POL212 TA Session

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```
## Clear Workspace
rm(list = ls())

## Set Working Directory to the File location
## (If using RStudio, can be set automatically)
setwd(dirname(rstudioapi::getActiveDocumentContext()$path))
getwd()
```

```
## [1] "C:/GoogleDrive/Lectures/2019_01to03_UCD/POL212_TA/POL212_TA_resource"
```

```
## Required Package
library(readstata13)
library(haven)
```

Practice of Analysis

1. Download **BRITISH GENERAL ELECTION CONSTITUENCY RESULTS 2010-2017, V1.2** from HERE. (Choose Any Version You Want)
2. Open Data in R

```
# I chose stata version

# Set Data Location (Set on your own)
dataloc <- "D:/BoxSync/Data/UK_votes/data/UK GE 2010_2015_2017 V1_2 (+Brexit vote).dta"

# Load Data
d <- read.dta13(dataloc, convert.factors = FALSE)
# OR
d <- read_dta(dataloc)
```

3. Check the codebook (available at the same website). Find following variables in data.

- % of Brexit "Leave" Vote in the District (2016)
- Vote Share of Liberal Democratic Party (2015)
- Proportion of Female (2011)
- Proportion of Whites who are British (2011)

Check the distribution by summary() function.

```
summary(d$BREXITLeave)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.    NA's
##   18.48   45.36   53.77   52.11   60.18   74.96      18
```

```
summary(d$LD15)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.    NA's
##   0.700   3.000   4.600   7.823   8.600  51.500      19
```

```r
summary(d$c11Female)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.    NA's
##   46.95   50.57   50.98   50.93   51.39   53.14      18
```

```r
summary(d$c11EthnicityWhiteBritish)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.    NA's
##   12.71   79.97   90.68   83.01   95.04   97.79      18
```

4. Create a new data.frame including all the above variables. Also, add following Variable by transoforming relevant variables in the original data.

- Proportion of Younger than Age 30 in the Population of Age 18 or Older (2011)

```r
# Initiate Data.Frame with No Columns, but same number of rows as d
dnew <- d[,FALSE]
dnew$leave <- d$BREXITLeave
dnew$LD15 <- d$LD15
dnew$pFEM <- d$c11Female
dnew$pWB <- d$c11EthnicityWhiteBritish
pU18 <- d$c11Age0to4 + d$c11Age10to14 + d$c11Age15 +
  d$c11Age16to17
p1830 <- d$c11Age18to19 + d$c11Age20to24 + d$c11Age25to29
dnew$pU30 <- (p1830 / (100 - pU18))*100
summary(dnew$pU30)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.    NA's
##   10.75   14.87   17.41   18.88   20.73   48.74      18
```

```r
dim(dnew)
```

```
## [1] 650   5
```

5. Compare means of Brexit vote proportion by Following two groups

- Proportion of Age <30 is larger than 20%
- Proportion of Age <30 is 20% or lower Interpretation?

```r
with(dnew, t.test(leave[pU30>20],leave[pU30<=20]))
```

```
##
##  Welch Two Sample t-test
##
## data:  leave[pU30 > 20] and leave[pU30 <= 20]
## t = -9.7926, df = 255.62, p-value < 2.2e-16
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -12.452005  -8.282339
## sample estimates:
## mean of x mean of y
##  44.73325  55.10042
```

6. Run OLS regression to test the hypothesis that larger the proportion of voters who are age 30 or younger, lower the proporition of Brexit votes. Run two models:

- Bivariate regression with only one variable
- Multiple Regression with control variables

Interpreations?

```r
# Conventional Way
m1 <- lm(leave ~ pU30, data=dnew)
m2 <- lm(leave ~ pU30 + LD15 + pFEM + pWB, data=dnew)
# Show Summary
summary(m1)
```

```
##
## Call:
## lm(formula = leave ~ pU30, data = dnew)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -30.4120  -7.0182   0.5273   7.1638  21.5874
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)  67.5955     1.3548   49.90   <2e-16 ***
## pU30         -0.8200     0.0684  -11.99   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 10.3 on 630 degrees of freedom
##   (18 observations deleted due to missingness)
## Multiple R-squared:  0.1858, Adjusted R-squared:  0.1845
## F-statistic: 143.7 on 1 and 630 DF,  p-value: < 2.2e-16
```

```r
summary(m2)
```

```
##
## Call:
## lm(formula = leave ~ pU30 + LD15 + pFEM + pWB, data = dnew)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -28.3715  -6.1869   0.4828   6.3862  22.8976
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept) 239.09901   28.83682   8.291 6.85e-16 ***
## pU30         -0.80237    0.08606  -9.324  < 2e-16 ***
## LD15         -0.34843    0.04493  -7.755 3.61e-14 ***
## pFEM         -3.59509    0.55304  -6.501 1.64e-10 ***
## pWB           0.16851    0.02584   6.520 1.45e-10 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 9.393 on 626 degrees of freedom
##   (19 observations deleted due to missingness)
## Multiple R-squared:  0.3274, Adjusted R-squared:  0.3231
## F-statistic: 76.18 on 4 and 626 DF,  p-value: < 2.2e-16
```

```r
# You can also compare with NULL Model
m0 <- lm(leave ~ 1, data=dnew)
var.test(m0,m1)
```

```
##
##  F test to compare two variances
##
## data:  m0 and m1
## F = 1.2262, num df = 631, denom df = 630, p-value = 0.01057
## alternative hypothesis: true ratio of variances is not equal to 1
## 95 percent confidence interval:
##  1.048807 1.433558
## sample estimates:
## ratio of variances
##           1.226189
```

```
library(texreg)
screenreg(list(m1,m2)) # in R console
```

```
##
## ===================================
##              Model 1     Model 2
## -----------------------------------
## (Intercept)   67.60 ***  239.10 ***
##               (1.35)     (28.84)
## pU30          -0.82 ***   -0.80 ***
##               (0.07)      (0.09)
## LD15                      -0.35 ***
##                           (0.04)
## pFEM                      -3.60 ***
##                           (0.55)
## pWB                        0.17 ***
##                           (0.03)
## -----------------------------------
## R^2            0.19        0.33
## Adj. R^2       0.18        0.32
## Num. obs.    632         631
## RMSE          10.30        9.39
## ===================================
## *** p < 0.001, ** p < 0.01, * p < 0.05
```

7. Now Test conditional hypothesis. For Example

- The effect of Age <30 Proportion of "Leave" Proportion is stronger for districts with lower proportion of British Whites.

Run OLS Regression. Interpretation?

```
# Conventional Way
m3 <- lm(leave ~ pU30*pWB + LD15 + pFEM, data=dnew)
# Dichotomous Group (British Whites Proportion 80% or Smaller)
dnew$pWB80 <- (dnew$pWB<80)*1
m4 <- lm(leave ~ pU30*pWB80 + LD15 + pFEM, data=dnew)

# Show Summary
summary(m3)
```

```
##
## Call:
## lm(formula = leave ~ pU30 * pWB + LD15 + pFEM, data = dnew)
##
```

```
## Residuals:
##     Min      1Q  Median      3Q     Max
## -28.604  -6.208   0.558   6.453  21.388
##
## Coefficients:
##               Estimate Std. Error t value Pr(>|t|)
## (Intercept) 304.634661  31.655870   9.623  < 2e-16 ***
## pU30         -2.268825   0.325465  -6.971 8.02e-12 ***
## pWB          -0.246835   0.092568  -2.667  0.00786 **
## LD15         -0.337058   0.044271  -7.613 9.89e-14 ***
## pFEM         -4.200805   0.559354  -7.510 2.05e-13 ***
## pU30:pWB      0.018243   0.003909   4.666 3.75e-06 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 9.241 on 625 degrees of freedom
##   (19 observations deleted due to missingness)
## Multiple R-squared:   0.35,  Adjusted R-squared:  0.3448
## F-statistic: 67.32 on 5 and 625 DF,  p-value: < 2.2e-16
```

```
summary(m4)
```

```
##
## Call:
## lm(formula = leave ~ pU30 * pWB80 + LD15 + pFEM, data = dnew)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -27.6174  -6.0883   0.5156   6.6918  21.5577
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept) 252.53003   29.30350   8.618  < 2e-16 ***
## pU30         -0.62196    0.11324  -5.493 5.77e-08 ***
## pWB80         9.82802    3.45645   2.843  0.00461 **
## LD15         -0.31863    0.04544  -7.012 6.12e-12 ***
## pFEM         -3.62349    0.56303  -6.436 2.45e-10 ***
## pU30:pWB80   -0.65664    0.15722  -4.177 3.38e-05 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 9.484 on 625 degrees of freedom
##   (19 observations deleted due to missingness)
## Multiple R-squared:  0.3155, Adjusted R-squared:   0.31
## F-statistic:  57.6 on 5 and 625 DF,  p-value: < 2.2e-16
```

```
screenreg(list(m1,m2,m3,m4)) # in R console
```

```
##
## ============================================================
##              Model 1     Model 2     Model 3     Model 4
## ------------------------------------------------------------
## (Intercept)   67.60 ***  239.10 ***  304.63 ***  252.53 ***
##               (1.35)     (28.84)     (31.66)     (29.30)
## pU30          -0.82 ***   -0.80 ***   -2.27 ***   -0.62 ***
```

```
##                (0.07)      (0.09)      (0.33)      (0.11)
## LD15                       -0.35 ***   -0.34 ***   -0.32 ***
##                            (0.04)      (0.04)      (0.05)
## pFEM                       -3.60 ***   -4.20 ***   -3.62 ***
##                            (0.55)      (0.56)      (0.56)
## pWB                         0.17 ***   -0.25 **
##                            (0.03)      (0.09)
## pU30:pWB                                0.02 ***
##                                        (0.00)
## pWB80                                                9.83 **
##                                                     (3.46)
## pU30:pWB80                                          -0.66 ***
##                                                     (0.16)
## ------------------------------------------------------------
## R^2             0.19        0.33        0.35        0.32
## Adj. R^2        0.18        0.32        0.34        0.31
## Num. obs.     632         631         631         631
## RMSE           10.30        9.39        9.24        9.48
## ============================================================
## *** p < 0.001, ** p < 0.01, * p < 0.05
```

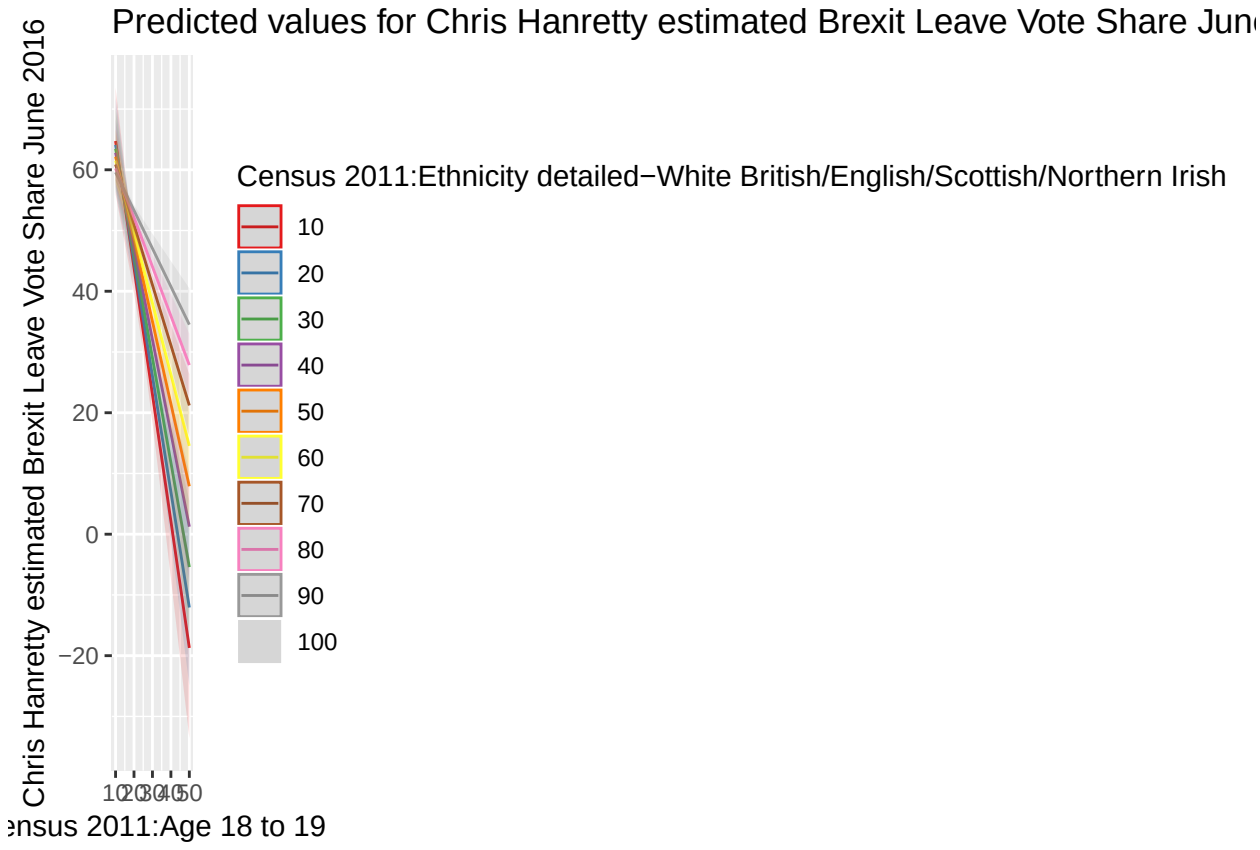
8. Visualize!

```
# Conditional Prediction
library(sjPlot)
plot_model(m3, type = "pred", terms = c("pU30", "pWB")) # Not Good
```

```
## Following variables had many unique values and were prettified: pU30, pWB. Use `pretty = FALSE` to g
```

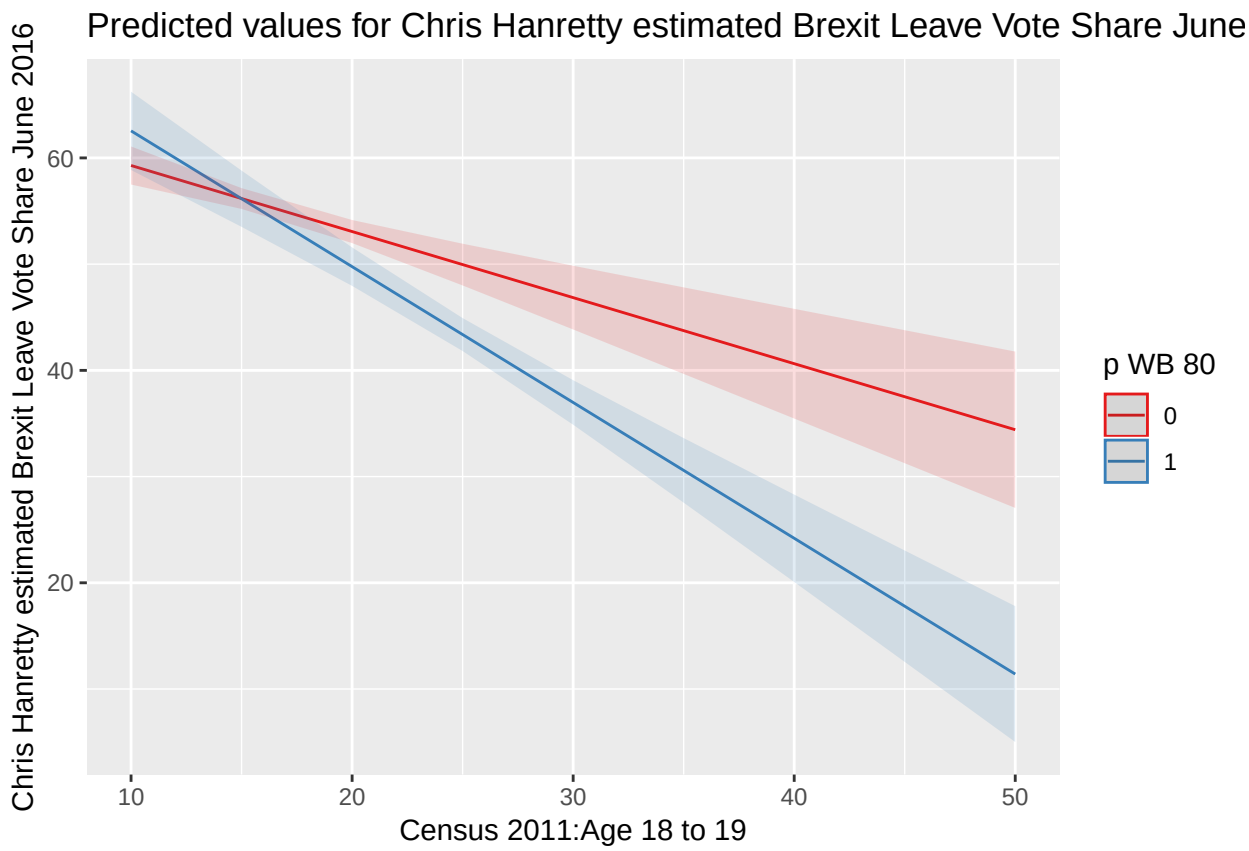
```
## Warning in RColorBrewer::brewer.pal(n, pal): n too large, allowed maximum for palette Set1 is 9
## Returning the palette you asked for with that many colors
```

```
## Warning: Removed 9 rows containing missing values (geom_path).
```



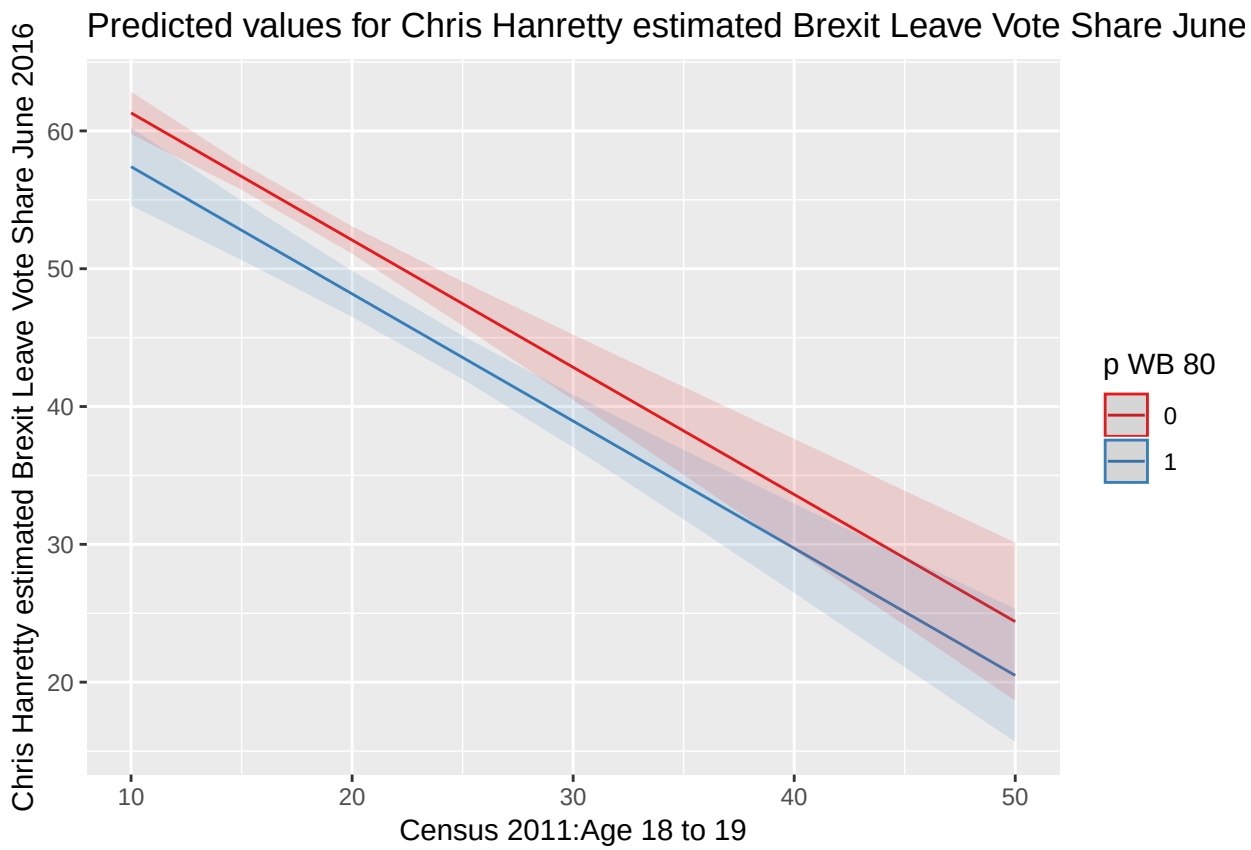

```
plot_model(m4, type = "pred", terms = c("pU30", "pWB80")) # OK
```

```
## Following variables had many unique values and were prettified: pU30. Use `pretty = FALSE` to get sm
```

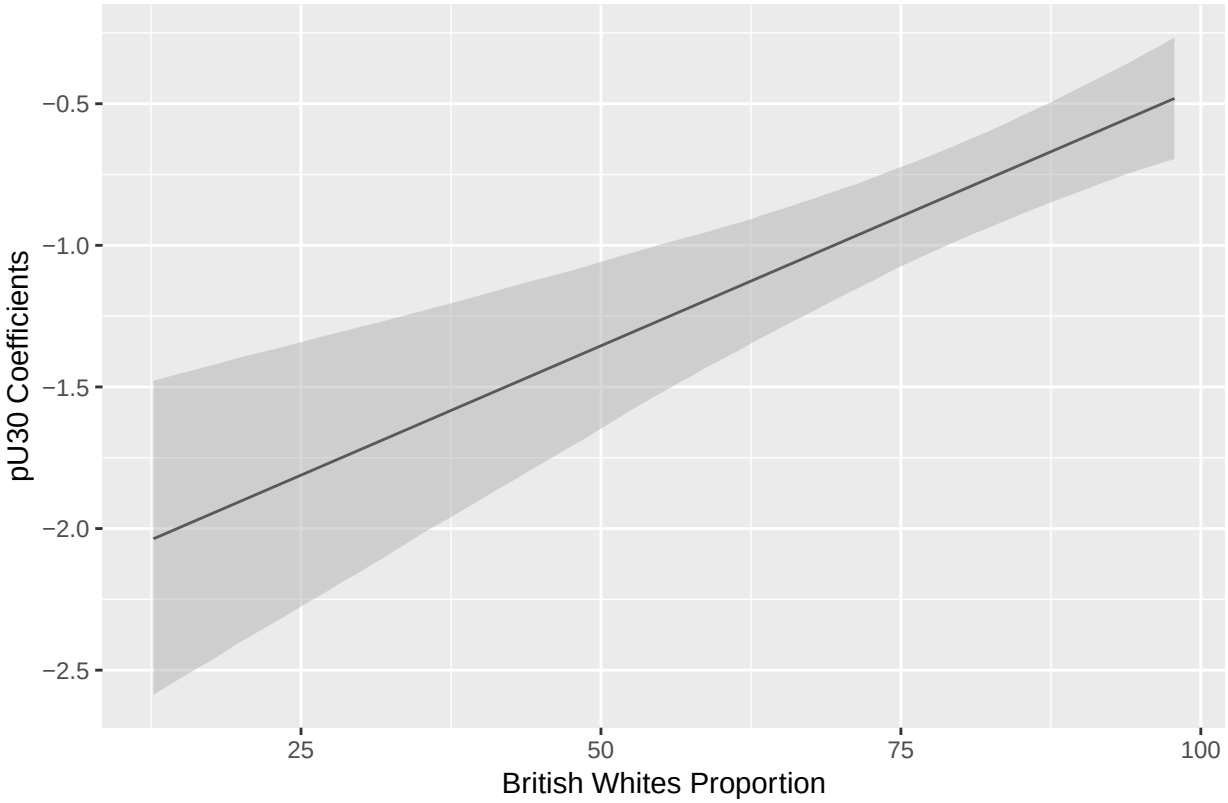



```
m2.5 <- lm(leave ~ pU30 + LD15 + pFEM + pWB80, data=dnew)
plot_model(m2.5, type = "pred", terms = c("pU30", "pWB80")) # Check if it's not interacted
```

```
## Following variables had many unique values and were prettified: pU30. Use `pretty = FALSE` to get sm
```




```
# Better Way to Plot Interaction in m3 (Conditional Coefficients)
library(interplot)
interplot(m3,"pU30","pWB") +
  ylab("pU30 Coefficients") + xlab("British Whites Proportion")
```



CI(Max − Min): [0.882, 2.229]