TYPOLOGY OF LOCAL PATTERNS OF VOTER SUPPORT FOR POLITICAL PARTIES AT THE 2004 FEDERAL ELECTION

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A distinctive spatial pattern has emerged for the Coalition and Labor vote in Australian federal elections, with voting landscapes associated with the particular demographic and socio-economic characteristics of local areas. The authors used Australian Electoral Commission data on voting at the polling booth level and socio-economic data on the areas surrounding each booth taken from the 2001 census. These two data sets were combined into a database, now available online. The current article describes the general socio-economic location of voters for the main political parties in 2001, and uses the model developed from these data to predict voting outcomes in 2004.

INTRODUCTION

At the 2004 federal election the Liberal–National Coalition government led by Prime Minister John Howard scored a decisive victory over the Labor opposition led by Mark Latham. The primary vote for the coalition parties had increased to 46.70 per cent while the primary vote for Labor had declined to 37.60 per cent. Under the preferential voting system used for the election of candidates to seats in the House of Representatives, after the allocation of preferences the 'two party preferred vote' was 52.74 per cent for the coalition parties and 47.26 per cent for the Labor Party. The gain in the level of the 'two party preferred vote' by the coalition parties in 2004 compared to the 2001 federal election was 1.79 per cent. The coalition won 85 seats in the House of Representatives in 2004 compared to Labor's 60 seats, with independents holding three seats. And for the first time in over two decades, the coalition parties narrowly won control of the Senate. It was Howard's fourth successive election victory since 1996, equalling the four successive victories by Labor which governed from 1983 to 1996.

In general there is a lack of detailed disaggregated statistical analysis of the degree of spatial concentration or dispersal of voting for political parties and independents at federal elections in Australia. The analyses reported in the media and in academic journals are mainly directed to what party wins what federal seats and what the seat-by-seat swings have been in voter support for political parties. We lack detailed analysis and modeling of patterns of voter support for political parties at a spatial scale smaller than that of electorates. We also lack information on the relationship between these patterns and the demographic and socio-economic characteristics of the local areas where voters cast their vote at federal elections.

However, the authors and their colleagues have conducted an analysis of the spatial patterns for the level of the primary vote for political parties at the local level of polling booth catchment areas across the electorates for the House of Representatives at the 2001 and the 2004 federal elections.[1] That research suggests an entrenched spatial pattern has emerged for the Coalition and the Labor vote across Australia's cities and regions, and that distinctive voting landscapes are associated with particular demographic and socio-economic characteristics of local areas. As a result we can identify distinctive socio-political spaces across Australia. This paper provides a summary overview of that research.

BUILDING AN ONLINE GIS-ENABLED ELECTORAL GEOGRAPHY OF AUSTRALIA

The research conducted by the authors and their colleagues has developed a Web-accessible geographic information system (GIS)-enabled electoral geography of Australia. The data used comes from two official sources:

- Data on voting at the 2001 and 2004 federal elections. This information is for the primary votes cast by voters for political parties and their candidates at all polling booths across Australia. It comes from the Australian Electoral Commission (AEC).
- Data on the demographic and socio-economic characteristics of the population living around each polling booth in what we call polling booth catchments. These data are derived from information in the 2001 Census collected by the Australian Bureau of Statistics. A total of 46 variables are used (see Table 1).

The GIS database used to analyse these data and to map the patterns of voting for political parties was compiled as follows:

- The location of each polling booth was geocoded in a GIS. For the 2004 election, a total of 7,575 polling booths across all of the House of Representative seats were geocoded
- The Census Collector District (CCD) data available in the C-Data package were rearranged so as to form polling booth catchment areas.This involved allocating CCDs to a polling booth location. We used a procedure whereby the CCD in which a polling booth is located formed the core of the catchment, with surrounding and, where necessary, other adjacent CCDs allocated to that core CCD to form the polling booth catchment. The procedure used a spatial allocation procedure whereby CCDs were allocated to a polling booth on the basis of minimising the distance from the centroid of a CCD to the geocoded location of a polling booth. Where there was more than one polling booth located in one CCD, those booths were combined into one booth for the purpose of the spatial analysis and modeling reported here. In this way a new electoral geography was derived in the form of polling booth catchments.

The databases thus developed comprise the following two matrices (rectangular arrays) of information. These can be visualised as tables:

- The first consists of a matrix of point locations which are the polling booth locations (rows) by the percentage of primary voted cast at each polling booth for all political parties (columns).
- The second consists of a matrix of areas which are the polling booth catchments (rows) by the incidence of demographic and socio-economic phenomena as measured by the 46 variables derived from the 2001 census (the columns). See Table 1.

These two data matrices may be merged to conduct statistical and spatial modeling and for the purpose of visualisation.

The reader may access that database at <http://www.uq.edu.au/cr-surf/AUS_voting2004.htm>. Alternatively, readers may access the database and interrogate the mapped patterns of voting for political parties through the ARC Research Network in Spatially Integrated Social Science website at <www.sis.edu.au> and go to the Shared Research Resources section.

USING GIS TECHNOLOGY TO CREATE MAPS OF VOTING LANDSCAPES

One of the advantages of GIS technology is the ability to not only integrate various layers of spatial information but also to create generalised spatial patterns, including surfaces, through the use of various carto-

Table 1: Variables derived from the 2001 Census representing the demographic and socio-economic characteristics of polling booth catchments

Age and sex
% population males MALES
% population age 0–17 years YOUTH
% population age 18–29 years GENY
% population age 30–39 years GENX
% population age 40–54 years BOOMERS
% population age 55–69 years (Post-Depression Wartime Generation) WW2GEN
% population age 70+ years (Pre Depression Generation) DEPGEN

Family and household structure
% single person households SINGLES
% couple without children households COUPLES
% one parent family households ONEPARENT
% couples with children households COUPCHILD

Housing tenure
% households that are home owners HOMEOWN
% households that are home purchasers MORTGAGEES
% households that are private renters RENTERS
% households that are public housing tenants PUBHOUS

Ethnicity/race
% population indigenous persons INDIG
% population born overseas (all countries of origin) IMMIG
% population born in UK and Ireland UK
% born in Southern and Eastern Europe countries SEEUROPE
% born in Middle East countries MIDEAST
% population born in Asian countries ASIA

Religious affiliation
% population Catholic CATH
% population Anglican ANG
% population Pentecostal PENT
% population other Christian OTHCRIST
% population Islamic ISLAM
% population other non-Christian religion ONCHREL
% population with no religion NORELIG

Residential stability/mobility
% of population at the same address 5 years ago RESSTABLE

Digital divide
% population using computer DIGCON

Engagement in work
Labour force participation rate INWORK
Unemployment rate UNEPMLOY

Industry of work
% labour force employed in Extractive Industries (agriculture, fishing, mining) EXTRACT
% labour force employed in Transformative Industries (manufacturing, utilities) TRANSFORM
% labour force employed in Distributive Services (retail, wholesale) DISTRIB
% labour force employed in Producer/ Business Services BISSERV
% labour force employed in Social Services (education, health, welfare) SOCSERV
% labour force employed in Hospitality Industries (accommodation, cafes, recreation) HOSPTOUR

Occupation*
% labour force in 'routine production worker' occupations ROUTPROD
% labour force in 'in-person service workers' occupations INPERS
% labour force in 'symbolic analyst' occupations SYMBA

Human capital
% persons age 15 years and over with a degree or higher qualification UNIVED
% persons age 15 and over with a certificate, diploma or advanced diploma TECH

Income
% households in the lowest quintile for household income (less than $600 per week) LOWINC
% households in the middle three quintiles for household income ($600–$1,499 per week) MIDINC

* The occupation categories relate to the classification proposed by Robert Reich, *The Work of Nations*, Vintage Books, New York, 1992 edition. Broad occupations in the 2001 census are grouped to approximate the Reich categories.

graphic and spatial modeling routines. The authors have used raster-based analysis in GIS to produce spatially-continuous surfaces of the patterns of voter support for political parties at the local level using the databases that are accessible on-line. In this way, it is possible to convert the point-located polling booth data to a raster pattern of 1 kilometre by 1 kilometre grids across Australia to form what we may call generalised voting landscapes.

The reader may interrogate online a series of maps for Australia and the capital city regions to view these voting landscapes for the political parties. From an analysis of the patterns shown on such maps, it is possible to draw the following generalisations:

1. As far as the primary vote for the combined coalition parties is concerned, there are marked concentrations of the primary votes across much of rural and regional Australia, and especially across the settled agricultural and pastoral regions. Within the large capital city regions, there are marked geographic belts of concentration of voter support for the coalition that segment those metropolitan cities into regions of coalition dominance.
2. The primary vote for the Liberal Party shows a lesser dominance across rural and regional areas in some of the eastern states, but support for the Liberals is widespread across much of regional New South Wales and Victoria, and also across regional areas of South Australia and Western Australia. Support is strongest and widespread across large continuous belts of middle and outer suburbia in the capital cities.
3. As expected, the primary vote for the National Party is concentrated across the settled agricultural and pastoral regions of Australia except in the Northern Territory and South Australia, and to a lesser extent in Western Australia. Within the metropolitan cities the Nationals vote is non-existent because the party does not contest city seats or, where there are candidates in electorates on the urban fringe, the vote is small.
4. The primary vote for the Labor Party reveals low levels of support across most of the settled agricultural and pastoral regions, with high concentrations of non-urban Labor voting occurring only in remote regions of Western Australia and the Northern Territory, where there are is a high incidence of Indigenous populations, and in some of the remote mining communities. There are pockets of high support for Labor in some of the larger regional cities and especially in older regional industrial centres. In the metropolitan cities the Labor vote is concentrated mainly in the inner areas and in some of the inner suburbs, as well as in belts across limited parts of the outer suburbs. The patterns of the Labor and Liberal vote clearly divide the metropolitan cities into distinctly contrasting voting landscapes that bifurcate the big cities.
5. The primary vote for the Australian Greens Party is markedly concentrated in and around the metropolitan cities, with relatively few pockets of strong voting support in rural and regional areas. Where Greens voters do occur outside of the metropolitan cities they tend to be in some of the coastal areas or tourist regions. Within the metropolitan cities, there are concentrations of votes for the Greens mainly in inner city areas, particularly in Sydney and Melbourne, and in some of the outer fringe areas of the big cities. However, across much of Australia, both in the regional areas and within the metropolitan cities, the maps show

generally low levels of support for the Greens.

6. The primary vote for the Australian Democrats is very low across most of rural and regional Australia except for some of the remote areas of South Australia and the Northern Territory. Within the metropolitan cities the maps demonstrate how the Democrats vote had dropped to very low levels. It was only in a handful of small areas in the outer suburbs and fringe areas of Adelaide and Perth that there was voting support for the Democrats above a minimal level.
7. The primary vote for the Family First Party, which contested its first federal election in 2004, had a few pockets of strength in the inland remote parts of Queensland and South Australia, and in the western parts of Victoria. Within the metropolitan cities the Family First vote was generally low and areas of higher voter support for this party were found in selected parts of the outer suburbs and fringe areas.

PREDICTING LOCAL PATTERNS OF VOTER SUPPORT FOR POLITICAL PARTIES

Multi-variate statistical analytic tools may be used to develop a model that seeks to predict the distribution of voting outcomes across polling booths. It can do this by analysing the relationship between voter support for political parties in 2001 and the demographic and socio-economic characteristics of the population living in polling booth catchments. The results of such a predictive model may be compared with the actual results of voting at the 2004 federal election.

Discriminant analysis[2] is used to analyse the relationship between voting outcomes at polling booths across Australia at the 2004 federal election and the demographic and socio-economic characteristics of people living in polling booth catchments using the GIS-enabled databases described earlier. The objective is to distinguish between patterns of voting for political parties across the nation's polling booths according to the demographic and socio-economic characteristics of the polling booth catchments as measured by the 46 variables derived from the 2001 census referred to above.

Discriminant analysis is a statistical tool specifically designed to detect differences between two or more groups; it can accommodate many variables in a multi-variate analysis approach such as that used here. It simplifies the interpretation of a large set of variables by combining them into a small number of functions that explain much of the variation in the dataset used. The analysis conducted resulted in the polling booths across Australia being classified into the seven groups listed in Table 2.

These groups are made up made up of polling booths that are characterised by particular levels of voting for a political party:

- Groups 1, 2 and 3 in the table comprise polling booths with favourable voting outcomes—'most votes'—for the major political parties, namely the Labor Party, the Liberal Party and the National Party. The fourth group relates to polling booths with favourable outcomes for the Country Liberal Party in the Northern Territory.
- There are also three further groups identified comprising those polling booths where there was a voting outcome favourable to a minor political party where the primary vote exceeded 20 per cent.
- Group 5 comprises 217 polling booths where the primary vote for the Greens party reached 20 per cent or more, and this was an increase of 136 polling booths on 2001.

- Group 6 comprises only 1 such polling booth in 2004 for the Australian Democrats, down from 24 polling booths at the 2001 election. Compared to the 2001 election, in 2004 there was a decline of 23 in the number of polling booths where the Democrats gained over 20 per cent of the primary vote
- Group 7 comprises only one polling booth where the Family First party, contesting its first federal election exceeded the 20 per cent primary vote level
- It is noteworthy that the One Nation Party dropped out of the analysis in 2004 because there was a dramatic decline in its primary vote, whereas at the 2001 election there were 97 polling booths where it gained 20 per cent or more of the primary vote.

The 46 demographic and socio-economic variables listed in Table 1 were used as predictors of voting behaviour in the Discriminant Analysis Model to derive a small number of functions that explain the large majority of the differences between the seven main groups of polling booths listed in Table 2. Three discriminant functions emerged as being significant, as shown in Table 3, and between them these functions explain 96.7 per cent of the between group variance across the groups of voter support for the political parties listed in Table 2. In Table 3, those variables among the 46 listed in Table 1 which have a significant loading on one of the first three most important discriminant functions are identified.

The information in Table 3 may be interpreted as follows:

Table 2: Descriptive statistics and the number of polling booths across Australia by favourable voting outcomes for each political party and the 2001 and 2004 federal elections

Polling booth groups vis-à-vis nature of voter support for a political party	Mean vote (per cent)	Standard deviation (per cent)	Number of polling booths 2001	Number of polling booths 2004	Change between 2001 and 2004 elections
1. Labor Party—most primary votes	34.03%	17.56	2,568	2,227	-341
2. Liberal Party—most primary votes	37.56%	22.60	3,421	3,879	+458
3. National Party—most primary votes	10.02%	21.21	1,039	1,199	+160
4. Country Liberal Party—most primary votes	0.59%	4.54	29	32	+3
5. Australian Greens Party					
20%+ primary vote	6.71%	5.17	81	217	+136
6. Australian Democrats Party					
20%+ primary vote	1.09%	1.07	24	1	-23
7. Family First Party					
20%+ primary vote	1.89%	1.96		1	
8. One Nation Party—20% + primary vote (not used in the 2004 election analysis)			97		
Total			7,259	7,556*	

*19 voting booths could not be allocated to a party on the criteria used here as two parties hold equal percentages of primary votes in those voting booths. Note: 2001 election results are from Stimson, et al. (2006)—see endnote 1.

- The figures in bold type indicate where a variable is significant for a discriminant function.
- Where it is significant, a variable is judged as being an important predictor of voting behaviour in discriminating between the groups listed in Table 2.
- The combination of those variables with significant loadings on a discriminant function in Table 3 is then used to develop a descriptive interpretation of what a function means.

The three discriminant functions are discussed below:

1. The first function derived from the discriminant analysis accounts for much of the between group difference, explaining 54.7 per cent of the variance, with 16 variables having significant loadings on the function. The function may be interpreted as one that differentiates between places (polling booth catchments) on the basis of their degree of mono-culturalism and older generation populations and people employed in extractive industries, especially farming. This is indicated by the variables with a significant positive loading versus their degree of multiculturalism, the degree to which they are populated by Generation Yers, the extent to which they are characterised by some disadvantage and by

Table 3: Function loadings of predictors loading onto Discriminant Functions 1, 2 and 3

Predictors	Function 1	Function 2	Function 3
IMMIG	**-.512**	-.243	-.097
EXTRACT	**+.475**	+.322	+.108
SEEUROPE	**-.464**	+.053	-.079
ONEPARENT	**-.461**	+.24	-.006
GENY	**-.455**	-.061	+.166
HOMEOWN	**+.452**	+.028	-.104
ANG	**+.421**	+.175	-.017
RENT	**-.418**	+.161	+.174
OTHNONCHREL	**-.417**	+.057	-.041
ASIA	**-.393**	-.022	-.064
ISLAM	**-.358**	+.147	-0.11
PUPHOUS	**-.342**	+.164	-.053
MIDEAST	**-.322**	+.103	-.111
WW2GEN	**+.321**	+.132	-.017
SOCSERV	**-.310**	-.131	-.28
DIGCON	+.185	**-.644**	+.021
UK	-.035	**-.546**	-.094
NORELIG	-.089	**-0.55**	+.398
HIGHINC	-.037	**-.494**	+.043
BUSSERV	-.245	**-.460**	+.118
LOWINC	+.059	**+.446**	+.092
MORTGAGEES	+.006	**-.369**	-.215
INWORK	+.123	**-.352**	+.165
UNEMPLOY	-.208	**+.348**	+.167
UNIEDUC	-.107	-.471	**+.461**
SYMBA	**+.384**	-.192	**+.451**
TRANSFORM	-.264	-.117	**-.372**
ROUTINEPROD	-.228	+.342	**-.351**
COUPCHILD	+.046	-.073	**-.343**
COUPLES	+.318	-.082	**+.339**

Note: The table includes only those variables with a loading of ≥+/-.300 on at least one of the first three functions.

people working in social service industries, as indicated by the variables with a significant negative loading. We label this a monocultural older/ multicultural younger discriminant function.

2. The second function derived from the discriminant analysis accounts for 28.9 per cent of the variance, with 11 variables having a significant loading on this function. This function might be described as differentiating between places that are characterised by disadvantage, with low income households, unemployed people and routine production workers (as indicated by the variables with a significant positive loading) versus places that are characterised by advantage, home purchasers, higher income households, digitally-connected people with high human capital and people working in business services (as indicated by the variables with a significant negative loading). We label this a disadvantage/advantage discriminant function.
3. The third function derived from the discriminant analysis accounts for a further 13.2 per cent of the variance, with eight variables having a significant loading on this function. The function may be interpreted as differentiating between places that are characterised by couples with no religious affiliation, high human capital, symbolic analyst occupations and people working in the transformative industry sectors (as indicated by the variables with a significant positive loading) versus places characterised by families with children and workers in routine production occupations (as indicated by the variables with a significant negative loading). To some extent this discriminant function is similar to the second function and, in the case of four of the eight variables with significant loadings on this third function, there is a commonality of variables that are significant as well on the second discriminant function. Because of the much smaller amount of the total variance accounted for by this discriminant function, we do not use it further in the analysis that follows.

THE POSITION OF THE POLITICAL PARTIES IN A SOCIO-POLITICAL SPACE

It is the first two of these discriminant functions that are of most interest as, combined, they account for 83.5 per cent of the total variance. Thus, the Z-scores for political parties were calculated on both of these functions for all the polling booths having a favourable outcome for a party. This then enables us to compile a diagram categorising the position of each polling booth categorised according to the political party voting group to which it belongs. The diagram or graph uses the first two discriminant functions as the axes and the booths appear on it according to their position on each of the axes of the graph. That results in more than 7,000 points being plotted, which makes the graph indecipherable. Thus, Figure 1 plots the centroid of the plot of points—that is, polling booths—for the political parties. Because of the miniscule number of polling booths associated with the groups defined by the Family First party, and because there were no polling booths identified in the model associated with the Australian Democrats, Figure 1 shows only the position of the Liberal, National, Country Liberal, Labor and Australian Greens parties.

In Figure 1:

- The horizontal axis on the graph is the monocultural–older/multicultural–younger discriminant function.
- The vertical axis is the disadvantage/advantage discriminant function.

In this way, the graph provides a visual representation of two concepts. These are the differentiation between the groups of polling booths distinguished by the predominance of the vote for a political party and the relationship of those polling booths vis-à-vis the demographic and socio-economic characteristics of polling booth catchments, as represented by scores on the first two discriminant functions. This figure may be interpreted as representing a type of social-political space for voting at the 2004 federal election for the House of Representatives.

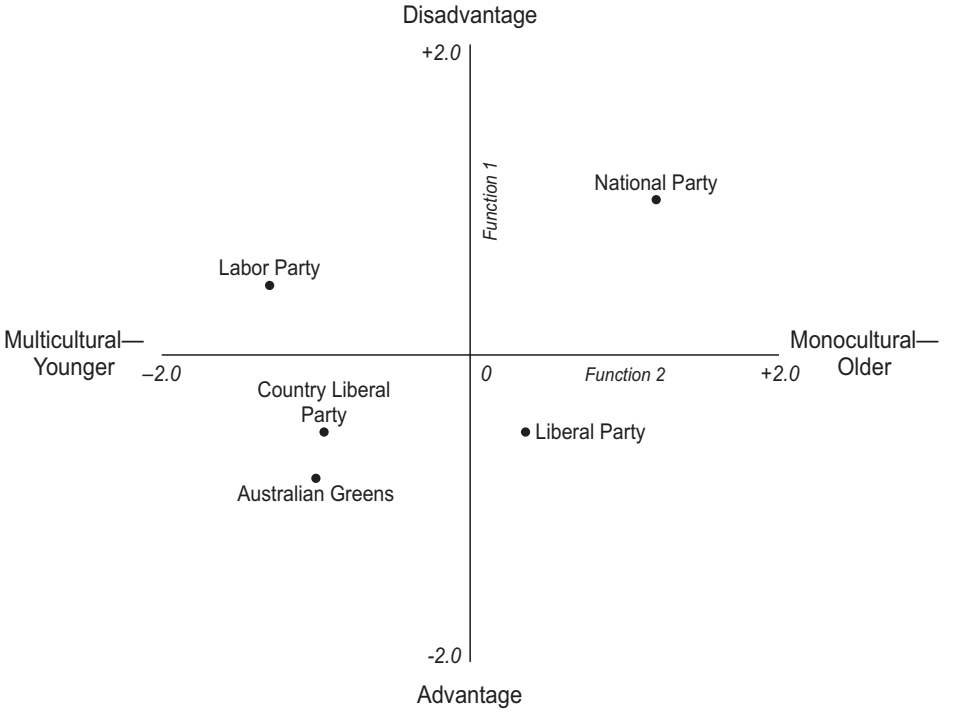
From the plot of the position of the centroids for the polling booths dominated by political parties on the two discriminant functions shown in Figure 1, we can see:

- The position of the centroid for a political party on the first two discriminant functions, namely the multicultural–younger/monocultural–older function and the disadvantage/advantage function
- The distance between the parties in the socio-political space represented by these two dimensions.

For example, from Figure 1 we may draw the following conclusions:

- The Labor Party is clearly separated from the other political parties, being located within the multicultural–younger and disadvantage quadrant of the graph
- While the Liberal Party is located within the opposite monocultural–older/advantage quadrant of the graph, it is nearest the centre of the axes for the discriminant functions.

Figure 1: Discrimination between the political parties on Functions 1 and 2 using Z scores between -2.0 and +2.0: centroid position of polling booths by party domination, 2001 federal election



- The National Party is located in the monocultural–older/disadvantage quadrant of the graph.
- The Australian Greens Party and the County Liberal Party are both located in the multicultural–younger/advantage quadrant of the graph.
- The widest separation is between the Nationals and the Greens
- There is a wide separation between the Nationals and the Liberals within the coalition parties, with the results from the discriminant analysis modelling demonstrating just how much the voting constituencies for the coalition partners are differentiated.

ACCURACY OF THE MODEL PREDICTIONS

Figure 1 uses the model to describe the general location of the supporters of different parties in socio-political space. But what happens if we use the discriminant functions in the model to predict voting outcomes? The data in the model come from the 2001 election and the 2001 census. We can therefore use the model to try to predict voting behaviour in the 2004 election.

The predictive accuracy of the discriminant analysis model is quite high, as shown by the figures in Table 4. The overall predictive accuracy is 67.2 per cent. But the predictive accuracy of the model varies for each of the voting outcomes for the groups, especially the main political parties. The final column of Table 4 shows actual voting outcomes for polling booths at the 2004 federal election for the House of Representative where the voting outcomes were 'most primary votes' in the case of the coalition parties and the Labor Party, and 20 per cent or more of the primary vote in the case of the Greens Party. The data in each row indicate the number (and percentage) of polling booths that the model correctly predicts for a political party.

For example, as seen in Table 4, the number of polling booths where the actual outcome of voting at the 2004 federal election was most primary votes for the Liberal Party was 3,879. The model correctly predicted that outcome in 2,507 polling booths, an accuracy of 64.6 per cent. But it incorrectly predicted a favourable outcome in the primary vote for Labor in 363 polling booths (9.3 per cent inaccuracy); the model incorrectly predicted a favourable outcome for the Nationals in 667 polling booths (17.5 per cent) inaccuracy and for the Country Liberal Party in 79 polling booths (2.00 per cent); and the model incorrectly predicted a favourable outcome for the Greens in 254 polling booths (6.5 per cent).

From the data in Table 4 we can draw these conclusions about the predictive accuracy of the model:

1. The model accurately predicted the Country Liberal Party vote in 100 per cent of the 32 polling booths where most primary votes were cast for candidates of that party. (Note that the CLP only operates in the Northern Territory where its candidates stand for the coalition.)
2. The next greatest level of accuracy in the predictive model was for the National Party vote, with 83.9 per cent of the 1,199 polling booths where most primary votes were cast for National Party candidates being accurately predicted. However, the model inaccurately predicted a most primary votes outcome for the Liberal Party in 145 or 12.2 per cent poll of polling booths that cast most primary votes for National Party candidates, and the model incorrectly predicted a most primary votes outcome for Labor in 24 or 2.0 per cent of the polling booths that voted for National candidates. In addition, in just one polling booth, the model incorrectly predicted that the Greens candidate would gain 20 per cent or more of the primary vote.

3. The model accurately predicted the outcome in 2,507 or 64.6 per cent of the 3,879 polling booths where most primary votes were cast for Liberal Party candidates. However, in 756 or 19.7 per cent of those polling booths that actually returned most primary votes for Liberal Party candidates, the model inaccurately predicted a most primary vote outcome for the other coalition parties. The model also incorrectly predicted a most primary votes outcome for the Labor Party in 362 or 9.3 per cent of the polling booths where the Liberal party gained most of the primary vote, and in 254 or 6.5 per cent of the polling booths the model incorrectly predicted an a favourable outcome of 20 per cent or more of the primary vote for the Greens.
4. The lowest accuracy in the predictive model is for the Labor Party vote, with 61.2 per cent of the 2,210 polling booths where most primary votes were cast for Labor Party candidates being accurately predicted. However, the model inaccurately predicted a most primary vote outcome for the coalition parties in 645 or 28.6 per cent of the polling booths that actually had most primary votes for the Labor Party, and in 213 or 9.6 per cent of the polling booths that voted for Labor candidates the model incorrectly predicted that the Greens Party would capture 20 per cent or more of the primary vote.
5. In predicting the 217 polling booths where there 20 per cent or more of the primary vote was captured by the Australian Greens Party the model had 76.6 per cent accuracy. However, for 38 or 18.0 per cent of those polling booths the model incorrectly predicted most of the primary votes would be cast for the coalition parties, and for 14 or 6.5 per cent of the polling booths the model

Table 4: Predicted and actual polling booth outcomes: number of polling booths and percentage of booths correctly predicted by the model, 2004 federal election

	Outcome predicted by model Number of polling booths and per cent correctly predicted					
Political party	Liberal	National	CLP	Labour	Greens	Actual outcome
Liberal Party—most primary votes	**2,507**	677	79	362	254	3,879
	64.6%	17.5%	2%	9.3%	6.5%	
National Party—most primary votes	145	**1,006**	6	24	18	1,199
	12.1%	**83.9%**	0.5%	2.0%	1.5%	
Country Liberal Party—	0	0	**32**	0	0	32
most primary votes	0%	0%	**100%**	0%	0%	
Labor Party—most primary votes	368	176	101	**1,352**	213	2,210
	16.6%	8.0%	4.6%	**61.2%**	9.6%	
Australian Greens Party—	28	8	2	14	**165**	217
20 per cent+ primary vote	12.9%	3.7%	0.9%	6.5%	**76.0%**	

incorrectly predicted most primary votes would go to the Labor Party.

Thus, the predictive capability of the discriminant analysis model as developed so far is reasonable in terms of this type of multi-variate statistical modeling. But it is short of that level of predictive accuracy that we would be happy with as tool for forecasting potential voting outcomes at a federal election. However, some progress toward that end has been made and, with further experimentation, it may be possible to improve predictive accuracy in such a modeling approach.

CONCLUSIONS

The research on which this paper is based demonstrates how it is possible to apply GIS-enabled statistical and spatial analysis, modeling and visualisation to investigate variations in levels of voter support for political parties at the 2004 federal election. We have done this at a spatially disaggregated level by mapping voter landscapes and investigating the local demographic and socio-economic factors associated with variations in voting support for political parties at the polling booth level. These factors may also help explain those variations.

The research has developed a predictive model to identify groupings of local polling booths that would be likely to produce primary votes at a particular level for a political party at the 2004 federal election, and the predictive model results are compared with actual voting outcomes in 2004. The modeling approach also enables us to identify a small number of key functions which explain most of the difference between groupings of polling booths where the primary vote supported a particular party, and thus allows us to plot the position of the political parties in a two dimensional socio-political space.

The research also allows us to identify patterns within political landscapes, both nationally and within the large metropolitan city regions, at a highly disaggregated spatial level. In this way, we can map coalition and Labor heartlands, as well as areas of voting dominance and zones in transition between those coalition and Labor heartlands, which are in fact marginal. These marginal areas indicate the local places where swings from allegiance from the government coalition parties to the opposition Labor Party, and vice versa, are most likely to occur as the next federal election. That analysis is available elsewhere.[3]

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