The Spatial Concentration of the Green Vote

Simon Jackman
September 13, 2010

The Greens performed relatively well in the 2010 election, winning 11.8% of 1st preferences and --- for the first time at a general election --- one seat in the House of Representatives (Melbourne). The Greens performance in 2010 is a stark improvement over previous elections; the Greens won 7.8% of House of Representatives 1st preferences in 2007, 7.2% in 2004, and 5.0% in 2001.

Even a casual inspection of the data points to tremendous spatial clustering of the Green vote. Figures 1 to 3 are maps, showing Green first preference vote share at polling places in Australia’s three most populous metropolitan areas (Sydney, Melbourne and Brisbane). “Hot spots” of Green support in the inner city are apparent in all three cities but perhaps particularly apparent in Sydney and Melbourne.

In this brief note we follow up on a “half-serious” suggestion by Antony Green on my blog, that distance from the GPO (General Post Office) be considered as a predictor of the Green vote. This is quite simple to do, so why not.

We begin by reading the polling place results from the Australian Electoral Commission’s virtual tally room:

```r
> stateAbbs <- c("NSW","VIC","QLD","WA","SA","TAS","ACT","NT")
> res <- NULL
> for(j in stateAbbs){
+ thisFile <- paste(stem,j,".csv",sep="")
+ con <- url(thisFile,open="r")
+ cat(paste("downloading",thisFile,\"\n\")
+ tmpRes <- read.table(file=con,
+ header=TRUE,
+ stringsAsFactors=FALSE,
+ quote="\",
+ skip=1,
+ sep="\","
+ close(con)
+ res <- rbind(res,tmpRes)
+ }
```

We collapse these data to form vote share by party, by polling place:

```r
> voteShares <- by(res,
+ function(x){
+ formal <- x$BallotPosition!=999
+ totalFormal <- sum(x$OrdinaryVotes[formal],na.rm=TRUE)
+ informal <- x$OrdinaryVotes[!formal]/sum(x$OrdinaryVotes,na.rm=TRUE)*100
+ props <- NULL
+ if(totalFormal>0){
+ props <- x$OrdinaryVotes[formal]/totalFormal*100
+ }
+ c(totalFormal,informal,props)
+ }
```
Figure 1: Sydney Metropolitan Area, Green primary vote share by polling place.
Figure 2: Melbourne Metropolitan Area, Green primary vote share by polling place.
Figure 3: Brisbane Metropolitan Area, Green primary vote share by polling place.
We extract Green votes:

```r
> getPartyVotes <- function(party="GRN"){
+   ## dump bad polling places -- no vote totals
+   bad <- unlist(lapply(voteShares,is.null))
+   
+   ## identifiers
+   thePollingPlaces <- unique(res$PollingPlaceID)
+   thePollingPlacesNames <- res$PollingPlace[match(thePollingPlaces,res$PollingPlaceID)]
+   theResults <- voteShares[match(thePollingPlaces,names(voteShares))]
+   theDivisionNames <- res$DivisionNm[match(thePollingPlaces,res$PollingPlaceID)]
+   theStates <- res$StateAb[match(thePollingPlaces,res$PollingPlaceID)]
+   
+   ## return totalFormal and target party results in a data frame
+   tmp <- data.frame(total=unlist(lapply(voteShares[!bad],
+     function(x)x["Total"])),
+     x=unlist(lapply(voteShares[!bad],
+       function(x){
+         sum(x[match(party,names(x))],na.rm=TRUE)
+       })),
+     division=theDivisionNames[!bad],
+     PollingPlace=thePollingPlacesNames[!bad],
+     PollingPlaceID=thePollingPlaces[!bad],
+     state=theStates[!bad])
+   rownames(tmp) <- NULL
+   return(tmp)
+ }
+>
+ grn <- getPartyVotes("GRN")
+>
+ summary(grn)

We now pick up the lat-longs of the polling places:

```
We merge the lat/lons with the vote results, and look to see that we have a data frame that seems right, by printing the Greens' top ten polling places:

```r
> names(ppData)
[1] "State"    "DivisionID" "DivisionNm"
[4] "PollingPlaceID" "PollingPlaceTypeID" "PollingPlaceNm"
[7] "PremisesNm" "PremisesAddress1" "PremisesAddress2"
[10] "PremisesAddress3" "PremisesSuburb" "PremisesStateAb"
[13] "PremisesPostCode" "Latitude" "Longitude"
```

```r
> grn <- merge(grn, ppData, 
+ by="PollingPlaceID")
```

```r
> indx <- order(grn$x, decreasing=TRUE)[1:10]
> grn[indx,]
```

<table>
<thead>
<tr>
<th>PollingPlaceID</th>
<th>total</th>
<th>x</th>
<th>division</th>
<th>PollingPlace</th>
<th>state</th>
</tr>
</thead>
<tbody>
<tr>
<td>8309</td>
<td>46588</td>
<td>3</td>
<td>66.66667</td>
<td>Curtin Special Hospital Team 8</td>
<td>WA</td>
</tr>
<tr>
<td>1935</td>
<td>2476</td>
<td>189</td>
<td>59.25926</td>
<td>Richmond Wilsonton</td>
<td>NSW</td>
</tr>
<tr>
<td>1897</td>
<td>2435</td>
<td>136</td>
<td>50.73529</td>
<td>Richmond Goonengerry</td>
<td>NSW</td>
</tr>
<tr>
<td>8331</td>
<td>4671</td>
<td>2</td>
<td>50.00000</td>
<td>Makin Prison Mobile Team 1</td>
<td>SA</td>
</tr>
<tr>
<td>1919</td>
<td>2460</td>
<td>900</td>
<td>49.44444</td>
<td>Richmond Nimbin</td>
<td>NSW</td>
</tr>
<tr>
<td>3501</td>
<td>4633</td>
<td>2310</td>
<td>48.52814</td>
<td>Melbourne Fitzroy North</td>
<td>VIC</td>
</tr>
<tr>
<td>2380</td>
<td>3099</td>
<td>940</td>
<td>48.19149</td>
<td>Batman Northcote West</td>
<td>VIC</td>
</tr>
<tr>
<td>7509</td>
<td>3353</td>
<td>2355</td>
<td>48.19149</td>
<td>Melbourne Fitzroy East</td>
<td>VIC</td>
</tr>
<tr>
<td>103</td>
<td>122</td>
<td>118</td>
<td>47.45763</td>
<td>Berowra Dangar Island</td>
<td>NSW</td>
</tr>
<tr>
<td>6720</td>
<td>12071</td>
<td>727</td>
<td>47.04264</td>
<td>Grayndler Newtown North (Grayndler)</td>
<td>NSW</td>
</tr>
</tbody>
</table>

```

<table>
<thead>
<tr>
<th>PollingPlaceTypeID</th>
<th>PollingPlaceNm</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Special Hospital Team 8</td>
</tr>
<tr>
<td>1</td>
<td>Wilsonton Goonengerry</td>
</tr>
<tr>
<td>4</td>
<td>Prison Mobile Team 1</td>
</tr>
<tr>
<td>1</td>
<td>Nimbin</td>
</tr>
<tr>
<td>1</td>
<td>Batman Northcote West</td>
</tr>
<tr>
<td>1</td>
<td>Fitzroy East</td>
</tr>
<tr>
<td>1</td>
<td>Dangar Island</td>
</tr>
<tr>
<td>1</td>
<td>Newtown North (Grayndler)</td>
</tr>
<tr>
<td>2</td>
<td>Bagot rd</td>
</tr>
<tr>
<td>724</td>
<td>Wilsons Creek Hall 724</td>
</tr>
<tr>
<td>4</td>
<td>Goonengerry Public School</td>
</tr>
<tr>
<td>1</td>
<td>Multiple sites</td>
</tr>
<tr>
<td>23B</td>
<td>Thorburn St</td>
</tr>
<tr>
<td>7</td>
<td>Fitzroy North Primary School</td>
</tr>
<tr>
<td>7</td>
<td>Northcote High School</td>
</tr>
<tr>
<td>2</td>
<td>St Georges Rd</td>
</tr>
</tbody>
</table>
```
We delete extremely tiny polling places (e.g., "Special Hospital Teams", "Prison Mobile Team") or polling places missing lat/longs:

R Code
```r
> bad <- c(grep("Special Hospital", grn$PollingPlace),
+ grep("Prison Mobile", grn$PollingPlace),
+ grep("Remote Mobile", grn$PollingPlace),
+ grep("PPVCS", grn$PollingPlace),
+ grep("PREPOLL", grn$PollingPlace))
> grn <- grn[-bad,]
> ## city hall voting by non-city divisions
> ## state capital look up function
> stateCapital <- function(state){
+ switch(state,
+ "NSW"="Sydney",
+ "VIC"="Melbourne",
+ "QLD"="Brisbane",
+ "SA"="Adelaide",
+ "WA"="Perth",
+ "TAS"="Hobart",
+ "NT" = "Darwin",
+ "ACT"="Canberra")
+ }
> stateLookUp <- function(division){
+ res$StateAb[match(division, res$DivisionNm)]
+ }
> capitalCity <- function(division){
+ stateCapital(stateLookUp(division))
+ }
> ## loop over divisions, build list of polling places to dump
> theDivisions <- unique(grn$DivisionNm)
> for(d in theDivisions){
+ theCapital <- capitalCity(d)
+ if(d!=theCapital){
+ badLoc <- paste(theCapital,
+ " (",d,")",
+ sep="")
+ bad <- grn$PollingPlaceNm==badLoc
+ if(sum(bad>0, na.rm=TRUE)){
+ grn <- grn[!bad,]
+ }
+ }
```
We now look again at the Greens' top ten polling places:

R Code
```r
indx <- order(grn$x, decreasing=TRUE)[1:10]

grn[indx,c("x","PollingPlaceNm","DivisionNm","state","Latitude","Longitude")]
```

<table>
<thead>
<tr>
<th>x</th>
<th>PollingPlaceNm</th>
<th>DivisionNm</th>
<th>state</th>
<th>Latitude</th>
<th>Longitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>1935</td>
<td>Wilsons Creek</td>
<td>Richmond</td>
<td>NSW</td>
<td>-28.5715</td>
<td>153.426</td>
</tr>
<tr>
<td>1897</td>
<td>Goonengerry</td>
<td>Richmond</td>
<td>NSW</td>
<td>-28.6103</td>
<td>153.439</td>
</tr>
<tr>
<td>1919</td>
<td>Nimbin</td>
<td>Richmond</td>
<td>NSW</td>
<td>-28.5968</td>
<td>153.223</td>
</tr>
<tr>
<td>3501</td>
<td>Fitzroy North</td>
<td>Melbourne</td>
<td>VIC</td>
<td>-37.7846</td>
<td>144.984</td>
</tr>
<tr>
<td>2380</td>
<td>Northcote West</td>
<td>Batman</td>
<td>VIC</td>
<td>-37.7742</td>
<td>144.989</td>
</tr>
<tr>
<td>7509</td>
<td>Fitzroy East</td>
<td>Melbourne</td>
<td>VIC</td>
<td>-37.8016</td>
<td>144.982</td>
</tr>
<tr>
<td>103</td>
<td>Dangar Island</td>
<td>Berowra</td>
<td>NSW</td>
<td>-33.5375</td>
<td>151.242</td>
</tr>
<tr>
<td>6720</td>
<td>Newtown North (Grayndler)</td>
<td>Grayndler</td>
<td>NSW</td>
<td>-33.8963</td>
<td>151.181</td>
</tr>
<tr>
<td>3489</td>
<td>Brunswick South East</td>
<td>Melbourne</td>
<td>VIC</td>
<td>-37.7787</td>
<td>144.973</td>
</tr>
<tr>
<td>1364</td>
<td>Scotland Island</td>
<td>Mackellar</td>
<td>NSW</td>
<td>-33.6376</td>
<td>151.292</td>
</tr>
</tbody>
</table>
```

Note that some polling places in the division of Richmond in northern NSW record Green party support around 50% of valid 1st preferences or higher. This isn't too surprising, given only a little knowledge of the places involved: Nimbin, etc. Figure 4 shows Green support (House of Representatives, 1st preferences) by polling place in the division of Richmond: the three small polling places with high levels of Green support (Wilsons Creek, Goonengerry and Nimbin) lie to the west and slightly to the south of Mullumbimby.

To compute distances from the state and territory capital-city GPOs, we first need the lat/longs of these places. According to sources such as Wiki/GeoHack etc these coordinates are:

R Code
```r
gpoLatLong <- c("Sydney","NSW",-33.867716,151.207699,
+ "Melbourne","VIC",-37.81384, 144.963028,
+ "Brisbane","QLD",-27.468174, 153.028173,
+ "Perth","WA", -31.9522, 115.8599,
+ "Adelaide","SA",-34.926752, 138.599219,
+ "Hobart", "TAS", -42.882607,147.330008,
+ "Canberra", "ACT",-35.278137,149.128348,
+ "Darwin", "NT",-12.460864,130.842015)
tmp <- matrix(gpoLatLong,ncol=4,byrow=TRUE)
gpoLatLong <- data.frame(city=tmp[,1],
+ state=tmp[,2],
+ lat=as.numeric(tmp[,3]),
+ long=as.numeric(tmp[,4]))
```

For each polling place, we compute the distance (great circle) to the GPO in the respective state. We use the `distVincentySphere` function in the `geosphere` package. This function returns distances in metres; we compute a summary in kilometres and print details on the 5 polling places in the country that are closest to (and most distant from) the GPO of their respective state.

R Code
```r
library(geosphere)
grn$distance <- distVincentySphere(p1=cbind(gpoLatLong$long[match(grn$state,gpoLatLong$state)],
+ gpoLatLong$lat[match(grn$state,gpoLatLong$state)]),
+ p2=cbind(grn$Longitude,grn$Latitude))
summary(grn$distance/1000)
```
Figure 4: Green 1st preferences, by polling place, division of Richmond (NSW)

Source: AEC. Computed by Simon Jackman, Stanford University, 8pm Sep 9, 2010.
distance
Min. :8.413e-02
1st Qu.:1.718e+01
Median :6.231e+01
Mean :1.779e+02
3rd Qu.:2.184e+02
Max. :3.696e+03

R Code

> grn[order(grn$distance)[1:5],
+ c("distance", "DivisionNm", "state", "PollingPlaceNm", "Latitude", "Longitude")]

<table>
<thead>
<tr>
<th>distance</th>
<th>DivisionNm</th>
<th>state</th>
<th>PollingPlaceNm</th>
<th>Latitude</th>
<th>Longitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>6221</td>
<td>84.13399</td>
<td>Denison</td>
<td>TAS</td>
<td>Hobart</td>
<td>-42.88240</td>
</tr>
<tr>
<td>6460</td>
<td>220.86800</td>
<td>Fraser</td>
<td>ACT</td>
<td>City</td>
<td>-35.27662</td>
</tr>
<tr>
<td>3505</td>
<td>481.86318</td>
<td>Melbourne</td>
<td>VIC Melbourne</td>
<td>(Melbourne)</td>
<td>-37.81810</td>
</tr>
<tr>
<td>6006</td>
<td>483.69396</td>
<td>Perth</td>
<td>WA</td>
<td>Northbridge</td>
<td>-31.94820</td>
</tr>
<tr>
<td>6003</td>
<td>524.97028</td>
<td>Perth</td>
<td>WA</td>
<td>Perth (Perth)</td>
<td>-31.95660</td>
</tr>
</tbody>
</table>

R Code

> grn[order(grn$distance, decreasing=TRUE)[1:5],
+ c("distance", "DivisionNm", "state", "PollingPlaceNm", "Latitude", "Longitude")]

<table>
<thead>
<tr>
<th>distance</th>
<th>DivisionNm</th>
<th>state</th>
<th>PollingPlaceNm</th>
<th>Latitude</th>
<th>Longitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>6423</td>
<td>3696045</td>
<td>Lingiari</td>
<td>NT</td>
<td>West Island</td>
<td>-12.1609</td>
</tr>
<tr>
<td>6001</td>
<td>3689388</td>
<td>Lingiari</td>
<td>NT</td>
<td>Home Island</td>
<td>-12.0882</td>
</tr>
<tr>
<td>6510</td>
<td>2756308</td>
<td>Lingiari</td>
<td>NT</td>
<td>Christmas Island</td>
<td>-10.4837</td>
</tr>
<tr>
<td>5764</td>
<td>2223762</td>
<td>Durack</td>
<td>WA</td>
<td>Kununurra</td>
<td>-15.7684</td>
</tr>
<tr>
<td>5802</td>
<td>2214257</td>
<td>Durack</td>
<td>WA</td>
<td>Wyndham</td>
<td>-15.4877</td>
</tr>
</tbody>
</table>

Observe that some of the Cocos Islands polling places (in the division of Lingiari) lie almost 3700 kilometres from Darwin, at longitude 96.8W (and some 5836 kilometres from Canberra); likewise, the massive division of Durack in WA has polling places over 2200 kilometres from Perth.

We now plot Green 1st preference vote share as a function of distance of the polling place from the state/territory GPO, by state, overlaying a loess curve on each graph. We use log-transformations to help us see more of the data; a graph using an untransformed version of the graph appears below.

```r
> grn$logx <- log(grn$x)
> grn$logd <- log(grn$distance/1000)
> library(lattice)
> pdf(file="GRNdistance.pdf",
+ useDingbats=FALSE)
> xyplot(logx ~ logd | state,
+ data=grn,
+ xlab="Distance of polling place from state GPO (km, log scale)",
+ ylab="Green 1st Preferences (% log scale)",
+ scales=list(y=list(at=log(c(.5,1,2,5,10,25,50)),
+ labels=c(.5,1,2,5,10,25,50))
+ ),
+ x=list(at=log(c(.1,.5,2,10,100,1000)),
+ labels=c(.1,.5,2,10,100,1000))
+ ),
+ panel=function(x,y,subscripts,...){
+ panel.abline(v=log(c(.1,.5,2,10,100,1000)),
+ h=log(c(.5,1,2,5,10,25,50))
+ lwd=.5,
+ col=gray(.85))
+ num <- sqrt(grn$total[subscripts])
+ cex <- num-min(num,na.rm=TRUE)
+ cex <- cex/max(cex,na.rm=TRUE) * 1.5
+ cex <- cex + .1
+ }
```

```r
```
null device
1

With the exception of the Northern Territory, the relationship between distance from GPO and Green vote share is usually negative, consistent with the spatial concentration of Green support in the inner-city. The pattern is non-monotonic in some states, with Green support actually increasing in some far-flung portions of WA, QLD and NSW.

We prod the data a little harder, looking at Green “hot spots” among the set of polling places in the top decile of distance from the GPO, by state/territory.

```
> ok <- !is.na(grn$x)
> tmp <- by(grn[ok,],
+ INDICES=grn$state[ok],
+ FUN=function(data){
+ farAway <- data$distance>quantile(data$distance,.90)
+ tmpData <- data[farAway,]
+ indx <- order(tmpData$x,decreasing=TRUE,na.last=TRUE)[1:5]
+ return(tmpData[indx,c("x","PollingPlaceNm","DivisionNm","distance")])
+ })
> tmp
```

```
grn$state[ok]: ACT
x PollingPlaceNm DivisionNm distance
6470 25.00000 Jervis Bay Fraser 144363.20
6447 18.25397 Tharwa Canberra 26254.79
6582 17.84703 Theodore Canberra 18879.79
6485 17.64706 Wreck Bay Fraser 143272.07
6526 16.98186 Calwell Canberra 18120.01

grn$state[ok]: NSW
x PollingPlaceNm DivisionNm distance
1935 59.25926 Wilsons Creek Richmond 626198.00
1897 50.73529 Goonengerry Richmond 625393.5
1919 49.44444 Nimbin Richmond 617272.2
1914 45.96774 Main Arm Upper Richmond 631159.3
1923 45.26749 Rosebank Richmond 617393.5

grn$state[ok]: NT
x PollingPlaceNm DivisionNm distance
6424 19.318182 Yulara Lingiari 1422154
6399 17.232376 Yirara Lingiari 1311560
6510 11.162791 Christmas Island Lingiari 2756308
6423 9.523810 West Island Lingiari 3696045
6401 0.913242 Home Island Lingiari 3689388

grn$state[ok]: QLD
x PollingPlaceNm DivisionNm distance
4424 22.88082 Kuranda Leichhardt 1408191
4428 22.61411 Machans Beach Leichhardt 1399088
```
Figure 5: Green first preferences by polling place (%) by distance of polling places from GPO.
<table>
<thead>
<tr>
<th>PollingPlaceNm</th>
<th>DivisionNm</th>
<th>distance</th>
<th>Latitude</th>
<th>Longitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>City</td>
<td>Fraser</td>
<td>220.868</td>
<td>-35.27662</td>
<td>149.1299</td>
</tr>
<tr>
<td>Lyneham</td>
<td>Fraser</td>
<td>2980.791</td>
<td>-35.25150</td>
<td>149.1250</td>
</tr>
<tr>
<td>Turner</td>
<td>Fraser</td>
<td>1477.892</td>
<td>-35.26791</td>
<td>149.1446</td>
</tr>
</tbody>
</table>

In Queensland, we see a few Green “hot spots” in locations lying far away from Brisbane such as Kuranda on the Atherton Tableland outside Cairns (division of Leichhardt). In Western Australia, the far-flung Green “hot spots” are around Broome.

Similarly, we look at the inner-capital-city Green “hotspots”, by state/territory, defining “inner-capital-city” as polling places lying within 10km of the GPO:

```r
> ok <- !is.na(grn$x)
> tmp <- by(grn[ok,]
+ INDICES=grn$state[ok],
+ FUN=function(data){
+ farAway <- data$distance<10e3
+ tmpData <- data[farAway,]
+ indx <- order(tmpData$x,decreasing=TRUE,na.last=TRUE)[1:5]
+ return(tmpData[indx,c("x","PollingPlaceNm","DivisionNm",
+ "distance","Latitude","Longitude")])
+ }
+ )
> tmp
```

<table>
<thead>
<tr>
<th>PollingPlaceNm</th>
<th>DivisionNm</th>
<th>Latitude</th>
<th>Longitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>City</td>
<td>Fraser</td>
<td>220.868</td>
<td>-35.27662</td>
</tr>
<tr>
<td>Lyneham</td>
<td>Fraser</td>
<td>2980.791</td>
<td>-35.25150</td>
</tr>
<tr>
<td>Turner</td>
<td>Fraser</td>
<td>1477.892</td>
<td>-35.26791</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PollingPlaceNm</th>
<th>DivisionNm</th>
<th>Latitude</th>
<th>Longitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>City</td>
<td>Fraser</td>
<td>220.868</td>
<td>-35.27662</td>
</tr>
<tr>
<td>Lyneham</td>
<td>Fraser</td>
<td>2980.791</td>
<td>-35.25150</td>
</tr>
<tr>
<td>Turner</td>
<td>Fraser</td>
<td>1477.892</td>
<td>-35.26791</td>
</tr>
</tbody>
</table>

In Queensland, we see a few Green “hot spots” in locations lying far away from Brisbane such as Kuranda on the Atherton Tableland outside Cairns (division of Leichhardt). In Western Australia, the far-flung Green “hot spots” are around Broome.

Similarly, we look at the inner-capital-city Green “hotspots”, by state/territory, defining “inner-capital-city” as polling places lying within 10km of the GPO:
There are few surprises here. In inner-city Sydney, Green support reaches its highest in Newtown, Camperdown and Annandale, close to the University of Sydney campus, with some polling places returning better than 40% support for the Green House of Representatives candidate in the division of Grayndler; see Figure 6. In Melbourne, even higher levels of Green support are recorded at polling places just north and east of the University of Melbourne campus (North Fitzroy, West Northcote, East...
Fitzroy). In Brisbane, polling places to the north, west and south of the CBD are the “inner-city” Green hotspots: Kelvin Grove, Petrie Terrace, Red Hill and Herston lie close to QUT’s faculties of Health, Education and Creative Industries, although even here Green support is just above 30%.

To emphasize the point, we also examine the relationship between Green vote share and distance from the GPO, but with distance restricted to 60 kilometres from the respective state or territory GPO. The resulting graph appears in Figure 7.

R Code

```r
> library(lattice)
> pdf(file="GRNdistanceMetro.pdf",
+ useDingbats=FALSE)
> xyplot(x ~ I(distance/1E3) | state,
+ data=grn,
+ subset=distance<60E3,
+ xlab="Distance of polling place from state GPO (km)",
+ ylab="Green 1st Preferences (%)",
+ panel=function(x,y,subscripts,...){
+ panel.grid()
+ num <- sqrt(grn$total[subscripts])
+ cex <- num-min(num,na.rm=TRUE)
+ cex <- cex/max(cex,na.rm=TRUE) * 1.5
+ cex <- cex + .1
+ panel.points(x,y,cex=cex,lwd=.25)
+ panel.loess(x,y,
+ span=.33,
+ degree=1,
+ family="symmetric",
+ eval=151,
+ col="black",
+ lwd=3)
+ }
+ }
> dev.off()
```

Finally, in Figure 8 we plot Green support by distance on a “raw scale”, replicating Figure 5, but without the log transformations.

null device

1
Figure 6: Green first preferences, division of Grayndler (NSW)

Source: AEC. Computed by Simon Jackman, Stanford University, 8pm Sep 9 2010
Figure 7: Green first preferences by polling place (%) by distance of polling places from GPO, restricted to 60 kilometres around the state or territory GPO.
Figure 8: Green first preferences by polling place (%) by distance of polling places from GPO.