MS Contribution to: Lee, C. (2019). China's Energy Diplomacy: Does Chinese Foreign Policy Favor Oil-Producing Countries? Foreign Policy Analysis, 15(4), 570–588. https://doi.org/10.1093/fpa/orz011

Applied Stats II
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1 Twist 1: Plots

Loading the data:

```
data_part <- read.csv("data_partner.csv") # Data on China's diplomatic partnerships (cross-national data)
data_TSCS <- read.csv("data_TSCS.csv") # Data on China's aid to Africa (TSCS data)
data_aid <- read.csv("data_aid.csv") # Data on China's aid to Africa (cross-national data)
data_visit <- read.csv("data_visit.csv") # Data on China's leadership visits (cross-national data)
```

Figure 2 Twist:

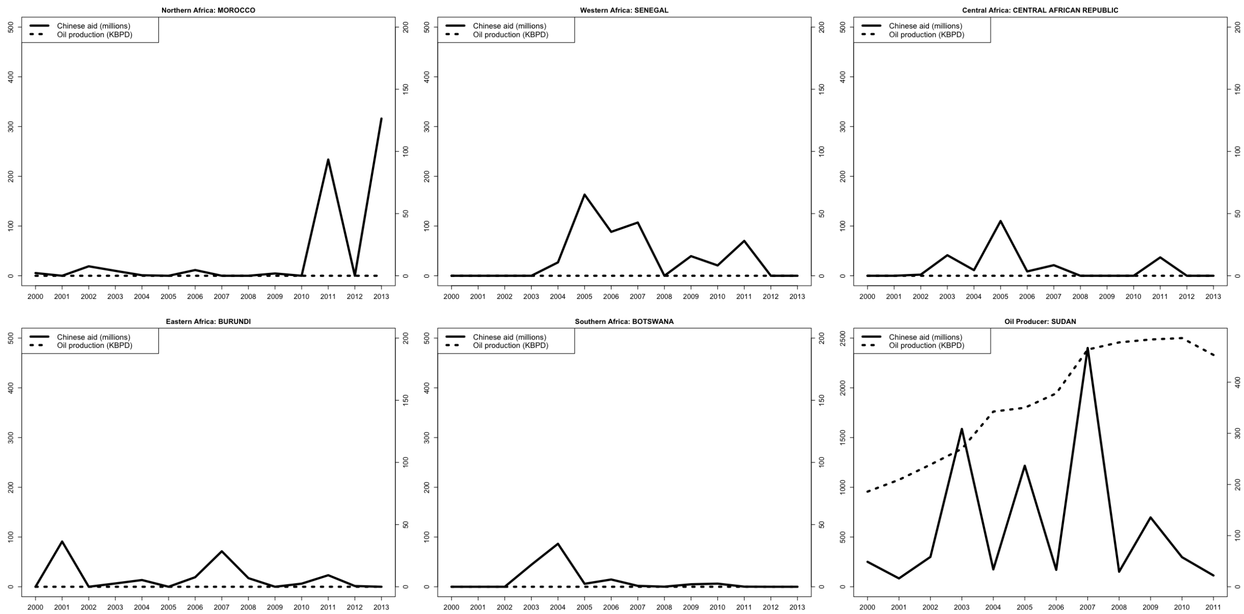
On p. 581, Lee presents four plots (Figure 2: 'I select four African oil-producing countries that have received Chinese aid (**Angola, Cameroon, Nigeria, Tunisia** — MS) , and graphically present the amount of aid received and their oil production from 2000 to 2013 in figure 2. As shown in figure 2, Chinese aid (denoted by the solid line) fluctuates from year to year, whereas oil production (denoted by the dashed line) is relatively stable over time. Angola, for example, received more than 2 billion dollars from China in 2005, 2007, and 2011 each but none in 2000 or 2009. In other words, if the time-serial variation is taken into account, the results may be confounded by the volatility of Chinese aid. Because the annual aid amount is subject to the Chinese government's yearly budget, it is less likely that it will clearly follow aid recipients' oil production every year. *When I only focus on the variation across African countries, however, it is observed that* ***African oil producers in general receive more Chinese aid than non–oil producers.*****.**

My idea was to test this last finding, therefore I randomly chose one non-oil producing state from each of the five UN African regions: **Morocco** from Northern Africa, **Senegal** from Western Africa, **Central African Republic** from Central Africa, **Burundi** from Eastern Africa, and **Botswana** from Southern Africa, and created similar plots of the amount of Chinese aid receives over their oil production 2000-2013 (which is denoted as 0 in this dataset). I also plotted one other major African oil-producer, Sudan, which was not included in Lee's initial analysis, to compare with the non-oil producers. **Overall. Lee's findings were proved to be correct: if focused on the variation across African countries, it is indeed observed that African non-oil producers receive notably less Chinese aid that oil-producers.**

```
africa <- subset(data_TSCS, africa==1 & year>1999)
africa <- cbind(africa["country"], africa["year"], africa["china_aid"], africa
    ["production2"])
africa$china_aid <- ifelse(is.na(africa$china_aid)==T, 0, africa$china_aid)
africa <- africa[order(africa$country, africa$year), ]

Morocco <- subset(africa, country == "Morocco")
Senegal <- subset(africa, country == "Senegal")
CAR <- subset(africa, country == "Central African Republic")
Burundi <- subset(africa, country == "Burundi")
Botswana <- subset(africa, country == "Botswana")
Sudan <- subset(africa, country == "Sudan")

par(mar=c(4,3,2,3), mfrow=c(2, 3))

#Northern Africa: Morocco
plot(Morocco$china_aid/1000000 ~ Morocco$year, type="l", lwd=4, xlab="", ylab=
    "", ylim=c(0, 500), axes=F, main="Northern Africa: MOROCCO")
axis(1, at= Morocco$year, label= Morocco$year, cex.axis=1.2)
axis(2, at=seq(0, 500, by=100), label=seq(0, 500, by=100), cex.axis=1.2)
par(new=T)
plot(Morocco$production2/1000 ~ Morocco$year, type="l", lwd=4, lty=9, xlab="",
     ylab="", ylim=c(0, 200), axes=F)
axis(4, at=seq(0, 200, by=50), label=seq(0, 200, by=50), cex.axis=1.2)
box()
legend("topleft", c("Chinese aid (millions)", "Oil production (KBPD)"), cex
    =1.3, lwd=4, lty=c(1, 9))

#Western Africa: Senegal
plot(Senegal$china_aid/1000000 ~ Senegal$year, type="l", lwd=4, xlab="", ylab=
    "", ylim=c(0, 500), axes=F, main="Western Africa: SENEGAL")
axis(1, at= Senegal$year, label= Senegal$year, cex.axis=1.2)
axis(2, at=seq(0, 500, by=100), label=seq(0, 500, by=100), cex.axis=1.2)
par(new=T)
plot(Senegal$production2/1000 ~ Senegal$year, type="l", lwd=4, lty=9, xlab="",
     ylab="", ylim=c(0, 200), axes=F)
axis(4, at=seq(0, 200, by=50), label=seq(0, 200, by=50), cex.axis=1.2)
box()
legend("topleft", c("Chinese aid (millions)", "Oil production (KBPD)"), cex
    =1.3, lwd=4, lty=c(1, 9))

```

```r
#Central Africa: Central African Republic
plot(CAR$china_aid/1000000 ~ CAR$year, type="l", lwd=4, xlab="", ylab="", ylim=c(0, 500), axes=F, main="Central Africa: CENTRAL AFRICAN REPUBLIC")
axis(1, at= CAR$year, label= CAR$year, cex.axis=1.2)
axis(2, at=seq(0, 500, by=100), label=seq(0, 500, by=100), cex.axis=1.2)
par(new=T)
plot(CAR$production2/1000 ~ CAR$year, type="l", lwd=4, lty=9, xlab="", ylab="", ylim=c(0, 200), axes=F)
axis(4, at=seq(0, 200, by=50), label=seq(0, 200, by=50), cex.axis=1.2)
box()
legend("topleft", c("Chinese aid (millions)", "Oil production (KBPD)"), cex=1.3, lwd=4, lty=c(1, 9))

#Eastern Africa: Burundi
plot(Burundi$china_aid/1000000 ~ Burundi$year, type="l", lwd=4, xlab="", ylab="", ylim=c(0, 500), axes=F, main="Eastern Africa: BURUNDI")
axis(1, at= Burundi$year, label= Burundi$year, cex.axis=1.2)
axis(2, at=seq(0, 500, by=100), label=seq(0, 500, by=100), cex.axis=1.2)
par(new=T)
plot(Burundi$production2/1000 ~ Burundi$year, type="l", lwd=4, lty=9, xlab="", ylab="", ylim=c(0, 200), axes=F)
axis(4, at=seq(0, 200, by=50), label=seq(0, 200, by=50), cex.axis=1.2)
box()
legend("topleft", c("Chinese aid (millions)", "Oil production (KBPD)"), cex=1.3, lwd=4, lty=c(1, 9))

#Southern Africa: Botswana
plot(Botswana$china_aid/1000000 ~ Botswana$year, type="l", lwd=4, xlab="", ylab="", ylim=c(0, 500), axes=F, main="Southern Africa: BOTSWANA")
axis(1, at= Botswana$year, label= Botswana$year, cex.axis=1.2)
axis(2, at=seq(0, 500, by=100), label=seq(0, 500, by=100), cex.axis=1.2)
par(new=T)
plot(Botswana$production2/1000 ~ Botswana$year, type="l", lwd=4, lty=9, xlab="", ylab="", ylim=c(0, 200), axes=F)
axis(4, at=seq(0, 200, by=50), label=seq(0, 200, by=50), cex.axis=1.2)
box()
legend("topleft", c("Chinese aid (millions)", "Oil production (KBPD)"), cex=1.3, lwd=4, lty=c(1, 9))

#Bonus: oil-producing Sudan
plot(Sudan$china_aid/1000000 ~ Sudan$year, type = "l", lwd = 4, xlab = "", ylab = "", ylim = c(0, 2500), axes = FALSE, main = "Oil Producer: SUDAN")
axis(1, at = Sudan$year, label = Sudan$year, cex.axis = 1.2)
axis(2, at = seq(0, 2500, by = 500), label = seq(0, 2500, by = 500), cex.axis = 1.2)
par(new = TRUE)
plot(Sudan$production2 ~ Sudan$year, type = "l", lwd = 4, lty = 9, xlab = "", ylab = "", ylim = c(0, max(Sudan$production2, na.rm = TRUE)), axes = FALSE)
axis(4, at = seq(0, max(Sudan$production2, na.rm = TRUE), by = 100), label = seq(0, max(Sudan$production2, na.rm = TRUE), by = 100), cex.axis = 1.2)
```

```
box()
legend("topleft", c("Chinese aid (millions)", "Oil production (KBPD)"), cex =
   1.3, lwd = 4, lty = c(1, 9))
```



Model 1 Twist:

Lee, p. 576: 'To test the first hypothesis (China is more likely to build partnerships with countries abundant in energy resources — MS), I use data on China's partnerships. Beijing considers three types of partnerships—partnerships, strategic partnerships, and comprehensive strategic partnerships. [...]. A country is coded as 1 as long as it has a partnership connection with China, regardless of the type' Lee, p. 579-580: '... the sample includes 125 developing countries. Developed countries (i.e., OECD members) are excluded from the sample because their relationships and interactions with China may follow a different pattern. All the independent and control variables enter the model at their mean values between 1992 and 2012.'. 'As can be seen, the coefficient for oil production is positive and statistically significant at the 5 percent level. This means that **China is more likely to build partnerships with oil-producing countries.** '. 'In other words, energy abundance plays an important role in determining Beijing's partnership building. In addition to oil production, FDI has a strong, positive effect in models 1 and 2, meaning that **China is more likely to form partnerships with countries that receive more FDI.** Trade importance is also positively associated with the formation of strategic or comprehensive strategic partnerships (Model 2 — MS). These findings show that **China's partnership diplomacy is largely driven by economic considerations.**'.

While original binomial logit Model 1 includes a binary dependent variable on partnership (0, 1), the dataset itself has more detailed data on the type of partnerships that China has with the non-OECD countries. It includes dummy variables for each of the three types of partnerships: **partnership, strategic partnership, comprehensive strategic partnership.** My understanding is that these types of partnership are following a certain order, though it might not be the case. My idea was to fit an unordered and ordered logit models with the same dependent variable (though relevelled accordingly for each of the models) and predictors, to test whether they would deliver any additional insights or be of better fit to the data.

I exponentiated the coefficients for all the models for better clarity, and calculated predicted probabilities to fit confusion matrices, which also helped with establishing the accuracy score of the models. I also estimated the models' statistics, such as **residual deviance** (how much probabilities estimated from our model differ from the observed proportions of successes), **Akaike Information Criterion** and **Bayesian Information Criterion** (goodness of fit measures), and performed **a Brant test** on the ordered model to establish whether the "proportional odds assumption" holds in its case.

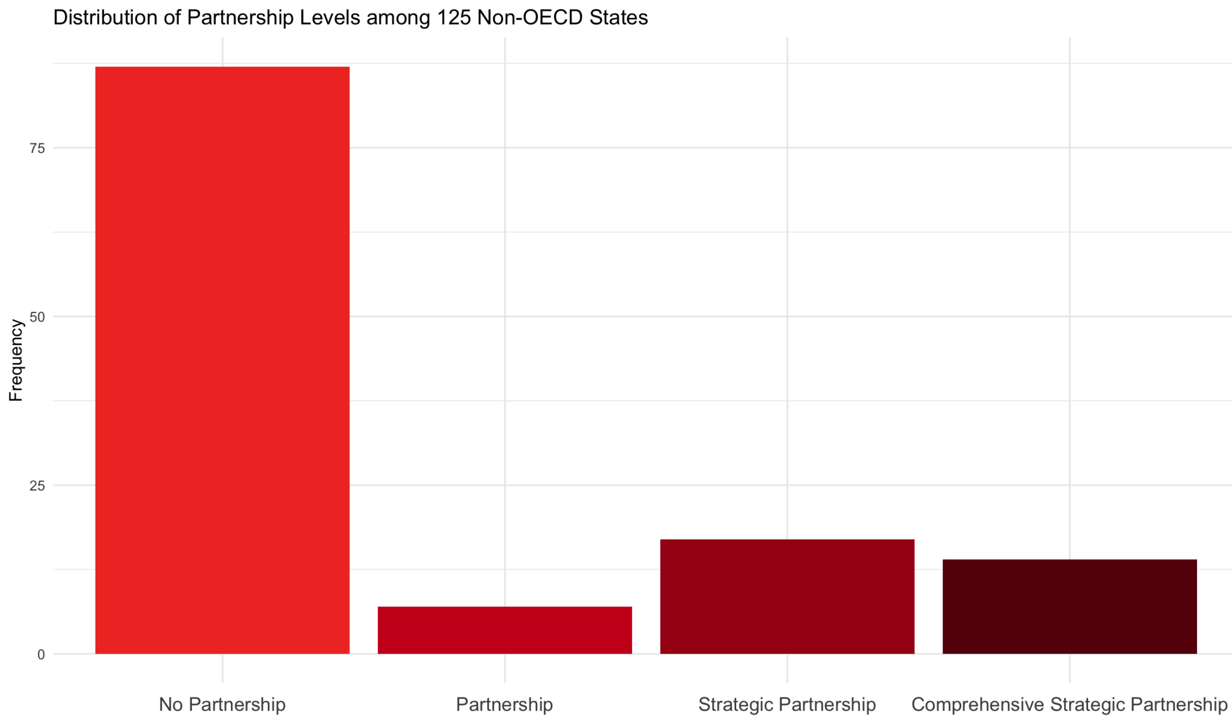
The following conclusions can be driven from my "twist":

- New models confirmed the initial findings that China is more likely to build partnerships with countries abundant in energy resources + it is also driven by economic considerations (significant coefficients for Oil production, FDI inflows, Trade importance).

- Both new models performed reasonably efficiently as compared to the initial binomial model, though the ordered model achieved a higher accuracy score and coefficients more similar in value.

- Parallel Regression Assumption (PRA) holds for the ordered model, which makes it a more adequate fit for the data.
- Interesting experiment overall, BUT: the original binomial logit Model 1 is still the most accurate → we might assume that being China's partner versus not being China's partner at all carries greater significance compared to being involved in a specific type of partnership.

```r
#PREPARING THE DATA

#1
#Model 1 dropped 4 observations from the 'subset(data_part, oecd==0)' (129),
#so there were 125 states left. After re-checking with the Table A2, and manually,
#we know that the 4 states dropped are: Cuba, Kyrgyzstan, Somalia, South Sudan.

#Subsetting 125 non-OECD members
data_part <- subset(data_part, !(country %in% c("Cuba", "Kyrgyzstan", "Somalia", "South Sudan")))
data_part125 <- subset(data_part, oecd==0)

#2
#Creating new column for the partnership level
data_part125$partlevel <- NA

#Combining partnership levels (dummy variables) into one column
data_part125$partlevel[data_part125$part == 1] <- "Partnership"
data_part125$partlevel[data_part125$part2 == 1] <- "Strategic Partnership"
data_part125$partlevel[data_part125$part3 == 1] <- "Comprehensive Strategic Partnership"
data_part125$partlevel[is.na(data_part125$partlevel)] <- "No Partnership"

#Recoding 'partlevel' into a categorical variable (as factor), unordered (for now),
#with reference category being "No Partnership"
data_part125$partlevel <- relevel(factor(data_part125$partlevel),
                                  ref = "No Partnership")

#Bar plot for 'partlevel'
color_palette <- brewer.pal(9, "Reds")[6:9] #Custom color palette in dark red colours
ggplot(data_part125, aes(x = factor(partlevel, levels = c("No Partnership", "Partnership", "Strategic Partnership", "Comprehensive Strategic Partnership")))) +
  geom_bar(fill = color_palette) +
  labs(title = "Distribution of Partnership Levels among 125 Non-OECD States",
       x = "",
       y = "Frequency") +
  theme_minimal() +
  theme(axis.text.x = element_text(size = 12, vjust = -0.5))
```




```r
#ORIGINAL MODEL 1 (DV: Partnership: 0 for no partnership,
#1 for partnership (any kind))
#Binomial logit regression. OECD countries excluded
model1 <- glm(partner~prod2+GDPpc2+growth2+FDI2+trade.de2+polity2+dom2+usally2
    , family=binomial, data = data_part125)
summary(model1)

#Exponentiating coefficients (to OR).
#Checking again by adding confidence intervals;
#CI should not contain 1 for a significant result (odds either below or above
    1)
exp_model1 <- exp(cbind(OR = coef(model1), confint(model1)))
print(round(exp_model1, 3))
stargazer(exp_model1, type="latex", t.auto=F); logLik(model1)
```

Table 1: Original Model 1 (exponentiated)

	Dependent variable:
	Partnership
Oil production	1.139**
	(0.058)
GDP per capita	0.715
	(0.270)
GDP growth	0.968
	(0.089)
FDI inflows	1.299***
	(0.081)
Trade importance	3.678
	(0.826)
Level of democracy	0.993
	(0.051)
Domestic conflict	1.223
	(0.138)
US ally	0.398
	(0.777)
Constant	0.012**
	(2.226)
Observations	125
Log Likelihood	−55.546
Residual Deviance	111.09
AIC	129.091
BIC	154.5459
Note:	*p<0.1; **p<0.05; ***p<0.01

```r
#Calculating predicted probabilities and converting it to a factor,
#where a probability <0.05 = 0 (no partnership), >0.5 = 1 (partnership)
predprob_model1 <- factor(ifelse(predict(model1, type = "response") > 0.5, 1,
    0), levels = c(0, 1))
#Converting the dependent variable into factor
data_part125$partner <- factor(data_part125$partner)
#Confusion matrix
cm_model1 <- confusionMatrix(predprob_model1, data_part125$partner)
cm_model1 #Accuracy score 0.784
```

```
Confusion Matrix and Statistics

          Reference
Prediction  0  1
         0 78 18
         1  9 20

               Accuracy : 0.784
                 95% CI : (0.7015, 0.8526)
    No Information Rate : 0.696
    P-Value [Acc > NIR] : 0.01828

                  Kappa : 0.4531

 Mcnemar's Test P-Value : 0.12366

            Sensitivity : 0.8966
            Specificity : 0.5263
         Pos Pred Value : 0.8125
         Neg Pred Value : 0.6897
             Prevalence : 0.6960
         Detection Rate : 0.6240
   Detection Prevalence : 0.7680
      Balanced Accuracy : 0.7114

       'Positive' Class : 0
```

```r
#UNORDERED MODEL. OECD countries excluded.
unordmodel <- multinom(partlevel~prod2+GDPpc2+growth2+FDI2+
                          trade.de2+trade.de2+polity2+dom2+usally2,
                       data_part125)
summary(unordmodel)

#Calculating p-values to estimate significance of the coefficients
coefs <- coef(unordmodel)
std_errors <- summary(unordmodel)$standard.errors
t_values <- coefs/std_errors
df <- nrow(data_part125) - length(coef(unordmodel))
```

```r
p_values <- 2 * pnorm(abs(t_values), lower.tail = FALSE)
p_values < 0.05
```

```
                                    (Intercept) prod2 GDPpc2 growth2  FDI2 trade.de2 polity2  dom2 usally2
Comprehensive Strategic Partnership       FALSE FALSE   TRUE   FALSE  TRUE     FALSE   FALSE FALSE   FALSE
Partnership                               FALSE FALSE  FALSE   FALSE FALSE     FALSE   FALSE FALSE   FALSE
Strategic Partnership                     FALSE  TRUE  FALSE   FALSE  TRUE     FALSE   FALSE FALSE   FALSE
```

```r
#Exponentiating coefficients (to OR).
#Checking again by adding confidence intervals;
#CI should not contain 1 for a significant result (odds either below or above
    1)
exp_unordmodel <- exp(coef(unordmodel))
print(round(exp_unordmodel, 3))
stargazer(exp_unordmodel, type="latex", t.auto=F); logLik(unordmodel)
```

Table 2: Unordered Model (exponentiated)

	Dependent variable:		
	Comprehensive Strategic Partnership	Partnership	Strategic Partnership
	(1)	(2)	(3)
Oil production	1.221**	1.013	1.197**
	(0.104)	(0.105)	(0.083)
GDP per capita	0.347**	1.004	0.756
	(0.520)	(0.490)	(0.363)
GDP growth	1.003	0.864	0.980
	(0.157)	(0.227)	(0.103)
FDI inflows	1.885**	1.133	1.266**
	(0.284)	(0.148)	(0.097)
Trade importance	10.218**	0.153	2.253
	(1.189)	(4.021)	(1.083)
Level of democracy	0.944	1.095	0.973
	(0.087)	(0.106)	(0.067)
Domestic conflict	0.957	1.308	1.337
	(0.239)	(0.236)	(0.177)
US ally	1.536	0.230	0.288
	(1.268)	(1.281)	(1.047)
Constant	0.000	0.008	0.003**
	(5.576)	(3.694)	(2.928)
Observations	125		
Log Likelihood	-83.263		
Residual Deviance	166.526		
AIC	220.526		
BIC	296.89		
Note:			*p<0.1; **p<0.05; ***p<0.01

```
#Calculating predicted probabilities
```

```r
predprob_unord <- predict(unordmodel, newdata = data_part125, type = "class")

#Confusion matrix
cm_unordmodel <- confusionMatrix(predprob_unord, data_part125$partlevel)
cm_unordmodel #Accuracy score 0.744
```

```
Confusion Matrix and Statistics

                                      Reference
Prediction                             No Partnership Comprehensive Strategic Partnership Partnership Strategic Partnership
  No Partnership                                   81                                   5           7                    12
  Comprehensive Strategic Partnership               3                                   8           0                     1
  Partnership                                       0                                   0           0                     0
  Strategic Partnership                             3                                   1           0                     4


Overall Statistics

               Accuracy : 0.744
                 95% CI : (0.6582, 0.8178)
    No Information Rate : 0.696
    P-Value [Acc > NIR] : 0.1419

                  Kappa : 0.3534

 Mcnemar's Test P-Value : NA

Statistics by Class:

                     Class: No Partnership Class: Comprehensive Strategic Partnership Class: Partnership
Sensitivity                         0.9310                                     0.5714             0.000
Specificity                         0.3684                                     0.9640             1.000
Pos Pred Value                      0.7714                                     0.6667               NaN
Neg Pred Value                      0.7000                                     0.9469             0.944
Prevalence                          0.6960                                     0.1120             0.056
Detection Rate                      0.6480                                     0.0640             0.000
Detection Prevalence                0.8400                                     0.0960             0.000
Balanced Accuracy                   0.6497                                     0.7677             0.500
                     Class: Strategic Partnership
Sensitivity                                0.2353
Specificity                                0.9630
Pos Pred Value                             0.5000
Neg Pred Value                             0.8889
Prevalence                                 0.1360
Detection Rate                             0.0320
Detection Prevalence                       0.0640
Balanced Accuracy                          0.5991
```

```r
#ORDERED MODEL. OECD countries excluded.
#Recoding 'partlevel' into a categorical ORDERED variable (as factor)
data_part125$partlevel <- factor(data_part125$partlevel,
                                 ordered = TRUE,
                                 levels = c("No Partnership",
                                            "Partnership",
                                            "Strategic Partnership",
```

```
                                                   "Comprehensive Strategic
    Partnership"))
#Fitting an ordered model
ordmodel<- polr(partlevel~prod2+GDPpc2+growth2+FDI2+
                  trade.de2+trade.de2+polity2+dom2+usally2,
                  data_part125)
summary(ordmodel)

#Calculating p-values to estimate significance of the coefficients
t_values <- coef(summary(ordmodel))[, "t value"]
df <- nrow(data_part125) - length(coef(ordmodel))
p_values <- 2 * pt(abs(t_values), df = df, lower.tail = FALSE)
p_values < 0.05
```

```
                                            prod2                                   GDPpc2
                                             TRUE                                    FALSE
                                          growth2                                     FDI2
                                            FALSE                                     TRUE
                                        trade.de2                                  polity2
                                             TRUE                                    FALSE
                                             dom2                                  usally2
                                            FALSE                                    FALSE
                       No Partnership|Partnership       Partnership|Strategic Partnership
                                             TRUE                                     TRUE
Strategic Partnership|Comprehensive Strategic Partnership
                                             TRUE
```

```
##Exponentiating coefficients (to OR).
#Checking again by adding confidence intervals;
#CI should not contain 1 for a significant result (odds either below or above
    1)
exp_ordmodel <- exp(cbind(OR = coef(ordmodel), confint(ordmodel)))
print(round(exp_ordmodel, 3))
stargazer(exp_ordmodel, type="latex", t.auto=F); logLik(ordmodel)
```

Table 3: Ordered Model (exponentiated)

	Dependent variable:
	Partnership Level
Oil production	1.124**
	(0.057)
GDP per capita	0.694
	(0.256)
GDP growth	0.958
	(0.086)
FDI inflows	1.324***
	(0.078)
Trade importance	6.095**
	(0.745)
Level of democracy	0.953
	(0.050)
Domestic conflict	1.155
	(0.131)
US ally	0.841
	(0.678)
Intercepts	
No Partnership—Partnership	77.138**
Partnership—Strategic Partnership	118.238**
Strategic Partnership—Comprehensive Strategic Partnership	513.783**
Observations	125
Log Likelihood	−90.19376
Residual Deviance	180.3875
AIC	202.3875
BIC	233.499
Note:	*p<0.1; **p<0.05; ***p<0.01

```r
#Calculating predicted probabilities
predprob_ord <- predict(ordmodel, newdata = data_part125, type = "class")

#Confusion matrix
cm_ordmodel <- confusionMatrix(data = predprob_ord, reference = data_part125$
    partlevel)
cm_ordmodel #Accuracy score 0.752
```

```
Confusion Matrix and Statistics

                                    Reference
Prediction                            No Partnership Partnership Strategic Partnership
  No Partnership                                  82           7                    11
  Partnership                                      0           0                     0
  Strategic Partnership                            2           0                     4
  Comprehensive Strategic Partnership              3           0                     2
                                    Reference
Prediction                            Comprehensive Strategic Partnership
  No Partnership                                                        4
  Partnership                                                           0
  Strategic Partnership                                                 2
  Comprehensive Strategic Partnership                                   8
```

```
Overall Statistics

               Accuracy : 0.752
                 95% CI : (0.6668, 0.8249)
    No Information Rate : 0.696
    P-Value [Acc > NIR] : 0.1016

                  Kappa : 0.3809

 Mcnemar's Test P-Value : NA

Statistics by Class:

                     Class: No Partnership Class: Partnership Class: Strategic Partnership
Sensitivity                         0.9425              0.000                       0.2353
Specificity                         0.4211              1.000                       0.9630
Pos Pred Value                      0.7885                NaN                       0.5000
Neg Pred Value                      0.7619              0.944                       0.8889
Prevalence                          0.6960              0.056                       0.1360
Detection Rate                      0.6560              0.000                       0.0320
Detection Prevalence                0.8320              0.000                       0.0640
Balanced Accuracy                   0.6818              0.500                       0.5991
                     Class: Comprehensive Strategic Partnership
Sensitivity                                              0.5714
Specificity                                              0.9550
Pos Pred Value                                           0.6154
Neg Pred Value                                           0.9464
Prevalence                                               0.1120
Detection Rate                                           0.0640
Detection Prevalence                                     0.1040
Balanced Accuracy                                        0.7632
```

```r
#MODELS STATISTICS
#Residual Deviance
deviance(unordmodel)
deviance(ordmodel)
deviance(model1)
```

```
[1] 166.5255
[1] 180.3875
[1] 111.0911
```

```r
#Akaike Information Criterion (the lower value, the better)
AIC(model1)
AIC(unordmodel)
AIC(ordmodel)
```

```
[1] 129.0911
[1] 220.5255
[1] 202.3875
```

```
#Bayesian Information Criterion (the lower value, the better)
BIC(model1)
BIC(unordmodel)
BIC(ordmodel)
```

```
[1] 154.5459
[1] 296.89
[1] 233.499
```

```
#Brant test for the ordered model (testing the "proportional odds assumption")
brant(ordmodel)
```

```
--------------------------------------------
Test for        X2      df      probability
--------------------------------------------
Omnibus         15.7    16      0.47
prod2           1.74    2       0.42
GDPpc2          2.55    2       0.28
growth2         -2.46   2       1
FDI2            1.66    2       0.44
trade.de2       3.99    2       0.14
polity2         1.39    2       0.5
dom2            3.42    2       0.18
usally2         3.64    2       0.16
--------------------------------------------

H0: Parallel Regression Assumption holds
```

2 References

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