Pol Sci 630: Problem Set 9 - Data Management and Omitted Variable Bias - Solutions

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Grading Due Date: Friday, October 30th, 12.00 PM (Beginning of Lab)

Insert your comments on the assignment that you are grading above the solution in bold and red text. For example write: "GRADER COMMENT: everything is correct! - 4/4 Points" Also briefly point out which, if any, problems were not solved correctly and what the mistake was.

Use the following scheme to assign points: For problems that were solved correctly in their entirety, assign the full point value of 4. For correctly solved bonus problems, add that value to the total score for a problem but do not go above 4 points per problem. If there are mistakes in any problem, subtract points according to the extent of the mistake. If you subtract points, explain why.

In order to make your text bold and red, you need to insert the following line at the beginning of the document:

```
\usepackage{color}
```

and the following lines above the solution of the specific task:

```
\textbf{\color{red} GRADER COMMENT: everything is correct! - 4/4 Points}
```

R Programming

Problem 1

```
### a
setwd("C:/Users/Jan/OneDrive/Documents/GitHub/ps630_lab/")
library(foreign)
LDC = read.dta("LDC_IO_replication.dta")

LDC$regime_class = NA
LDC$regime_class[LDC$polityiv_update2 > 5] = "Democracy"
unique(LDC$regime_class)

## [1] "Democracy" NA

LDC$regime_class[LDC$polityiv_update2 >= -5 & LDC$polityiv_update2 <= 5] = "Anocracy"
unique(LDC$regime_class)

## [1] "Democracy" "Anocracy"  NA

LDC$regime_class[LDC$polityiv_update2 < -5] = "Autocracy"
unique(LDC$regime_class)

## [1] "Democracy" "Anocracy"  "Autocracy" NA

### b

LDC$l1polity = LDC$l1polity + 10
LDC$l1polity_squared = (LDC$l1polity)^2

lm_fdi2 = lm(fdignp ~ l1polity + l1polity_squared + l1signed + l1office + l1gdp_pc +
    l1lnpop + l1ecris2 + l1bpc1 + l1avnewtar + factor(ctylabel) - 1, data = LDC)
summary(lm_fdi2)

##
## Call:
## lm(formula = fdignp ~ l1polity + l1polity_squared + l1signed +
```

```
##     l1office + l1gdp_pc + l1lnpop + l1ecris2 + l1bpc1 + l1avnewtar +
##     factor(ctylabel) - 1, data = LDC)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -32.027  -0.908  -0.124   0.604 152.058
##
## Coefficients:
##                                        Estimate Std. Error t value
## l1polity                             -1.359e-01  1.634e-01  -0.832
## l1polity_squared                      8.910e-03  7.833e-03   1.138
## l1signed                             -2.362e-01  3.101e-01  -0.762
## l1office                             -3.138e-02  2.554e-02  -1.229
## l1gdp_pc                             -1.431e-04  3.028e-04  -0.473
## l1lnpop                               3.489e+00  1.049e+00   3.326
## l1ecris2                              8.556e-02  4.716e-01   0.181
## l1bpc1                               -4.308e-01  3.520e-01  -1.224
## l1avnewtar                           -4.951e-02  1.399e-02  -3.540
## factor(ctylabel)Albania              -4.864e+01  1.538e+01  -3.162
## factor(ctylabel)Algeria              -5.726e+01  1.748e+01  -3.276
## factor(ctylabel)Angola               -1.823e+01  1.734e+01  -1.051
## factor(ctylabel)Argentina            -5.702e+01  1.757e+01  -3.246
## factor(ctylabel)Armenia              -4.769e+01  1.565e+01  -3.047
## factor(ctylabel)Azerbaijan           -3.893e+01  1.642e+01  -2.371
## factor(ctylabel)Bangladesh           -6.255e+01  1.902e+01  -3.289
## factor(ctylabel)Belarus              -5.406e+01  1.669e+01  -3.239
## factor(ctylabel)Benin                -5.103e+01  1.571e+01  -3.248
## factor(ctylabel)Bhutan               -4.434e+01  1.373e+01  -3.230
## factor(ctylabel)Bolivia              -5.113e+01  1.607e+01  -3.182
## factor(ctylabel)Botswana             -4.432e+01  1.414e+01  -3.134
## factor(ctylabel)Brazil               -6.260e+01  1.913e+01  -3.272
## factor(ctylabel)Bulgaria             -5.252e+01  1.635e+01  -3.212
## factor(ctylabel)Burundi              -5.217e+01  1.605e+01  -3.250
## factor(ctylabel)Cambodia             -4.832e+01  1.681e+01  -2.874
```

```
## factor(ctylabel)Cameroon                -5.341e+01  1.671e+01  -3.196
## factor(ctylabel)CentralAfricanRepublic -4.939e+01  1.526e+01  -3.235
## factor(ctylabel)Chad                    -5.145e+01  1.611e+01  -3.193
## factor(ctylabel)Chile                   -5.280e+01  1.669e+01  -3.164
## factor(ctylabel)China                   -6.837e+01  2.161e+01  -3.164
## factor(ctylabel)Colombia                -5.796e+01  1.765e+01  -3.283
## factor(ctylabel)Comoros                 -4.258e+01  1.323e+01  -3.217
## factor(ctylabel)Congo                   -4.767e+01  1.495e+01  -3.189
## factor(ctylabel)CostaRica               -4.861e+01  1.513e+01  -3.213
## factor(ctylabel)Coted'Ivoire            -5.290e+01  1.673e+01  -3.163
## factor(ctylabel)Croatia                 -4.894e+01  1.581e+01  -3.096
## factor(ctylabel)DominicanRepublic       -5.137e+01  1.602e+01  -3.207
## factor(ctylabel)Ecuador                 -5.356e+01  1.642e+01  -3.263
## factor(ctylabel)Egypt                   -5.739e+01  1.821e+01  -3.151
## factor(ctylabel)ElSalvador              -5.175e+01  1.575e+01  -3.285
## factor(ctylabel)EquatorialGuinea        -1.025e+01  1.325e+01  -0.773
## factor(ctylabel)Estonia                 -4.181e+01  1.451e+01  -2.882
## factor(ctylabel)Ethiopia                -5.923e+01  1.830e+01  -3.237
## factor(ctylabel)Fiji                    -4.236e+01  1.366e+01  -3.102
## factor(ctylabel)Gabon                   -4.290e+01  1.402e+01  -3.060
## factor(ctylabel)Gambia                  -4.400e+01  1.391e+01  -3.164
## factor(ctylabel)Georgia                 -4.530e+01  1.660e+01  -2.729
## factor(ctylabel)Ghana                   -5.470e+01  1.689e+01  -3.239
## factor(ctylabel)Guatemala               -5.256e+01  1.627e+01  -3.230
## factor(ctylabel)Guinea                  -5.208e+01  1.619e+01  -3.218
## factor(ctylabel)GuineaBissau            -4.540e+01  1.424e+01  -3.188
## factor(ctylabel)Guyana                  -3.964e+01  1.390e+01  -2.851
## factor(ctylabel)Haiti                   -5.228e+01  1.618e+01  -3.231
## factor(ctylabel)Honduras                -5.059e+01  1.564e+01  -3.235
## factor(ctylabel)Hungary                 -5.118e+01  1.648e+01  -3.106
## factor(ctylabel)India                   -7.061e+01  2.107e+01  -3.351
## factor(ctylabel)Indonesia               -6.279e+01  1.962e+01  -3.201
## factor(ctylabel)Iran                    -5.920e+01  1.822e+01  -3.249
## factor(ctylabel)Jamaica                 -4.856e+01  1.500e+01  -3.236
```

```
## factor(ctylabel)Jordan                -4.818e+01  1.530e+01  -3.148
## factor(ctylabel)Kazakhstan            -5.137e+01  1.710e+01  -3.004
## factor(ctylabel)Kenya                 -5.609e+01  1.740e+01  -3.223
## factor(ctylabel)Korea                 -5.814e+01  1.790e+01  -3.249
## factor(ctylabel)KyrgyzRepublic        -4.708e+01  1.587e+01  -2.967
## factor(ctylabel)Laos                  -4.803e+01  1.588e+01  -3.024
## factor(ctylabel)Latvia                -4.446e+01  1.513e+01  -2.938
## factor(ctylabel)Lesotho               -4.348e+01  1.475e+01  -2.947
## factor(ctylabel)Lithuania             -4.874e+01  1.560e+01  -3.124
## factor(ctylabel)Madagascar            -5.428e+01  1.667e+01  -3.257
## factor(ctylabel)Malawi                -5.266e+01  1.644e+01  -3.203
## factor(ctylabel)Malaysia              -5.172e+01  1.686e+01  -3.068
## factor(ctylabel)Mali                  -5.285e+01  1.636e+01  -3.230
## factor(ctylabel)Mauritania            -4.705e+01  1.491e+01  -3.156
## factor(ctylabel)Mauritius             -4.666e+01  1.410e+01  -3.310
## factor(ctylabel)Mexico                -5.938e+01  1.858e+01  -3.196
## factor(ctylabel)Moldova               -4.931e+01  1.582e+01  -3.117
## factor(ctylabel)Mongolia              -4.886e+01  1.506e+01  -3.245
## factor(ctylabel)Morocco               -5.593e+01  1.749e+01  -3.198
## factor(ctylabel)Mozambique            -5.425e+01  1.704e+01  -3.184
## factor(ctylabel)Nepal                 -5.665e+01  1.712e+01  -3.308
## factor(ctylabel)Nicaragua             -4.865e+01  1.553e+01  -3.133
## factor(ctylabel)Niger                 -5.271e+01  1.625e+01  -3.244
## factor(ctylabel)Nigeria               -5.918e+01  1.890e+01  -3.131
## factor(ctylabel)Oman                  -4.650e+01  1.497e+01  -3.106
## factor(ctylabel)Pakistan              -6.220e+01  1.898e+01  -3.277
## factor(ctylabel)Panama                -4.640e+01  1.498e+01  -3.098
## factor(ctylabel)PapuaNewGuinea        -4.864e+01  1.548e+01  -3.143
## factor(ctylabel)Paraguay              -4.981e+01  1.551e+01  -3.213
## factor(ctylabel)Peru                  -5.567e+01  1.715e+01  -3.245
## factor(ctylabel)Philippines           -5.965e+01  1.840e+01  -3.242
## factor(ctylabel)Poland                -5.726e+01  1.787e+01  -3.204
## factor(ctylabel)Romania               -5.611e+01  1.738e+01  -3.229
## factor(ctylabel)Russia                -6.290e+01  1.931e+01  -3.257
```

```
## factor(ctylabel)Rwanda                -5.203e+01  1.613e+01  -3.226
## factor(ctylabel)Senegal               -5.173e+01  1.608e+01  -3.216
## factor(ctylabel)SierraLeone           -5.104e+01  1.566e+01  -3.259
## factor(ctylabel)SouthAfrica           -5.868e+01  1.803e+01  -3.255
## factor(ctylabel)SriLanka              -5.559e+01  1.698e+01  -3.275
## factor(ctylabel)Swaziland             -3.991e+01  1.400e+01  -2.850
## factor(ctylabel)Syria                 -5.380e+01  1.672e+01  -3.217
## factor(ctylabel)Tanzania              -5.669e+01  1.771e+01  -3.201
## factor(ctylabel)Thailand              -5.903e+01  1.815e+01  -3.252
## factor(ctylabel)Togo                  -4.827e+01  1.541e+01  -3.133
## factor(ctylabel)Trinidad&Tobago       -4.267e+01  1.415e+01  -3.017
## factor(ctylabel)Tunisia               -5.075e+01  1.630e+01  -3.112
## factor(ctylabel)Turkey                -6.036e+01  1.814e+01  -3.327
## factor(ctylabel)Uganda                -5.492e+01  1.712e+01  -3.208
## factor(ctylabel)Ukraine               -5.954e+01  1.833e+01  -3.249
## factor(ctylabel)Uruguay               -4.993e+01  1.519e+01  -3.288
## factor(ctylabel)Venezuela             -5.623e+01  1.697e+01  -3.314
## factor(ctylabel)Zambia                -5.020e+01  1.631e+01  -3.078
## factor(ctylabel)Zimbabwe              -5.316e+01  1.644e+01  -3.234
##                                       Pr(>|t|)
## l1polity                              0.405792
## l1polity_squared                      0.255484
## l1signed                              0.446403
## l1office                              0.219355
## l1gdp_pc                              0.636568
## l1lnpop                               0.000901 ***
## l1ecris2                              0.856053
## l1bpc1                                0.221207
## l1avnewtar                            0.000412 ***
## factor(ctylabel)Albania               0.001595 **
## factor(ctylabel)Algeria               0.001078 **
## factor(ctylabel)Angola                0.293357
## factor(ctylabel)Argentina             0.001196 **
## factor(ctylabel)Armenia               0.002351 **
```

```
## factor(ctylabel)Azerbaijan             0.017864 *
## factor(ctylabel)Bangladesh             0.001028 **
## factor(ctylabel)Belarus                0.001226 **
## factor(ctylabel)Benin                  0.001187 **
## factor(ctylabel)Bhutan                 0.001266 **
## factor(ctylabel)Bolivia                0.001491 **
## factor(ctylabel)Botswana               0.001759 **
## factor(ctylabel)Brazil                 0.001093 **
## factor(ctylabel)Bulgaria               0.001346 **
## factor(ctylabel)Burundi                0.001180 **
## factor(ctylabel)Cambodia               0.004105 **
## factor(ctylabel)Cameroon               0.001421 **
## factor(ctylabel)CentralAfricanRepublic 0.001240 **
## factor(ctylabel)Chad                   0.001437 **
## factor(ctylabel)Chile                  0.001587 **
## factor(ctylabel)China                  0.001585 **
## factor(ctylabel)Colombia               0.001049 **
## factor(ctylabel)Comoros                0.001321 **
## factor(ctylabel)Congo                  0.001455 **
## factor(ctylabel)CostaRica              0.001340 **
## factor(ctylabel)Coted'Ivoire           0.001594 **
## factor(ctylabel)Croatia                0.001997 **
## factor(ctylabel)DominicanRepublic      0.001367 **
## factor(ctylabel)Ecuador                0.001128 **
## factor(ctylabel)Egypt                  0.001656 **
## factor(ctylabel)ElSalvador             0.001042 **
## factor(ctylabel)EquatorialGuinea       0.439418
## factor(ctylabel)Estonia                0.004010 **
## factor(ctylabel)Ethiopia               0.001233 **
## factor(ctylabel)Fiji                   0.001958 **
## factor(ctylabel)Gabon                  0.002250 **
## factor(ctylabel)Gambia                 0.001586 **
## factor(ctylabel)Georgia                0.006429 **
## factor(ctylabel)Ghana                  0.001224 **
```

```
## factor(ctylabel)Guatemala              0.001265 **
## factor(ctylabel)Guinea                 0.001319 **
## factor(ctylabel)GuineaBissau           0.001460 **
## factor(ctylabel)Guyana                 0.004418 **
## factor(ctylabel)Haiti                  0.001259 **
## factor(ctylabel)Honduras               0.001242 **
## factor(ctylabel)Hungary                0.001932 **
## factor(ctylabel)India                  0.000823 ***
## factor(ctylabel)Indonesia              0.001400 **
## factor(ctylabel)Iran                   0.001182 **
## factor(ctylabel)Jamaica                0.001236 **
## factor(ctylabel)Jordan                 0.001675 **
## factor(ctylabel)Kazakhstan             0.002704 **
## factor(ctylabel)Kenya                  0.001294 **
## factor(ctylabel)Korea                  0.001182 **
## factor(ctylabel)KyrgyzRepublic         0.003056 **
## factor(ctylabel)Laos                   0.002534 **
## factor(ctylabel)Latvia                 0.003349 **
## factor(ctylabel)Lesotho                0.003256 **
## factor(ctylabel)Lithuania              0.001818 **
## factor(ctylabel)Madagascar             0.001152 **
## factor(ctylabel)Malawi                 0.001390 **
## factor(ctylabel)Malaysia               0.002189 **
## factor(ctylabel)Mali                   0.001262 **
## factor(ctylabel)Mauritania             0.001630 **
## factor(ctylabel)Mauritius              0.000953 ***
## factor(ctylabel)Mexico                 0.001422 **
## factor(ctylabel)Moldova                0.001858 **
## factor(ctylabel)Mongolia               0.001199 **
## factor(ctylabel)Morocco                0.001411 **
## factor(ctylabel)Mozambique             0.001484 **
## factor(ctylabel)Nepal                  0.000961 ***
## factor(ctylabel)Nicaragua              0.001763 **
## factor(ctylabel)Niger                  0.001206 **
```

```
## factor(ctylabel)Nigeria                0.001775 **
## factor(ctylabel)Oman                   0.001934 **
## factor(ctylabel)Pakistan               0.001073 **
## factor(ctylabel)Panama                 0.001983 **
## factor(ctylabel)PapuaNewGuinea         0.001703 **
## factor(ctylabel)Paraguay               0.001343 **
## factor(ctylabel)Peru                   0.001198 **
## factor(ctylabel)Philippines            0.001210 **
## factor(ctylabel)Poland                 0.001383 **
## factor(ctylabel)Romania                0.001268 **
## factor(ctylabel)Russia                 0.001151 **
## factor(ctylabel)Rwanda                 0.001280 **
## factor(ctylabel)Senegal                0.001325 **
## factor(ctylabel)SierraLeone            0.001141 **
## factor(ctylabel)SouthAfrica            0.001160 **
## factor(ctylabel)SriLanka               0.001082 **
## factor(ctylabel)Swaziland              0.004424 **
## factor(ctylabel)Syria                  0.001322 **
## factor(ctylabel)Tanzania               0.001399 **
## factor(ctylabel)Thailand               0.001171 **
## factor(ctylabel)Togo                   0.001765 **
## factor(ctylabel)Trinidad&Tobago        0.002596 **
## factor(ctylabel)Tunisia                0.001889 **
## factor(ctylabel)Turkey                 0.000897 ***
## factor(ctylabel)Uganda                 0.001363 **
## factor(ctylabel)Ukraine                0.001183 **
## factor(ctylabel)Uruguay                0.001033 **
## factor(ctylabel)Venezuela              0.000941 ***
## factor(ctylabel)Zambia                 0.002124 **
## factor(ctylabel)Zimbabwe               0.001248 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 4.963 on 1546 degrees of freedom
```

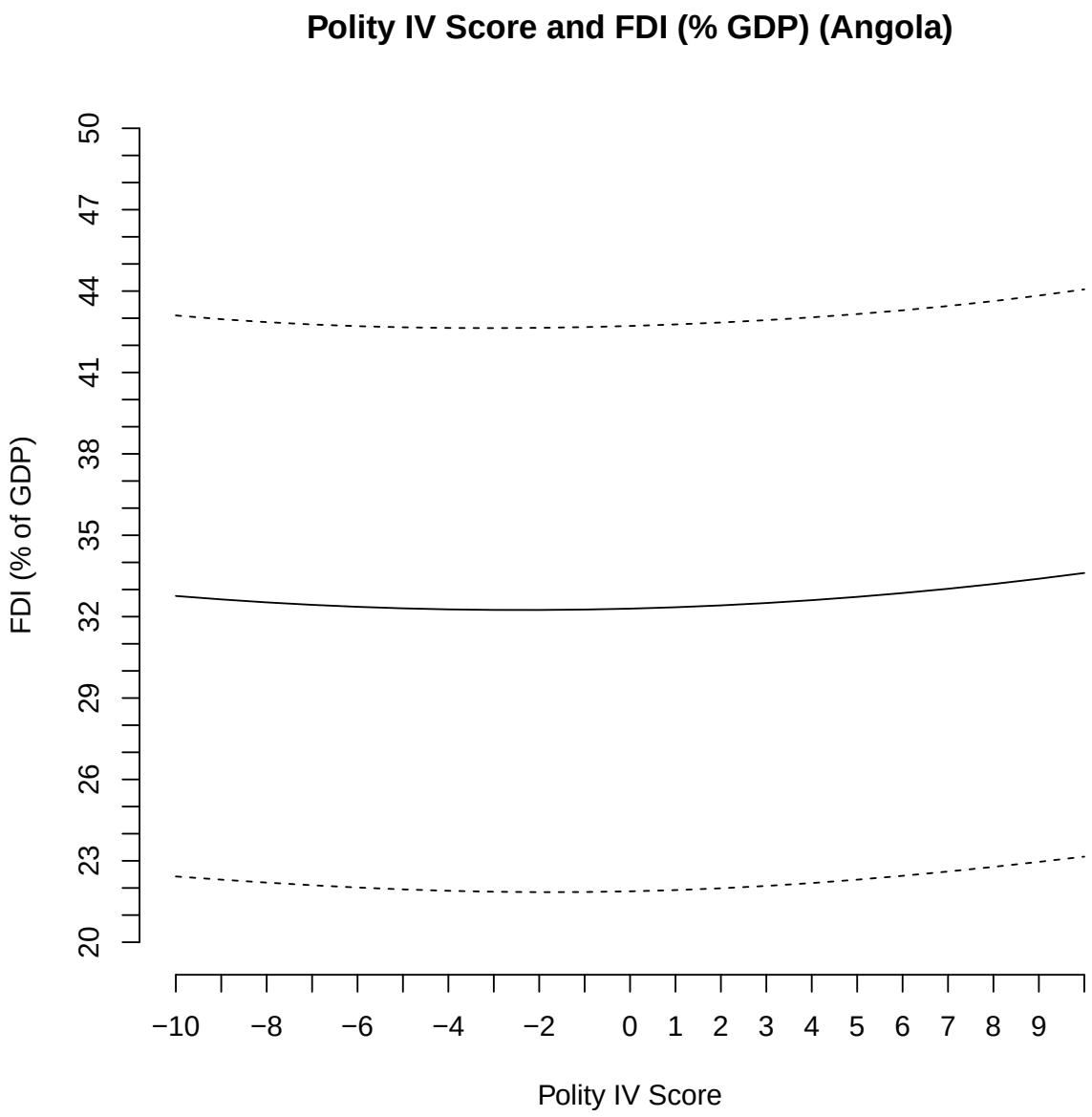
```
##   (3712 observations deleted due to missingness)
## Multiple R-squared:  0.3616,Adjusted R-squared:  0.3153
## F-statistic: 7.817 on 112 and 1546 DF,  p-value: < 2.2e-16

nd <- data.frame(l1polity = seq(0, 20, by = 1), l1polity_squared = seq(0, 20,
    by = 1)^2, l1signed = rep(0.1511, 21), l1office = rep(8.431, 21), l1gdp_pc = rep(288
    21), l1lnpop = rep(15.1, 21), l1ecris2 = rep(0.0641, 21), l1bpc1 = rep(0.5909,
    21), l1avnewtar = rep(14.91, 21), ctylabel = rep("Angola", 21))

pred.p1 <- predict(lm_fdi2, type = "response", se.fit = TRUE, newdata = nd)
pred.table <- cbind(pred.p1$fit, pred.p1$se.fit)

fit <- pred.p1$fit
low <- pred.p1$fit - 2 * pred.p1$se.fit
high <- pred.p1$fit + 2 * pred.p1$se.fit
cis <- cbind(fit, low, high)

plot(pred.p1$fit, type = "l", ylim = c(20, 50), main = "Polity IV Score and FDI (% GDP)
    xlab = "Polity IV Score", ylab = "FDI (% of GDP)", axes = FALSE)
axis(1, at = seq(1, 21), labels = seq(-10, 10, 1))
axis(2, at = seq(20, 50), labels = seq(20, 50))
matlines(cis[, c(2, 3)], lty = 2, col = "black")
```



Problem 2

```
### a
setwd("C:/Users/Jan/OneDrive/Documents/GitHub/ps630_lab/")
library(readstata13)
na_data = read.dta13("na_data.dta")
summary(na_data)
```

```
##  countrycode             year           v_c
##  Length:10624       Min.   :1950   Min.   :0.000e+00
##  Class :character   1st Qu.:1973   1st Qu.:7.600e+02
##  Mode  :character   Median :1986   Median :1.296e+04
##                     Mean   :1985   Mean   :8.369e+06
##                     3rd Qu.:1999   3rd Qu.:2.230e+05
##                     Max.   :2011   Max.   :4.053e+09
##                                    NA's   :561
##       v_i                  v_g                v_x
##  Min.   :     -7427   Min.   :        0   Min.   :0.000e+00
##  1st Qu.:       251   1st Qu.:      171   1st Qu.:4.260e+02
##  Median :      4319   Median :     3197   Median :5.520e+03
##  Mean   :   4418919   Mean   :  1658085   Mean   :4.787e+06
##  3rd Qu.:     70963   3rd Qu.:    49433   3rd Qu.:8.595e+04
##  Max.   :2433863510   Max.   :667440135   Max.   :1.955e+09
##  NA's   :561          NA's   :561         NA's   :519
##       v_m                v_gdp                q_c
##  Min.   :0.000e+00   Min.   :0.000e+00   Min.   :2.000e+00
##  1st Qu.:5.320e+02   1st Qu.:1.188e+03   1st Qu.:7.238e+03
##  Median :6.670e+03   Median :2.077e+04   Median :1.263e+05
##  Mean   :4.538e+06   Mean   :1.473e+07   Mean   :1.202e+07
##  3rd Qu.:1.094e+05   3rd Qu.:3.398e+05   3rd Qu.:9.104e+05
##  Max.   :2.194e+09   Max.   :7.427e+09   Max.   :2.343e+09
##  NA's   :519         NA's   :519         NA's   :561
##       q_i                  q_g                q_x
##  Min.   :    -39042   Min.   :        6   Min.   :0.000e+00
##  1st Qu.:      2543   1st Qu.:     1865   1st Qu.:3.730e+03
##  Median :     39263   Median :    27296   Median :4.116e+04
##  Mean   :   6616470   Mean   :  2764949   Mean   :7.191e+06
##  3rd Qu.:    279383   3rd Qu.:   224138   3rd Qu.:2.672e+05
##  Max.   :1098261440   Max.   :372916568   Max.   :1.453e+09
##  NA's   :561          NA's   :561         NA's   :519
##       q_m                q_gdp                pop
##  Min.   :7.000e+00   Min.   :9.000e+00   Min.   :4.608e+03
```

```
##  1st Qu.:5.002e+03   1st Qu.:1.252e+04   1st Qu.:7.673e+05
##  Median :4.708e+04   Median :2.065e+05   Median :4.951e+06
##  Mean   :6.188e+06   Mean   :2.188e+07   Mean   :3.177e+07
##  3rd Qu.:3.579e+05   3rd Qu.:1.424e+06   3rd Qu.:1.614e+07
##  Max.   :1.223e+09   Max.   :3.903e+09   Max.   :1.324e+09
##  NA's   :519         NA's   :519         NA's   :459
##        xr                 xr2                v_gfcf
##  Min.   :    0.00   Min.   :    0.00   Min.   :0.000e+00
##  1st Qu.:    0.90   1st Qu.:    0.91   1st Qu.:3.900e+02
##  Median :    2.57   Median :    2.64   Median :7.822e+03
##  Mean   :  220.40   Mean   :  221.12   Mean   :4.854e+06
##  3rd Qu.:   28.58   3rd Qu.:   31.64   3rd Qu.:1.101e+05
##  Max.   :31900.00   Max.   :31900.00   Max.   :2.378e+09
##  NA's   :459        NA's   :459        NA's   :2370
##      q_gfcf
##  Min.   :3.000e+00
##  1st Qu.:1.826e+03
##  Median :4.209e+04
##  Mean   :6.118e+06
##  3rd Qu.:3.044e+05
##  Max.   :1.004e+09
##  NA's   :2390
```

```
### b
na_data$gdpgrowth = NA
for (i in 2:length(na_data$q_gdp)) {
    if (na_data$countrycode[i] == na_data$countrycode[i - 1]) {
        na_data$gdpgrowth[i] = (na_data$q_gdp[i]/na_data$q_gdp[i - 1] - 1) *
            100
    }
}

summary(na_data$gdpgrowth)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.    NA's
```

```
## -66.120   1.372   4.038   3.997   6.776 205.000     728

### c
na_data$date = na_data$year

LDC$countrycode = NA
LDC$countrycode[LDC$ctylabel == "Turkey"] = "TUR"
LDC$countrycode[LDC$ctylabel == "SouthAfrica"] = "ZAF"
LDC$countrycode[LDC$ctylabel == "Mexico"] = "MEX"

merged_data = merge(LDC, na_data, by = c("countrycode", "date"))

newmodel = lm(newtar ~ l1polity + gdpgrowth + factor(countrycode) - 1, data = merged_dat
summary(newmodel)

##
## Call:
## lm(formula = newtar ~ l1polity + gdpgrowth + factor(countrycode) -
##     1, data = merged_data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -9.4339 -3.7056 -0.2797  4.1416 11.7623
##
## Coefficients:
##                         Estimate Std. Error t value Pr(>|t|)
## l1polity                 -1.4270     0.2978  -4.792 3.40e-05 ***
## gdpgrowth                 0.4709     0.2907   1.620    0.115
## factor(countrycode)MEX   29.4030     3.2636   9.009 2.06e-10 ***
## factor(countrycode)TUR   43.4783     5.0282   8.647 5.41e-10 ***
## factor(countrycode)ZAF   34.8150     5.1067   6.818 8.89e-08 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 5.694 on 33 degrees of freedom
```

```
##   (52 observations deleted due to missingness)
## Multiple R-squared:  0.9176,Adjusted R-squared:  0.9051
## F-statistic: 73.52 on 5 and 33 DF,  p-value: < 2.2e-16
```

Problem 3

a) As grader, please make sure that the person who has submitted the homework has answered all questions of this problem. This includes a brief explanation (2-3 sentences) of the student's theory and a reference to both the dependent and key independent variable.

Make sure that the students has done the following things:

1. The student has explained which datasets contain the variables and provided an overview of how the variables are coded there.

2. If and only if there were variables that were nominal or ordinal scale or coded as characters, the student has recognized that these variables have to be transformed to be used for a linear regression. Nominal variables have to be introduced as factors (dummies). Ordinal variables have to be either used as factors (dummies) or have to be assigned numerical values. Similarly, variables that are coded as characters have to be either introduced as factors (dummies) or recoded as numerical variables.

3. The students has discussed the numbers of units and the time periods covered by the datasets.

b) As grader, please make sure that the person who has submitted the homework has answered all questions of this problem. This includes a brief theoretical explanation for the importance of at least two control variables that the student suggests to use for the final paper. For all control variables there should be a brief reference to either literature that has used the variable, the concept of omitted variable bias, or both.

Make sure that the students has done the following things:

1. The student has explained which datasets contain the variables and provided an overview of how the variables are coded there.

2. If and only if there were variables that were nominal or ordinal scale or coded as characters, the student has recognized that these variables have to be transformed to

be used for a linear regression. Nominal variables have to be introduced as factors (dummies). Ordinal variables have to be either used as factors (dummies) or have to be assigned numerical values. Similarly, variables that are coded as characters have to be either introduced as factors (dummies) or recoded as numerical variables.

3. The students has addressed potential differences in the time periods and units covered. For example, data for the control variables may be available only for OECD countries while the data for the dependent variable may only be available for developing countries. Another example would be that data for the control variables may be available on a quarterly basis while data for the dependent variable may be available on an annual basis.

4. The students has addressed differences in the coding of time periods and units. For example, the names of countries are coded as full names in one dataset while another dataset uses 3-letter isocodes to refer to countries. Another example would be that time in one dataset could be coded in the format YYYY-MM (Y = year, M = month) while it could be coded in the format YY-MM in another dataset.

Statistical Theory: Omitted Variable Bias

Problem 4

a)

b)