```
---
title: "King Sejong's National Referendum on Tax Reform (ggplot)"
author: "coop711"
date: '`r Sys.Date()`'
output: html_document
---

## Data

Source are from [Sejong silok](http://sillok.history.go.kr/id/kda_11208010_005), summary
table from Professor Oh, Kisoo.

<img src = "../pics/sejong_poll_data.png">

```{r, data, echo = FALSE, message = FALSE, results = 'hide'}
knitr::opts_chunk$set(echo = TRUE)
library(pander)
library(knitr)
library(ggplot2)
library(grid)
library(gridExtra)
library(extrafont)
panderOptions('table.split.table', Inf)
load("sejong_poll_data_en.RData")
str(sejong.poll.2)
```

```{r, kable, echo = FALSE, results = 'asis'}
kable(sejong.poll.2[c(4, 3, 5, 2, 1)])
```

<P style = "page-break-before:always">

Total Pros and Cons

```{r, overall votes}
# pander(format(tbl.vote, big.mark = ","))
kable(t(as.matrix(format(tbl.vote, big.mark = ","))), caption = "Total Pros and Cons",
align = 'c')
kable(t(as.table(format(tbl.vote, big.mark = ","))), caption = "Total Pros and Cons", align
= 'c')
kable(t(as.table(format(prop.table(tbl.vote)*100, digits = 3, nsmall = 1))), caption =
"Total Pros and Cons(%)", align = 'c')
```

<P style = "page-break-before:always">

Pie Charts

R-Base Plot

```{r, pie for total, fig.width = 5, fig.height = 5}
par(family = "NanumGothic")
gray.2 <- gray.colors(12)[c(12, 7)]
rainbow.2 <- rainbow(2)[2:1]
pie(tbl.vote, col = rainbow.2)
title(main = "Total Pros and Cons")
text(x = 0, y = c(0.4, -0.4), labels = format(tbl.vote, big.mark = ","))
# dev.copy(png, "../pics/sejong_total_pie.png", width = 480, height = 480)
# dev.off()
```

ggplot2

```{r, coord_polar, message = FALSE, fig.width = 4, fig.height = 4}
source("./theme_Nanum_kr.R")
# str(theme.kr)
# par(family = "NanumGothic")
vote.df <- as.data.frame(tbl.vote)
```
```

```
# y.coord <- cumsum(vote.df$Freq)/2 + c(0, cumsum(head(vote.df$Freq, -1))/2)
y.coord <- cumsum(vote.df$Freq)/2
pie.label <- paste(levels(vote.df$vote), format(vote.df$Freq, big.mark = ","), sep = "\n")
str(vote.df)
p1 <- ggplot(vote.df, aes(x = "", y = Freq, fill = vote))
p2 <- p1 +
  geom_bar(width = 1, stat = "identity")
p2
p2.2 <- p1 +
  geom_bar(width = 1, stat = "identity", position = "dodge")
p2.2
p3.2 <- p2.2 +
  theme_bw()
p3.2
p4.2 <- p3.2
p4.2
p5.2 <- p4.2 +
  scale_x_discrete(name = "Pros and Cons") +
  scale_y_continuous(name = "Total", breaks = vote.df$Freq, labels = format(vote.df$Freq,
big.mark = ","))
p5.2
p6.2 <- p5.2 +
  scale_fill_manual(name = "Pros and Cons", values = rainbow(2)[2:1], labels =
vote.df$vote)
p6.2
p7.2 <- p6.2 +
  theme(legend.position = c(0.8, 0.85))
p7.2
# ggsave("../pics/sejong_geom_bar_total_ggplot.png", p7.2, dpi = 72)
p3 <- p2 +
  theme_bw()
p3
p4 <- p3
p4
p5 <- p4 +
  scale_x_discrete(name = "Pros and Cons") +
  scale_y_continuous(name = "Total", breaks = cumsum(vote.df$Freq), labels =
format(cumsum(vote.df$Freq), big.mark = ","))
p5
p6 <- p5 +
  scale_fill_manual(name = "Pros and Cons", values = rainbow(2)[2:1], labels =
vote.df$vote)
p6
# ggsave("../pics/sejong_geom_bar_total_ggplot_stack.png", p6, dpi = 72)
p7 <- p6 +
  theme(legend.position = c(0.5, 0.25))
p7
pie.total.1 <- p2 +
  coord_polar(theta = "y", start = 3*pi/2, direction = -1)
pie.total.1
pie.total.2 <- pie.total.1 +
  scale_y_continuous(name = "", breaks = NULL) +
  scale_x_discrete(name = "")
pie.total.2
pie.total.3 <- pie.total.2 +
  scale_fill_manual(name = "", values = rainbow(2)[2:1])
pie.total.3
pie.total.4 <- pie.total.3 +
  theme_void(base_family = "NanumGothic")
pie.total.4
pie.total.5 <- pie.total.4 +
  guides(fill = "none")
pie.total.5
pie.total.6 <- pie.total.5 +
#  geom_text(aes(y = y.coord), label = pie.label, family = "NanumGothic")
  geom_text(aes(y = y.coord), label = pie.label, family = "NanumGothic", position =
position_stack())
pie.total.6
pie.total.7 <- pie.total.6 +
  ggtitle("Total Pros and Cons") +
```

```
  theme(plot.margin = unit(c(1, 1, 1.5, 1), "lines"))
pie.total.7
# ggsave("../pics/sejong_total_pie_ggplot.png", pie.total.7, dpi = 72)
```

`pie.gg()`

```{r, pie.gg, fig.width = 4, fig.height = 4}
pie.gg <- function(df, ggtitle = "", font.family = ""){
  n <- length(names(df))
  y.coord <- cumsum(df$Freq)
  pie.label <- paste(levels(df$vote), format(df$Freq, big.mark = ","), sep = "\n")
  p1 <- ggplot(df, aes(x = "", y = Freq, fill = vote))
  p2 <- p1 +
    geom_bar(width = 1, stat = "identity")
  pie.1 <- p2 +
    coord_polar(theta = "y", start = 3*pi/2, direction = -1)
  pie.2 <- pie.1 +
    scale_y_continuous(name = "", breaks = NULL) +
    scale_x_discrete(name = "")
  pie.3 <- pie.2 +
    scale_fill_manual(name = "", values = rainbow(n)[n:1])
  pie.4 <- pie.3 +
    theme_void(base_family = font.family)
  pie.5 <- pie.4 +
    guides(fill = "none")
  pie.6 <- pie.5 +
    geom_text(aes(y = y.coord/n), label = pie.label, family = font.family, position =
position_stack())
  pie.7 <- pie.6 +
    ggtitle(ggtitle) +
    theme(plot.margin = unit(c(1, 1, 1.5, 1), "lines"))
  return(pie.7)
}
dump("pie.gg", file = "./pie.gg.R")
pie.gg(vote.df, ggtitle = "Total Pros and Cons", font.family = "NanumGothic")
```

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Class and Region : Pros and Cons

Classwise Pros and Cons

```{r, vote by classes}
kable(format(vote.class, big.mark = ","), align = "r", caption = "Classwise Pros and Cons")
kable(format(prop.table(vote.class, margin = 2)*100, digits = 3, nsmall = 1), align = "r",
caption = "Classwise Pros and Cons(%)")
```

Commons Regionwise Analysis

Commons 수효가 상대적으로 많아서

```{r, vote by class2}
kable(format(vote.class.2, big.mark = ","), align = rep("r", 2), caption = "Commons")
```

소계를 교차표 주변에 계산

```{r, addmargins}
kable(format(vote.class.2.am, big.mark = ","), caption = "Bureaus and Commons(소계)", align
= rep("r", 3))
```

백분율을 계산하여 주변에 Total.

```{r, Percentage}
kable(format(prop.table(vote.class.2, margin = 2)*100, digits = 3, nsmall = 1), caption =
"Bureaus and Commons(%)", align = rep("r", 3))
```

```

<P style = "page-break-before:always">

### Pie Charts

#### R-Base Plot

```{r, pie for class2, message = FALSE, fig.width = 10, fig.height = 5}
par(family = "NanumGothic")
par(mfrow = c(1, 2))
pie(vote.class.2[, 1], labels = c("Yes", "No"), col = rainbow.2)
title(main = "Bureaus' Pros and Cons")
text(x = 0, y = c(0.4, -0.4), labels = vote.class.2[, 1])
pie(vote.class.2[, 2], labels = c("Yes", "No"), col = rainbow.2)
title(main = "Commons Pros and Cons")
text(x = 0, y = c(0.4, -0.4), labels = format(vote.class.2[, 2], big.mark = ","))
# dev.copy(png, "../pics/sejong_bureaus_commons_pie.png", width = 960, height = 480)
# dev.off()
par(mfrow = c(1, 1))
```

ggplot2

```{r, coord_polar.2, message = FALSE, fig.width = 8, fig.height = 4}
vote.class.2.df <- as.data.frame(vote.class.2)
v.names.class.en <- c("Pros.Cons", "Class", "Total")
kable(format(vote.class.2.df, big.mark = ","), align = c('c', 'c', 'r'), col.names =
v.names.class.en, caption = "Bureaus and Commons")
vote.bureaus.df <- subset(vote.class.2.df, vote.class.2.df$class.2 == "Bureaus", select =
c("vote", "Freq"))
kable(format(vote.bureaus.df, big.mark = ","), align = 'r', col.names =
v.names.class.en[-2], caption = "Bureaus' Pros and Cons")
vote.commons.df <- subset(vote.class.2.df, vote.class.2.df$class.2 == "Commons", select =
c("vote", "Freq"))
kable(format(vote.commons.df, big.mark = ","), align = 'r', row.names = FALSE, col.names =
v.names.class.en[-2], caption = "Commons' Pros and Cons")
pie.bureaus <- pie.gg(vote.bureaus.df, ggtitle = "Bureaus' Pros and Cons", font.family =
"NanumGothic")
pie.commons <- pie.gg(vote.commons.df, ggtitle = "Commons' Pros and Cons", font.family =
"NanumGothic")
pies.grid <- grid.arrange(pie.bureaus, pie.commons, ncol = 2, top = "")
pies.grid
# ggsave("../pics/sejong_bureaus_commons_pie_ggplot.png", pies.grid, width = 8, height = 4,
dpi = 72)
```

<P style = "page-break-before:always">

Regionwise Pros and Cons

Bureaus and Commons

```{r, by region}
kable(vote.region.bureaus, caption = "Bureaus'들 Regionwise Pros and Cons")
kable(format(prop.table(vote.region.bureaus, margin = 2)*100, digits = 3, nsmall = 1),
align = rep("r", 9), caption = "Bureaus'들 Regionwise Pros and Cons(%)")
kable(format(vote.region.commons, big.mark = ","), align = rep("r", 9), caption = "Commons
들 Regionwise Pros and Cons")
kable(format(prop.table(vote.region.commons, margin = 2)*100, digits = 1, nsmall = 1),
align = rep("r", 9), caption = "Commons들 Regionwise Pros and Cons(%)")
```

Seoul Pros and Cons

```{r, Seoul}
kable(vote.seoul.class, caption = "Seoul Pros and Cons")
kable(format(prop.table(vote.seoul.class, margin = 2)*100, digits = 1, nsmall = 1), align =
rep("r", 3), caption = "Seoul Pros and Cons(%)")
```
```

<P style = "page-break-before:always">

Barplots

R-Base Plot

Seoul Classwise Pros and Cons을 `barplot`으로 그려봄. `text()` 좌표는 `locator()`로 찾아냄.

```{r, seoul by class, fig.width = 6, fig.height = 4.5}
par(family = "NanumGothic")
barplot(vote.seoul.class, col = rainbow.2)
title(main = "Seoul Pros and Cons")
text(x = c(0.7, 1.9, 1.9, 3.1, 3.1), y = c(120, 450, 135, 500, 220), labels =
c("194","393", "259", "117", "443"))
legend("topleft", inset = 0.05, fill = rainbow.2, legend = c("Yes", "No"))
# dev.copy(png, "../pics/sejong_seoul_barplot.png", width = 480, height = 360)
# dev.off()
```

ggplot

Stack

```{r, seoul geom_bar stack, fig.width = 6, fig.height = 4.5}
vote.seoul.df <- as.data.frame(vote.seoul.class)
x.stack <- vote.seoul.df[, 2]
# y.stack <- unlist(tapply(vote.seoul.df$Freq, vote.seoul.df$class, function(x){cumsum(x) +
c(0, cumsum(head(x, -1)))}))
y.stack <- unlist(tapply(vote.seoul.df$Freq, vote.seoul.df$class, cumsum))
b1.seoul <- ggplot(vote.seoul.df, aes(x = x.stack, y = Freq, fill = vote)) +
  geom_bar(stat = "identity", position = "stack")
b1.seoul
b2.seoul <- b1.seoul +
  theme_bw(base_family = "NanumGothic") +
  theme.kr +
  scale_x_discrete(name = "Class") +
  scale_y_continuous(name = "Total", breaks = vote.seoul.df$Freq, labels =
vote.seoul.df$Freq) +
  scale_fill_manual(name = "Pros and Cons", values = rainbow(2)[2:1])
b2.seoul
b3.seoul <- b2.seoul +
# geom_text(aes(y = y.stack/2), label = vote.seoul.df$Freq)
  geom_text(aes(y = y.stack/2), label = vote.seoul.df$Freq, position = position_stack())
b3.seoul
# ggsave("../pics/sejong_seoul_barplot_stack_ggplot.png", b3.seoul, width = 6, height =
4.5, dpi = 72)
```

Dodge

```{r, seoul geom_bar dodge, fig.width = 6, fig.height = 4.5}
b1.seoul.dodge <- ggplot(vote.seoul.df, aes(x = x.stack, y = Freq, fill = vote)) +
  geom_bar(stat = "identity", position = "dodge")
b1.seoul.dodge
b2.seoul.dodge <- b1.seoul.dodge +
  theme_bw(base_family = "NanumGothic") +
  theme.kr +
  scale_x_discrete(name = "Class") +
  scale_y_continuous(name = "Total", breaks = vote.seoul.df$Freq, labels =
vote.seoul.df$Freq) +
  scale_fill_manual(name = "Pros and Cons", values = rainbow(2)[2:1])
b2.seoul.dodge
b3.seoul.dodge <- b2.seoul.dodge +
  geom_text(aes(y = vote.seoul.df$Freq/2), label = vote.seoul.df$Freq, position =
position_dodge(width = 0.9)) +
  ggtitle("Seoul Pros and Cons")
b3.seoul.dodge
# ggsave("../pics/sejong_seoul_barplot_dodge_ggplot.png", b3.seoul.dodge, width = 6, height
= 4.5, dpi = 72)
```

```

#### Fill

```{r, seoul geom_bar fill, fig.width = 6, fig.height = 4.5}
y.fill <- unlist(tapply(vote.seoul.df$Freq, x.stack, function(x){cumsum(x)/sum(x)}))
b1.seoul.fill <- ggplot(vote.seoul.df, aes(x = x.stack, y = Freq, fill = vote)) +
  geom_bar(stat = "identity", position = "fill")
b1.seoul.fill
b2.seoul.fill <- b1.seoul.fill +
  theme_bw(base_family = "NanumGothic") +
  theme.kr +
  scale_x_discrete(name = "Class") +
  scale_y_continuous(name = "Total", breaks = vote.seoul.df$Freq, labels =
vote.seoul.df$Freq) +
  scale_fill_manual(name = "Pros and Cons", values = rainbow(2)[2:1])
b2.seoul.fill
b3.seoul.fill <- b2.seoul.fill +
  geom_text(aes(y = y.fill/2), label = vote.seoul.df$Freq, position = position_stack()) +
  ggtitle("Seoul Pros and Cons")
b3.seoul.fill
# ggsave("../pics/sejong_seoul_barplot_fill_ggplot.png", b3.seoul.fill, width = 6, height =
4.5, dpi = 72)
```

barplot.gg

```{r, barplot.gg, fig.width = 6, fig.height = 4.5}
barplot.gg.stack <- function(df, base_family = "", ggtitle = "", xlab = ""){
x <- df[, 2]
y <- unlist(tapply(df$Freq, x, cumsum))
b1 <- ggplot(df, aes(x = x, y = Freq, fill = vote)) +
  geom_bar(stat = "identity", position = "stack")
b2 <- b1 +
  theme_bw(base_family = base_family) +
#  theme.kr +
  scale_x_discrete(name = xlab) +
  scale_y_continuous(name = "Total", breaks = NULL) +
  scale_fill_manual(name = "Pros and Cons", values = rainbow(2)[2:1], guide =
guide_legend(reverse = TRUE))
b3 <- b2 +
  geom_text(aes(y = y/2), label = format(df$Freq, big.mark = ","), position =
position_stack()) +
  ggtitle(ggtitle)
return(b3)
}
barplot.gg.dodge <- function(df, base_family = "", ggtitle = "", xlab = ""){
x <- df[, 2]
y <- unlist(tapply(df$Freq, x, cumsum))
b1 <- ggplot(df, aes(x = x, y = Freq, fill = vote)) +
  geom_bar(stat = "identity", position = "dodge")
b2 <- b1 +
  theme_bw(base_family = base_family) +
#  theme.kr +
  scale_x_discrete(name = xlab) +
  scale_y_continuous(name = "Total", breaks = NULL) +
  scale_fill_manual(name = "Pros and Cons", values = rainbow(2)[2:1])
b3 <- b2 +
  geom_text(aes(y = df$Freq/2), label = format(df$Freq, big.mark = ","), position =
position_dodge(width = 0.9)) +
  ggtitle(ggtitle)
return(b3)
}
barplot.gg.fill <- function(df, base_family = "", ggtitle = "", xlab = ""){
x <- df[, 2]
y <- unlist(tapply(df$Freq, x, function(x){cumsum(x)/sum(x)}))
b1 <- ggplot(df, aes(x = x, y = Freq, fill = vote)) +
  geom_bar(stat = "identity", position = "fill")
b2 <- b1 +
  theme_bw(base_family = base_family) +
```
```

```
#  theme.kr +
  scale_x_discrete(name = xlab) +
  scale_y_continuous(name = "Total", breaks = NULL) +
  scale_fill_manual(name = "Pros and Cons", values = rainbow(2)[2:1], guide =
guide_legend(reverse = TRUE))
b3 <- b2 +
  geom_text(aes(y = y/2), label = format(df$Freq, big.mark = ","), position =
position_stack()) +
  ggtitle(ggtitle)
return(b3)
}
barplot.gg <- function(x, position, base_family = "", ggtitle = "", xlab = ""){
  switch(position,
         stack = barplot.gg.stack(x, base_family = base_family, ggtitle = ggtitle, xlab =
xlab),
         dodge = barplot.gg.dodge(x, base_family = base_family, ggtitle = ggtitle, xlab =
xlab),
         fill = barplot.gg.fill(x, base_family = base_family, ggtitle = ggtitle, xlab =
xlab))
}
(bar_seoul_stack <- barplot.gg(vote.seoul.df, position = "stack", base_family =
"NanumGothic", ggtitle = "Seoul Pros and Cons", xlab = "Class"))
# ggsave("../pics/sejong_seoul_barplot_stack_ggplotv2.png", bar_seoul_stack, width = 6,
height = 4.5, dpi = 72)
(bar_seoul_dodge <- barplot.gg(vote.seoul.df, position = "dodge", base_family =
"NanumGothic", ggtitle = "Seoul Pros and Cons", xlab = "Class"))
# ggsave("../pics/sejong_seoul_barplot_dodge_ggplotv2.png", bar_seoul_dodge, width = 6,
height = 4.5, dpi = 72)
(bar_seoul_fill <- barplot.gg(vote.seoul.df, position = "fill", base_family =
"NanumGothic", ggtitle = "Seoul Pros and Cons", xlab = "Class"))
# ggsave("../pics/sejong_seoul_barplot_fill_ggplotv2.png", bar_seoul_fill, width = 6,
height = 4.5, dpi = 72)
dump(c("barplot.gg","barplot.gg.stack", "barplot.gg.dodge", "barplot.gg.fill"), file =
"./barplot.gg.R")
```

mosaic plot

R-Base Plot

```{r, mosaicplot for seoul, fig.width = 6, fig.height = 4.5}
par(family = "NanumGothic")
mosaicplot(t(vote.seoul.class), col = rainbow.2, main = "Seoul Pros and Cons", xlab =
"Class" , ylab = "Pros and Cons")
# dev.copy(png, "../pics/sejong_seoul_mosaic.png", width = 480, height = 360)
# dev.off()
```

ggplot

```{r, mosaic plot for seoul ggplot, fig.width = 6, fig.height = 4.5}
vote.seoul.class.df <- as.data.frame(vote.seoul.class)
vote.seoul.class.sum <- tapply(vote.seoul.class.df$Freq, vote.seoul.class.df[, 2], sum)
vote.seoul.class.p.m <- prop.table(vote.seoul.class.sum)
vote.seoul.class.p <- prop.table(vote.seoul.class)
vote.seoul.class.p.2 <- prop.table(vote.seoul.class, margin = 2)
vote.seoul.class.p.df <- as.data.frame(vote.seoul.class.p)
vote.seoul.class.p.df$width <- vote.seoul.class.p.m[match(vote.seoul.class.p.df$class,
names(vote.seoul.class.p.m))]
vote.seoul.class.p.df$height <- as.data.frame(vote.seoul.class.p.2)$Freq
vote.seoul.class.p.df$label.height <- unlist(tapply(vote.seoul.class.p.df$height,
vote.seoul.class.p.df$class, cumsum))
x.center <- (cumsum(vote.seoul.class.p.m) + c(0, head(cumsum(vote.seoul.class.p.m), -1)))/2
vote.seoul.class.p.df$center <- x.center[match(vote.seoul.class.p.df$class,
names(x.center))]
m1 <- ggplot(vote.seoul.class.p.df, aes(x = center, y = height)) +
  geom_bar(aes(width = width, fill = vote), stat = "identity", col = "white", size = 2)
m1
m2 <- m1 +
  theme_bw(base_family = "NanumGothic")
```

```
m2
m3 <- m2 +
  geom_text(aes(x = center, y = 1.05), label = vote.seoul.class.p.df$class, family =
"NanumGothic")
m3
m4 <- m3 +
  geom_text(aes(x = center, y = label.height/2), label = format(vote.seoul.class.df$Freq,
big.mark = ","), position = position_stack())
m4
x.breaks <- c(0, ifelse(cumsum(vote.seoul.class.p.m) < 0.1, 0.0,
cumsum(vote.seoul.class.p.m)))
x.label <- format(x.breaks, digits = 2, nsmall = 2)
m5 <- m4 +
  scale_x_continuous(name = "Class", breaks = x.breaks, label = x.label) +
  scale_y_continuous(name = "Pros and Cons") +
  scale_fill_manual(name = "Pros and Cons", values = rainbow(2)[2:1], guide =
guide_legend(reverse = TRUE)) +
  ggtitle("Seoul Pros and Cons")
m5
```

```{r mosaic_gg, fig.width = 6, fig.height = 4.5}
source("./mosaic.gg_en.R")
mosaic_gg
m5.seoul <- mosaic_gg(vote.seoul.class, base_family = "NanumGothic", ggtitle = "Seoul Pros
and Cons", xlab = "Class")
m5.seoul
# ggsave("../pics/sejong_seoul_mosaic_ggplot.png", m5.seoul, width = 6, height = 4.5, dpi =
72)
```

<P style = "page-break-before:always">

Bureaus' Regionwise Pros and Cons (Except for Seoul)

```{r, local bureaus}
kable(vote.region.bureaus[, -1], caption = "Bureaus' Regionwise Pros and Cons (Except for
Seoul)")
kable(format(prop.table(vote.region.bureaus[, -1], margin = 2)*100, digits = 1, nsmall =
1), align = "r", caption = "Bureaus' Regionwise Pros and Cons (Except for Seoul)")
```

Barplots

R-Base Plot

```{r, barplot for regional bureaus, fig.width = 9, fig.height = 4.5}
par(family = "NanumGothic")
barplot(vote.region.bureaus[, -1], beside = FALSE, col = rainbow.2)
title(main = "Bureaus' Regionwise Pros and Cons (Except for Seoul)")
legend("topleft", inset = 0.05, fill = rainbow.2, legend = c("Yes", "No"))
# dev.copy(png, "../pics/sejong_bureaus.png", width = 720, height = 360)
# dev.off()
```

ggplot

```{r, geom_bar for regional bureaus, fig.width = 9, fig.height = 4.5}
vote.region.bureaus.df <- as.data.frame(vote.region.bureaus[, -1])
barplot.gg(vote.region.bureaus.df, position = "stack", base_family = "NanumGothic", ggtitle
= "Bureaus' Regionwise Pros and Cons (Except for Seoul)", xlab = "Region")
# ggsave("../pics/sejong_bureaus_barplot_stack_ggplot.png", width = 9, height = 4.5, dpi =
72)
```

mosaic plot

R-Base Plot

```{r, mosaic for local bureaus, fig.width = 9, fig.height = 4.5}
```

```
par(family = "NanumGothic")
mosaicplot(t(vote.region.bureaus[, -1]), col = rainbow.2, main = "", xlab = "Region", ylab
= "Pros and Cons")
title(main = "Bureaus' Regionwise Pros and Cons")
# dev.copy(png, "../pics/sejong_bureaus_mosaic.png", width = 720, height = 360)
# dev.off()
```

ggplot

```{r, mosaic plot for region ggplot, fig.width = 12, fig.height = 4.5}
# source("./mosaic.gg.R")
m5.bureaus <- mosaic_gg(vote.region.bureaus[, -1], base_family = "NanumGothic", ggtitle =
"Bureaus' Regionwise Pros and Cons", xlab = "Regionwise Proprtion of Bureaus")
m5.bureaus
# ggsave("../pics/sejong_bureaus_mosaic_ggplot.png", m5.bureaus, width = 9, height = 4.5,
dpi = 72)
```

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Regionwise Commons' Pros and Cons

Barplots

R-Base Plot

```{r, barplot for commons, fig.width = 12, fig.height = 4.5}
par(family = "NanumGothic")
barplot(vote.region.commons, beside = FALSE, col = rainbow.2, axes = FALSE)
axis(2, at = seq(0, 30000, by = 5000), labels = c("0", "", "10", "", "20", "", "30"), las =
1)
title(main = "Commons' Regionwise Pros and Cons")
legend("topleft", inset = 0.05, fill = rainbow.2, legend = c("Yes", "No"))
# dev.copy(png, "../pics/sejong_commons_barplot.png", width = 720, height = 360)
# dev.off()
```

ggplot

```{r, geom_bar for commons, fig.width = 12, fig.height = 4.5}
vote.region.commons.df <- as.data.frame(vote.region.commons)
barplot.gg(vote.region.commons.df, position = "stack", base_family = "NanumGothic", ggtitle
= "Commons' Pros and Cons", xlab = "Region")
# ggsave("../pics/sejong_commons_barplot_stack_ggplot.png", width = 9, height = 4.5, dpi =
72)
```

mosaic plot

R-Base Plot

```{r, mosaicplot for commons, fig.width = 12, fig.height = 4.5}
par(family = "NanumGothic")
mosaicplot(t(vote.region.commons), col = rainbow.2, main = "Commons; Regionwise Pros and
Cons", xlab = "Region", ylab = "Pros and Cons")
# dev.copy(png, "../pics/sejong_commons_mosaic.png", width = 720, height = 360)
# dev.off()
```

ggplot

```{r, mosaic plot for commons ggplot, fig.width = 12, fig.height = 4.5}
# source("./mosaic.gg.R")
m5.commons <- mosaic_gg(vote.region.commons, base_family = "NanumGothic", ggtitle =
"Commons Pros and Cons", xlab = "Regionwise Commons Proportion")
m5.commons
# ggsave("../pics/sejong_commons_mosaic_ggplot.png", m5.commons, width = 12, height = 4.5,
dpi = 72)
```

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Chungcheong

Bureaus'들 Pros and Cons과 Commons Pros and Cons이 다른 곳.

```{r, chungcheong}
kable(format(vote.chung.class, big.mark = ","), caption = "Chungcheong Case", align = "r")
kable(format(prop.table(vote.chung.class, margin = 2)*100, digits = 3, nsmall = 1), caption
= "Chungcheong Case", align = "r")
```

Barplots

R-Base Plot

```{r, barplot for chungcheong, fig.width = 6, fig.height = 4.5}
par(mar = c(5.1, 4.1, 4.1, 8.1), xpd = TRUE, family = "NanumGothic")
barplot(prop.table(vote.chung.class, margin = 2), col = rainbow.2, ylim = c(0,  1.1), axes
= FALSE)
axis(side = 2, at = c(0, 0.5, 1.0), labels = c("0", "50%", "100%"), las = 1)
title(main = "Chungcheong Classwise Pros and Cons 비율")
legend("right", inset = -0.3, fill = rainbow.2, legend = c("Yes", "No"))
text(x = c(0.6, 1.85, 1.85, 3.1, 3.1), y = c(0.5, 0.3, 0.8, 0.15, 0.65), labels =
format(c(2, 35, 26, 6982, 14013), big.mark = ","))
# dev.copy(png, "../pics/sejong_chungcheong_barplot.png", width = 480, height = 360)
# dev.off()
```

ggplot

```{r, geom_bar fill for Chungcheong, fig.width = 6, fig.height = 4.5}
vote.chung.class.df <- as.data.frame(vote.chung.class)
barplot.gg(vote.chung.class.df, position = "fill", base_family = "NanumGothic", ggtitle =
"Chungcheong Pros and Cons", xlab = "Class")
# ggsave("../pics/sejong_chungcheong_barplot_fill_ggplot.png", width = 6, height = 4.5, dpi
= 72)
```

mosaic plot

수효 차이가 너무 커서 비교하기 어려움. '대신 등' 제외하고 작업

```{r, mosaic chungcheong, fig.width = 9, fig.height = 4.5}
par(family = "NanumGothic")
mosaicplot(t(vote.chung.class[, -1]), col = rainbow.2, main = "", xlab = "Class", ylab =
"Pros and Cons")
title(main = "Chungcheong Pros and Cons")
# dev.copy(png, "../pics/sejong_chungcheong_mosaic.png", width = 480, height = 360)
# dev.off()
```

ggplot

```{r, mosaic plot for chungcheong ggplot, fig.width = 12, fig.height = 4.5}
# source("./mosaic.gg.R")
m5.chungcheong <- mosaic_gg(vote.chung.class[, -1], base_family = "NanumGothic", ggtitle =
"Chungcheong Pros and Cons", xlab = "Class")
m5.chungcheong
# ggsave("../pics/sejong_chungcheong_mosaic_ggplot.png", m5.chungcheong, width = 12, height
= 4.5, dpi = 72)
```

자료 정리

```{r, save}
save.image(file = "./sejong_ggplot.RData")
```