

The Imputed Demographic and Political Characteristics of the Proposed Federal Ridings for Quebec

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Contents

Summary / Résumé (version française)	ii
Introduction.....	1
Methodology.....	1
Socio-demographic characteristics	2
Summary	2
Socio-Demographic Characteristics by Riding.....	2
Population Deviation and Socio-Demographic Characteristics	4
Political Representation and Social Groups.....	7
Political Characteristics	9
Seat-Share	10
Seat-Vote Ratios	12
Estimates Based on the 2008 Election Results.....	13
Summary	15
Sources of Error	16
Census Data	16
Election Data.....	17
Spatial Allocation Errors	18
Appendix A: Centroid Allocation	19
Appendix B: Actual (2011) and Imputed (2006) Population Deviations	22

Summary

The redistribution plan proposed by the Federal Electoral Boundaries Commission for Quebec reduces population deviation, and provides greater representation for Aboriginals, non-official language speakers, and visible minorities compared to the riding boundaries of the 2003 Representation Order. The gains by such minority groups reflects demographic changes in Quebec and the addition of three additional ridings to Quebec's parliamentary allocation. The Francophone majority, however, retains the lion's share of political power.

The partisan consequences are minimal given the significant changes required by changes in population between 2001 and 2011 and the addition of three new ridings in Quebec. The relatively small partisan impact holds true when using the "exceptional" 2011 election results, and (according to preliminary analysis) the "normal" 2008 election returns.

Résumé

Le plan de redécoupage électoral mis en avant par la Commission de délimitation des circonscriptions électorales fédérales pour le Québec réduit l'écart de population entre les circonscriptions. Il offre aussi une représentation plus importante que ne l'offrait le découpage de 2003 aux Autochtones, aux populations ne parlant pas les langues officielles, et aux minorités visibles. Les gains de ces groupes minoritaires reflètent les changements démographiques du Québec et l'addition de 3 circonscriptions fédérales supplémentaires pour la province de Québec. Néanmoins, la majorité francophone conserve la plus importante partie du pouvoir politique.

Les conséquences partisanses sont minimales, notamment du fait de l'accroissement important de la population entre 2001 et 2011, et de l'addition de ces trois nouvelles circonscriptions. L'impact relativement peu important sur l'équilibre partisan est confirmé aussi bien par les résultats « exceptionnels » des élections de 2011, que par les résultats « normaux » de l'élection de 2008 qui émanent de l'analyse préliminaire.

Introduction

The Federal Electoral Boundaries Commission for Quebec released its proposal for new Federal Election Districts (FEDs or ridings) on July 17, 2012. In its report, the commission included a description of the boundaries of the 78 ridings, and the total population of each district according to 2011 Census data.

In this analysis, we impute the demographic and political characteristics of the proposed ridings using, respectively, 2006 Census data and the results of the 2011 41st General Federal Election. In doing so, we provide estimates of the socio-demographic and political composition of the proposed ridings.

Methodology

Both Census and election data were assigned to the proposed districts through spatial allocation. We obtained Census data at the dissemination area (DA) level, and election results at the poll division (PD) level.¹ Both DAs and PDs are small spatial and demographic units compared to ridings, which allowed us to agglomerate data associated with DAs and PDs into the proposed districts. In Quebec, the average population of non-zero DAs was 573, and the average non-zero PD had 412 electors and 218 votes in the 2011 election.

Such agglomeration is unproblematic if a DA or PD lies entirely within the boundary of a riding. We had to allocate data, however, in cases where a DA or a PD was split by two or more ridings (21.5% of DAs and 18.5% of PDs). For this analysis, we used centroid allocation. The riding containing the centroid of a DA or PD received all of the data associated with that unit. Appendix A contains further information and two maps illustrating this process.

¹ Census data were obtained from the CHASS Data Centre at the University of Toronto (www.chass.utoronto.ca). Election data for the 41st General Election were obtained from Elections Canada (www.elections.ca).

Socio-Demographic Characteristics

We use data on total population, language (mother tongue), citizenship, immigration status, Aboriginal status, visible minority status, and median income from the 2006 Census to estimate the characteristics of the proposed ridings.

Summary

Table 1 summarizes the imputed characteristics of the 78 proposed ridings.

Table 1: Imputed Riding Values of Socio-Demographic Variables (2006 Census)

Variable	Riding Mean	Standard Deviation	Minimum	Maximum
Language				
English Mother Tongue	7.7%	10.0%	0.3%	50.0%
French Mother Tongue	79.0%	21.7%	24.0%	98.9%
Other Mother Tongue	11.9%	14.2%	0.5%	53.0%
Proportion Non-Citizen	3.7%	4.8%	0.2%	23.4%
Proportion Immigrant	11.4%	13.2%	0.5%	48.9%
Proportion Aboriginal	1.5%	4.0%	0.5%	35.3%
Proportion Visible Minority	8.7%	11.2%	0.2%	32.6%
Median Income (population weighted)	\$25,994	\$4151	\$19,139	\$38,205

Socio-Demographic Characteristics by Riding

In this section, we highlight ridings with especially high or low values of our variables.

Total Population

Table 20 in Appendix B shows the actual and imputed population deviations for the proposed ridings. As expected, we confirmed the population deviation calculations of the Commission. Our estimates based on the 2006 data are not important on their own because the 2011 data is available for population.

Total population does allow us to compare our estimates to the actual data. (This is the only variable for which we can do so.) The largest difference is for Aylmer, where we overestimate the deviation by 14%. Typically, however, the difference between our estimated population deviation and the actual deviation is 5%.

Language (mother tongue)

No proposed riding has an absolute majority of English-speakers, although one (Lac-Saint-Louis) is just under 50%. Three ridings, Denis-Benjamin-Viger, Wilder-Penfield, and Lac-Saint-Louis, have English pluralities.

Allophones are an absolute majority in one riding, George-Étienne-Cartier, and hold pluralities in Outremont, MacDonald-Langstaff, Papineau, and John-Peters-Humphrey.

Citizenship

Outremont is also outstanding in terms of citizenship status, with nearly one out of every four residents being a non-citizen. In addition, eight other ridings have at least 10% non-citizen populations (Maurice-Richard, Ville-Marie, MacDonald-Langstaff, Plateau—Mile End, John-Peters-Humphrey, Wilder-Penfield, Papineau, and George-Étienne-Cartier).

In contrast, nearly 60 ridings are over 95% Canadian citizens.

Immigration Status

The population of 28 ridings are at least 10% immigrants, with four above 40% (Papineau, John-Peters-Humphrey, Outremont, MacDonald-Langstaff, George-Étienne-Cartier).

At the other end of the spectrum, over 40 ridings have fewer than 5% immigrant population.

Aboriginal Status

The concentration of Quebec's Aboriginal population in the north is reflected by their distribution in the proposed ridings. Only one, Abitibi—Nunavik at 32.6%, is close to 35% Aboriginal, although Manicouagan is nearly 10%. Only one other riding (Hautes-Laurentides—Pontiac) is more than 5% Aboriginal population.

Visible Minorities

Five ridings have more than 35% visible minority population, Maurice-Richard, Papineau, Outremont, George-Étienne-Cartier, and MacDonald-Langstaff, while eight more are over 20%.

Forty-seven of Quebec's 78 ridings have fewer than 5% visible minority population.

Income

The income characteristics of districts are difficult to assess without access to individual Census records. We looked at the total per capita income of the population aged 15 years and over. The Census reports the median of this figure by dissemination area (DA). When

we aggregated the DAs by district, we calculated the population-weighted average of these median incomes. This provides an estimate of relative wealth and poverty of districts.

By this measure, the three wealthiest ridings are Aylmer, Cap-Rouge, and Mille-Îles, while the three poorest are Papineau, Bourassa, and Ville-Marie.

Population Deviation and Socio-Demographic Characteristics

Voters in ridings with relatively small populations enjoy relatively greater political power compared with citizens in overpopulated ridings. (One vote among 100 carries more weight than one vote among 1000.) Canadian redistricting standards allow routine population deviations of $\pm 25\%$, although the Quebec Commission kept its proposed deviations to less than 10% in all but two cases. Nonetheless, it is important to see if there are any systematic relationships between population deviations and the socio-demographic characteristics described above. **Table 2** shows the correlation of these variables.

Table 2: Pairwise Correlations: 2011 Population Deviation and 2006 Socio-Demographic Characteristics

Variable	Correlation
Language	
Proportion English Mother Tongue	-0.0721
Proportion French Mother Tongue	0.2533*
Proportion Other Mother Tongue	-0.3228**
Proportion Non-Citizen	-0.1821
Proportion Immigrant	-0.1989
Proportion Aboriginal	-0.4167**
Proportion Visible Minority	-0.2087
Income	0.1060

* significant at $p=.05$ level

** significant at $p=.01$ level

Based on this measure, ridings with a relatively high proportion of Aboriginal population and non-official mother tongue speakers tend to have smaller populations (negative population deviation). In contrast, ridings with a relatively high proportion of French mother tongue speakers tend to be overpopulated. The first is not surprising as the Aboriginal population is concentrated in the sparsely populated northern regions of Quebec, and the Electoral Boundaries Readjustment Act (EBRA) charges boundary commissions with limiting the physical size of ridings. Abitibi—Nunavik is an extreme case, with the largest Aboriginal percentage and the lowest relative population, but the relationship holds true (if less dramatically) for other districts. **Figure 1** shows this graphically.

The other two results are more surprising. It suggests a slight bias – in terms of population deviation – in favor of non-official language speakers and against native French speakers. These relationships are shown in **Figure 2**, where most ridings with deviations above 1 (*i.e.*, those that are overpopulated compared to the electoral quota) have high proportions of French mother tongue population, and low proportions of non-official language speakers. The latter correlation remains significant, and nearly unchanged, when controlling for the proportion of non-citizens and for the proportion Aboriginal.

Figure 1: 2011 Population Deviation and Aboriginal Population

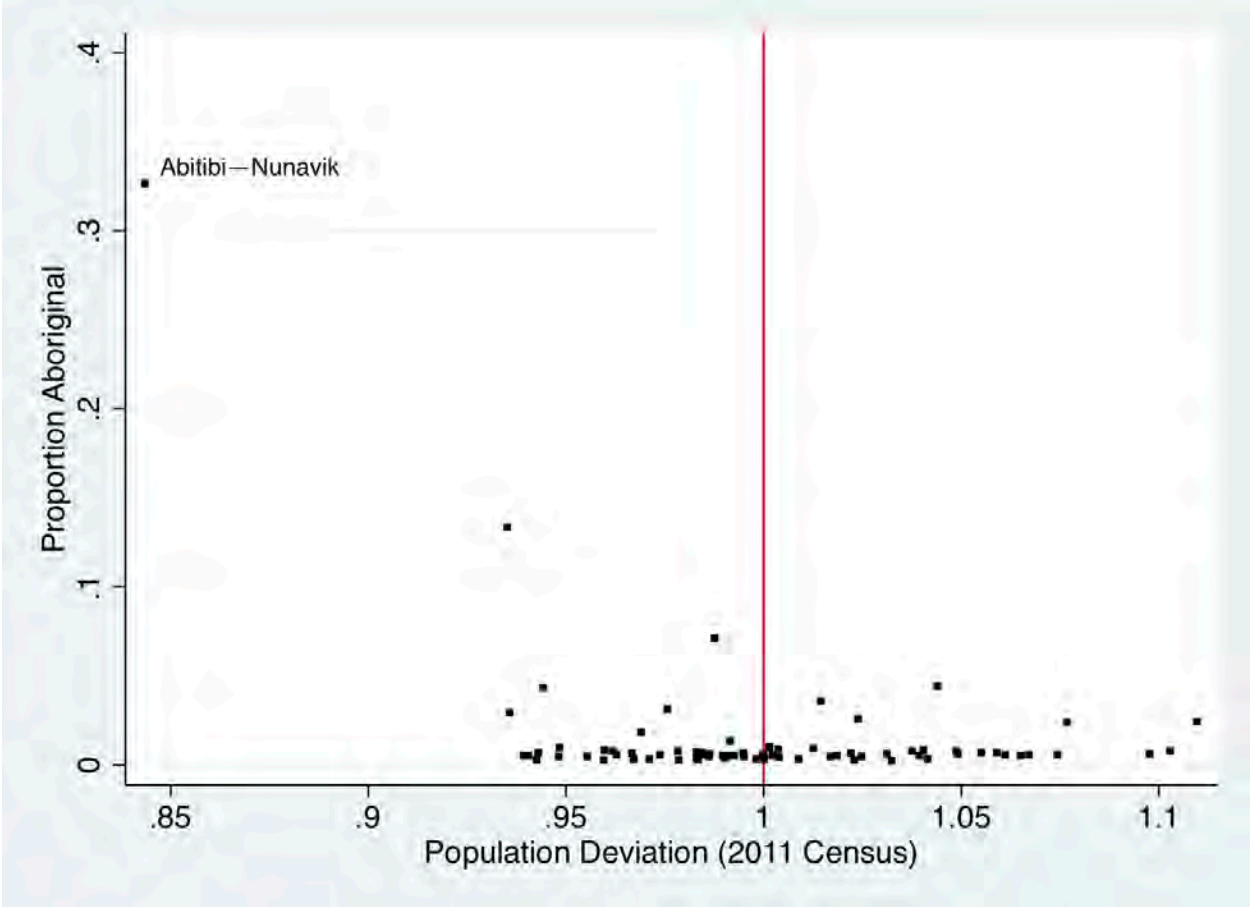
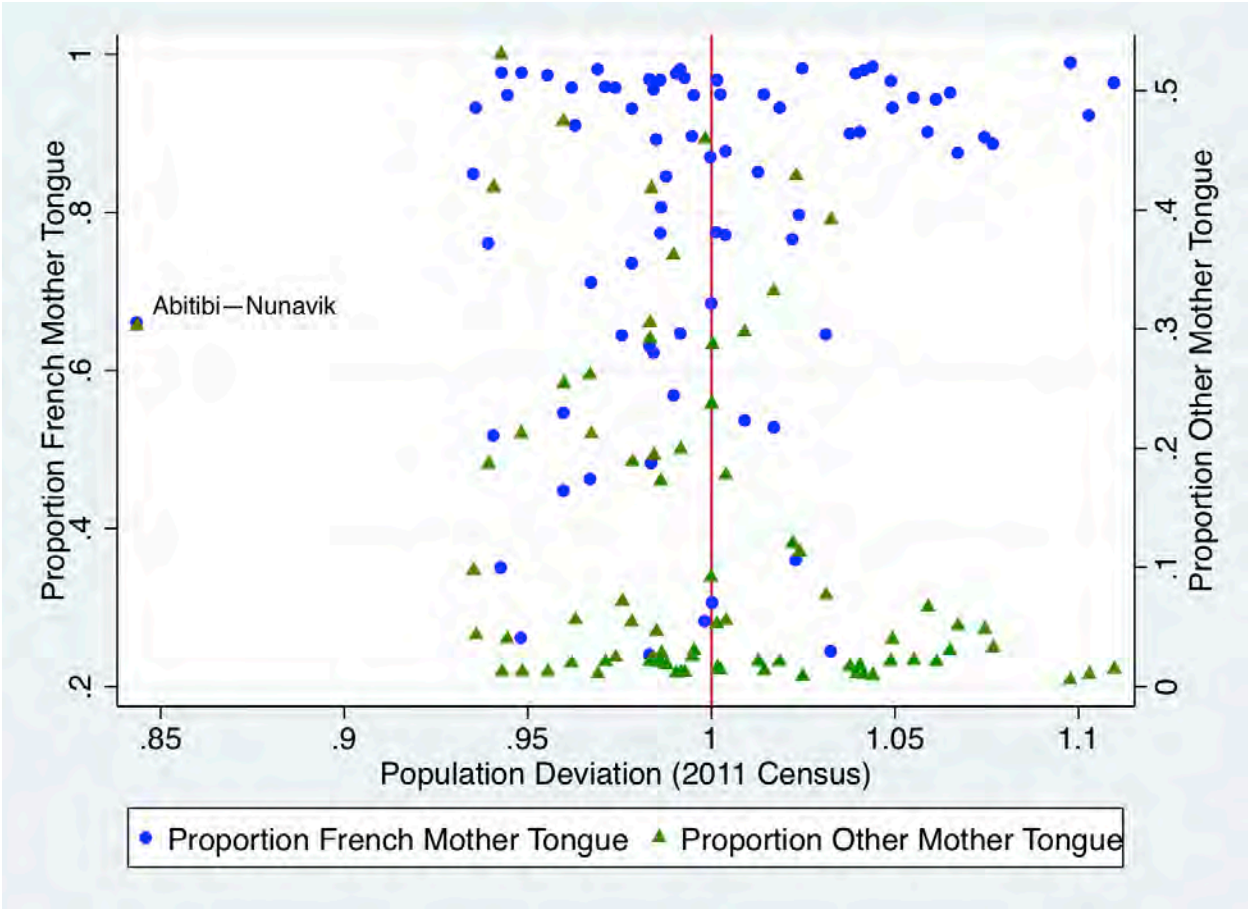


Figure 2: Population Deviation and Language



Political Representation and Social Groups

The relationship between population deviation and the various socio-demographic characteristics of ridings says something about the voting power of individual members of particular social groups. Assessing the political power of groups is more difficult, but one basic measure is the “representation ratio.” As commonly used, it is the ratio between the proportion of group members in a legislature and the proportion of that group in the population. Ratios less than one reflect under-representation, while ratios above one reflect over-representation. The higher the ratio, the greater the political power.

Here we use a modified measure, the *Riding Representation Ratio*. It compares the number of ridings with more than 35% (Table 3) and 50% (Table 4) of a particular group to that group's proportion in the overall population. A 35% population share does not necessarily mean that a group has 35% of electors, nor is a 35% share of electors sufficient to guarantee the election of a candidate. Nonetheless, unless voting is highly polarized, any group comprising 35% or more of a riding should exert significant influence on the selection and behavior of a representative. A 50% population share essentially guarantees a group the ability to determine the outcome of elections, particularly in the context of Canada’s multi-party system.

The Riding Representation Ratios for the proposed plan compare very favorably with the 2003 Representation Order because ratio is higher and substantially closer to one for Allophones, immigrants, Aboriginals, and visible minorities. The ratio for Francophones is essentially unchanged while the ratio for Anglophones is lower. This reduction is probably not significant for reasons discussed below. See Table 5.

Table 3: Riding Representation Ratio (District 35% or Greater)

Variable	Proportion of Ridings 35% or more (n)	Proportion in Population	Riding Representation Ratio
Language			
Proportion English	0.038 (3)	0.078	0.49
Proportion French	0.94 (75)	0.80	1.18
Proportion Other	0.10 (8)	0.12	0.83
Proportion Immigrant	0.09 (7)	0.11	0.82
Proportion Aboriginal	0.013 (1)*	0.014	0.92
Proportion Visible Minority	0.064 (5)	0.087	0.74

* For this table, we have counted Abitibi—Nunavik (32.6% Aboriginal).

As shown in Table 3, French speakers have a higher proportion of 35% or more districts than their population share. All other groups have lower shares, a common pattern in territorial electoral systems. Non-official language speakers, immigrants, and visible minorities all have representation ratios relatively close to one (0.74 to 0.83), values that compare favorably with the Canada-wide values in the 2003 representation (see Table 5).

English speakers have only about half the proportion of districts as population share, although the small number of districts makes the ratio sensitive to small changes. The John-Peters-Humphrey riding has nearly 33% English speakers; including it would raise the District Representation ratio to 0.65.

Table 4: Riding Representation Ratio (District 50% or Greater)

Variable	Proportion of Districts 50% or more (n)	Proportion in Population	District Representation Ratio
Language			
Proportion English	0.013 (1)	0.078	0.17
Proportion French	0.87 (68)	0.80	1.09
Proportion Other	0.013 (1)	0.12	0.11
Proportion Immigrant	(0)	0.11	0
Proportion Aboriginal	(0)	0.014	0
Proportion Visible Minority	(0)	0.087	0

The higher 50% threshold shown in Table 5 reflects the dominance of Francophones in most Quebec ridings. Indeed they are the only group that comprises more than 50% of the population in more than one riding.

Table 5: Riding Representation Ratio: 2003 versus 2011 Proposed

Variable	Riding Representation Ratio (2003 Representation)	Riding Representation Ratio (2011 Proposed)
Language		
Proportion English	0.69	0.49
Proportion French	1.17	1.18
Proportion Other	0.68	0.83
Proportion Immigrant	0.00	0.82
Proportion Aboriginal	0.00	0.92
Proportion Visible Minority	0.19	0.74

Political Characteristics

We recognize that estimates of the partisan effects of the proposal ridings are politically sensitive. Changes in the boundaries of districts can influence the outcome of elections, and such changes are zero-sum: if one party wins a riding, the others must lose. Moreover, changes made for one reason - to rectify population imbalance, for example - may have unanticipated partisan effects.

For reasons discussed below (in **Sources of Error**), estimating the political characteristics of the proposed districts is more difficult than estimating the socio-demographic characteristics. Our figures should not be seen as a prediction of the next election, but rather as an indication of how the proposed districts may affect the relationship between the votes cast and seats won by different parties.

We report two sets of calculations. The first is based on the day-of-election votes only (about 82% of the ballots in Quebec), and the second is based on figures adjusted to account for the pattern of advanced voting. As discussed in the **Sources of Error** section, votes cast in advance or under special voting rules are not associated with specific geographic polling divisions and therefore cannot be re-allocated to the proposed districts. Nearly 25% of Liberal votes, for example, came from such ballots. To compensate, we calculated a set of adjusted figures for each proposed district that increases a party's imputed vote by the percentage of advanced votes received by the party. See Table 17. In George-Étienne-Cartier, for example, the Liberal's imputed total is 11,216 votes, while the adjusted total is 14,812.43 (24.3% higher). This method assumes that every district had the same percentage of advanced voters for each party.

Our analysis suggests that with one exception, the Commission's proposed plan has relatively little partisan impact (Table 6). Compared to the previous Representation Order, the four major parties would have received a remarkably similar share of seats. The seat-

vote ratios for three of the four major parties are almost identical, but our calculations show a less favorable ratio for the Conservative Party in the proposed set of ridings.

Seat-share

The current round of redistribution increases the number of seats held by Quebec from 75 to 78. Thus the most relevant comparison is seat-share (the percentage of seats held by a party) rather than the absolute number of seats held. Table 6 shows the unadjusted figures while **Table 7** shows the adjusted ones.

Table 6 has three sets of figures: Actual, Back-cast, and Imputed. “Actual” indicates the seats won by each party in the 2011 election under the 2003 Representation Order. “Back-cast” seats are also based on the 2003 Representation Order, but are calculated using only on votes from day-of-the-election votes. “Imputed” seats are based on the proposed riding boundaries using day-of-the-election votes. Consequently, the comparison between Back-cast and Imputed seats reveals the effects of the proposed riding boundaries.

For example, the Bloc Québécois won four seats in the Actual figures but only two seats in the Back-cast and Imputed calculations. These differences, however, are due to the difference between the all votes and the day-of-election ballots, not the difference between the actual and proposed riding boundaries.

The unadjusted figures show that – compared to current riding boundaries -- the Conservative Party would have lost a seat and 1.5% of the total seat-share, and the Liberal Party, would have gained a seat and 1% of the total seat-share. The NDP would have gained 0.6% of seat-share, but would have won an additional 3 seats. The seat-share and number of seats held by the Bloc Québécois under the Back-cast and Imputed calculations are almost unchanged.

Table 6: Actual, Back-cast, and Imputed Seats by Party in Quebec (2011 Election)

Party	Actual seats	%	Back-cast seats	%	Imputed seats	Imputed %
NDP	59	78.6%	62	82.7%	65	83.3%
Conservative Party	5	6.7%	5	6.7%	4	5.1%
Liberal Party	7	9.3%	6	8%	7	9.0%
Bloc Québécois	4	5.3%	2	2.7%	2	2.6%
Total	75		75		78	

The adjusted figures in **Table 7** show slightly different results. Here, the vote totals of parties have been increased to compensate for the difference between all votes and day-of-election ballots. Both the Conservatives and Bloc would lose seat-share and one seat each. The Liberals would pick up one seat and 1% of the seat share, while the NDP would gain four seats and 2% seat-share.

Table 7: Actual and Imputed Seats by Adjusted Party Totals (2011 Election)

Party	Actual seats	%	Adjusted Imputed seats	Adjusted %
NDP	59	78.6%	63	80.7%
Conservative Party	5	6.7%	4	5.1%
Liberal Party	7	9.3%	8	10.3%
Bloc Québécois	4	5.3%	3	3.8%
Total	75		78	

Table 6 and **Table 7** do not account for the margin of victory. As shown in Table 8, the NDP and Conservative Party tended to win by large margins, while Liberals and the Bloc eke out narrow victories. In addition, the latter two parties won a relatively large proportion of their seats by narrow margins. This means that even a small swing against Liberals or the Bloc (relative to the 2011 election) could further reduce their already small presence in Parliament.

Table 8: Margin of Victory by Adjusted Party Total (2011 Election)

Party	Average Margin of Victory	Seats	Margin of Victory <5%	% Close Margins
NDP	17.8%	63	5	7.9%
Conservative Party	17.1%	4	0	0%
Liberal Party	7.5%	8	2	25%
Bloc Québécois	3.4%	3	2	66.7%
Total		78	9	11.5%

At the same time, narrow margins could work in favour of the Bloc and Liberal Party if there was a swing away from the NDP. As shown in Table 9, our calculations show the NDP winning five seats by less than 5% of the vote. A small shift to other parties could result in two additional seats for the Bloc and Conservative Party and one for the Liberals. Indeed, Conservatives and the NDP are essentially tied in the proposed riding of Lévis.

Finally, we can calculate the number of “safe” seats for each party, or the number of ridings where we estimate the margin of victory is over 5%. In a sense, this represents the minimum number of seats that our estimates suggest each party would hold in Parliament. Table 10 shows these results.

Table 9: Closely Contested Ridings (Adjusted Party Totals)

Winning Party	Second Party	Margin of Victory	Proposed Riding
Bloc Québécois	NDP	2.6%	Richmond—Arthabaska
Bloc Québécois	NDP	2.5%	Paul-Comtois
Liberal Party	NDP	4.7%	Wilder-Penfield
Liberal Party	NDP	0.3%	Maurice-Richard
NDP	Bloc Québécois	3.5%	Rimouski
NDP	Bloc Québécois	4.8%	Charlevoix—Saguenay
NDP	Conservative Party	1.8%	Elzéar-Bernier
NDP	Conservative Party	0.0%	Lévis
NDP	Liberal Party	3.6%	Denis-Benjamin-Viger

Table 10: Actual, Imputed, and “Safe” Seats by Adjusted Party Totals (2011 Election)

Party	Actual seats	%	Adjusted Imputed seats	Adjusted %	“Safe” Seats	% “Safe” Seats (out of 78)
NDP	59	78.6%	63	80.7%	58	74.4%
Conservative Party	5	6.7%	4	5.1%	4	5.1%
Liberal Party	7	9.3%	8	10.3%	6	7.7%
Bloc Québécois	4	5.3%	3	3.8%	1	1.3%
Total	75		78		69	88.5%

Seat-Vote Ratios

The seat-vote ratio is another way to measure the effects of a redistribution plan. The ratio is the percentage of seats held by a party divided by the percentage of votes received by that party. Ratios above one mean that a party has relatively more seats than vote-share, while ratios below one mean that a party has relatively fewer seats. (Election by district seldom produces proportionality, *i.e.*, a seat-vote ratio of exactly one.) Low seat-vote ratios often result when a party’s supporters are spread evenly throughout a jurisdiction without holding a plurality in very many ridings. The Green Party, for example, won just over 2% of the vote in Quebec but did not win any seats, earning a seat-vote ratio of 0.

The unadjusted figures (Table 11) show that the seat-vote ratio of the NDP, Liberal Party, and Bloc Québécois are similar in the current and proposed districts, but the Conservative Party’s ratio drops from 0.43 to 0.33. This suggests that, all other things being equal, the Conservative Party would be less successful in electing candidates under the proposed plan.

Table 11: Unadjusted Seat-Vote Ratios by Party (2011 Election)

Party	Number of Votes*	Percentage of Vote	Actual seat-vote ratio	Back-cast seat-vote ratio	Imputed seat-vote ratio
NDP	1,391,565	44.1%	1.78	1.87	1.89

Conservative Party	493,937	15.7%	0.43	0.43	0.33
Liberal Party	407,713	12.9%	0.72	0.62	0.69
Bloc Québécois	705,379	22.4%	0.24	0.12	0.11

*Day-of-Election Votes

The adjusted figures produce similar results, although the Conservative Party fares slightly worse, and the Bloc Québécois fares better compared to the unadjusted figures.

Table 12: Adjusted Seat-Vote Ratios by Party (2011 Election)

Party	Actual Number of Votes	Percentage of Vote	Actual seat-vote ratio	Adjusted Imputed seat-vote ratio
NDP	1,630,865	42.3%	1.78	1.91
Conservative Party	627,961	16.3%	0.43	0.31
Liberal Party	538,447	14.0%	0.72	0.73
Bloc Québécois	891,425	23.1%	0.24	0.17

Estimates Based on the 2008 Election Results

The 2011 election were dramatically different from the 2008 results. In particular, the NDP went from 12.2% to 42.9% of the vote in Quebec, with other parties suffering significant losses. The question remains whether 2011 was a one-time departure from the “normal” pattern of votes in Quebec, or if it represents a durable political realignment.

We did not perform a full analysis using the 2008 election results. To do so would require imputing the vote totals of the proposed districts using the polling division results from that election. To gain some sense of how the proposed districts would perform in a 2008-like election, we modified the adjusted estimated 2011 riding vote totals by the 2008 results. The matrix used to adjust the vote totals is in Table 13.

Table 13: Adjustment Ratios for 2008 Election Results

Party	Percentage in 2008 Election	Percentage in 2011 Election	Ratio: 2008/2011
NDP	12.2	42.9	0.28
Conservative	21.7	16.5	1.32

Liberal	23.8	14.2	1.68
Bloc	38.1	23.4	1.63
Green	3.5	2.1	1.67
Other	0.8	0.8	1.00

To estimate vote total by party in the proposed ridings, we multiplied the adjusted vote totals by the party's 2008/2011 ratio. This, for example, reduced the NDP's total in each riding by nearly three-quarters. This method assumes that the shift in votes between parties was uniform across the province. The results, shown in Table 14, are substantially different from those based on the 2011 Election.

Table 14: Actual and Estimated Seats by Party (2008 Election)

Party	Actual seats	Seat %	Estimated seats	Estimated Seat %
NDP	1	1.3%	0	0.0%
Conservative Party	10	13.3%	10	12.8%
Liberal Party	14	18.7%	18	23.1%
Bloc Québécois	49	65.3%	50	64.1%
Other	1	1.3%	0	0.0%
Total	75		78	

The figures in Table 14 show remarkable stability in party seat-share. (Compare to **Table 7** for the 2011 results). The Conservative Party and the Bloc have nearly identical shares compared to the 2008 results, while the Liberal Party gains about 4% of seat share. The NDP and minor parties each lose their sole seats.

Our calculations for the seat-vote ratios tell a similar story. As shown in Table 15, the ratios for the Conservative Party and Bloc are similar in the 2008 Election and the proposed ridings. (Compare to Table 12 for the 2011 results.) The Liberal Party does slightly better under the proposed districts, while the already low values of the other parties drop to zero.

The 2008 analysis is only preliminary, but it suggests that the partisan effect of the proposed ridings would be relatively minor even in a "normal" election.

Table 15: Seat-Vote Ratios Based on 2008 Election and Proposed Ridings

Party	Actual seat-vote ratio	Estimated seat-vote ratio
NDP	0.11	0.00
Conservative Party	0.61	0.59
Liberal Party	0.79	0.97
Bloc Québécois	1.71	1.68
Other	1.63	0.00

Sources of Error

There are potentially three sources of error in the allocation of both Census and election data. Given the constraints discussed below, however, our estimates provide a reasonable prediction of the social and political characteristics of the proposed ridings.

Census Data

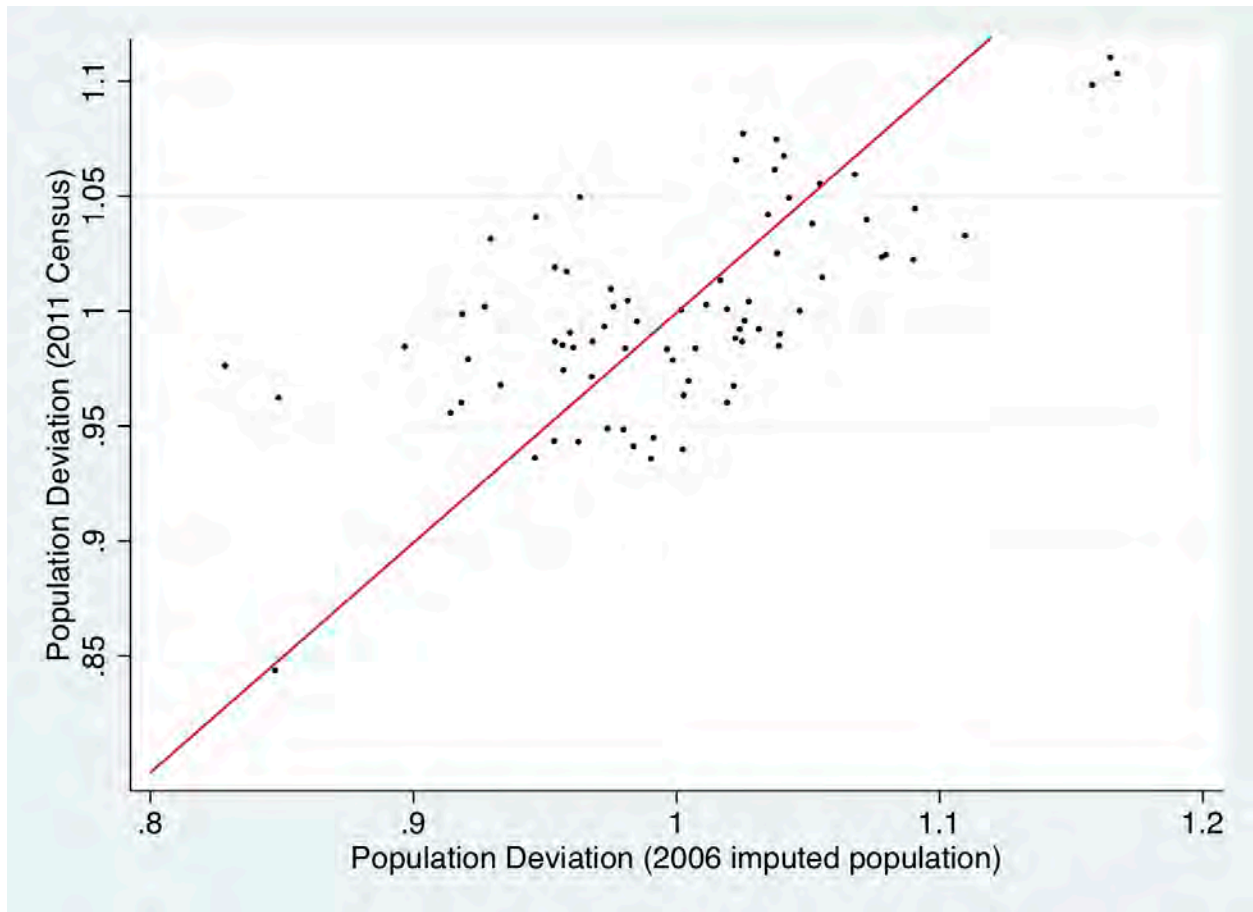
The commission drew the proposed districts based on population data from the 2011 Census. We use data from the 2006 Census because Statistics Canada has not yet released detailed demographic data from the more recent Census. There have been changes in population between the 2006 and 2011; the total population increased by over 380,000 people (based on the data we used), from 7,516,363 in 2006 to 7,903,001 in 2011. (If our imputed 2006 population were distributed equally among districts, each would have an electoral quota of 96,364, compared to the actual 2011 value of 101,321.)

This population growth was not uniform across Quebec. Ridings containing areas of fast growth would appear underpopulated when using the 2006 data, while slow-growing or shrinking regions would seem overpopulated.

Table 20 in Appendix B shows the difference in population deviation between the actual and imputed data for selected districts. Rimouski, for example, is actually overpopulated by 11% (2011 data). The imputed overpopulation is over 16% (2006 data), suggesting that this riding experienced slow population growth relative to the rest of Quebec. In contrast, Aylmer has an imputed population deviation of -17.1%, but an actual deviation of only -2.4%, reflecting greater than average population growth. The correlation between these two sets of values is 0.66, and Figure 3 shows their relationship graphically. Points above the red line indicate ridings where we under-estimated population relative to the actual 2011 values; points below the line indicate over-estimates.

The various sub-populations we analyze here (language, visible minorities, etc.) may also have moved or grown at different rates in the five-year period. Without the 2011 data for these variables, we assume that the growth and movement of these subpopulations is the same as for total population.

Figure 3: Population Deviations: Actual (2011) versus Imputed (2006) Values



Election Data

For federal elections, voters may cast ballots on the day of the election at their designated polling place; or may vote in advance. Special rules also apply to electors unable to come to a polling place, such as those confined to hospitals and long-term care facilities, those residing overseas, or incarcerated voters. Only votes cast on the day of the election at physical polling places are reported by actual (geographic) polling divisions. All other types cannot be reliably tied to a particular geographic location. Consequently, our estimated allocation of votes is based on votes in the first category. For the 2011 election in Quebec, this excludes over 18% of ballots. See Table 16.

Table 16: Votes in Quebec (2011 Federal Election)

Type of Vote	Number	Percentage
Votes used for estimates	3,135,247	81.4%
Votes excluded	717,873	18.6%
All Votes (includes rejected ballots)	3,853,120	100%

The percentage of excluded votes varies by party as well. As shown in Table 17, nearly one out of every four votes for a Liberal candidate were cast in advance or under special rules. For the Bloc Québécois and Conservative Parties, it was about one out of every five. In contrast, only about 15% of NDP and Green Party votes were excluded. These figures reflect both the different characteristics of the party constituencies, and the late surge in support for the NDP.

Table 17: Excluded Votes by Party

Party	Percent excluded
NDP	14.7%
Conservative	21.3%
Liberal	24.3%
Bloc Québécois	20.9%
Green	15.4%
Independent and Minor Parties	18.5%

The impact of such exclusions means that – all things being equal – the imputed vote totals will tend to overstate the percentage of votes for the NDP and Green Party in the proposed ridings, and understate them for other parties.

The exclusion of these votes is less serious for our purposes because we are estimating the partisan effect of the proposed riding boundaries rather than trying to predict the outcome of a hypothetical election. First, using day-of-election ballots only provides a consistent basis for a comparison between the current and proposed riding boundaries. Second, adjusting the totals in each riding based on the values in Table 17 compensates for the excluded ballots. The similarity of the results of these two methods adds confidence to our analysis.

Spatial Allocation Errors

The spatial allocation process may introduce errors for both types of data. As explained in the Methodology section and Appendix A, whenever a DA or PD lies within two or more proposed districts, their data are fully allocated to one district or another. In reality, population and votes would be split among the districts, depending on their precise location within the DA or PD.

The errors our method introduces are random, however, and should not bias the results.

Appendix A: Centroid Allocation

Maps 1 and 2 illustrate the centroid allocation process using the proposed riding boundaries and Census Dissemination Areas (DAs). A and B on Map 1 mark two DAs that are split between two ridings, and the coloured dots indicate the centroid of each DA. The centroid of A falls within the boundaries of the “red” riding, while the centroid of B falls within the “green” one. Map 2 indicates how the DAs were then allocated, with each DA now entirely within the boundaries of its respective riding.

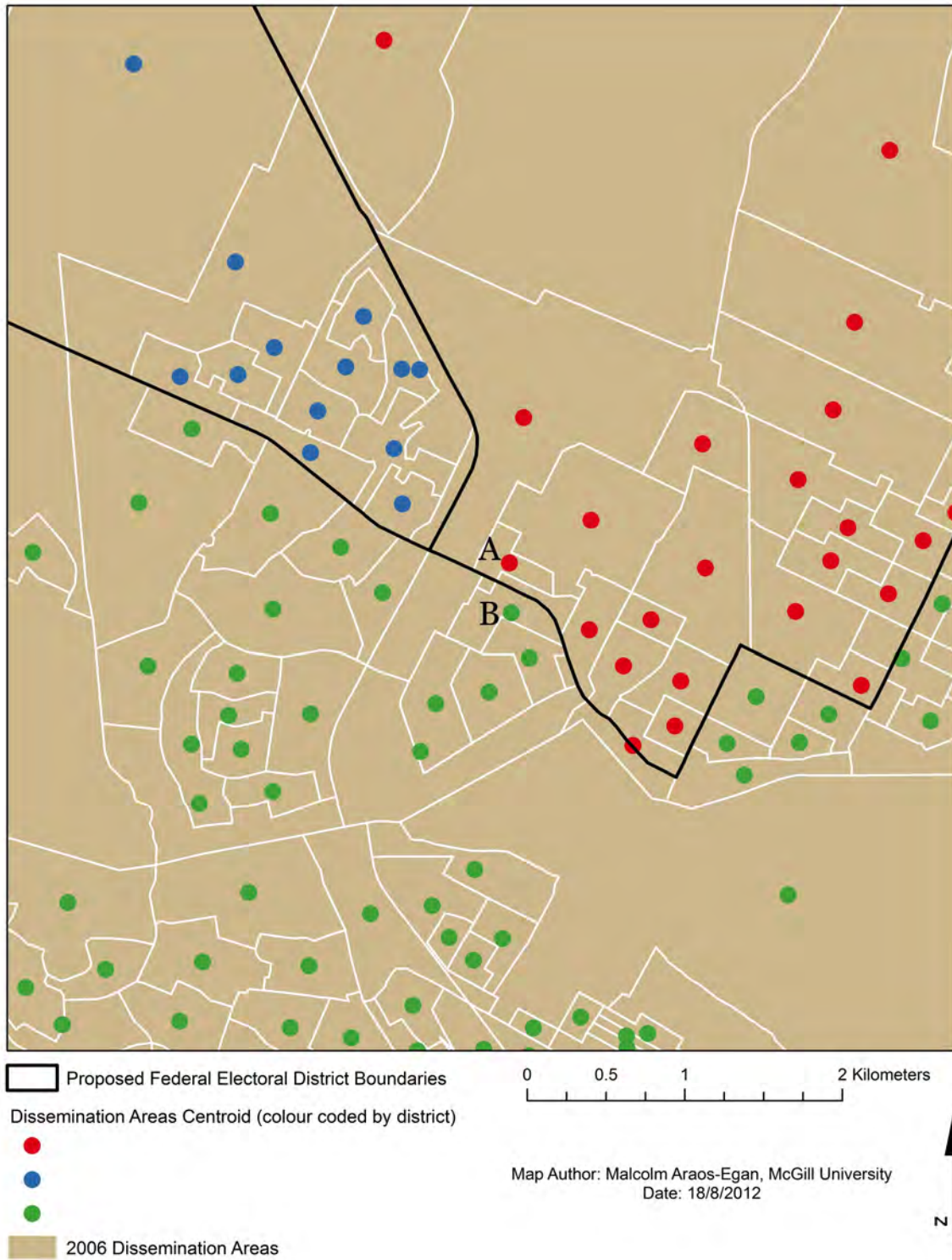
Approximately 80% of both PDs and DAs fell within a single riding, so about 1 in 5 of each type of unit had to be allocated. About 13% of PD and 16% of DAs were split between two ridings, and 3.7% and 4.4% split among 3 respectively. Units split among 4 or more ridings constituted less than 2% of PDs and less than 1% of DAs. See Table 18 and Table 19.

Table 18: Polling Divisions Split by Ridings

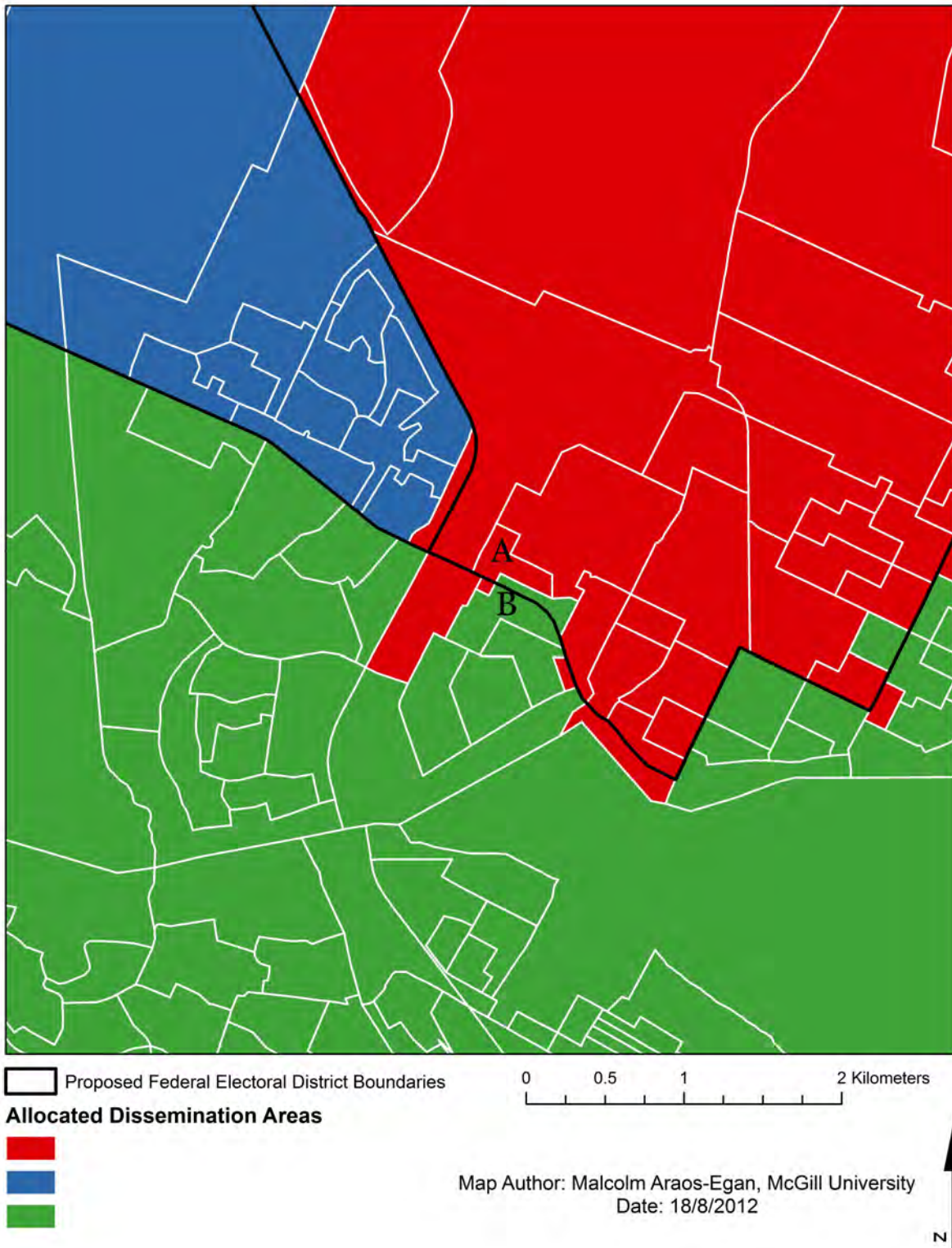
Number of PDs	Number of Ridings sharing PD	Percentage
12,827	1	81.47%
2,032	2	12.91%
580	3	3.68%
171	4	1.09%
72	5	0.46%
25	6	0.16%
24	7	0.15%
14	8	0.09%

Table 19: Dissemination Areas Split by Ridings

Number of DAs	Number of Ridings sharing DA	Percentage
10841	1	78.6%
2225	2	16.1%
608	3	4.4%
99	4	0.7%
12	5	0.09%
12	6	0.09%



Map 1: Proposed Boundaries and Census Dissemination Areas



Map 2: Census Dissemination Areas Allocated by Riding

Appendix B

Table 20: Actual (2011) and Imputed (2006) Population Deviations

Riding	Population Deviation (2011 Actual)	Population Deviation (2006 Imputed)	Difference (2011 Deviation – 2006 Deviation)
<i>Electoral Quota</i>	101,321	96,364	--
<i>Standard Deviation</i>	4.5%	6.4%	4.9%
Abitibi—Nunavik	-15.6%	-15.2%	-0.4%
Abitibi—Témiscamingue	1.5%	5.6%	-4.1%
Alfred-Dubuc	-3.1%	0.5%	-3.6%
Alfred-Pellan	-3.3%	-6.7%	3.4%
Anne-Hébert	-0.7%	-2.7%	2.0%
Aylmer	-2.4%	-17.1%	14.7%
Beauce	2.5%	3.9%	-1.4%
Bourassa	-1.0%	3.9%	-5.0%
Brome—Missisquoi	-1.4%	-3.2%	1.8%
Cap-Rouge	-0.5%	2.6%	-3.1%
Charlevoix—Saguenay	-0.8%	3.1%	-4.0%
Châteauguay	0.2%	-2.4%	2.5%
Compton—Stanstead	1.3%	1.7%	-0.4%
Côte-de-Beaupré	-4.4%	-8.6%	4.1%
Curé-Labelle	-1.6%	-10.3%	8.7%
Denis-Benjamin-Viger	0.0%	1.9%	-1.9%
Drummond	-2.6%	-4.3%	1.7%
Elzéar-Bernier	9.8%	15.8%	-6.0%
Étienne-Parent	-1.4%	-4.6%	3.2%
Gaspésie—Les Îles	10.3%	16.8%	-6.5%
George-Étienne-Cartier	-5.7%	-3.7%	-2.0%
Gilles-Villeneuve	-5.7%	-4.6%	-1.1%
Hautes-Laurentides—Pontiac	-1.2%	2.2%	-3.5%
Hochelaga	0.4%	2.8%	-2.4%
Idola-Saint-Jean	-6.1%	0.3%	-6.3%
John-Peters-Humphrey	3.3%	11.0%	-7.7%
Joliette	-6.4%	-5.4%	-1.0%
La Chute	4.1%	-5.3%	9.4%
Lachine—LaSalle	-3.3%	2.2%	-5.5%
Lac-Saint-Jean	4.4%	9.1%	-4.7%
Lac-Saint-Louis	-5.2%	-2.0%	-3.2%
Laurentides	-0.5%	-1.5%	1.0%
Lévis	-1.0%	-4.0%	3.1%
Lignery	-1.5%	-4.3%	2.8%
Longueuil	0.0%	4.7%	-4.7%
Lotbinière—Mégantic	3.9%	7.3%	-3.3%
Louis-Frédéric	4.2%	3.5%	0.7%
MacDonald-Langstaff	-0.2%	-8.1%	7.9%
Manicouagan	-6.5%	-1.0%	-5.5%
Maurice-Richard	-5.9%	-1.6%	-4.3%
Mille-Îles	7.5%	3.8%	3.6%

Montarville	0.4%	-1.8%	2.2%
Montcalm	-3.8%	-15.1%	11.3%
Montréal-Est	-1.4%	2.5%	-3.9%
Nicolas-Vincent	0.2%	-7.3%	7.4%
Outaouais	2.4%	8.0%	-5.6%
Outremont	2.3%	7.8%	-5.5%
Ozias-Leduc	1.9%	-4.6%	6.4%
Papineau	-4.0%	1.9%	-6.0%
Paul-Comtois	-5.1%	-2.6%	-2.6%
Paul-Ragueneau	1.7%	-4.1%	5.8%
Paul-Sauvé	6.7%	4.1%	2.6%
Petite-Nation	7.7%	2.6%	5.1%
Pierre-Legardeur	6.5%	2.3%	4.2%
Plateau—Mile End	-0.8%	2.4%	-3.3%
Québec	-3.7%	0.3%	-4.0%
Richmond—Arthabaska	0.2%	1.2%	-0.9%
Rimouski	11.0%	16.5%	-5.5%
Rivière-des-Prairies	-1.7%	-0.3%	-1.3%
Roger-Lemelin	-2.2%	-0.1%	-2.0%
Sainte-Rose	-2.1%	-7.9%	5.7%
Saint-Hyacinthe—Bagot	-1.7%	-1.9%	0.3%
Saint-Jean	5.5%	5.5%	0.0%
Saint-Lambert	2.2%	9.0%	-6.8%
Saint-Léonard	-1.6%	-3.9%	2.3%
Sault-au-Récollet	0.0%	0.2%	-0.2%
Shawinigane	-5.5%	-0.9%	-4.7%
Shefford	6.1%	3.7%	2.4%
Sherbrooke	5.9%	6.8%	-0.9%
Soulanges	3.8%	5.2%	-1.4%
Terrebonne	4.9%	-3.6%	8.6%
Trois-Rivières	4.9%	4.3%	0.6%
Urbain-Brossard	0.9%	-2.5%	3.4%
Vaudreuil	3.1%	-7.0%	10.2%
Verchères—Les Patriotes	-2.9%	-3.2%	0.3%
Verdun	-1.6%	3.9%	-5.5%
Ville-Marie	-4.0%	-8.1%	4.1%
Wilder-Penfield	-1.7%	0.8%	-2.5%