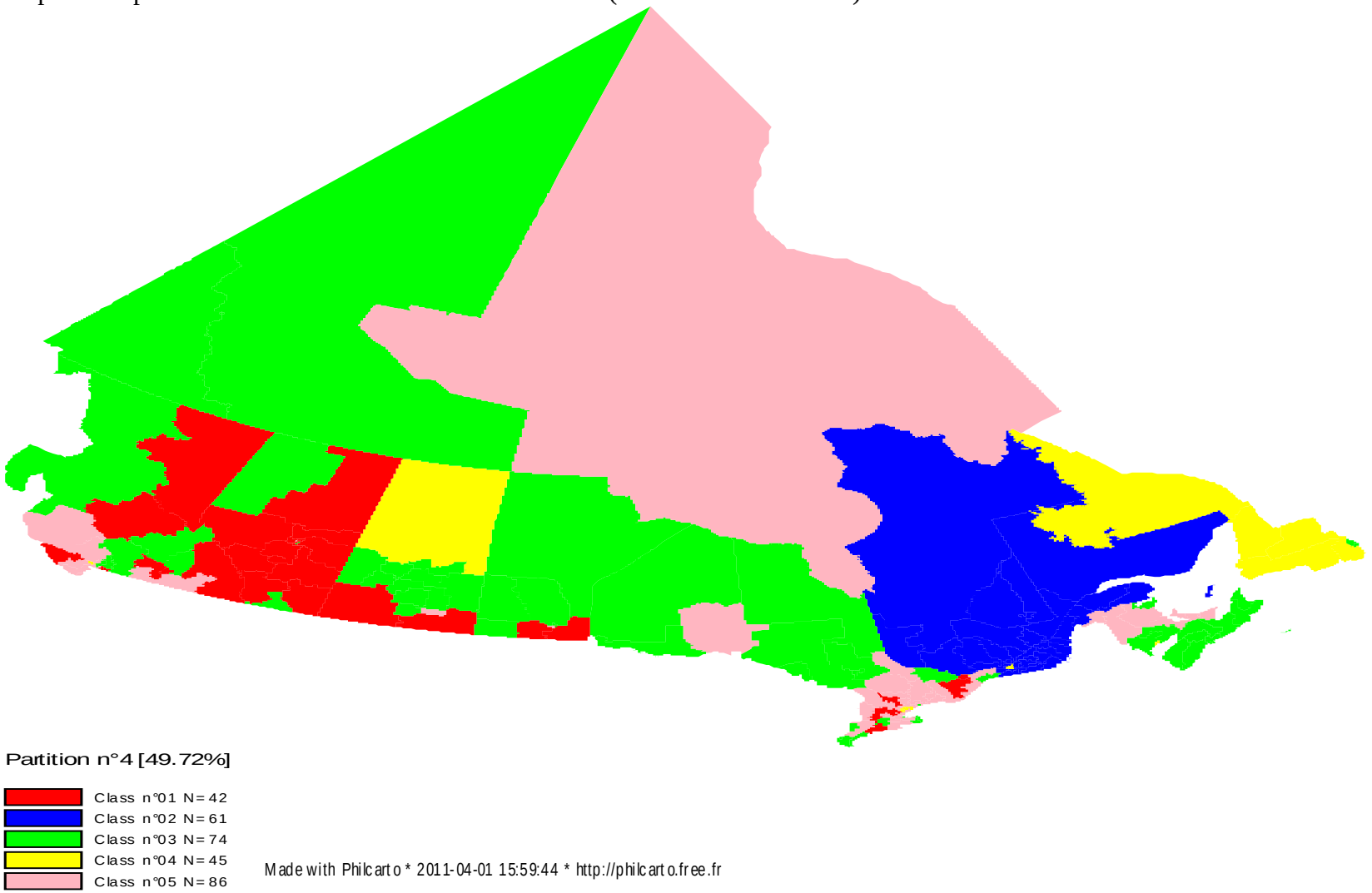


Table 2 – Summary of relevant information about the HAC (2006 federal election results)

CLUSTERS	# of FEDs*	Spatial distribution of clusters
1	42	Almost all of AB's FEDs; 2 FEDs in MB and SK; a few ridings in BC and ON
2	61	All of QC's FEDs (except West Montreal and Hull-Aylmer)
3	74	St John's (NL); all of NS; parts of NB; parts of Southern ON; Northern ON; parts of MB, SK, AB, BC; YT, NT.
4	45	NL (except St John's); West Montreal and Hull-Aylmer; 22 FED's in the GTA; isolated FEDs in Vancouver and in SK.
5	86	PEI; several ridings in NB, southern ON, Winnipeg, BC; isolated ridings in Edmonton and in SK; NU.

* FED stands for "Federal Electoral District". There are 308 FEDs altogether.

Map 2 – Map of Canada's FEDs for a Five-cluster HAC (2006 Federal Election)



2008: For the 2008 election, we again find a five-cluster solution accounting for about 50% of inter-group variance. The first category shows above average scores for the LPC as well as for nonvoting. This category is spread across the country with no geographical concentration except in the GTA. The second class is made up of 74 out of 75 Quebec FEDs. It is characterized by below average performance for the CPC and the NDP. It is seems however that a few ridings could be grouped into other categories especially in West Montreal. The third category is where the CPC does well above its national average and the LPC does below its national average. This category is spread across the country with a few ridings in the Maritimes, as well as in Southern Ontario; but the highest concentration of it is in the West (especially Alberta). The fourth category like the first refers to LPC voting above its average score, but with comparatively smaller than average nonvoting. This is spread in rural regions of the Maritimes and Ontario, as well as in several places in Manitoba, Saskatchewan, and British Columbia.
To sum up, here again we retain a five-cluster solution. We have two interesting concentrations with the clear domination of a party to the expenses of others: category 2 (where the BQ is high not with regard to the LPC but with regard to the CPC and the NDP) and category 3 (where the CPC is high and the LPC is low). Other categories are more spread out.

Graph 3 – Five-cluster solution of an HAC performed on the 2008 federal election results

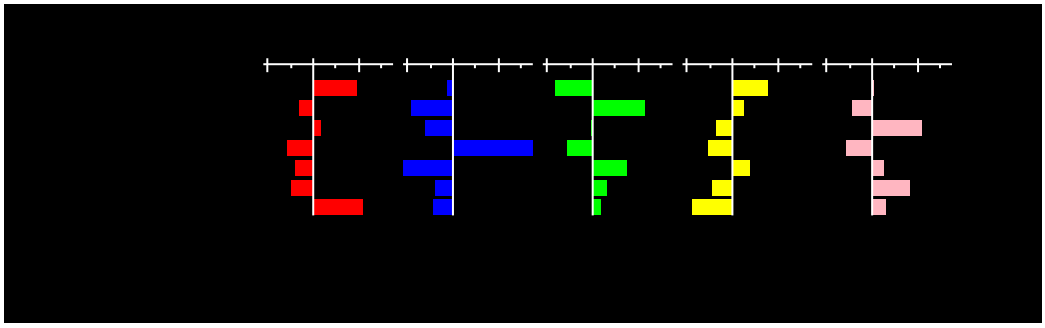
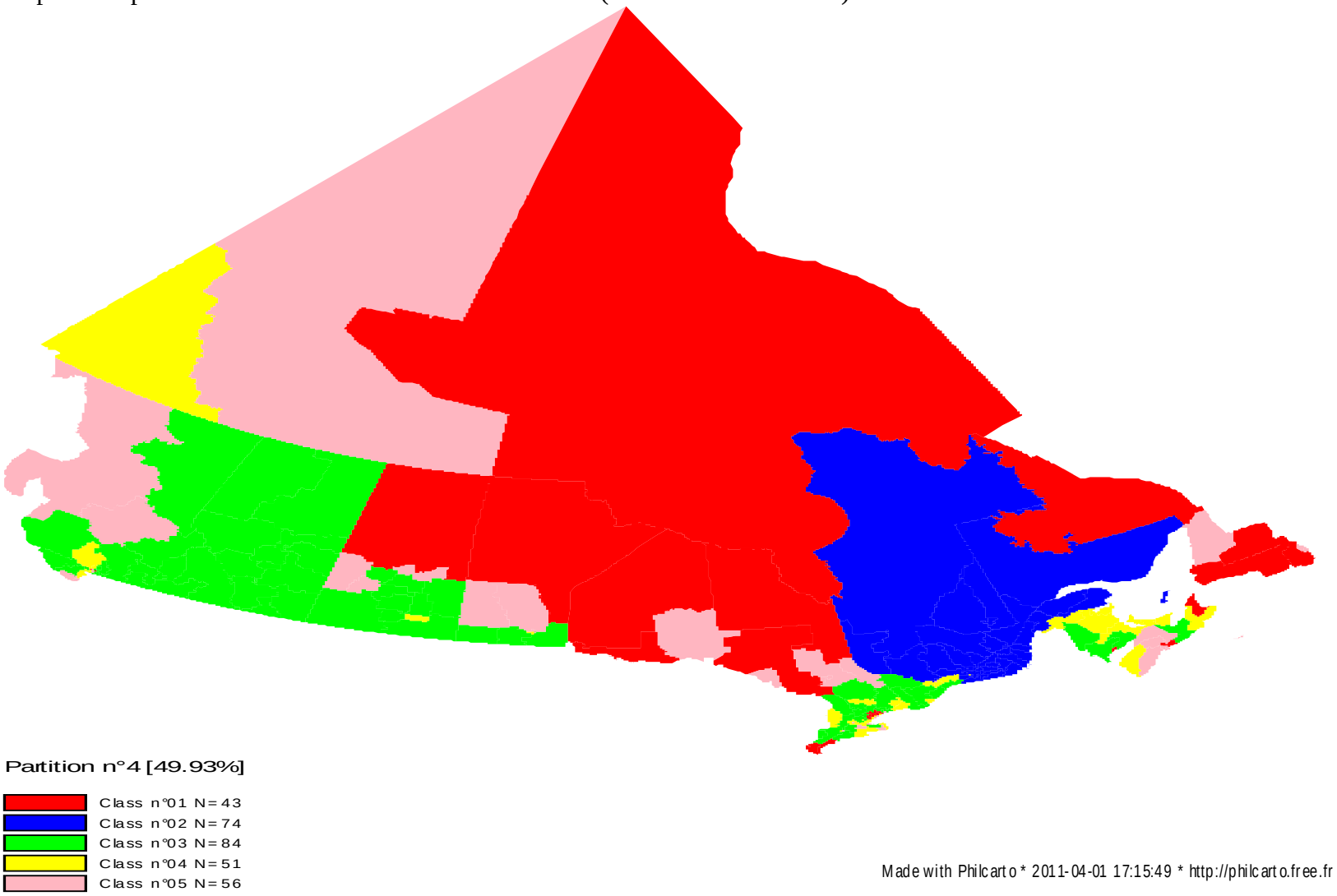


Table 3 – Summary of relevant information about the HAC (2008 federal election results)

CLUSTERS	# of FED*	Spatial distribution of clusters
1	43	Parts of NL, NS, NB, GTA, Southern ON, BC; Northern ON/MB/SK; NU
2	74	All of Quebec's FEDs save one
3	84	Parts of NS/NB, FEDs in Southern ON; parts of MB/SK/BC; all of AB
4	51	PEI; Parts of NS/NB/Southern ON; isolated ridings in Montreal and SK, parts of Winnipeg; parts of BC; YT
5	56	Parts of NL/NS/ON (in the North and South), parts of MB/SK/BC; NT

* FED stands for "Federal Electoral District". There are 308 FEDs altogether.

Map 3 – Map of Canada's FEDs for a Five-cluster HAC (2008 Federal Election)



That being said, the next question to consider is: how much of stability do we observe from one election to the next? In other words, how many ridings have shifted categories?
In order to answer this question, it is useful to examine the frequency of ridings that fall in each combination of categories over elections. Since we have a five-category typology for each election, there are 5^3 that is 125 possible combinations of categories. We only retain those who account for 10% or more of cases in the five original categories for the 2004 election. This yields 11 different "trajectories" for federal ridings. Altogether, this 10% threshold allows retaining 246 ridings (which amounts to about 80% of all FEDs). Table 4 sums up all the relevant information.
Combinations 1.0 and 1.1 account for about 80% of cases comprised in category 1 of the 2004 typology. We distinguish two paths. Common to both of them are ridings where LPC voting as well as nonvoting was above average in 2004 and 2006 while CPC and NDP voting was below average. A few ridings (combination 1.0) experienced a similar conjecture of high LPC voting and high nonvoting in the 2008 election while other ridings (combination 1.1) experienced below average CPC and NDP voting but average LPC voting and significant BQ voting.
The second category of the 2004 typology is absolutely constant over time. BQ voting is the main characteristic of this combination while the other three parties represented in the House of Commons are below their national average (or for the case of the LPC in 2008, at its average).
The third category in the 2004 typology is the one that yields the biggest number of different paths (4). We can group combinations 3.1, 3.2 and 3.3 because ridings involved in these combinations belonged to the same categories in 2004 and 2006 (categories 3 and 5 respectively). These categories are characterized by above average voting for the LPC, CPC, NDP, and GPC. In the meantime, nonvoting was below its national average. In 2008, these ridings took one of three possible paths. The first group of them (depicted in combination 3.1) experienced a drop in LPC voting while both voting for the CPC and nonvoting increased. The second group experienced a sharp decrease in the relative position of the NDP while the rest remained pretty much the same. The third group experienced an important change in the relative strength of the NDP as well as a smaller performance of the LPC and CPC. One group of ridings followed another path as soon as 2006 (combination 3.0 in Table 4). This is a path where the CPC did above its own average while the LPC did below. Note that categories 1 in 2006 and 3 in 2008 are virtually similar.
The fourth category in the 2004 typology yields a similar picture in 2004 and 2006 in which years a very strong NDP voting was the dominant feature. However three paths are observed in the 2008 election. The first path (combination 4.0) is one in which the above average performance of the NDP is replaced by an above average performance of the LPC as well as an above average performance of nonvoting. The second path portrayed in combination 4.1 is that of an above average performance of the CPC replacing the above average performance of the NDP as well as a below average performance of the NDP. Finally, combination 4.2 replicates categories 4 and 3 in the 2004 and 2006 elections (respectively) that is where the dominant feature is strong NDP voting (at least when compared to its own national average).

Finally the fifth category from the 2004 typology yields a stable portrait. The ridings depicted by this category are characterized by the same features that is above average CPC and GPC voting and below average LPC voting.

Table 4 – Summary of clusters characteristics over elections

Combination	Cluster in '04	Cluster in '06	Cluster in '08	N (% of Cluster in '04)
1.0	**1**	4	1	17 (46%)
1.1	1	4	2	13 (35%)
2.0	**2**	2	2	58 (100%)
3.0	**3**	1	3	13 (12%)
3.1	3	5	3	18 (17%)
3.2	3	5	4	38 (36%)
3.3	3	5	5	14 (13%)
4.0	**4**	3	1	11 (13%)
4.1	4	3	3	12 (15%)
4.2	4	3	5	29 (35%)
5.0	**5**	1	3	23 (92%)

To sum up on the trajectories of ridings across time, first we remark that out of the 246 ridings depicted in table 4, 81 are completely stable (combinations 2.0 and 5.0). 152 FEDs are stable in 2004 and 2006 and change in 2008. This supports the argument of stability with regard to electoral competition over elections. However, 20% of ridings do not take part in the making of Table 4 and as such have experienced some change. It thus seems more appropriate to consider that the empirical typology has to be recalculated in each election.

Discussion and conclusion

This paper addressed three research questions: what are federal ridings' profiles with regard to electoral competition? Are they geographically clustered? Are they stable over time?

First, we found that for each election a five-cluster solution is a reasonable result. This setting allows capturing relevant characteristics without being too idiosyncratic. Once again, the advantage of using a clustering approach is that it accounts for the multidimensionality of electoral competition. Each cluster is characterized by the score of each of the seven variables compared to their respective national average.

In terms of geographic clustering we have visually observed that neighbor ridings tend to belong to the same category. However, it does not imply that a geographic continuum is the rule. Rather, for each category, except perhaps for that capturing the successes of the BQ and to some extent the successes of the CPC in Alberta, we observe separated pockets (geographical clusters) of success for each category.

Finally, the typology is relatively stable over elections. That notwithstanding a non trivial number of ridings experience change in electoral competition from an election to the

next. This suggests that the typology should not be taken too rigidly and may be recalculated each time an election is analyzed.

The goal of this paper was to present a typology of federal ridings drawn from electoral competition variables in three elections. While we assessed the spatial distribution and looked at the temporal stability of the typology, the lesson to be retained is that it is straightforward to obtain categories of an empirical typology for each election one is interested in. So whether one uses the categories of this typology as values of a dependent or an independent variable, it is easy to obtain and refine them as wished simply by replicating the approach presented here. Once again the advantage of using empirical typologies such as those produced by HAC and related methods is clear over using collinear measures of party vote shares or using synthetic indexes of electoral competition. By using HAC and related methods one is able to take the multidimensionality of electoral competition into account while at the same time using a single variable with multiple categories.

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