Abigail Higham
Political Science 328
Professor Goodliffe
Section 006
Aryanna Hyde
Final Exam: Part 4

Esteemed Undersecretary of the State,

To help investigate what causes domestic unrest in countries around the world, I was asked to specifically investigate how democracy affects internals stability. The data I was given involves Polity scores, real GDP, average years of education, population, and inflation rate. With the data I was provided with, I ran statistical analyses to help better understand what can predict coups. My findings are that a country's polity score can be an important determinant of if they will experience a coup, but there are other factors that are considerably important, population, inflation, and GDP.

For my methodology, I ran statistical tests that analyze the relationships between democracy and coups. I ran different tests that included different factors that could contribute to reducing the amount of coups, and this helped me explore different possibilities of relationships between coups and democracy. This method was most appropriate, because coups and democracy are caused by many different socioeconomic factors. From my methodology, I was able to look at different types of relationships that coups and democracy may have.

My findings are that polity score matters, but there are other factors that are considerably important. Population and GDP can influence the likelihood of coups. My theory behind this is that states with large populations and high GDP have more of the necessary resources to combat any type of military coup, whereas smaller states with less money have less security and resources to combat a coup. As well, the politics of states that are smaller and a lower real GDP can be easily influenced by outside forces and can serve as a proxy war to larger states, such as Syria. Polity score can be influenced by these same factors as well.

There are limitations to my findings. One of my main concerns are that there might be potential factors that cause coups that I did not have the data for. In this data set, there is a lot of general information about civilian populations, but there is not a lot of information about their military. I would be interested to see how the size of the military relative to population, conscription, and ethnic division could influence coups. Also, it is difficult to say that a specific region is more prone to coups than others, because besides North America, there have been a lot of military coups throughout the world. My findings do suggest that there could be some type of relationship between real GDP, population size, and polity score, but there are other factors that could potentially help predict coups.

My recommendations are that you should look towards states with smaller populations, less GDP, inflation rates, and lower polity scores. Collectively, these factors indicate key countries that could be at risk for instability.

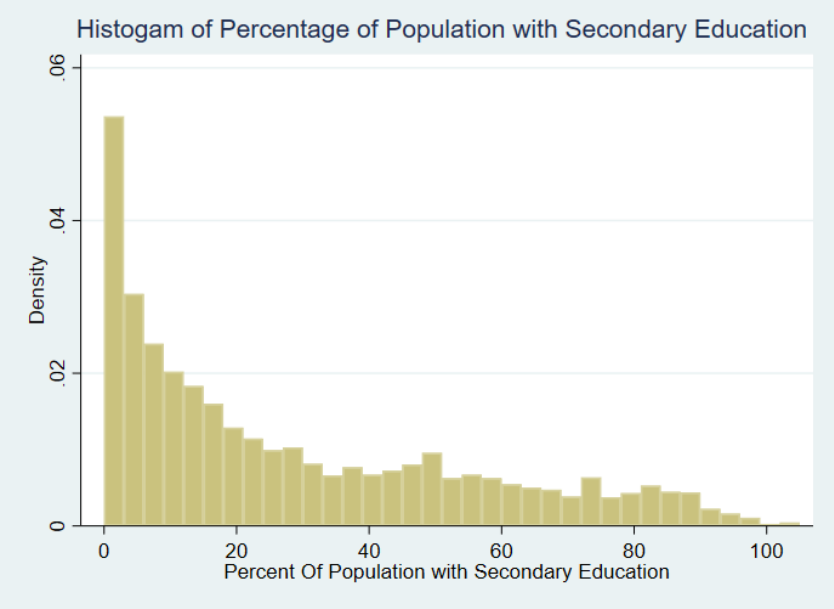
In conclusion, there is a lot more to be understood about coups, but looking at key indicators that are easily accessible, such as population, GDP, and inflation, can help point out countries that could potentially have a coup.

APPENDIX

State Assumptions: [Goodliffe PP 3/22]

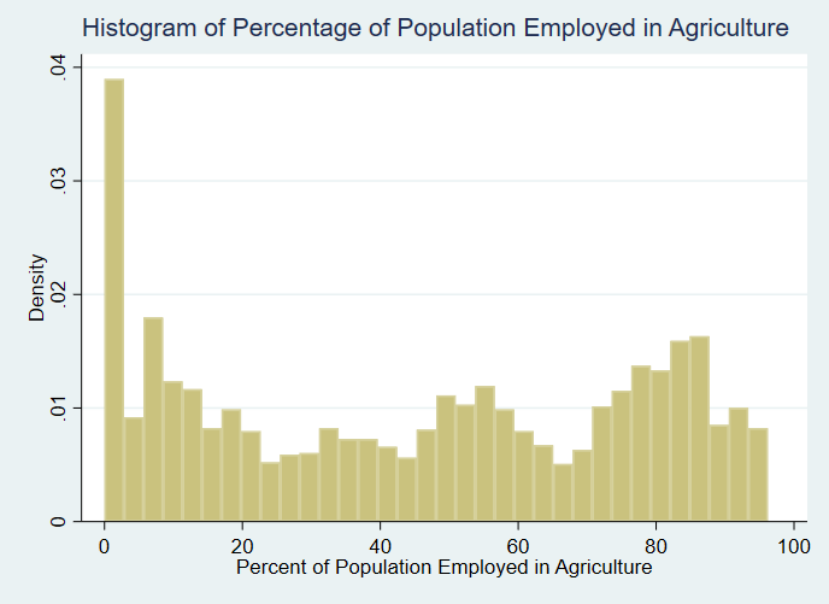
1. u_{it} has a mean zero, given that the state fixed effect and the entire history of the Xs for that state.
2. $(X_{i1}, \dots, X_{iT}, Y_{i1}, \dots, Y_{iT})$ are i.i.d.
3. (X_{i1}, Y_{i1}) have finite fourth moments
4. There is no perfect multicollinearity.

Graph 1: Histogram of Percentage of Population with Secondary Education



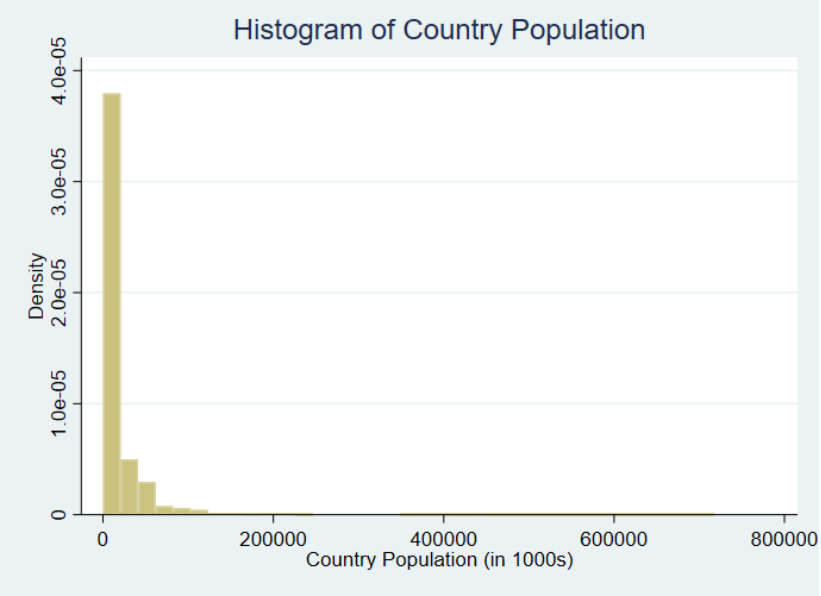
Graph 1: Histogram of Percentage of Population with Secondary Education: *From this graph, we can see that the variable, percentage of population with secondary education, is strongly right-skewed. To make the data easier to interpret, I will use the natural log of percentage of population with a secondary education.*

Graph 2: Histogram of Percentage of Population Employed in Agriculture



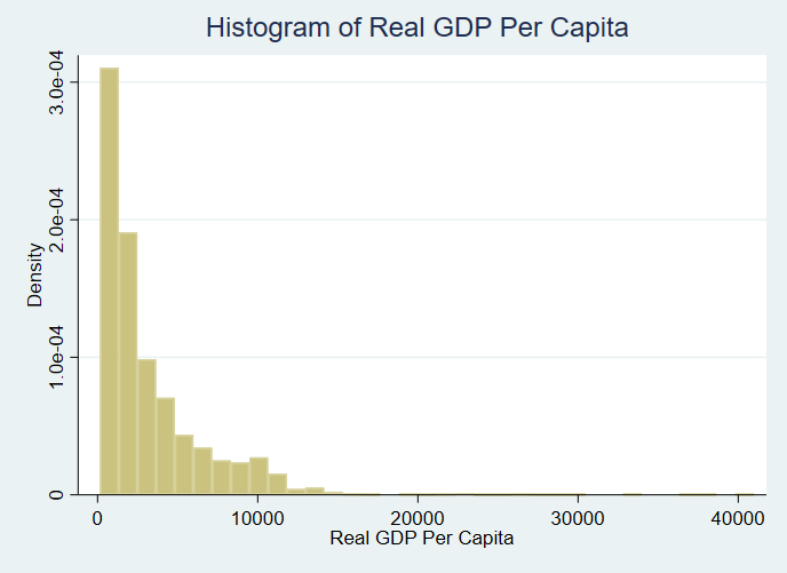
Graph 2: Histogram of Percentage of Population Employed in Agriculture: *From this graph, we can see that the variable, percentage of population employed in agriculture, is strongly right-skewed. To make the data easier to interpret, I will use the natural log of percentage of population employed in agriculture.*

Graph 3: Histogram of Country Population



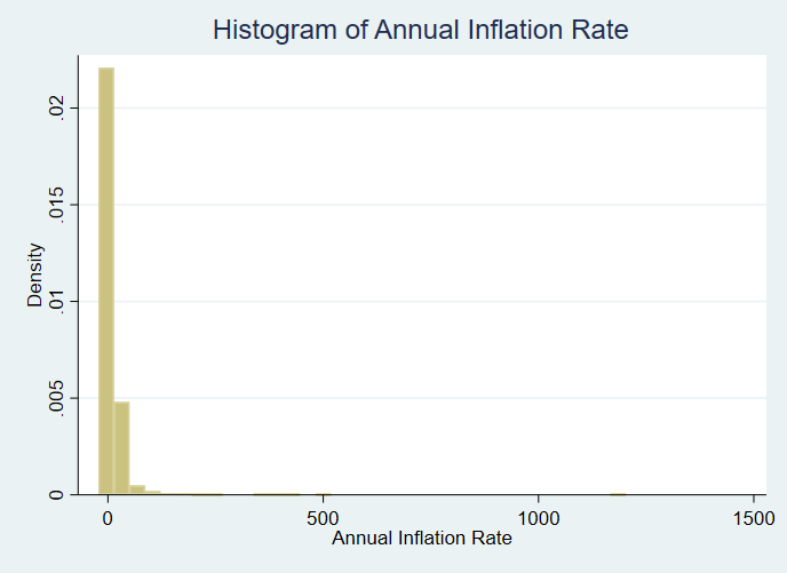
Graph 3: Histogram of Country Population *From this graph, we can see that the variable, country population, is strongly right-skewed. To make the data easier to interpret, I will use the natural log of country population.*

Graph 4: Histogram of Real GDP Per Capita



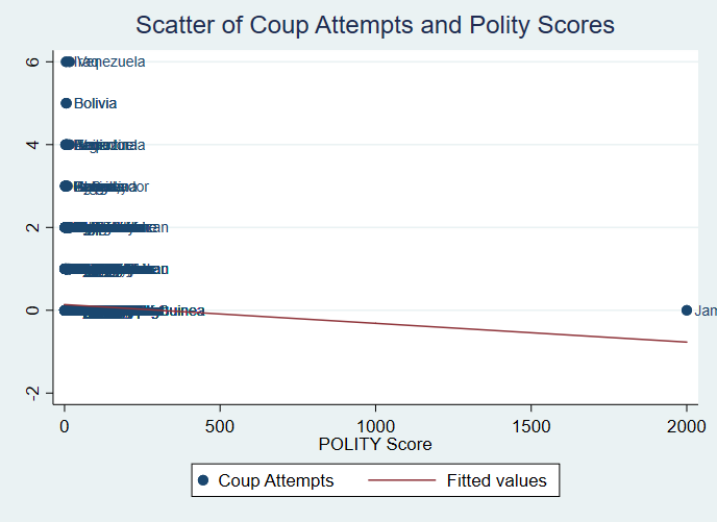
Graph 4: Histogram of Real GDP Per Capita: *From this graph, we can see that the variable, Real GDP per Capita, is strongly right-skewed. To make the data easier to interpret, I will use the natural log of GDP per Capita.*

Graph 5: Histogram of Annual Inflation Rate



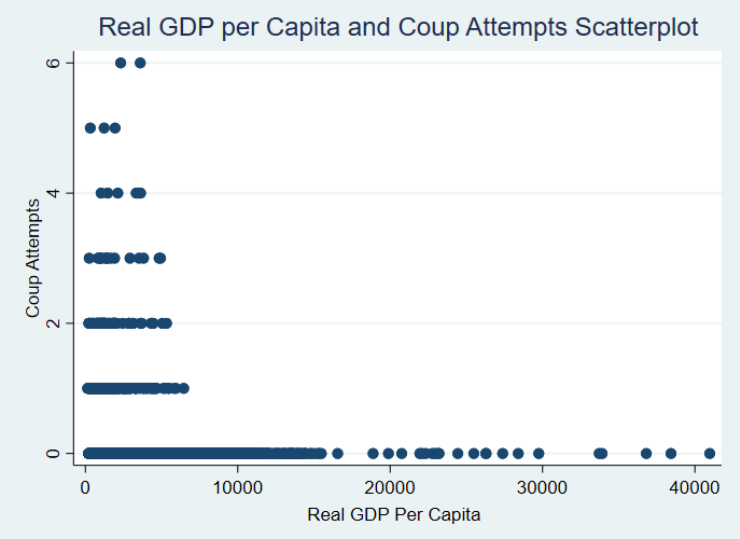
Graph 5: Histogram of Annual Inflation Rate: *From this graph, we can see that the variable, Annual Inflation Rate, is strongly right-skewed. To make the data easier to interpret, I will use the natural log of Annual Inflation Rate.*

Graph 6: Scatterplot of Coup Attempts and Polity Scores



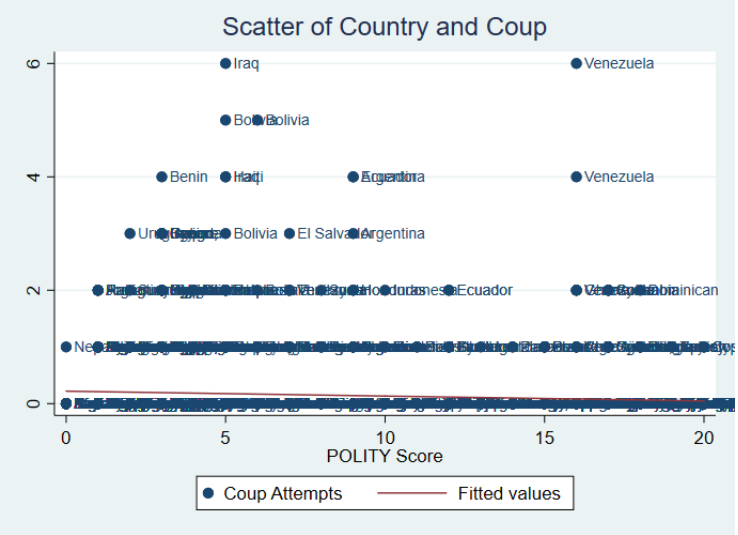
Graph 6: Scatterplot of Coup Attempts and Polity Scores: *From this graph, we can see one extreme outlier, Jamaica. After examining the data, it appears someone mislabeled one of Jamaica's polity scores as 2000 instead of 20, which was Jamaica's score for every other year. I changed the observation's polity score to 20.*

Graph 7: Scatterplot of Coup Attempts and Polity Scores without Outlier



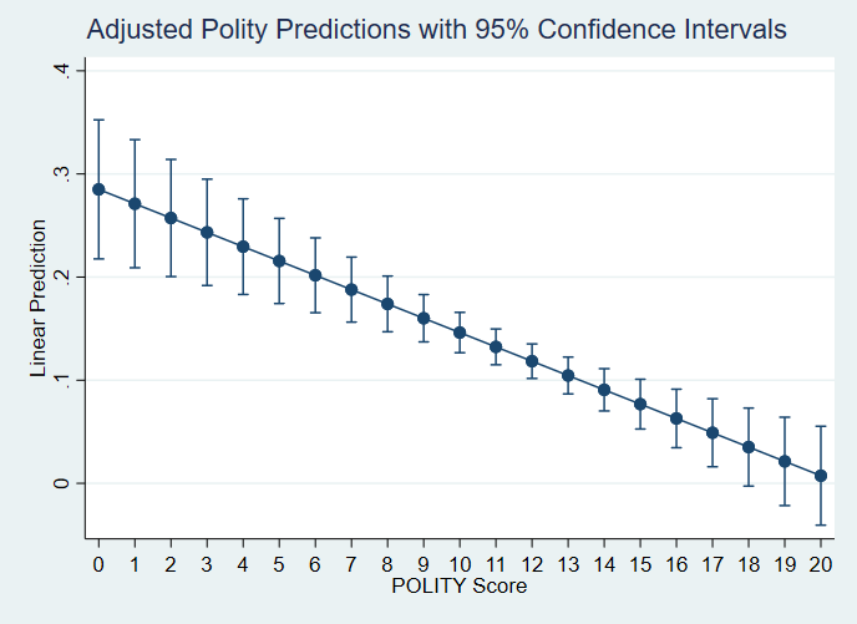
Graph 7: Scatterplot of Coup Attempts and Polity Scores without Outlier: *From this graph, we can see that coups occur in countries with less than 10,000 units of Real GDP per Capita.*

Graph 8: Scatter of Countries and Amount of Coups



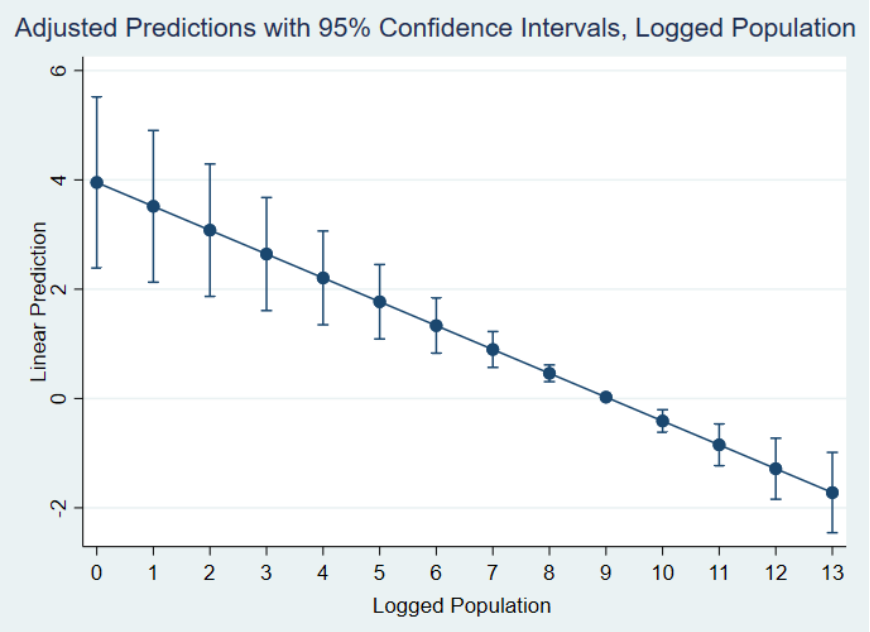
Graph 8: Scatter of Countries and Amount of Coups: *From this graph, we can see that there is not a strong relationship with Polity score and the number of coups a country has. It appears that the countries that have coups are more likely to happen with lower scores, but there are still coups that have occurred with higher polity scores.*

Graph 9: Adjusted Polity Predictions with 95% Confidence Intervals



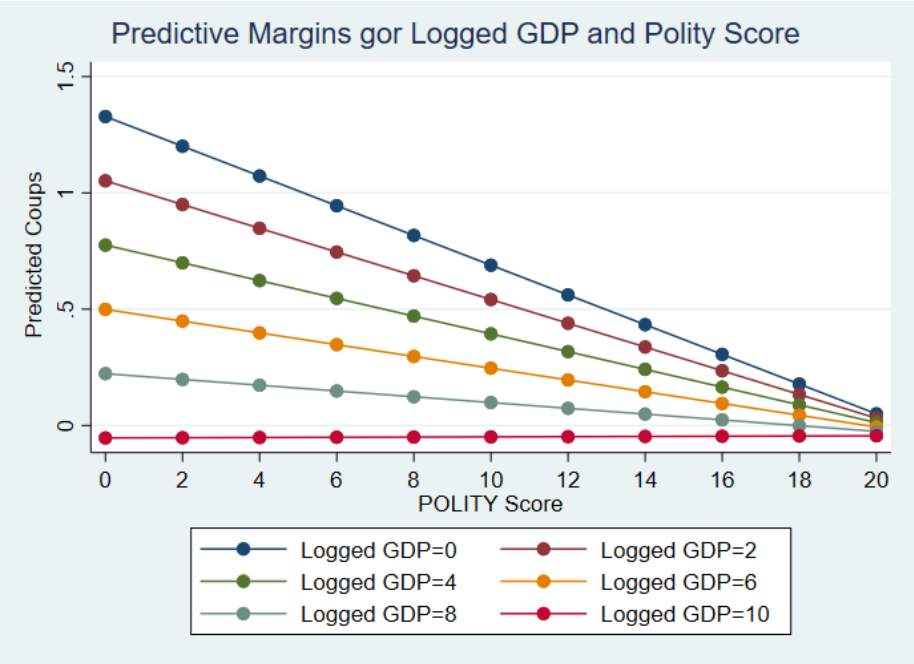
Graph 9: Adjusted Polity Predictions with 95% Confidence Intervals*: From this graph, it appears that a higher polity score has an associated lower predicted number of coups, holding all else constant. For a higher polity score of 16, the model estimates that there will be no coup.*

Graph 10: Adjusted Logged Population Predictions with 95% Confidence Intervals



Graph 10: Adjusted Logged Population Predictions with 95% Confidence Intervals: *From this graph, we can see there is an associated decrease in likelihood of a coup with larger log populations.*

Graph 11: Predictive Margins for Interaction Logged Real GDP and Polity Score



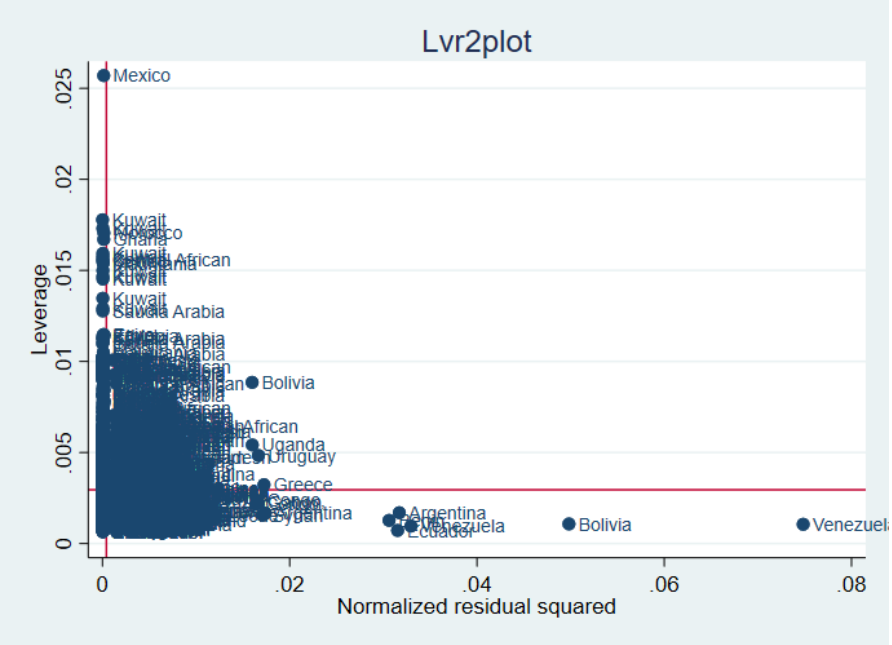
Graph 11: Predictive Margins for Interaction Logged GDP and Polity Score: *From this graph, we can see the varying levels of GDP and Polity scores have different slopes. To control for this, I am going to run an interaction term for real GDP and Polity scores.*

VIF Test

Variable	VIF
Polity	92.08
Logged GDP	5.65
Polity x Logged GDP	111.71
Logged Secondary Education	2.70
Logged Population	1.04
Logged Inflation Rate	1.10
Mean VIF	35.71

Table 1: VIF Test: *From this table, we can see that our model does not have problems of high multicollinearity. The variables with high VIF scores, polity, logged real GDP, and the interaction term, should be accounted for by Stata.*

Graph 12: Lvr2plot



Graph 12: Lvr2plot: *The graph shows us that Venezuela and Bolivia have a very large residuals, but they don't have much leverage. Mexico has high leverage, but it does not have a large residual. If there were any observations in the top right corner, then I would further investigate.*

Table 2: Cook's D Test

Iceland
India
Barbados

Table 2: Cook's D Test: *From my Cook's D test, I identified three influential outliers that I could consider removing. The three outliers do not significantly change the data, so I will keep my first model as the preferred model.*

Table 3: Ovtest

	Ho: model has no omitted variables
F(3, 2362)	3.00
Prob > F	0.0294

Table 3: Ovtest: *From this test, we can see that the p-value, .0294, is less than .05. Because of this, we can reject the null hypothesis that there are no omitted variables in the model.*

Table of Models

VARIABLES	(1) Model 1: including outliers	(2) Model 2: without outliers
Polity	-0.064***	-0.061**
	(0.024)	(0.024)
Logged Real GDP	-0.138**	-0.128**
	(0.062)	(0.063)
Polity x Logged Real GDP	0.006**	0.006*
	(0.003)	(0.003)
Logged Average Years of Education	0.069**	0.070**
	(0.027)	(0.028)
Logged Population	-0.436***	-0.443***
	(0.090)	(0.093)
Logged Inflation Rate	0.023**	0.021**
	(0.010)	(0.010)
Constant	4.925***	4.915***
	(0.730)	(0.747)
Observations	2,372	2,294
R-squared	0.030	0.030
Number of country1	104	101

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Note: I chose an fixed effects model, because the corr(u_i, Xb)of .9249. I also chose to exclude the percentage of people who work in agriculture, because substantively, agriculture is both a job that can pay well or poorly. The p-value of agriculture was extremely high, and when I removed it, some of my other variables became more significant.

Interpretations of Model 1:

For every additional Polity point added, there is an associated .064 decrease in the amount of estimated coups.

For every additional 1% increase in logged Real GDP, there is an associated .138% decrease in the amount of estimated coups.

For every additional 1% increase in logged average years of education, there is an associated .069% decrease in the amount of estimated coups.

For every additional 1% increase in logged population, there is an associated decrease of .436% decrease in the amount of estimated coups.

For every additional 1% increase in logged inflation rate, there is an associated increase of .023% in the amount of estimated coups.

GRADER'S APPENDIX

Do File

```
encode cname, gen(country1)

xtset country1 year

xtsum

xtline coup

xtline coup, overlay

gen region1 = region

tab country1, gen(state)

tab region, gen(continent)

twoway scatter coup polity, mlabel(country1) || lfit coup polity

replace polity = 20 in 1836

twoway scatter coup polity, mlabel(country1) || lfit coup polity, clstyle(p2)

scatter coup rgdptt

hist edsec

gen lnedsec = ln(edsec)
```

```
hist ag
gen lnag=ln(ag)
hist pop
gen lnpop = ln(pop)
tab polity
hist rgdptt
gen lnrgdp = ln(rgdptt)
hist inf
*inflation??
gen lninf =ln(inf)
xtreg coup polity, fe cluster(country1)
xtreg coup polity lnag lnedsec lnpop lnrgdp lninf, fe cluster(country1)
test lnrgdp polity
xtreg coup c.polity##c.lnrgdp lnedsec lnpop lninf, fe cluster(country1)
testparm c.polity##c.lnrgdp
margins, at(polity=(0(2)20) lnrgdp=(0(2)10))
marginsplot, noci
*statistically significant
ssc install outreg2
xtreg coup c.polity##c.lnrgdp lnedsec lnpop lninf, fe i(country1)
outreg2 using abbey9.doc, word dec(3)
margins, at(polity=(0(1)20)) atmeans vsquish
xtreg coup c.polity##c.lnrgdp lnedsec lnpop lninf, fe i(country1)
margins, at(lnpop=(0(1)13)) atmeans vsquish
marginsplot
margins, at(polity=(0(1)20)) atmeans vsquish
marginsplot
margins, at(polity=(0(2)20) lnrgdp=(0(2)10))
marginsplot, noci
reg coup c.polity##c.lnrgdp lnedsec lnpop lninf
lvr2plot, mlabel(country1)
vif
ovtest
xtreg coup c.polity##c.lnrgdp lnedsec lnpop lninf, fe i(country1)
predict d, cooksd
sort d
```

```
di 4/2372
list country1 coup d if d>4/2372
list country1 coup d if d>7
*India Iceland Barbados
xtreg coup c.polity##c.lnrgdp lnedsec lnpop lninf if d<7, fe i(country1)
outreg2 using abbey9.doc, word dec(3)
log close
```

Log File

```
. use "C:\Users\ahigham4\Downloads\coups.dta"
(Instability & Growth)

. do "C:\Users\ahigham4\AppData\Local\Temp\STD2670_000000.tmp"

. encode cname, gen(country1)

. xtset country1 year
       panel variable:  country1 (strongly balanced)
        time variable:  year, 1950 to 1982
                delta:  1 unit

. xtsum
. xtline coup

. xtline coup, overlay


. do "C:\Users\ahigham4\AppData\Local\Temp\STD2670_000000.tmp"

. xtreg coup polity lnag lnedsec lnpop lnrgdp lninf, fe cluster(country1)

Fixed-effects (within) regression               Number of obs     =      1,781
Group variable: country1                        Number of groups  =        103

R-sq:                                           Obs per group:
     within  = 0.0250                                         min =          6
     between = 0.0005                                         avg =       17.3
```

```
     overall = 0.0009                                        max =         21

                                                  F(6,102)          =       3.74
corr(u_i, Xb)  = -0.9690                          Prob > F          =     0.0021

                              (Std. Err. adjusted for 103 clusters in country1)
------------------------------------------------------------------------------
             |               Robust
        coup |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      polity |  -.0149517   .0050087    -2.99   0.004    -.0248864   -.0050171
        lnag |  -.0585173   .0981953    -0.60   0.553    -.2532872    .1362525
     lnedsec |   .0784657   .0591414     1.33   0.188    -.0388411    .1957724
       lnpop |   -.523802   .2479055    -2.11   0.037    -1.015521   -.0320826
      lnrgdp |  -.1427013   .1001981    -1.42   0.157    -.3414439    .0560412
       lninf |    .024038   .0150808     1.59   0.114    -.0058747    .0539507
       _cons |   5.912535   2.206367     2.68   0.009     1.536216    10.28885
-------------+----------------------------------------------------------------
     sigma_u |  .83267478
     sigma_e |  .40698929
         rho |  .80716801   (fraction of variance due to u_i)
------------------------------------------------------------------------------

.
end of do-file

. do "C:\Users\ahigham4\AppData\Local\Temp\STD2670_000000.tmp"

. test lnrgdp polity

 ( 1)  lnrgdp = 0
 ( 2)  polity = 0

       F(  2,   102) =    6.07
            Prob > F =    0.0032
```

```
.
end of do-file

. do "C:\Users\ahigham4\AppData\Local\Temp\STD2670_000000.tmp"

. xtreg coup c.polity##c.lnrgdp lnedsec lnpop lninf, fe cluster(country1)

Fixed-effects (within) regression               Number of obs     =      2,372
Group variable: country1                        Number of groups  =        104

R-sq:                                           Obs per group:
     within  = 0.0300                                         min =          8
     between = 0.0009                                         avg =       22.8
     overall = 0.0016                                         max =         33

                                                F(6,103)          =       3.84
corr(u_i, Xb)  = -0.9567                        Prob > F          =     0.0017

                            (Std. Err. adjusted for 104 clusters in country1)
------------------------------------------------------------------------------
             |               Robust
        coup |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      polity |  -.0639114   .0339665    -1.88   0.063    -.1312759    .0034531
      lnrgdp |  -.1381897   .0943583    -1.46   0.146    -.3253271    .0489476
             |
    c.polity#|
    c.lnrgdp |   .0064368   .0045989     1.40   0.165    -.0026841    .0155577
             |
     lnedsec |   .0691365   .0363666     1.90   0.060    -.0029881     .141261
       lnpop |  -.4363696   .1852034    -2.36   0.020    -.8036769   -.0690622
       lninf |   .0230759   .0124409     1.85   0.066    -.0015976    .0477494
       _cons |   4.925197   1.499853     3.28   0.001     1.950592    7.899803
-------------+----------------------------------------------------------------
     sigma_u |  .69101229
     sigma_e |   .4149388
```

```
         rho |  .73498295   (fraction of variance due to u_i)
------------------------------------------------------------------------------

.
end of do-file

. do "C:\Users\ahigham4\AppData\Local\Temp\STD2670_000000.tmp"

. testparm c.polity##c.lnrgdp

 ( 1)  polity = 0
 ( 2)  lnrgdp = 0
 ( 3)  c.polity#c.lnrgdp = 0

       F(  3,   103) =    6.89
            Prob > F =    0.0003

.
end of do-file

. do "C:\Users\ahigham4\AppData\Local\Temp\STD2670_000000.tmp"

. margins, at(polity=(0(2)20) lnrgdp=(0(2)10))

. marginsplot, noci

  Variables that uniquely identify margins: polity lnrgdp

.
end of do-file

. do "C:\Users\ahigham4\AppData\Local\Temp\STD2670_000000.tmp"

. ssc install outreg2
checking outreg2 consistency and verifying not already installed...
all files already exist and are up to date.
```

```
.
. xtreg coup c.polity##c.lnrgdp lnedsec lnpop lninf, fe i(country1)

Fixed-effects (within) regression               Number of obs     =      2,372
Group variable: country1                        Number of groups  =        104

R-sq:                                           Obs per group:
     within  = 0.0300                                         min =          8
     between = 0.0009                                         avg =       22.8
     overall = 0.0016                                         max =         33

                                                F(6,2262)         =      11.66
corr(u_i, Xb)  = -0.9567                        Prob > F          =     0.0000

------------------------------------------------------------------------------
        coup |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      polity |  -.0639114   .0237007    -2.70   0.007    -.1103889   -.0174339
      lnrgdp |  -.1381897    .061962    -2.23   0.026    -.2596981   -.0166814
             |
    c.polity#|
    c.lnrgdp |   .0064368   .0030652     2.10   0.036      .000426    .0124477
             |
     lnedsec |   .0691365    .027237     2.54   0.011     .0157244    .1225485
       lnpop |  -.4363696   .0902282    -4.84   0.000    -.6133082   -.2594309
       lninf |   .0230759   .0099676     2.32   0.021     .0035293    .0426225
       _cons |   4.925197   .7304867     6.74   0.000     3.492703    6.357691
-------------+----------------------------------------------------------------
     sigma_u |  .69101229
     sigma_e |   .4149388
         rho |  .73498295   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0: F(103, 2262) = 4.43                   Prob > F = 0.0000

. outreg2 using abbey9.doc, word dec(3)
```

```
abbey9.doc
dir : seeout

.
end of do-file

. do "C:\Users\ahigham4\AppData\Local\Temp\STD2670_000000.tmp"

. xtreg coup c.polity##c.lnrgdp lnedsec lnpop lninf if d<7, fe i(country1)
d not found
r(111);

end of do-file

r(111);

. do "C:\Users\ahigham4\AppData\Local\Temp\STD2670_000000.tmp"

. xtreg coup c.polity##c.lnrgdp lnedsec lnpop lninf, fe i(country1)
.
end of do-file

. do "C:\Users\ahigham4\AppData\Local\Temp\STD2670_000000.tmp"

. predict d, cooksd
(1,555 missing values generated)

. sort d

. di 4/2372
.00168634

.
end of do-file

. do "C:\Users\ahigham4\AppData\Local\Temp\STD2670_000000.tmp"
```

```
. xtreg coup c.polity##c.lnrgdp lnedsec lnpop lninf if d<7, fe i(country1)

Fixed-effects (within) regression               Number of obs     =      2,294
Group variable: country1                        Number of groups  =        101

R-sq:                                           Obs per group:
     within  = 0.0297                                         min =          8
     between = 0.0019                                         avg =       22.7
     overall = 0.0023                                         max =         33

                                                F(6,2187)         =      11.16
corr(u_i, Xb)  = -0.9480                        Prob > F          =     0.0000

------------------------------------------------------------------------------
        coup |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      polity |  -.0613084   .0241669    -2.54   0.011     -.108701   -.0139159
      lnrgdp |  -.1275537   .0630936    -2.02   0.043    -.2512833   -.0038242
             |
    c.polity#|
    c.lnrgdp |   .0060808   .0031259     1.95   0.052    -.0000492    .0122108
             |
     lnedsec |   .0703573   .0277434     2.54   0.011     .0159511    .1247635
       lnpop |  -.4432905   .0925817    -4.79   0.000    -.6248477   -.2617333
       lninf |   .0209612   .0102207     2.05   0.040      .000918    .0410045
       _cons |   4.915027   .7472795     6.58   0.000     3.449575    6.380479
-------------+----------------------------------------------------------------
     sigma_u |  .64847949
     sigma_e |  .42024189
         rho |  .70424602   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0: F(100, 2187) = 4.44                  Prob > F = 0.0000

.
end of do-file
```

```
. do "C:\Users\ahigham4\AppData\Local\Temp\STD2670_000000.tmp"

. outreg2 using abbey9.doc, word dec(3)
abbey9.doc
dir : seeout

.
end of do-file

. shellout using `"abbey9.doc"'

.
```