

KOREAN VOTERS ARE NO LONGER RED-ALLERGIC[§]

An Application of the Proportional Odds Model

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1 Overview

The Parliament of the Republic of Korea has just reshuffled its members on April 15 as many significant outcomes pose for a new era of more diversified ideological spectrum in the history of modern Korean politics with a newly- registered political party, Democratic Labor Party (DLP), in official legislature—that stunned the conventional right-wingers who have hitherto dominated the public opinion, news journals and so to speak of politics. Voters in general and the news quotes are ubiquitously dubbing a new surge of leftist factions, the ruling Our Open Party (OOP) (although its chief is the tentatively impeached—awaits a final verdict of the Constitutional Law Court within May 2004—and “incumbent” President Roh, Moo-hyun) and DLP.

Since Korea’s liberation from the Japanese occupation in the first-half of the 20th century, the Korea has broadly been bisected, that is the North and the South, in terms of sovereignty, and the South has also suffered from a East-West bias for the South-eastern part of Korea has traditionally been in politico-economic hegemony of the Peninsular. Until the very last Presidential election, the Korean politics has been very geographically divided with little ideological contrasts. The ideological traits, undoubtedly the leftist doctrines, have been tabooed for it reminded of any suspicion in close relationship with the North since close to half of the living South Korean population had experienced the patricidal Korean War, 1950 - 1953, and thus are red-or-left-allergic. For the North is no longer a properly governed communist regime, not even a health-service haven like Cuba, and with this fact being increasingly recognized by more Korean voters, they have become more immune and open to ideological debates which has just fruited in the last 17th General Election on April 15th.

On its surface, it seems that the wings of the Parliament are now fully fledged and evenly spread—not folded and/or biased towards either side which is a great leap from the 16th General Election which was significantly left-skewed (skewed to the right).

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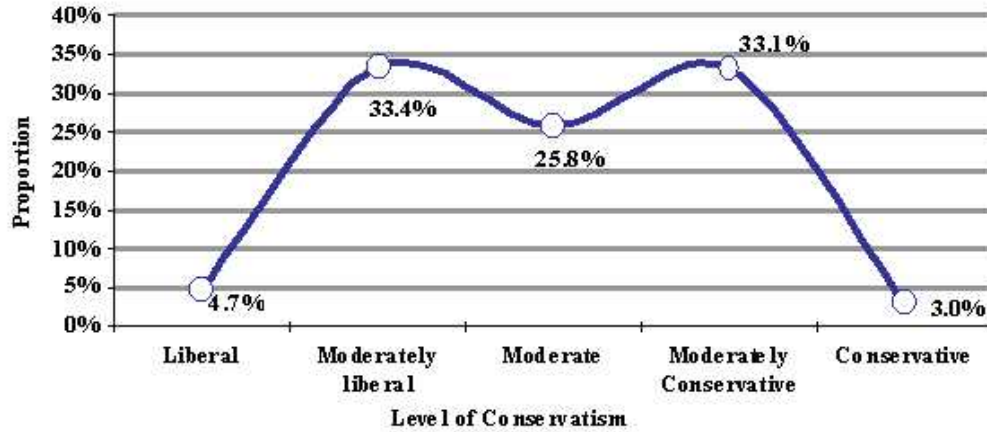


Figure 1.1 The Korean Parliament - Ideological Spectrum of the 17th General Election

In this regard, I would like to ask if there really exist partisan traits in terms of ideology in the newly constituted Parliament by fitting the level of conservatism, as gathered by various surveys and contacts, onto party-wise seats as follows:

Table 1.1 Korean Political Parties - Ideological Spectrum of the 17th General Election Results

Level of conservatism	Moderately liberal		Moderately Conservative		Conservative	Total seats
	Liberal	liberal	Moderate	Conservative		
OOP	9	85	43	15	0	152
GNP	0	10	29	76	6	121
DLP	5	5	0	0	0	10
NMDP	0	0	4	5	0	9
ULD	0	0	0	1	3	4
NP	0	0	1	1	0	2
KM21	0	0	0	1	0	1
Total seats	14	100	77	99	9	299

Source: *The Chosun Ilbo*, Party websites, political contacts

The party-wise number of seats won is ordered in a descending order: OOP, Grand National Party (GNP), DLP, New Millenium Democratic Party (NMDP), United Liberal Democrats (ULD), non-partisan members of the Parliament (NP) and Kookmin Unification 21 (KM21). A consensus and “observed median” in an ascending order of level of conservatism is DLP, OOP, NP, NMDP, GNP, KM21 and ULD as follows:

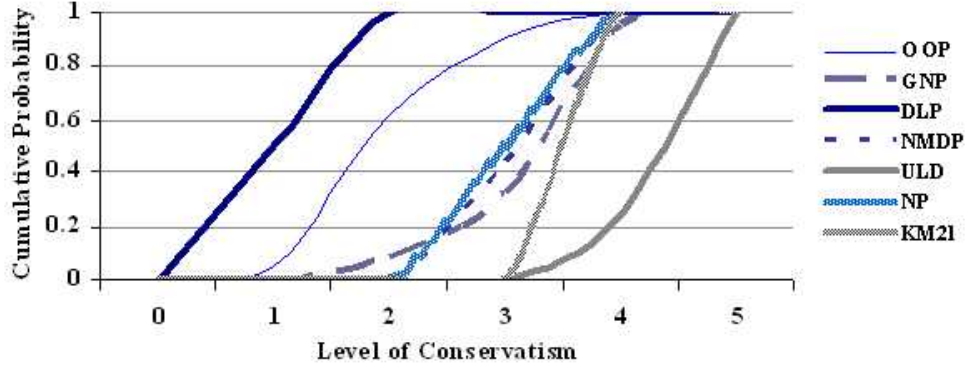


Figure 1.2 The Korean Parliament - Cumulative Ideological Spread (Observed)

2 Method

Given the dependent response variable is categorical, i.e. the level of conservatism can range “Liberal (LI = 1)”, “Moderately Liberal (ML = 2)”, “Moderate (MO = 3)”, “Moderately Conservative (MC = 4)” and “Conservative (CO = 5)” and can be ordered (ordinal), the desirable fitting model is the Proportional Odds Model (POM) according to Agresti (1996). For a POM setting, our basic simultaneous equations system is as follows:

$$\text{logit} [P(Y \leq j)] = \alpha_j + X' \beta, \quad (1)$$

where $j = 1 < 2 < 3 < 4$, i.e. level of conservatism, and

$$X = \begin{bmatrix} \mathbf{1}\{i = GNP\} \\ \mathbf{1}\{i = KM21\} \\ \mathbf{1}\{i = NMDP\} \\ \mathbf{1}\{i = NP\} \\ \mathbf{1}\{i = OOP\} \\ \mathbf{1}\{i = ULP\} \end{bmatrix} \quad \text{and} \quad \beta = \begin{bmatrix} \beta_{i=GNP} \\ \beta_{i=KM21} \\ \beta_{i=NMDP} \\ \beta_{i=NP} \\ \beta_{i=OOP} \\ \beta_{i=ULP} \end{bmatrix}. \quad (2)$$

The logit for $j = 5$ (Conservative) is not estimated for its cumulative probability is always equal to 1. The baseline predictor is set at DLP: the estimated intercept terms are interpreted as the log of the odds for a DLP congressman taking an at most j^{th} ideological stance, or being towards liberal direction from the j^{th} level of conservatism. Also, an estimated slope coefficient is the log of odds ratio that of an i -Party (other than DLP) congressman, compared to a DLP peer, taking an at most j ideological stance, or being towards liberal direction from j^{th} level of conservatism (see below).

$$\hat{\alpha}_j = \log \left[\frac{\hat{F}_j(X = 0)}{1 - \hat{F}_j(X = 0)} \right] = \log (\text{Odds}_{Y \leq y_j | X=0}), \quad (3)$$

and

$$\hat{\beta}_{i \in \{DLP\}^c} = \log \left[\frac{\frac{\hat{F}_j(X=i \in \{DLP\}^c)}{1 - \hat{F}_j(X=i \in \{DLP\}^c)}}{\frac{\hat{F}_j(X=0)}{1 - \hat{F}_j(X=0)}} \right] = \log \left(\hat{\theta}_{Y \leq y_j | X=i \in \{DLP\}^c : DLP} \right). \quad (4)$$

3 Results

I used R¹ to fit the model as follows:

Level of conservatism	Liberal	Moderately liberal	Moderate	Moderately Conservative	Conservative	Total seats
OOP	9	85	43	15	0	152
	<i>8.32</i>	<i>85.98</i>	<i>43.25</i>	<i>14.11</i>	<i>0.34</i>	
GNP	0	10	29	76	6	121
	<i>0.35</i>	<i>8.70</i>	<i>29.67</i>	<i>77.09</i>	<i>5.20</i>	
DLP	5	5	0	0	0	10
	<i>5.15</i>	<i>4.52</i>	<i>0.27</i>	<i>0.06</i>	<i>0.00</i>	
NMDP	0	0	4	5	0	9
	<i>0.04</i>	<i>0.93</i>	<i>2.74</i>	<i>5.03</i>	<i>0.26</i>	
ULD	0	0	0	1	3	4
	<i>0.00</i>	<i>0.00</i>	<i>0.02</i>	<i>0.97</i>	<i>3.01</i>	
NP	0	0	1	1	0	2
	<i>0.01</i>	<i>0.24</i>	<i>0.66</i>	<i>1.05</i>	<i>0.05</i>	
KM21	0	0	0	1	0	1
	<i>0.00</i>	<i>0.02</i>	<i>0.10</i>	<i>0.75</i>	<i>0.13</i>	
Total seats	14	100	77	99	9	299

Note: Italic numeric values denote fitted number of seats
Source: The Chosun Ilbo, Party websites, political contacts

Now, Table 3.1 shows the fitted values for Table 1.1, denoted in italic, and the goodness-of-fit statistics with $df = 3$ are all tested insignificant under “ H_0 : model adequate,” thus our POM shows a reasonable fit. Two goodness-of-fit measures (Agresti, 1996) are as followed:

$$\chi^2 = 4.19 \ll \chi^2_{.95,df} = 7.81, \text{ p-value} = 0.24;$$

$$G^2 = 6.88 \ll \chi^2_{.95,df} = 7.81, \text{ p-value} = 0.08.$$

As a rule of thumb for checking the model adequacy, following plots for Pearson residuals show that the residuals in general fluctuate with mean zero which provides a supporting evidence for the goodness of fit test results.

The estimated parameters are:

$$\hat{\alpha} = [\hat{\alpha}_1, \hat{\alpha}_2, \hat{\alpha}_3, \hat{\alpha}_4]^T = [0.06, 3.40, 5.16, 9.02]^T,$$

and

$$\begin{aligned} \beta &= [\beta_{i=GNP}, \beta_{i=KM21}, \beta_{i=NMDP}, \beta_{i=NP}, \beta_{i=OOP}, \beta_{i=ULP}] \\ &= [5.92, 7.09, 5.52, 5.36, 2.91, 10.13]^T, \end{aligned}$$

and the resultant estimated odds-ratios are:

$$\begin{aligned} \Theta &= [\Theta_{i=GNP}, \Theta_{i=KM21}, \Theta_{i=NMDP}, \Theta_{i=NP}, \Theta_{i=OOP}, \Theta_{i=ULP}] \\ &= [0.00269, 0.00083, 0.00401, 0.00470, 0.05445, 0.00004]^T. \end{aligned}$$

¹The R Project for Statistical Computing: <http://www.r-project.org>.

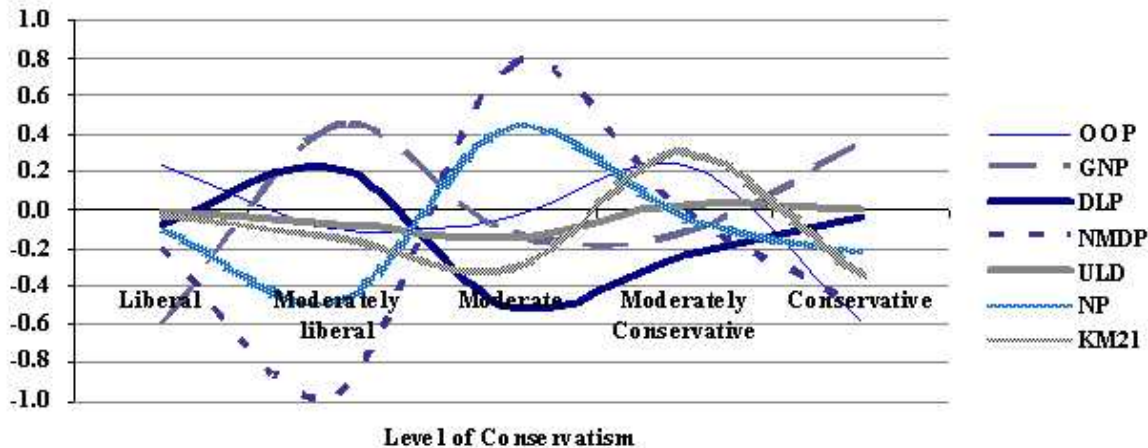


Figure 3.1 Pearson Residuals

For instance, for any fixed level of conservatism, the estimated odds that a ULD, an ultra conservative faction, a congressman’s response is in the liberal direction rather than the conservative equal only $1/25000^{th}$ of the estimated odds for a DLP counterpart. Since no estimated odds ratio exceed 1 and the baseline predictor is DLP, we can say that both DLP and ULD demark both extrema, left and right, respectively. The degree of leftist-tendency for DLP is again 20 times that of the ruling OOP which is considered the second most leftist group within the Parliament. In an ascending order of the estimated odds ratios, the level of conservatism intensifies as follows: DLP, OOP, NP, NMDP, GNP, KM21 and ULD—which is inline with the general public opinion that appears on news media.

Level of conservatism	Moderately				
	Liberal	liberal	Moderate	Conservative	Conservative
OOP	0.05	0.62	0.90	1.00	1.00
GNP	0.00	0.07	0.32	0.96	1.00
DLP	0.52	0.97	0.99	1.00	1.00
NMDP	0.00	0.11	0.41	0.97	1.00
ULD	0.00	0.00	0.01	0.25	1.00
NP	0.00	0.12	0.45	0.97	1.00
KM21	0.00	0.02	0.13	0.87	1.00

Table 3.2 abstracts the estimated probabilities for each political parties in terms of ideological tendency. The derivation naturally follows from the initial logit equation as:

$$\hat{F}_j(X = 0) = \frac{\exp(\hat{\alpha}_j)}{1 + \exp(\hat{\alpha}_j)}$$

for the estimated probability of a DLP congressman taking a liberal stance from the j^{th} level of conservatism, and

$$\hat{F}_j(X = i \in \{DLP\}^c) = \frac{\exp(\hat{\alpha}_j + \hat{\beta}_{i \in \{DLP\}^c})}{1 + \exp(\hat{\alpha}_j + \hat{\beta}_{i \in \{DLP\}^c})}$$

for the estimated probability of a non-DLP congressman taking a liberal stance from the j^{th} level of conservatism. Table 3.1 shows that other than OOP and DLP, being extremely liberal is an “event of measure-zero.” The estimated probability of an average DLP congressman standing in the frontline of progressiveness ($j = 1$) is more than 10 times that of an OOP peer. We can therefore say that DLP can be the most liberal of all Korean political parties. Continuous plots for Table 3.1 is depicted on Figure 3.2.

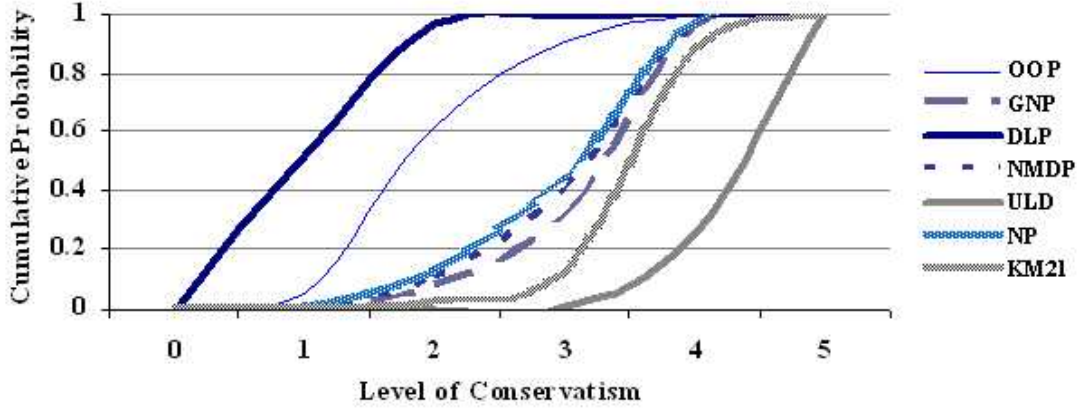


Figure 3.2 Fitted Cumulative Probabilities

The most crucial question is whether seemingly partisan ideological traits are empirically justified. Testing following hypotheses will conclude on a partial association between a political party and its level of conservatism.

$$H_0 : \beta = 0 \text{ vs. } H_1 : \beta \neq 0.$$

Since there are 0 observed values for some cells on Table 3.1, we use the likelihood ratio test using following test statistic:

$$\Lambda = 2 [\log(L_1) - \log(L_0)] = D_0 - D_1 = 188.0226 \xrightarrow{d} \chi^2_{.95,df}$$

With $df = 6$, the 95 percentile chi-squared critical value is approximately 12.59 and the above null hypothesis cannot be accepted by a wide margin. An alternative Wald test can be conducted with following Wald statistics for the estimated slope coefficients:

$$W_i = z_i^2 \approx t_i^2 = \left[\frac{\hat{\beta}_i}{\text{s.e.}(\hat{\beta}_i)} \right]^2 \implies W = [W_i]_{6 \times 1} = [64.06, 9.92, 34.72, 13.69, 17.52, 50.79]^T,$$

where $i \in \{GNP, KM21, NMDP, NP, OOP, ULD\}$.

With $df = 1$ for each null hypothesis, “ $H_0 : \beta_i = 0$,” the 95 percentile chi-squared critical value is approximately 3.84 and all Wald statistics prove significant which poses another evidence for a partial relationship between political parties and their ideological identities.

Instead of the original linear systematic component, replacing that with a quadratic one may be conjectured to improve the goodness of fit. Here, the suggested model can be

$$\text{logit}[P(Y \leq j)] = \alpha_j + X'\beta + (X^2)'\gamma. \quad (2)$$

Unfortunately, this model will not enhance the goodness of fit for the quadratic systematic component is “observationally equivalent” with the existing linear structure: the predictor variable is a binary dummy and will be the same with any power; thus 3 explanatory columns (including the first column with ones) have same rank with the existing 2 columns.

4 Conclusion

The last General Election in Korea is thought to have set a landmark in wholesomeness of Korean politics: ideological contrasts, rather than a geographical bias, appealed to the voters and the traditional conservative factions (NMPD, ULD and GNP) that had exploited the bigotry which stemmed out of the chronic East-West distortion have either lost their coalesced majority position or almost faded away.

The seemingly balancing-out effect by the emergence of new DLP and a bit more centric and ruling OOP is an outcome of the conviction that the voters are now choosing candidates for their pledges based on the party doctrines rather than relying on un-enlightened prejudices. Section 3 has shown that we can arrange the political parties in an ascending order of fitted probabilities of taking liberal stance from the median level: ULD < KM21 < GNP < NMDP < NP < OOP < DLP, which is in fact ordered in a descending level of conservatism (see Table 3.1).

Technically, the leftists (DLP and OOP) have now occupied more than half of the seats in the Parliament, 163 out of 299—coincidentally, their seats are placed in the left-hand side from the podium of the Speaker of the Parliament. The most likely sequential strategy for now dwarfed right-wingers will be to adjust their party doctrines towards a moderate version: that way they can better sympathize the “middle-income grass roots” or median swing voters—circa equivalent with the median effective level at which the impact on an incremental change in the likelihood of winning seats is the greatest.

References

- [1] Agresti, A. 1996. *An Introduction to Categorical Data Analysis*. New York: Wiley.
- [2] Kim, M.-C., and M.-S. Park. 2004. A Survey on Ideological Identity of the New Legislature. *The Chosun Ilbo*, 30 April: A5.

Appendix A1: R code

```
# Read-in the data set on the 17th General Election in RoK

election <- read.table("election.txt", header = T)
election

# Label the response variable in an ascending order of "Very Liberal (VL)",
# "Slightly Liberal (SL)", "Moderate (MO)", "Slightly Conservative (SC)",
# "Very Conservative (VC)"

election$conservatism <- factor(election$conservatism,
  labels = c("LI", "ML", "MO", "MC", "CO"),
  ordered = T)
election

# Regress the level of conservatism onto the political parties I.A.W.
# "Proportional Odds Model"

library(MASS)
election.polr <- polr(conservatism ~ party,
  data = election, weights = count)
summ.polr <- summary(election.polr)
summ.polr
summ.polr$coeff
alpha <- cbind(summ.polr$coeff[7:10,1])
alpha # fitted intercepts or the logit of baseline functions
# and the log of the odds of a DLP taking an at most a certain level of conservatism
beta <- cbind(summ.polr$coeff[1:6,1])
beta # log of the estimated odds-ratio
theta <- exp(-beta)
theta # estimated odds-ratio of each partisan member's taking
# an at most a certain level of conservatism
exp(alpha)/(1+exp(alpha)) # fitted c.d.f. for DLP
GNP0 <- exp(alpha - beta[1,])
GNP0/(1+GNP0) # fitted c.d.f. for GNP
summ.polr$fitted
pi <- summ.polr$fitted[1:7,] # fitted p.m.f. for partisan ideological spectrum
pi # fitted p.m.f. for partisan ideological spectrum

J <- matrix(rep(1,25),nrow=5,ncol=5)
U <- matrix(as.numeric(upper.tri(J, diag = TRUE)),nrow=5,ncol=5)
F <- pi%*%U
F # fitted c.d.f. for partisan ideological spectrum

# LRT on H_0 : beta = 0

model.polr.null <- polr(conservatism ~ 1,
  data = election, weights = count)
summ.polr.null <- summary(model.polr.null)
summ.polr.null$deviance # null-deviance
```

```

summ.polr.null$edf
L <- summ.polr.null$deviance - summ.polr$deviance # LRT statistic
df <- abs(summ.polr$edf - summ.polr.null$edf)
L # Likelihood ratio test statistic
qchisq(.95,df) # Chi^2 critical value

# Wald Test on H_0 : beta = 0

wald <- cbind(summ.polr$coeff[1:6,3])^2
wald # Wald test statistic for each slope coefficient
qchisq(.95,1) # Chi^2 critical value

# Regress the level of conservatism onto a quadratic systematic component

library(MASS)
election.polr.quad <- polr(conservatism ~ party + party^2,
  data = election, weights = count)
summ.polr.quad <- summary(election.polr)
summ.polr.quad
summ.polr.quad$coeff

```

Appendix A2: Data

Seats of the 17th Parliament, Republic of Korea.

party	conservatism	count
OOP	1	9
GNP	1	0
DLP	1	5
NMDP	1	0
ULD	1	0
NP	1	0
KM21	1	0
OOP	2	85
GNP	2	10
DLP	2	5
NMDP	2	0
ULD	2	0
NP	2	0
KM21	2	0
OOP	3	43
GNP	3	29
DLP	3	0
NMDP	3	4
ULD	3	0
NP	3	1
KM21	3	0
OOP	4	15
GNP	4	76
DLP	4	0
NMDP	4	5
ULD	4	1
NP	4	1
KM21	4	1
OOP	5	0
GNP	5	6
DLP	5	0
NMDP	5	0
ULD	5	3
NP	5	0
KM21	5	0