MSD 2019 Final Project

A replication of Greed and Grievance in Civil War by Paul Collier and Anke Hoeffler, 2000

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Contents

Reading Data

```
setwd(".")
options(scipen = 100, digits = 4)

data <- read.dta("data/G&G.dta")
# data_war_period <- data %>% filter(warsa == 1)
# subdata<- data %>% select(warsa, sxp, sxp2,
# coldwar, secm, lngdp_, gy1, peace, mount, geogia,
# lnpop, frac, elfo, rf, pol16, etdo4590, dem,
# ygini, grievxb, greedxb, oilsxp, oilsxp2)
```

Helper Functions

```
summarize_into_table <- function(summary_obj) {
    # takes summary object as input, and returns a DF
    # res.  to print res, use print(summ(obj), quote =
    # FALSE) is you don't want quotes

    options(digits = 4)
    res <- t(round(summary_obj$coefficients, digits = 4))
    z.values <- res[4, ]
    Signif <- symnum(z.values, corr = FALSE, na = FALSE,
        cutpoints = c(0, 0.01, 0.05, 0.1, 1), symbols = c("***",
            "**", "*", ""))
    res <- rbind(res, Signif)
    res <- t(res)
```

```
    res <- res[-1, ]
    res
}

comma_sep = function(x) {
    x = strsplit(x, "")
}
```

Opportunity Models

Generating the various opportunity models

```
# Opportunity Models

filtering_columns_list <- list("warsa,sxp,sxp2,coldwar,secm,gy1,peace,prevwara,mount,geogia,frac,lnpop"
    "warsa,sxp,sxp2,coldwar,secm,gy1,peace,mount,geogia,frac,lnpop",
    "warsa,sxp,sxp2,coldwar,lngdp_,gy1,peace,mount,geogia,frac,lnpop",
    "warsa,sxp,sxp2,lngdp_,peace,lnpop,diaspeaa", "warsa,sxp,sxp2,lngdp_,peace,lnpop,difdpeaa,diahpeaa"

regression_formula_list <- list("warsa ~  sxp + sxp2 + coldwar + secm + gy1 + peace + prevwara + mount +
    "warsa ~  sxp + sxp2 + coldwar + secm + gy1 + peace + mount + geogia + frac + lnpop",
    "warsa ~  sxp + sxp2 + coldwar + lngdp_ + gy1 + peace + mount + geogia + frac + lnpop",
    "warsa ~  sxp + sxp2 + lngdp_ + peace + lnpop + diaspeaa",
    "warsa ~  sxp + sxp2 + lngdp_ + peace + lnpop + difdpeaa + diahpeaa")


for (i in c(1:5)) {
    print(paste0("Opportunity Model ", i))

    filtering_columns <- strsplit(filtering_columns_list[[i]],
        ",")[[1]]
    print(filtering_columns)
    opportunity.data <- data[, filtering_columns]

    opportunity.data <- na.omit(opportunity.data)
    print(paste0("N : ", nrow(opportunity.data)))
    print(paste0("No of wars : ", nrow(opportunity.data[opportunity.data$warsa ==
        1, ])))

    opportunity_fit <- glm(as.formula(regression_formula_list[[i]]),
        family = binomial(link = "logit"), data = opportunity.data)

    print(paste0("Pseudo R2 : ", round(PseudoR2(opportunity_fit),
        digits = 2)))
    print(paste0("Log likelihood : ", round(logLik(opportunity_fit),
        digits = 2)))

    print(summarize_into_table(summary(opportunity_fit)),
        quote = FALSE)
}
```

```
## [1] "Opportunity Model 1"
##  [1] "warsa"    "sxp"      "sxp2"     "coldwar"  "secm"     "gy1"
```

```
##  [7] "peace"    "prevwara" "mount"    "geogia"   "frac"     "lnpop"
## [1] "N : 688"
## [1] "No of wars : 46"
## [1] "Pseudo R2 : 0.24"
## [1] "Log likelihood : -128.49"
##          Estimate Std. Error z value Pr(>|z|) Signif
## sxp      18.1486  6.0065     3.0215  0.0025   ***
## sxp2     -27.4453 11.9963    -2.2878 0.0221   **
## coldwar  -0.3257  0.4695     -0.6937 0.4879
## secm     -0.0248  0.0103     -2.4028 0.0163   **
## gy1      -0.117   0.0437     -2.6782 0.0074   ***
## peace    -0.0025  0.0017     -1.5234 0.1277
## prevwara 0.4639   0.5467     0.8487  0.3961
## mount    0.0129   0.0093     1.3929  0.1636
## geogia   -2.2115  1.0377     -2.1311 0.0331   **
## frac     -0.0002  0.0001     -1.6019 0.1092
## lnpop    0.6688   0.1631     4.1016  0        ***
## [1] "Opportunity Model 2"
##  [1] "warsa"   "sxp"     "sxp2"    "coldwar" "secm"    "gy1"     "peace"
##  [8] "mount"   "geogia"  "frac"    "lnpop"
## [1] "N : 688"
## [1] "No of wars : 46"
## [1] "Pseudo R2 : 0.24"
## [1] "Log likelihood : -128.85"
##         Estimate Std. Error z value Pr(>|z|) Signif
## sxp     18.8998  5.9478     3.1776  0.0015   ***
## sxp2    -29.1226 11.9047    -2.4463 0.0144   **
## coldwar -0.207   0.4496     -0.4605 0.6451
## secm    -0.0239  0.0101     -2.3565 0.0184   **
## gy1     -0.1182  0.0438     -2.6967 0.007    ***
## peace   -0.0036  0.0011     -3.1021 0.0019   ***
## mount   0.0137   0.0091     1.5097  0.1311
## geogia  -2.1291  1.0324     -2.0622 0.0392   **
## frac    -0.0002  0.0001     -1.5449 0.1224
## lnpop   0.6855   0.1617     4.2396  0        ***
## [1] "Opportunity Model 3"
##  [1] "warsa"   "sxp"     "sxp2"    "coldwar" "lngdp_"  "gy1"     "peace"
##  [8] "mount"   "geogia"  "frac"    "lnpop"
## [1] "N : 750"
## [1] "No of wars : 52"
## [1] "Pseudo R2 : 0.22"
## [1] "Log likelihood : -146.86"
##         Estimate Std. Error z value Pr(>|z|) Signif
## sxp     16.4757  5.2071     3.1641  0.0016   ***
## sxp2    -23.0168 9.9722     -2.3081 0.021    **
## coldwar -0.4543  0.4162     -1.0916 0.275
## lngdp_  -0.837   0.2532     -3.3055 0.0009   ***
## gy1     -0.1051  0.0421     -2.4933 0.0127   **
## peace   -0.0035  0.0011     -3.3355 0.0009   ***
## mount   0.0084   0.0085     0.9966  0.3189
## geogia  -0.8655  0.9482     -0.9127 0.3614
## frac    -0.0002  0.0001     -1.9716 0.0487   **
## lnpop   0.4927   0.1286     3.8308  0.0001   ***
## [1] "Opportunity Model 4"
```

```
## [1] "warsa"    "sxp"      "sxp2"     "lngdp_"   "peace"    "lnpop"
## [7] "diaspeaa"
## [1] "N : 595"
## [1] "No of wars : 32"
## [1] "Pseudo R2 : 0.25"
## [1] "Log likelihood : -93.27"
##          Estimate Std. Error z value Pr(>|z|) Signif
## sxp      17.5671  6.7436     2.605   0.0092   ***
## sxp2     -28.8151 15.35      -1.8772 0.0605   *
## lngdp_   -1.2366  0.2826     -4.3756 0        ***
## peace    -0.002   0.0014     -1.4716 0.1411
## lnpop    0.2949   0.1414     2.0859  0.037    **
## diaspeaa 700.9343 363.2903   1.9294  0.0537   *
## [1] "Opportunity Model 5"
## [1] "warsa"    "sxp"      "sxp2"     "lngdp_"   "peace"    "lnpop"
## [7] "difdpeaa" "diahpeaa"
## [1] "N : 595"
## [1] "No of wars : 32"
## [1] "Pseudo R2 : 0.25"
## [1] "Log likelihood : -93.23"
##          Estimate Std. Error z value Pr(>|z|) Signif
## sxp      17.4034  6.7493     2.5785  0.0099   ***
## sxp2     -28.4562 15.3642    -1.8521 0.064    *
## lngdp_   -1.2426  0.2837     -4.3794 0        ***
## peace    -0.002   0.0014     -1.4816 0.1385
## lnpop    0.2962   0.1413     2.0959  0.0361   **
## difdpeaa 823.9412 556.0224   1.4818  0.1384
## diahpeaa 741.1547 387.6344   1.912   0.0559   *
```

Grievance Models

Generating the various grievance models

```
# Grievance Models

filtering_columns_list <- list("warsa,elfo,rf,pol16,etdo4590,dem,peace,mount,geogia,lnpop",
    "warsa,elfo,rf,pol16,etdo4590,dem,peace,mount,geogia,lnpop,ygini",
    "warsa,elfo,rf,pol16,etdo4590,dem,peace,mount,geogia,lnpop,lgini")

regression_formula_list <- list("warsa ~  elfo + rf + pol16 + etdo4590 + dem + peace + mount + geogia +
    "warsa ~  elfo + rf + pol16 + etdo4590 + dem + peace + mount + geogia + lnpop + ygini",
    "warsa ~  elfo + rf + pol16 + etdo4590 + dem + peace + mount + geogia + lnpop + lgini")


for (i in c(1:3)) {
    print(paste0("Grievance Model ", i))

    filtering_columns <- strsplit(filtering_columns_list[[i]],
        ",")[[1]]
    print(filtering_columns)
    grievance.data <- data[, filtering_columns]

    grievance.data <- na.omit(grievance.data)
```

```
    print(paste0("N : ", nrow(grievance.data)))
    print(paste0("No of wars : ", nrow(grievance.data[grievance.data$warsa ==
        1, ])))

    grievance_fit <- glm(as.formula(regression_formula_list[[i]]),
        family = binomial(link = "logit"), data = grievance.data)

    print(paste0("Pseudo R2 : ", round(PseudoR2(grievance_fit),
        digits = 2)))
    print(paste0("Log likelihood : ", round(logLik(grievance_fit),
        digits = 2)))

    print(summarize_into_table(summary(grievance_fit)),
        quote = FALSE)
}
```

```
## [1] "Grievance Model 1"
##  [1] "warsa"    "elfo"     "rf"       "pol16"    "etdo4590" "dem"
##  [7] "peace"    "mount"    "geogia"   "lnpop"
## [1] "N : 850"
## [1] "No of wars : 59"
## [1] "Pseudo R2 : 0.13"
## [1] "Log likelihood : -185.57"
##          Estimate Std. Error z value Pr(>|z|) Signif
## elfo     0.0104   0.0057     1.8068  0.0708   *
## rf       -0.0032  0.0067     -0.4723 0.6367
## pol16    -3.0675  7.0207     -0.4369 0.6622
## etdo4590 0.4136   0.4958     0.8342  0.4042
## dem      -0.1091  0.0445     -2.4552 0.0141   **
## peace    -0.0037  0.001      -3.78   0.0002   ***
## mount    0.0109   0.0068     1.6033  0.1089
## geogia   -0.5092  0.8564     -0.5946 0.5521
## lnpop    0.2215   0.0959     2.3102  0.0209   **
## [1] "Grievance Model 2"
##  [1] "warsa"    "elfo"     "rf"       "pol16"    "etdo4590" "dem"
##  [7] "peace"    "mount"    "geogia"   "lnpop"    "ygini"
## [1] "N : 604"
## [1] "No of wars : 41"
## [1] "Pseudo R2 : 0.11"
## [1] "Log likelihood : -133.46"
##          Estimate Std. Error z value Pr(>|z|) Signif
## elfo     0.0108   0.0067     1.6199  0.1053
## rf       -0.0064  0.0082     -0.7851 0.4324
## pol16    -4.6818  8.2671     -0.5663 0.5712
## etdo4590 0.5747   0.5863     0.9802  0.327
## dem      -0.0834  0.0508     -1.6398 0.1011
## peace    -0.0031  0.0012     -2.6649 0.0077   ***
## mount    0.007    0.0089     0.7911  0.4289
## geogia   -0.7632  1.0531     -0.7247 0.4686
## lnpop    0.2461   0.1188     2.071   0.0384   **
## ygini    0.0153   0.0179     0.8543  0.393
## [1] "Grievance Model 3"
##  [1] "warsa"    "elfo"     "rf"       "pol16"    "etdo4590" "dem"
##  [7] "peace"    "mount"    "geogia"   "lnpop"    "lgini"
```

```
## [1] "N : 603"
## [1] "No of wars : 38"
## [1] "Pseudo R2 : 0.17"
## [1] "Log likelihood : -117.12"
##          Estimate Std. Error z value Pr(>|z|) Signif
## elfo     0.0117   0.0084     1.3867  0.1655
## rf       -0.0037  0.0094     -0.3992 0.6897
## pol16    -6.536   8.5782     -0.7619 0.4461
## etdo4590 1.0841   0.6285     1.7249  0.0846   *
## dem      -0.1211  0.0533     -2.2728 0.023    **
## peace    -0.0044  0.0013     -3.4254 0.0006   ***
## mount    -0.0001  0.0093     -0.0083 0.9934
## geogia   -1.2926  1.1016     -1.1734 0.2406
## lnpop    0.2991   0.1331     2.2465  0.0247   **
## lgini    0.4607   1.3052     0.353   0.7241
```

Combined Model

Generating the combined opportunity and grievance models

```
# Combined Models

filtering_columns_list <- list("warsa,sxp,sxp2,coldwar,secm,gy1,peace,mount,geogia,lnpop,frac,grievxb",
    "warsa,peace,mount,geogia,lnpop,elfo,rf,pol16,etdo4590,dem,greedxb",
    "warsa,sxp,sxp2,coldwar,secm,gy1,peace,mount,geogia,lnpop,frac,elfo,rf,pol16,etdo4590,dem,ygini",
    "warsa,sxp,sxp2,coldwar,secm,gy1,peace,mount,geogia,lnpop,frac,elfo,rf,pol16,etdo4590,dem",
    "warsa,sxp,sxp2,secm,gy1,peace,geogia,lnpop,frac,etdo4590",
    "warsa,sxp,sxp2,lngdp_,gy1,peace,geogia,lnpop,frac,etdo4590",
    "warsa,sxp,sxp2,secm,gy1,peace,geogia,lnpop,frac,etdo4590,oilsxp,oilsxp2")

regression_formula_list <- list("warsa ~ sxp + sxp2 + coldwar + secm + gy1 + peace + mount + geogia + l
    "warsa ~  peace + mount + geogia + lnpop + elfo + rf + pol16 + etdo4590 + dem + greedxb",
    "warsa ~  sxp + sxp2 + coldwar + secm + gy1 + peace + mount + geogia + lnpop + frac + elfo + rf + p
    "warsa ~ sxp + sxp2 + coldwar + secm + gy1 + peace + mount + geogia + lnpop + frac + elfo + rf + pol
    "warsa ~  sxp + sxp2 + secm + gy1 + peace + geogia + lnpop + frac + etdo4590",
    "warsa ~  sxp + sxp2 + lngdp_ + gy1 + peace + geogia + lnpop + frac + etdo4590",
    "warsa ~  sxp + sxp2 + secm + gy1 + peace + geogia + lnpop + frac + etdo4590 +  oilsxp + oilsxp2")


for (i in c(1:7)) {
    print(paste0("Combined Model ", i))

    filtering_columns <- strsplit(filtering_columns_list[[i]],
        ",")[[1]]
    print(filtering_columns)
    combined.data <- data[, filtering_columns]

    combined.data <- na.omit(combined.data)
    print(paste0("N : ", nrow(combined.data)))
    print(paste0("No of wars : ", nrow(combined.data[combined.data$warsa ==
        1, ])))

    combined_fit <- glm(as.formula(regression_formula_list[[i]]),
```

```
        family = binomial(link = "logit"), data = combined.data)

    print(paste0("Pseudo R2 : ", round(PseudoR2(combined_fit),
        digits = 2)))
    print(paste0("Log likelihood : ", round(logLik(combined_fit),
        digits = 2)))

    print(summarize_into_table(summary(combined_fit)),
        quote = FALSE)
}
```

```
## [1] "Combined Model 1"
##  [1] "warsa"   "sxp"     "sxp2"    "coldwar" "secm"    "gy1"     "peace"
##  [8] "mount"   "geogia"  "lnpop"   "frac"    "grievxb"
## [1] "N : 665"
## [1] "No of wars : 46"
## [1] "Pseudo R2 : 0.24"
## [1] "Log likelihood : -126.7"
##         Estimate Std. Error z value Pr(>|z|) Signif
## sxp     19.1073  5.9961     3.1866  0.0014   ***
## sxp2    -30.2619 12.0145    -2.5188 0.0118   **
## coldwar -0.2084  0.4572     -0.4559 0.6484
## secm    -0.0212  0.0106     -1.9984 0.0457   **
## gy1     -0.1084  0.0437     -2.4794 0.0132   **
## peace   -0.0003  0.0021     -0.1381 0.8902
## mount   0.0052   0.01       0.5198  0.6032
## geogia  -1.9761  1.0495     -1.883  0.0597   *
## lnpop   0.4886   0.1929     2.5329  0.0113   **
## frac    -0.0002  0.0001     -2.0499 0.0404   **
## grievxb 0.7648   0.4129     1.8524  0.064    *
## [1] "Combined Model 2"
##  [1] "warsa"    "peace"    "mount"    "geogia"   "lnpop"    "elfo"
##  [7] "rf"       "pol16"    "etdo4590" "dem"      "greedxb"
## [1] "N : 665"
## [1] "No of wars : 46"
## [1] "Pseudo R2 : 0.25"
## [1] "Log likelihood : -125.29"
##          Estimate Std. Error z value Pr(>|z|) Signif
## peace    0.0005   0.0014     0.3607  0.7183
## mount    0.0009   0.008      0.1123  0.9106
## geogia   0.0533   1.1006     0.0484  0.9614
## lnpop    -0.022   0.1364     -0.1614 0.8718
## elfo     0.0083   0.0071     1.1706  0.2418
## rf       -0.0048  0.0081     -0.6005 0.5482
## pol16    -9.3378  8.7336     -1.0692 0.285
## etdo4590 1.2103   0.6484     1.8666  0.062    *
## dem      -0.0365  0.0537     -0.6791 0.4971
## greedxb  1.0435   0.2106     4.9546  0        ***
## [1] "Combined Model 3"
##  [1] "warsa"    "sxp"      "sxp2"     "coldwar"  "secm"     "gy1"
##  [7] "peace"    "mount"    "geogia"   "lnpop"    "frac"     "elfo"
## [13] "rf"       "pol16"    "etdo4590" "dem"      "ygini"
## [1] "N : 479"
## [1] "No of wars : 32"
```

```
## [1] "Pseudo R2 : 0.24"
## [1] "Log likelihood : -89.55"
##          Estimate Std. Error z value Pr(>|z|) Signif
## sxp      37.0716  10.2919    3.602   0.0003   ***
## sxp2     -69.2696 21.6957    -3.1928 0.0014   ***
## coldwar  -0.873   0.6438     -1.356  0.1751
## secm     -0.0288  0.0133     -2.1632 0.0305   **
## gy1      -0.0455  0.0619     -0.7352 0.4622
## peace    -0.0003  0.0015     -0.2283 0.8194
## mount    0.0054   0.0116     0.4673  0.6403
## geogia   -4.0317  1.4898     -2.7061 0.0068   ***
## lnpop    0.9272   0.2501     3.707   0.0002   ***
## frac     -0.0008  0.0004     -2.2865 0.0222   **
## elfo     0.0412   0.0188     2.1902  0.0285   **
## rf       0.0148   0.0202     0.7312  0.4647
## pol16    -25.2763 13.3891    -1.8878 0.059    *
## etdo4590 2.0202   0.915      2.2079  0.0273   **
## dem      -0.0177  0.0618     -0.2861 0.7748
## ygini    0.0252   0.024      1.0507  0.2934
## [1] "Combined Model 4"
##  [1] "warsa"    "sxp"      "sxp2"     "coldwar"  "secm"     "gy1"
##  [7] "peace"    "mount"    "geogia"   "lnpop"    "frac"     "elfo"
## [13] "rf"       "pol16"    "etdo4590" "dem"
## [1] "N : 665"
## [1] "No of wars : 46"
## [1] "Pseudo R2 : 0.26"
## [1] "Log likelihood : -124.6"
##          Estimate Std. Error z value Pr(>|z|) Signif
## sxp      23.3851  6.6915     3.4947  0.0005   ***
## sxp2     -36.3352 12.9976    -2.7955 0.0052   ***
## coldwar  -0.2811  0.459      -0.6124 0.5403
## secm     -0.022   0.0108     -2.0372 0.0416   **
## gy1      -0.1078  0.0446     -2.4169 0.0157   **
## peace    -0.0032  0.0012     -2.7143 0.0066   ***
## mount    0.015    0.0093     1.6068  0.1081
## geogia   -1.9622  1.1491     -1.7076 0.0877   *
## lnpop    0.6974   0.1807     3.8604  0.0001   ***
## frac     -0.0005  0.0003     -1.5846 0.113
## elfo     0.0228   0.0149     1.5362  0.1245
## rf       0.0136   0.0185     0.7344  0.4627
## pol16    -15.9917 10.5178    -1.5204 0.1284
## etdo4590 1.5918   0.746      2.1338  0.0329   **
## dem      -0.0418  0.0542     -0.7706 0.441
## [1] "Combined Model 5"
##  [1] "warsa"    "sxp"      "sxp2"     "secm"     "gy1"      "peace"
##  [7] "geogia"   "lnpop"    "frac"     "etdo4590"
## [1] "N : 688"
## [1] "No of wars : 46"
## [1] "Pseudo R2 : 0.24"
## [1] "Log likelihood : -128.21"
##          Estimate Std. Error z value Pr(>|z|) Signif
## sxp      18.937   5.8651     3.2287  0.0012   ***
## sxp2     -29.4432 11.7813    -2.4992 0.0124   **
## secm     -0.0316  0.0098     -3.2252 0.0013   ***
```

```
## gy1      -0.1152  0.0431     -2.6753 0.0075   ***
## peace    -0.0037  0.0011     -3.397  0.0007   ***
## geogia   -2.487   1.0052     -2.4741 0.0134   **
## lnpop    0.7677   0.1658     4.6318  0        ***
## frac     -0.0002  0.0001     -2.3451 0.019    **
## etdo4590 0.6704   0.3535     1.8963  0.0579   *
## [1] "Combined Model 6"
##  [1] "warsa"    "sxp"      "sxp2"     "lngdp_"   "gy1"      "peace"
##  [7] "geogia"   "lnpop"    "frac"     "etdo4590"
## [1] "N : 750"
## [1] "No of wars : 52"
## [1] "Pseudo R2 : 0.22"
## [1] "Log likelihood : -146.84"
##          Estimate Std. Error z value Pr(>|z|) Signif
## sxp      16.7734  5.2064     3.2217  0.0013   ***
## sxp2     -23.8005 10.0396    -2.3707 0.0178   **
## lngdp_   -0.9504  0.2454     -3.8723 0.0001   ***
## gy1      -0.098   0.0415     -2.3625 0.0182   **
## peace    -0.0038  0.001      -3.8085 0.0001   ***
## geogia   -0.9919  0.9093     -1.0909 0.2753
## lnpop    0.5105   0.1284     3.9751  0.0001   ***
## frac     -0.0002  0.0001     -2.6953 0.007    ***
## etdo4590 0.4801   0.3283     1.4625  0.1436
## [1] "Combined Model 7"
##  [1] "warsa"    "sxp"      "sxp2"     "secm"     "gy1"      "peace"
##  [7] "geogia"   "lnpop"    "frac"     "etdo4590" "oilsxp"   "oilsxp2"
## [1] "N : 654"
## [1] "No of wars : 45"
## [1] "Pseudo R2 : 0.3"
## [1] "Log likelihood : -114.2"
##          Estimate  Std. Error z value Pr(>|z|) Signif
## sxp      50.6076   13.0928    3.8653  0.0001   ***
## sxp2     -130.9982 42.9311    -3.0514 0.0023   ***
## secm     -0.0343   0.0105     -3.2697 0.0011   ***
## gy1      -0.1335   0.0464     -2.8762 0.004    ***
## peace    -0.0032   0.0012     -2.8139 0.0049   ***
## geogia   -2.8712   1.1298     -2.5415 0.011    **
## lnpop    1.1235    0.2258     4.9752  0        ***
## frac     -0.0003   0.0001     -2.8706 0.0041   ***
## etdo4590 0.7688    0.3681     2.0886  0.0367   **
## oilsxp   -28.2748  9.3506     -3.0239 0.0025   ***
## oilsxp2  106.4589  38.7041    2.7506  0.0059   ***
```

Robustness Check

```
# Robustness Check 1
robustness.data <- data %>% select(warsa, country,
    year, sxp, sxp2, secm, gy1, peace, geogia, frac,
    etdo4590, lnpop)

for (i in c(1:6)) {
    print(paste0("Robustness Check ", i))
```

```
if (i == 1) {
    robustness.subdata <- robustness.data %>% filter(country !=
        "Iran") %>% filter(country != "Romania")
}

if (i == 2) {
    robustness.subdata <- robustness.data %>% filter(country !=
        "Iran") %>% filter(country != "Romania") %>%
        filter(!(country == "Angola" & year ==
            "1975")) %>% filter(!(country == "Iraq" &
        year == "1985")) %>% filter(!(country ==
        "Zaire" & year == "1995"))
}

if (i == 3) {
    robustness.subdata <- robustness.data %>% filter(!(country ==
        "Iran" & year == "1970")) %>% filter(!(country ==
        "Romania" & year == "1985")) %>% filter(!(country ==
        "Congo" & year == "1995"))
}

if (i == 4) {
    robustness.subdata <- robustness.data %>% filter(country !=
        "Saudi Arabia") %>% filter(country != "Guyana") %>%
        filter(country != "Oman") %>% filter(country !=
        "Trinidad and Tobago")
}

if (i == 5) {
    robustness.subdata <- robustness.data %>% filter(!(country ==
        "Angola" & year == "1975")) %>% filter(!(country ==
        "Somalia" & year == "1985"))
}

if (i == 6) {
    robustness.subdata <- robustness.data %>% filter(!(country ==
        "Angola" & year == "1975")) %>% filter(!(country ==
        "Somalia" & year == "1985")) %>% filter(!(country ==
        "Mozambique" & year == "1975")) %>% filter(!(country ==
        "Sierra Leone" & year == "1995")) %>% filter(!(country ==
        "Zaire" & year == "1995"))
}

robustness.1.data <- na.omit(robustness.subdata)
print(paste0("N : ", nrow(robustness.subdata)))
print(paste0("No of wars : ", nrow(robustness.subdata[robustness.subdata$warsa ==
    1, ])))

robustness.subdata <- glm(warsa ~ sxp + sxp2 +
    secm + gy1 + peace + geogia + frac + etdo4590 +
    lnpop, family = binomial(link = "logit"), data = robustness.1.data)

print(paste0("Pseudo R2 : ", round(PseudoR2(robustness.subdata),
```

```
        digits = 2)))
    print(paste0("Log likelihood : ", round(logLik(robustness.subdata),
        digits = 2)))

    print(summarize_into_table(summary(robustness.subdata)),
        quote = FALSE)
}
```

```
## [1] "Robustness Check 1"
## [1] "N : 1272"
## [1] "No of wars : 195"
## [1] "Pseudo R2 : 0.25"
## [1] "Log likelihood : -118.4"
##          Estimate Std. Error z value Pr(>|z|) Signif
## sxp      19.6965  6.6069     2.9812  0.0029   ***
## sxp2     -34.0902 14.3523    -2.3752 0.0175   **
## secm     -0.0345  0.0109     -3.1699 0.0015   ***
## gy1      -0.1398  0.0468     -2.9878 0.0028   ***
## peace    -0.0037  0.0012     -3.1601 0.0016   ***
## geogia   -2.1135  1.0796     -1.9577 0.0503   *
## frac     -0.0002  0.0001     -2.0407 0.0413   **
## etdo4590 0.727    0.3678     1.9766  0.0481   **
## lnpop    0.7472   0.1739     4.2968  0        ***
## [1] "Robustness Check 2"
## [1] "N : 1269"
## [1] "No of wars : 192"
## [1] "Pseudo R2 : 0.22"
## [1] "Log likelihood : -116.17"
##          Estimate Std. Error z value Pr(>|z|) Signif
## sxp      19.0288  6.6699     2.8529  0.0043   ***
## sxp2     -33.2498 14.604     -2.2768 0.0228   **
## secm     -0.0372  0.0112     -3.3188 0.0009   ***
## gy1      -0.0996  0.0518     -1.9247 0.0543   *
## peace    -0.0032  0.0012     -2.6524 0.008    ***
## geogia   -2.2718  1.09       -2.0842 0.0371   **
## frac     -0.0002  0.0001     -2.0445 0.0409   **
## etdo4590 0.7315   0.3695     1.9797  0.0477   **
## lnpop    0.7429   0.175      4.2456  0        ***
## [1] "Robustness Check 3"
## [1] "N : 1285"
## [1] "No of wars : 196"
## [1] "Pseudo R2 : 0.29"
## [1] "Log likelihood : -114.04"
##          Estimate Std. Error z value Pr(>|z|) Signif
## sxp      28.745   7.8622     3.6561  0.0003   ***
## sxp2     -54.818  17.7813    -3.0829 0.002    ***
## secm     -0.0415  0.0114     -3.626  0.0003   ***
## gy1      -0.1375  0.0459     -2.9965 0.0027   ***
## peace    -0.0041  0.0012     -3.5129 0.0004   ***
## geogia   -2.8902  1.1361     -2.5439 0.011    **
## frac     -0.0003  0.0001     -2.7478 0.006    ***
## etdo4590 0.6554   0.3717     1.7633  0.0778   *
## lnpop    0.8986   0.1955     4.5969  0        ***
## [1] "Robustness Check 4"
```

```
## [1] "N : 1256"
## [1] "No of wars : 199"
## [1] "Pseudo R2 : 0.24"
## [1] "Log likelihood : -127.55"
##          Estimate Std. Error z value Pr(>|z|) Signif
## sxp      18.7714  6.0632     3.0959  0.002    ***
## sxp2     -28.4663 12.2989    -2.3145 0.0206   **
## secm     -0.0312  0.0098     -3.1933 0.0014   ***
## gy1      -0.1215  0.044      -2.7622 0.0057   ***
## peace    -0.0036  0.0011     -3.2808 0.001    ***
## geogia   -2.4491  1.0079     -2.4299 0.0151   **
## frac     -0.0002  0.0001     -2.3871 0.017    **
## etdo4590 0.6468   0.3536     1.8293  0.0674   *
## lnpop    0.7722   0.1682     4.5904  0        ***
## [1] "Robustness Check 5"
## [1] "N : 1286"
## [1] "No of wars : 197"
## [1] "Pseudo R2 : 0.23"
## [1] "Log likelihood : -126.33"
##          Estimate Std. Error z value Pr(>|z|) Signif
## sxp      19.1466  5.9393     3.2237  0.0013   ***
## sxp2     -30.1497 12.0316    -2.5059 0.0122   **
## secm     -0.0306  0.0097     -3.1538 0.0016   ***
## gy1      -0.1024  0.0441     -2.3198 0.0204   **
## peace    -0.0034  0.0011     -3.0647 0.0022   ***
## geogia   -2.5411  1.0115     -2.5121 0.012    **
## frac     -0.0002  0.0001     -2.2107 0.0271   **
## etdo4590 0.7318   0.3573     2.0484  0.0405   **
## lnpop    0.7822   0.167      4.6841  0        ***
## [1] "Robustness Check 6"
## [1] "N : 1283"
## [1] "No of wars : 194"
## [1] "Pseudo R2 : 0.21"
## [1] "Log likelihood : -124.2"
##          Estimate Std. Error z value Pr(>|z|) Signif
## sxp      19.7632  5.9958     3.2962  0.001    ***
## sxp2     -31.0063 12.0769    -2.5674 0.0102   **
## secm     -0.0308  0.0097     -3.1734 0.0015   ***
## gy1      -0.0795  0.0458     -1.7345 0.0828   *
## peace    -0.0031  0.0011     -2.7503 0.006    ***
## geogia   -2.7197  1.0203     -2.6656 0.0077   ***
## frac     -0.0002  0.0001     -2.4131 0.0158   **
## etdo4590 0.6984   0.3602     1.9389  0.0525   *
## lnpop    0.7949   0.1689     4.7069  0        ***
```

The following is a list of all packages used to generate these results. (Leave at very end of file.)

```
sessionInfo()
```

```
## R version 3.5.2 (2018-12-20)
## Platform: x86_64-apple-darwin17.7.0 (64-bit)
## Running under: macOS High Sierra 10.13.6
##
## Matrix products: default
## BLAS/LAPACK: /usr/local/Cellar/openblas/0.3.5/lib/libopenblasp-r0.3.5.dylib
```

```
##
## locale:
## [1] en_US.UTF-8/en_US.UTF-8/en_US.UTF-8/C/en_US.UTF-8/en_US.UTF-8
##
## attached base packages:
## [1] stats     graphics  grDevices utils     datasets  methods   base
##
## other attached packages:
##  [1] lme4_1.1-21       Matrix_1.2-15     DescTools_0.99.28
##  [4] foreign_0.8-71    forcats_0.3.0     stringr_1.4.0
##  [7] dplyr_0.8.0       purrr_0.3.0       readr_1.3.1
## [10] tidyr_0.8.2       tibble_2.0.1      ggplot2_3.1.0
## [13] tidyverse_1.2.1   scales_1.0.0      here_0.1
##
## loaded via a namespace (and not attached):
##  [1] tidyselect_0.2.5 xfun_0.4         splines_3.5.2    haven_2.0.0
##  [5] lattice_0.20-38  expm_0.999-4     colorspace_1.4-0 generics_0.0.2
##  [9] htmltools_0.3.6  yaml_2.2.0       rlang_0.3.1      nloptr_1.2.1
## [13] pillar_1.3.1     glue_1.3.0       withr_2.1.2      modelr_0.1.3
## [17] readxl_1.3.0     plyr_1.8.4       munsell_0.5.0    gtable_0.2.0
## [21] cellranger_1.1.0 rvest_0.3.2      mvtnorm_1.0-10   evaluate_0.13
## [25] knitr_1.21       manipulate_1.0.1 broom_0.5.1      Rcpp_1.0.0
## [29] formatR_1.6      backports_1.1.3  jsonlite_1.6     hms_0.4.2
## [33] digest_0.6.18    stringi_1.3.1    grid_3.5.2       rprojroot_1.3-2
## [37] cli_1.0.1        tools_3.5.2      magrittr_1.5     lazyeval_0.2.1
## [41] crayon_1.3.4     pkgconfig_2.0.2  MASS_7.3-51.1    xml2_1.2.0
## [45] lubridate_1.7.4  minqa_1.2.4      assertthat_0.2.0 rmarkdown_1.11
## [49] httr_1.4.0       rstudioapi_0.9.0 R6_2.4.0         boot_1.3-20
## [53] nlme_3.1-137     compiler_3.5.2
```