Panel Analysis, Interaction Models (Two-Way FE and First Difference)

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```
knitr::opts_chunk$set(
  echo = TRUE, warning = FALSE, message = FALSE,
  tidy = TRUE, tidy.opts = list(width.cutoff = 60)
)
```

0.1 LOAD DATA AND REGIME CHANGE FUNCTION

```
# set working directory
setwd("~/Documents/GitHub/stat_casualties_study")

#load libraries/packages
source("packages.R")

# load data
source("Comp2_panel_wrangling.R")

# load custom function for regime change variables [MUST LOAD BEFORE DATA]
source("wrangling/creating_regime_variables/identify_regime_change_main.R")

# Regime Change Identification Function [using EIU classifications]
panel_data_reg_eps <- identify_regime_change(panel_data)
```

0.2 CHECKING REGIME CHANGE VARIABLES

```
# Check results for specific countries [EXAMPLES]
panel_data_reg_eps %>%
  filter(country_code %in% c("HUN", "TUR", "POL")) %>%
  select(country_name, year, di_score, di_reg_cat, di_reg_cat_lag1,
         regime_changed, regime_change_direction, eiu_aut_ep, eiu_aut_ep_ext) %>%
  print(n = 50)
```

```
## # A tibble: 24 x 9
##    country_name  year di_score di_reg_cat di_reg_cat_lag1 regime_changed
##    <chr>        <dbl>    <dbl> <fct>      <fct>                    <dbl>
##  1 Hungary       2016     6.72 2          <NA>                         0
```

```
##  2 Hungary       2017     6.64 2          2                              0
##  3 Hungary       2018     6.63 2          2                              0
##  4 Hungary       2019     6.63 2          2                              0
##  5 Hungary       2020     6.56 2          2                              0
##  6 Hungary       2021     6.5  2          2                              0
##  7 Hungary       2022     6.64 2          2                              0
##  8 Hungary       2023     6.72 2          2                              0
##  9 Poland        2016     6.83 2          <NA>                           0
## 10 Poland        2017     6.67 2          2                              0
## 11 Poland        2018     6.67 2          2                              0
## 12 Poland        2019     6.62 2          2                              0
## 13 Poland        2020     6.85 2          2                              0
## 14 Poland        2021     6.8  2          2                              0
## 15 Poland        2022     7.04 2          2                              0
## 16 Poland        2023     7.18 2          2                              0
## 17 Turkey        2016     5.04 1          <NA>                           0
## 18 Turkey        2017     4.88 1          1                              0
## 19 Turkey        2018     4.37 1          1                              0
## 20 Turkey        2019     4.09 1          1                              0
## 21 Turkey        2020     4.48 1          1                              0
## 22 Turkey        2021     4.35 1          1                              0
## 23 Turkey        2022     4.35 1          1                              0
## 24 Turkey        2023     4.33 1          1                              0
## # i 3 more variables: regime_change_direction <dbl>, eiu_aut_ep <dbl>,
## #   eiu_aut_ep_ext <dbl>
```

```r
# Summary of transitions
panel_data_reg_eps %>%
  filter(regime_changed == 1) %>%
  group_by(country_name, year) %>%
  summarize(
    from = first(di_reg_cat_lag1),
    to = first(di_reg_cat),
    direction = first(regime_change_direction),
    .groups = "drop"
  ) %>%
  arrange(year, country_name)
```

```
## # A tibble: 54 x 5
##    country_name     year from  to    direction
##    <chr>           <dbl> <fct> <fct>     <dbl>
##  1 Armenia          2017 0     1             0
##  2 Cambodia         2017 1     0             0
##  3 Ecuador          2017 1     2             0
##  4 Gambia           2017 0     1             0
##  5 Moldova          2017 2     1             0
##  6 Myanmar (Burma)  2017 1     0             0
##  7 South Korea      2017 2     3             0
##  8 Venezuela        2017 1     0             0
##  9 Costa Rica       2018 2     3             0
## 10 Côte d'Ivoire    2018 0     1             0
## # i 44 more rows
```

0.3 TWO-WAY FIXED EFFECTS MODELS WITH INTERACTIONS AND LAGS (k=2)

[SUBSET: DEMOCRACIES]

```
# set as pdata.frame
panel_data_reg_eps <- pdata.frame(panel_data_reg_eps,
                                  index = c("country_code", "year"))
pdim(panel_data_reg_eps) # check panel dimensions
```

```
## Balanced Panel: n = 162, T = 8, N = 1296
```

```
## STAGE I
fe_s1_interact <- plm(
  formula = spi_comp ~ di_score * factor(eiu_aut_ep_ext)
  + lag(di_score, 1) * factor(eiu_aut_ep)
  + lag(di_score, 2) * factor(eiu_aut_ep)
  + log_gdppc
  + factor(year),
  data = panel_data_reg_eps,
  subset = di_score > 6,
  model = "within"
)
summary(fe_s1_interact,
        vcov = vcovHC(fe_s1_interact, cluster = "group", type = "HC1"))
```

```
## Oneway (individual) effect Within Model
##
## Note: Coefficient variance-covariance matrix supplied: vcovHC(fe_s1_interact, cluster = "group", typ
##
## Call:
## plm(formula = spi_comp ~ di_score * factor(eiu_aut_ep_ext) +
##     lag(di_score, 1) * factor(eiu_aut_ep) + lag(di_score, 2) *
##     factor(eiu_aut_ep) + log_gdppc + factor(year), data = panel_data_reg_eps,
##     subset = di_score > 6, model = "within")
##
## Unbalanced Panel: n = 78, T = 1-6, N = 431
##
## Residuals:
##      Min.   1st Qu.    Median   3rd Qu.      Max.
## -6.732194 -0.906398  0.019005  0.896941  4.885054
##
## Coefficients: (1 dropped because of singularities)
##                                    Estimate Std. Error t-value  Pr(>|t|)
## di_score                          -1.641212   0.954759 -1.7190   0.08653 .
## factor(eiu_aut_ep_ext)1           -4.721546   3.917841 -1.2051   0.22899
## lag(di_score, 1)                   0.497365   0.540014  0.9210   0.35769
## lag(di_score, 2)                   0.053911   0.798510  0.0675   0.94621
## log_gdppc                          1.440022   1.157952  1.2436   0.21451
## factor(year)2019                   0.140509   0.188392  0.7458   0.45628
## factor(year)2020                   1.993426   0.303217  6.5743 1.842e-10 ***
## factor(year)2021                   6.212037   0.390053 15.9261 < 2.2e-16 ***
## factor(year)2022                   5.734803   0.375552 15.2703 < 2.2e-16 ***
```

```
## factor(year)2023                       7.049627   0.393507 17.9149 < 2.2e-16 ***
## di_score:factor(eiu_aut_ep_ext)1     -1.691064   9.269315 -0.1824   0.85535
## lag(di_score, 1):factor(eiu_aut_ep)1 -1.101782  10.133928 -0.1087   0.91349
## factor(eiu_aut_ep)1:lag(di_score, 2)  3.247099   2.581331  1.2579   0.20929
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    4799.9
## Residual Sum of Squares: 1084.5
## R-Squared:      0.77405
## Adj. R-Squared: 0.71424
## F-statistic: 46.0809 on 13 and 77 DF, p-value: < 2.22e-16
```

```
## STAGE II: Direct Effect (DI → SDG, no mediator)
fe_s2_dir_interact <- plm(
  formula = sdg_overall ~ di_score * factor(eiu_aut_ep)
  + lag(di_score, 1) * factor(eiu_aut_ep)
  + lag(di_score, 2) * factor(eiu_aut_ep)
  + log_gdppc
  + factor(year),
  data = panel_data_reg_eps,
  subset = di_score > 6,
  model = "within"
)
summary(fe_s2_dir_interact,
        vcov = vcovHC(fe_s2_dir_interact, cluster = "group", type = "HC1"))
```

```
## Oneway (individual) effect Within Model
##
## Note: Coefficient variance-covariance matrix supplied: vcovHC(fe_s2_dir_interact, cluster = "group",
##
## Call:
## plm(formula = sdg_overall ~ di_score * factor(eiu_aut_ep) + lag(di_score,
##     1) * factor(eiu_aut_ep) + lag(di_score, 2) * factor(eiu_aut_ep) +
##     log_gdppc + factor(year), data = panel_data_reg_eps, subset = di_score >
##     6, model = "within")
##
## Unbalanced Panel: n = 78, T = 1-6, N = 431
##
## Residuals:
##      Min.   1st Qu.    Median   3rd Qu.      Max.
## -2.022618 -0.195716  0.021229  0.183064  1.382024
##
## Coefficients:
##                                      Estimate Std. Error t-value  Pr(>|t|)
## di_score                             0.411770   0.203388  2.0246  0.043694 *
## factor(eiu_aut_ep)1                 -0.605183   1.229104 -0.4924  0.622770
## lag(di_score, 1)                    -0.037712   0.143946 -0.2620  0.793488
## lag(di_score, 2)                    -0.315004   0.249064 -1.2648  0.206826
## log_gdppc                           -0.026589   0.449686 -0.0591  0.952884
## factor(year)2019                     0.334573   0.046685  7.1667 4.808e-12 ***
## factor(year)2020                     0.783218   0.084057  9.3177 < 2.2e-16 ***
## factor(year)2021                     0.872001   0.072291 12.0624 < 2.2e-16 ***
## factor(year)2022                     1.067249   0.091065 11.7196 < 2.2e-16 ***
```

```
## factor(year)2023                       1.071908   0.110029  9.7420 < 2.2e-16 ***
## di_score:factor(eiu_aut_ep)1          -2.111809   1.553670 -1.3592  0.174972
## factor(eiu_aut_ep)1:lag(di_score, 1)   3.645306   1.719959  2.1194  0.034780 *
## factor(eiu_aut_ep)1:lag(di_score, 2) -1.563472   0.530005 -2.9499  0.003399 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    124.19
## Residual Sum of Squares: 57.869
## R-Squared:      0.53402
## Adj. R-Squared: 0.41067
## F-statistic: 33.7306 on 13 and 77 DF, p-value: < 2.22e-16
```

```
## STAGE II: Mediation Effect (DI → SDG, SPI mediator)
fe_s2_med_interact <- plm(
  formula = sdg_overall ~ spi_comp * factor(eiu_aut_ep)
  + lag(spi_comp, 1) * factor(eiu_aut_ep)
  + lag(spi_comp, 2) * factor(eiu_aut_ep)
  + di_score * factor(eiu_aut_ep)
  + lag(di_score, 1) * factor(eiu_aut_ep)
  + lag(di_score, 2) * factor(eiu_aut_ep)
  + log_gdppc
  + factor(year),
  data = panel_data_reg_eps,
  subset = di_score > 6,
  model = "within"
)
summary(fe_s2_med_interact,
        vcov = vcovHC(fe_s2_med_interact, cluster = "group", type = "HC1"))
```

```
## Oneway (individual) effect Within Model
##
## Note: Coefficient variance-covariance matrix supplied: vcovHC(fe_s2_med_interact, cluster = "group",
##
## Call:
## plm(formula = sdg_overall ~ spi_comp * factor(eiu_aut_ep) + lag(spi_comp,
##     1) * factor(eiu_aut_ep) + lag(spi_comp, 2) * factor(eiu_aut_ep) +
##     di_score * factor(eiu_aut_ep) + lag(di_score, 1) * factor(eiu_aut_ep) +
##     lag(di_score, 2) * factor(eiu_aut_ep) + log_gdppc + factor(year),
##     data = panel_data_reg_eps, subset = di_score > 6, model = "within")
##
## Unbalanced Panel: n = 78, T = 1-6, N = 430
##
## Residuals:
##      Min.   1st Qu.    Median   3rd Qu.      Max.
## -2.048759 -0.197263  0.019285  0.181234  1.340836
##
## Coefficients:
##                                    Estimate Std. Error t-value  Pr(>|t|)
## spi_comp                         -0.0014097  0.0171948 -0.0820 0.9347083
## factor(eiu_aut_ep)1              -0.0063170  1.3995503 -0.0045 0.9964014
## lag(spi_comp, 1)                  0.0104946  0.0127065  0.8259 0.4094366
## lag(spi_comp, 2)                 -0.0014555  0.0093943 -0.1549 0.8769670
## di_score                          0.4236700  0.2125904  1.9929 0.0470889
```

```
## lag(di_score, 1)                     -0.0288253  0.1430362 -0.2015 0.8404117
## lag(di_score, 2)                     -0.3311653  0.2546214 -1.3006 0.1942884
## log_gdppc                            -0.0595994  0.4708624 -0.1266 0.8993532
## factor(year)2019                      0.3228501  0.0582719  5.5404 6.139e-08
## factor(year)2020                      0.7625210  0.1029134  7.4093 1.054e-12
## factor(year)2021                      0.8544556  0.1180915  7.2355 3.217e-12
## factor(year)2022                      0.9999774  0.1531927  6.5276 2.493e-10
## factor(year)2023                      1.0198959  0.1819158  5.6064 4.341e-08
## spi_comp:factor(eiu_aut_ep)1         -0.0847876  0.0300171 -2.8246 0.0050186
## factor(eiu_aut_ep)1:lag(spi_comp, 1) -0.0326642  0.0416350 -0.7845 0.4332830
## factor(eiu_aut_ep)1:lag(spi_comp, 2)  0.1086612  0.0304670  3.5665 0.0004148
## factor(eiu_aut_ep)1:di_score         -4.6878651  1.4350100 -3.2668 0.0012011
## factor(eiu_aut_ep)1:lag(di_score, 1)  5.9133845  1.6893503  3.5004 0.0005278
## factor(eiu_aut_ep)1:lag(di_score, 2) -1.3130824  0.5180658 -2.5346 0.0117155
##
## spi_comp
## factor(eiu_aut_ep)1
## lag(spi_comp, 1)
## lag(spi_comp, 2)
## di_score                             *
## lag(di_score, 1)
## lag(di_score, 2)
## log_gdppc
## factor(year)2019                     ***
## factor(year)2020                     ***
## factor(year)2021                     ***
## factor(year)2022                     ***
## factor(year)2023                     ***
## spi_comp:factor(eiu_aut_ep)1         **
## factor(eiu_aut_ep)1:lag(spi_comp, 1)
## factor(eiu_aut_ep)1:lag(spi_comp, 2) ***
## factor(eiu_aut_ep)1:di_score         **
## factor(eiu_aut_ep)1:lag(di_score, 1) ***
## factor(eiu_aut_ep)1:lag(di_score, 2) *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    124.12
## Residual Sum of Squares: 56.656
## R-Squared:      0.54355
## Adj. R-Squared: 0.41196
## F-statistic: 78.9769 on 19 and 77 DF, p-value: < 2.22e-16
```

0.4 FIRST DIFFERENCE MODELS WITH INTERACTIONS AND LAGS (k=2)

[SUBSET: DEMOCRACIES]

```r
## STAGE I
fd_s1_interact <- plm(
  formula = spi_comp ~ di_score * factor(eiu_aut_ep_ext)
  + lag(di_score, 1) * factor(eiu_aut_ep)
  + lag(di_score, 2) * factor(eiu_aut_ep)
```

```
  + log_gdppc
  + factor(year),
  data = panel_data_reg_eps,
  subset = di_score > 6,
  model = "fd"
)
summary(fd_s1_interact,
        vcov = vcovHC(fd_s1_interact, cluster = "group", type = "HC1"))
```

```
## Oneway (individual) effect First-Difference Model
##
## Note: Coefficient variance-covariance matrix supplied: vcovHC(fd_s1_interact, cluster = "group", typ
##
## Call:
## plm(formula = spi_comp ~ di_score * factor(eiu_aut_ep_ext) +
##     lag(di_score, 1) * factor(eiu_aut_ep) + lag(di_score, 2) *
##     factor(eiu_aut_ep) + log_gdppc + factor(year), data = panel_data_reg_eps,
##     subset = di_score > 6, model = "fd")
##
## Unbalanced Panel: n = 78, T = 1-6, N = 431
## Observations used in estimation: 353
##
## Residuals:
##     Min.  1st Qu.   Median  3rd Qu.     Max.
## -6.63147 -0.93986 -0.13248  0.80075  8.34614
##
## Coefficients: (1 dropped because of singularities)
##                                      Estimate Std. Error t-value  Pr(>|t|)
## (Intercept)                           1.298780   0.335554  3.8706 0.0001303 ***
## di_score                             -1.849338   0.807574 -2.2900 0.0226356 *
## factor(eiu_aut_ep_ext)1              -6.169990   2.927493 -2.1076 0.0357993 *
## lag(di_score, 1)                      0.029949   0.522087  0.0574 0.9542897
## lag(di_score, 2)                     -0.829733   0.648272 -1.2799 0.2014503
## log_gdppc                            -0.972716   1.380240 -0.7047 0.4814533
## factor(year)2019                     -1.223967   0.282922 -4.3262 1.999e-05 ***
## factor(year)2020                     -0.829727   0.651245 -1.2741 0.2035138
## factor(year)2021                      2.414134   1.233552  1.9571 0.0511610 .
## factor(year)2022                      0.699665   1.447003  0.4835 0.6290337
## factor(year)2023                      0.937921   1.714322  0.5471 0.5846639
## di_score:factor(eiu_aut_ep_ext)1      0.697559   5.751712  0.1213 0.9035423
## lag(di_score, 1):factor(eiu_aut_ep)1 -3.651922   6.726301 -0.5429 0.5875337
## factor(eiu_aut_ep)1:lag(di_score, 2)  3.755719   2.154294  1.7434 0.0821766 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    2311
## Residual Sum of Squares: 1222.3
## R-Squared:      0.4711
## Adj. R-Squared: 0.45082
## F-statistic: 51.8801 on 13 and 77 DF, p-value: < 2.22e-16
```

```
## STAGE II: Direct Effect (DI → SDG, no mediator)
fd_s2_dir_interact <- plm(
```

```r
  formula = sdg_overall ~ di_score * factor(eiu_aut_ep)
  + lag(di_score, 1) * factor(eiu_aut_ep)
  + lag(di_score, 2) * factor(eiu_aut_ep)
  + log_gdppc
  + factor(year),
  data = panel_data_reg_eps,
  subset = di_score > 6,
  model = "fd"
)
summary(fd_s2_dir_interact,
        vcov = vcovHC(fd_s2_dir_interact, cluster = "group", type = "HC1"))
```

```
## Oneway (individual) effect First-Difference Model
##
## Note: Coefficient variance-covariance matrix supplied: vcovHC(fd_s2_dir_interact, cluster = "group",
##
## Call:
## plm(formula = sdg_overall ~ di_score * factor(eiu_aut_ep) + lag(di_score,
##     1) * factor(eiu_aut_ep) + lag(di_score, 2) * factor(eiu_aut_ep) +
##     log_gdppc + factor(year), data = panel_data_reg_eps, subset = di_score >
##     6, model = "fd")
##
## Unbalanced Panel: n = 78, T = 1-6, N = 431
## Observations used in estimation: 353
##
## Residuals:
##      Min.   1st Qu.    Median   3rd Qu.      Max.
## -1.448094 -0.191383  0.039656  0.213962  1.369060
##
## Coefficients:
##                                      Estimate Std. Error t-value  Pr(>|t|)
## (Intercept)                          0.332291   0.088719  3.7455 0.0002115 ***
## di_score                             0.171109   0.177849  0.9621 0.3366832
## factor(eiu_aut_ep)1                  0.562657   1.021141  0.5510 0.5819911
## lag(di_score, 1)                    -0.181394   0.162683 -1.1150 0.2656344
## lag(di_score, 2)                    -0.220228   0.185447 -1.1875 0.2358429
## log_gdppc                            0.141497   0.290704  0.4867 0.6267572
## factor(year)2019                     0.017850   0.096559  0.1849 0.8534517
## factor(year)2020                     0.125761   0.186749  0.6734 0.5011374
## factor(year)2021                    -0.178832   0.290607 -0.6154 0.5387207
## factor(year)2022                    -0.284592   0.354341 -0.8032 0.4224451
## factor(year)2023                    -0.600303   0.403625 -1.4873 0.1378700
## di_score:factor(eiu_aut_ep)1        -1.421181   0.871579 -1.6306 0.1039075
## factor(eiu_aut_ep)1:lag(di_score, 1)  1.446336   1.185034  1.2205 0.2231231
## factor(eiu_aut_ep)1:lag(di_score, 2) -0.150330   0.544476 -0.2761 0.7826388
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    72.522
## Residual Sum of Squares: 61.932
## R-Squared:      0.14603
## Adj. R-Squared: 0.11328
## F-statistic: 30.5716 on 13 and 77 DF, p-value: < 2.22e-16
```

```r
## STAGE II: Mediation Effect (DI → SDG, SPI mediator)
fd_s2_med_interact <- plm(
  formula = sdg_overall ~ spi_comp * factor(eiu_aut_ep)
  + lag(spi_comp, 1) * factor(eiu_aut_ep)
  + lag(spi_comp, 2) * factor(eiu_aut_ep)
  + di_score * factor(eiu_aut_ep)
  + lag(di_score, 1) * factor(eiu_aut_ep)
  + lag(di_score, 2) * factor(eiu_aut_ep)
  + log_gdppc
  + factor(year),
  data = panel_data_reg_eps,
  subset = di_score > 6,
  model = "fd"
)
summary(fd_s2_med_interact,
        vcov = vcovHC(fd_s2_med_interact, cluster = "group", type = "HC1"))
```

```
## Oneway (individual) effect First-Difference Model
##
## Note: Coefficient variance-covariance matrix supplied: vcovHC(fd_s2_med_interact, cluster = "group",
##
## Call:
## plm(formula = sdg_overall ~ spi_comp * factor(eiu_aut_ep) + lag(spi_comp,
##     1) * factor(eiu_aut_ep) + lag(spi_comp, 2) * factor(eiu_aut_ep) +
##     di_score * factor(eiu_aut_ep) + lag(di_score, 1) * factor(eiu_aut_ep) +
##     lag(di_score, 2) * factor(eiu_aut_ep) + log_gdppc + factor(year),
##     data = panel_data_reg_eps, subset = di_score > 6, model = "fd")
##
## Unbalanced Panel: n = 78, T = 1-6, N = 430
## Observations used in estimation: 352
##
## Residuals:
##      Min.   1st Qu.    Median   3rd Qu.      Max.
## -1.481405 -0.205035  0.036638  0.227172  1.334569
##
## Coefficients:
##                                          Estimate Std. Error t-value  Pr(>|t|)
## (Intercept)                             0.2669799  0.0875214  3.0505 0.0024689
## spi_comp                                0.0138594  0.0134925  1.0272 0.3050778
## factor(eiu_aut_ep)1                     1.8771398  1.2585067  1.4916 0.1367637
## lag(spi_comp, 1)                        0.0112373  0.0104314  1.0773 0.2821457
## lag(spi_comp, 2)                        0.0080876  0.0088384  0.9150 0.3608318
## di_score                                0.2114112  0.1807754  1.1695 0.2430537
## lag(di_score, 1)                       -0.1557385  0.1593599 -0.9773 0.3291445
## lag(di_score, 2)                       -0.2222387  0.1949093 -1.1402 0.2550182
## log_gdppc                               0.0584149  0.2989832  0.1954 0.8452162
## factor(year)2019                        0.0444980  0.0962653  0.4622 0.6442096
## factor(year)2020                        0.1538130  0.1824743  0.8429 0.3998745
## factor(year)2021                       -0.1534618  0.2931769 -0.5234 0.6010142
## factor(year)2022                       -0.2543720  0.3553828 -0.7158 0.4746372
## factor(year)2023                       -0.5532218  0.4018637 -1.3766 0.1695511
## spi_comp:factor(eiu_aut_ep)1           -0.0219763  0.0262409 -0.8375 0.4029232
## factor(eiu_aut_ep)1:lag(spi_comp, 1) -0.0718248  0.0407830 -1.7611 0.0791339
```

```
## factor(eiu_aut_ep)1:lag(spi_comp, 2)  0.0877718  0.0348486  2.5187 0.0122497
## factor(eiu_aut_ep)1:di_score         -3.1421795  0.7368454 -4.2644 2.617e-05
## factor(eiu_aut_ep)1:lag(di_score, 1)  2.9795800  0.8153397  3.6544 0.0002995
## factor(eiu_aut_ep)1:lag(di_score, 2) -0.1312770  0.4272744 -0.3072 0.7588511
##
## (Intercept)                           **
## spi_comp
## factor(eiu_aut_ep)1
## lag(spi_comp, 1)
## lag(spi_comp, 2)
## di_score
## lag(di_score, 1)
## lag(di_score, 2)
## log_gdppc
## factor(year)2019
## factor(year)2020
## factor(year)2021
## factor(year)2022
## factor(year)2023
## spi_comp:factor(eiu_aut_ep)1
## factor(eiu_aut_ep)1:lag(spi_comp, 1) .
## factor(eiu_aut_ep)1:lag(spi_comp, 2) *
## factor(eiu_aut_ep)1:di_score         ***
## factor(eiu_aut_ep)1:lag(di_score, 1) ***
## factor(eiu_aut_ep)1:lag(di_score, 2)
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    72.516
## Residual Sum of Squares: 60.417
## R-Squared:      0.16685
## Adj. R-Squared: 0.11917
## F-statistic: 28.2839 on 19 and 77 DF, p-value: < 2.22e-16
```

0.5 SOME INSIGHTS

TWFE MODELS: - SPI ~ DI x aut_ep [not significant]
- SDG ~ DI x aut_ep [significant]
- SDG ~ SPI x aut_ep [significant]
- Mediation effect varies by aut_ep status for democracies

FD MODELS: - SPI ~ DI x aut_ep [marginally significant]
- SDG ~ DI x aut_ep [not significant]
- SDG ~ SPI x aut_ep [significant]
- Mediation effect varies by aut_ep status for democracies