

Replication of: 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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Due: March 31, 2024

1 Replication Results

Loading the data:

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

Table 1:

```
1 #PARTNERSHIPS
2 table_partnerships <- table(subset(data_part, oecd==0)$partner, I(subset(data_
  part, oecd==0)$prod2>0)) #Table 1: partnerships
3 table_partnerships
4 #Notes. 1: China's partner; 0: Non-partner; True: Oil producer; False: Non-oil
  producer
5 rownames(table_partnerships) <- c("Non-partner", "Partner")
6 colnames(table_partnerships) <- c("Non-oil producer", "Oil producer")
7 col_sums <- colSums(table_partnerships)
8 table_partnerships <- cbind(table_partnerships, ColumnSums = col_sums)
9 table_partnerships_p <- round(prop.table(table_partnerships, margin = 2) *
  100)
10 rownames(table_partnerships_p) <- c("Non-partner (%)", "Partner (%)")
11 colnames(table_partnerships_p) <- c("Non-oil producer (%)", "Oil producer (%)",
  "ColumnSums (%)")
12 table_partnerships <- cbind(table_partnerships, table_partnerships_p)
13 table_partnerships
```

```

14
15 #AID
16 table_aid <- table(I(data_aid$aid2)>0, I(data_aid$prod2>0)) #Table 1: aid to
    Africa
17 #Notes. True (row): China's aid recipient; False (row): Non-aid recipient;
    True (column): Oil producer; False (column): Non-oil producer
18 rownames(table_aid) <- c("Non-aid recipient", "Aid recipient")
19 colnames(table_aid) <- c("Non-oil producer", "Oil producer")
20 col_sums <- colSums(table_aid)
21 table_aid <- cbind(table_aid, ColumnSums = col_sums)
22 table_aid_p <- round(prop.table(table_aid, margin = 2) * 100)
23 rownames(table_aid_p) <- c("Non-aid recipient (%)", "Aid recipient (%)")
24 colnames(table_aid_p) <- c("Non-oil producer (%)", "Oil producer (%)", "
    ColumnSums (%)")
25 table_aid <- cbind(table_aid, table_aid_p)
26 table_aid
27
28 #STATE VISITS
29 table_state_visits <- table(I(subset(data_visit, oecd==0)$visit)>0, I(subset(
    data_visit, oecd==0)$prod2>0)) #Table 1: state visits
30 #Notes. True (row): Country visited; False (row): Country not visited; True (
    column): Oil producer; False (column): Non-oil producer
31 rownames(table_state_visits) <- c("Country not visited", "Country visited")
32 colnames(table_state_visits) <- c("Non-oil producer", "Oil producer")
33 col_sums <- colSums(table_state_visits)
34 table_state_visits <- cbind(table_state_visits, ColumnSums = col_sums)
35 table_state_visits_p <- round(prop.table(table_state_visits, margin = 2) *
    100)
36 rownames(table_state_visits_p) <- c("Country not visited (%)", "Country
    visited (%)")
37 colnames(table_state_visits_p) <- c("Non-oil producer (%)", "Oil producer (%)",
    "ColumnSums (%)")
38 table_state_visits <- cbind(table_state_visits, table_state_visits_p)
39 table_state_visits
40
41 table_partnerships
42 table_aid
43 table_state_visits

```

```

> table_partnerships
      Non-oil producer Oil producer ColumnSums Non-oil producer (%) Oil producer (%)
Non-partner          48          41          56          86          57
Partner              8          31          72          14          43
      ColumnSums (%)
Non-partner          44
Partner              56
> table_aid
      Non-oil producer Oil producer ColumnSums Non-oil producer (%)
Non-aid recipient      3           0          30          10
Aid recipient          27          20          20          90
      Oil producer (%) ColumnSums (%)
Non-aid recipient      0           60
Aid recipient          100          40
> table_state_visits
      Non-oil producer Oil producer ColumnSums Non-oil producer (%)
Country not visited    37          24          57          65
Country visited        20          48          72          35
      Oil producer (%) ColumnSums (%)
Country not visited    33          44
Country visited        67          56

```

The original Table 1 from the article for reference:

Table 1. Cross-tabulation of dependent and independent variables

	Oil producers	Non-oil producers	Total
China's partners	31 (43%)	8 (14%)	39
Nonpartners	41 (57%)	48 (86%)	89
Aid recipients*	20 (100%)	27 (90%)	47
Non-aid recipients*	0 (0%)	3 (10%)	3
Countries visited	48 (67%)	20 (35%)	68
Countries not visited	24 (33%)	37 (65%)	61

Notes: OECD countries are excluded in the table. *Only African countries are reported. Percentages by columns are shown in the parentheses.

Table 2:

```

1 ## Table 2 ##
2 model1 <- glm(partner ~ prod2+GDPpc2+growth2+FDI2+trade.de2+polity2+dom2+usally2
  , family=binomial, subset(data_part, oecd==0)) # Model 1
3 stargazer(model1, type="text", t.auto=F); logLik(model1); BIC(model1)
4
5 model2 <- glm(partner2 ~ prod2+GDPpc2+growth2+FDI2+trade.de2+trade.de2+polity2+
  dom2+usally2, family=binomial, subset(data_part, oecd==0)) # Model 2
6 stargazer(model2, type="text", t.auto=F); logLik(model2); BIC(model2)
7
8 model3 <- lmer(lnaid ~ lnaid.1+lnprod1+lnGDPpc.1+growth.1+I(lnFDI.1/10)+trade.de
  .1+polity.1+ln-dom.1+usally.1+(1|country)+(1|year), subset(data_TSCS, oecd
  ==0 & country!="China" & africa==1)) # Model 3
9 stargazer(model3, type="text", t.auto=F); logLik(model3); AIC(model3); BIC(
  model3)

```

10

```

11 model4 <- lm(lnaid2~prod2+GDPpc2+growth2+FDI2+trade.de2+polity2+dom2+usally2 ,
    data_aid) # Model 4
12 stargazer(model4, type="text", t.auto=F); logLik(model4); AIC(model4); BIC(
    model4)
13
14 model5 <- glm.nb(visit~prod2+GDPpc2+growth2+FDI2+trade.de2+polity2+dom2+
    usally2, subset(data_visit, oecd==0)) # Model 5
15 stargazer(model5, type="text", t.auto=F); logLik(model5); BIC(model5)
16
17 #Store the models in a list
18 table_2 <- list(
19   model1, model2, model3, model4, model5)
20
21 #Create the table using stargazer
22 table_2 <- stargazer(
23   table_2,
24   type = "html",
25   t.auto = FALSE,
26   title = "Table 2",
27   align = TRUE,
28   header = FALSE
29 )
30
31 writeLines(table_2, "table2.html")

```

Table 2

	<i>Dependent variable:</i>				
	partner <i>logistic</i>	partner2 <i>logistic</i>	lnaid <i>linear</i> <i>mixed-effects</i>	lnaid2 <i>OLS</i>	visit <i>negative</i> <i>binomial</i>
	(1)	(2)	(3)	(4)	(5)
prod2	0.131** (0.058)	0.184*** (0.069)		0.316** (0.151)	0.074*** (0.025)
GDPpc2	-0.335 (0.270)	-0.525 (0.322)		-0.673 (0.683)	-0.232** (0.110)
growth2	-0.033 (0.089)	-0.003 (0.088)		0.068 (0.170)	0.009 (0.034)
FDI2	0.261*** (0.081)	0.305*** (0.096)		0.090 (0.134)	0.121*** (0.031)
trade.de2	1.302 (0.826)	1.825** (0.879)		2.582 (5.063)	1.194*** (0.249)
polity2	-0.007 (0.051)	-0.046 (0.059)		0.298*** (0.108)	-0.025 (0.021)
dom2	0.201 (0.138)	0.166 (0.159)		0.222 (0.327)	-0.030 (0.061)
usally2	-0.921 (0.777)	-0.505 (0.891)		-1.132 (3.435)	-0.099 (0.315)
lnaid.1			0.203*** (0.040)		
lnprod1			0.050 (0.080)		
lnGDPpc.1			-0.108 (0.356)		
growth.1			0.041 (0.035)		
I(lnFDI.1/10)			0.129 (0.235)		
trade.de.1			3.186 (2.096)		
polity.1			0.145** (0.066)		
lndom.1			0.111* (0.064)		
usally.1			0.734 (2.704)		
Constant	-4.416** (2.226)	-4.817* (2.611)	5.289** (2.380)	13.537*** (4.767)	-0.810 (0.939)
Observations	125	125	603	49	125
R ²				0.314	
Adjusted R ²				0.176	
Log Likelihood	-55.546	-44.352	-1,778.551		-191.219
theta					2.152*** (0.818)
Akaike Inf. Crit.	129.091	106.704	3,583.102		400.438
Bayesian Inf. Crit.			3,640.327		
Residual Std. Error				3.312 (df = 40)	
F Statistic				2.284** (df = 8; 40)	

Note: *p<0.1; **p<0.05; ***p<0.01

Table 3:

```
1 ## Table 3 ##
2 model6 <- glm(partner~reserve2+GDPpc2+growth2+FDI2+trade.de2+polity2+dom2+
  usally2, family=binomial, subset(data_part, oecd==0)) # Model 6
3 stargazer(model6, type="text", t.auto=F); logLik(model6); BIC(model6)
4
5 model7 <- glm(partner2~reserve2+GDPpc2+growth2+FDI2+trade.de2+trade.de2+
  polity2+dom2+usally2, family=binomial, subset(data_part, oecd==0)) #
  Model 7
6 stargazer(model7, type="text", t.auto=F); logLik(model7); BIC(model7)
7
8 model8 <- lmer(lnaid~lnaid.1+lnreserve1+lnGDPpc.1+growth.1+I(lnFDI.1/10)+trade
  .de.1+polity.1+ln-dom.1+usally.1+(1|country)+(1|year), subset(data_TSCS,
  oecd==0 & country!="China" & africa==1)) # Model 8
9 stargazer(model8, type="text", t.auto=F); logLik(model8); AIC(model8); BIC(
  model8)
10
11 model9 <- lm(lnaid2~reserve2+GDPpc2+growth2+FDI2+trade.de2+polity2+dom2+
  usally2, data_aid) # Model 9
12 stargazer(model9, type="text", t.auto=F); logLik(model9); AIC(model9); BIC(
  model9)
13
14 model10 <- glm.nb(visit~reserve2+GDPpc2+growth2+FDI2+trade.de2+polity2+dom2+
  usally2, subset(data_visit, oecd==0)) # Model 10
15 stargazer(model10, type="text", t.auto=F); logLik(model10); BIC(model10)
16
17 model11 <- glm.nb(day~prod2+GDPpc2+growth2+FDI2+trade.de2+polity2+dom2+usally2
  , subset(data_visit, oecd==0)) # Model 11
18 stargazer(model11, type="text", t.auto=F); logLik(model11); BIC(model11)
19
20 model12 <- glm.nb(day~reserve2+GDPpc2+growth2+FDI2+trade.de2+polity2+dom2+
  usally2, subset(data_visit, oecd==0)) # Model 12
21 stargazer(model12, type="text", t.auto=F); logLik(model12); BIC(model12)
22
23 table_3 <- list(
24   model6, model7, model8, model9, model10, model11, model12)
25
26 table_3 <- stargazer(
27   table_3,
28   type = "html",
29   t.auto = FALSE,
30   title = "Table 3",
31   align = TRUE,
32   header = FALSE
33 )
34
35 writeLines(table_3, "table3.html")
```

Table 3

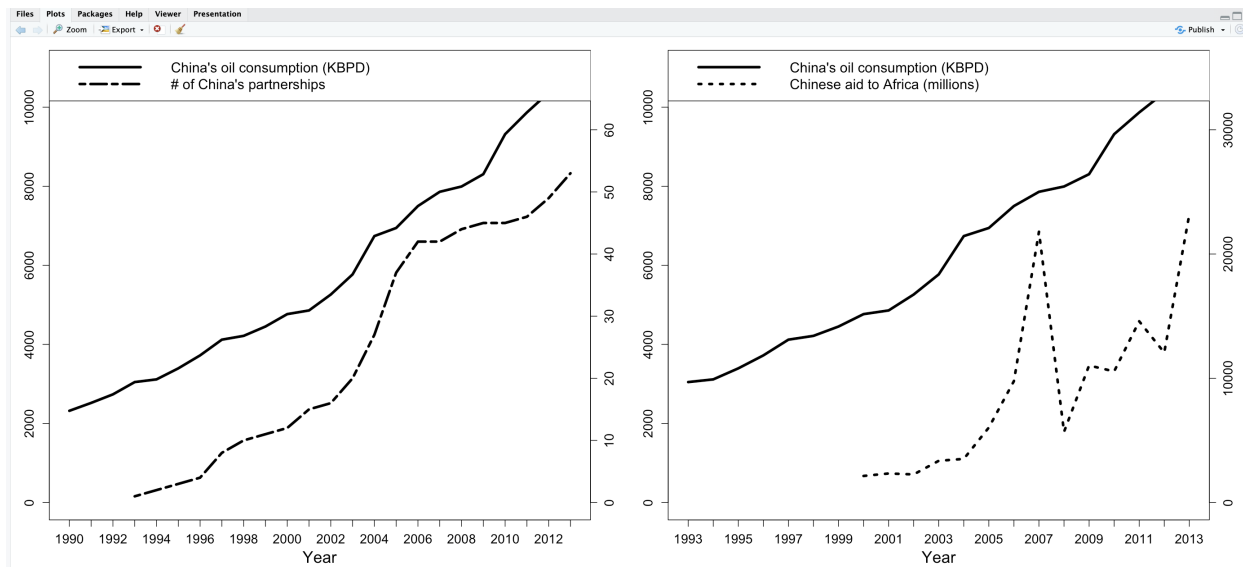
	<i>Dependent variable:</i>						
	partner <i>logistic</i>	partner2 <i>logistic</i>	lnaid <i>linear</i> <i>mixed-effects</i>	lnaid2 <i>OLS</i>	visit <i>negative</i> <i>binomial</i>	day <i>negative</i> <i>binomial</i>	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
reserve2	0.106** (0.050)	0.137** (0.059)		0.273** (0.119)	0.055** (0.022)		0.051* (0.028)
prod2						0.073** (0.033)	
GDPpc2	-0.321 (0.268)	-0.462 (0.310)		-0.615 (0.646)	-0.209* (0.112)	-0.196 (0.145)	-0.164 (0.146)
growth2	-0.027 (0.092)	0.004 (0.092)		0.067 (0.168)	0.014 (0.035)	0.012 (0.046)	0.019 (0.046)
FDI2	0.261*** (0.080)	0.306*** (0.095)		0.131 (0.136)	0.122*** (0.031)	0.149*** (0.038)	0.149*** (0.039)
trade.de2	1.327 (0.823)	1.830** (0.873)		3.122 (4.890)	1.235*** (0.252)	1.558*** (0.392)	1.645*** (0.396)
polity2	-0.005 (0.052)	-0.050 (0.060)		0.301*** (0.106)	-0.024 (0.022)	-0.020 (0.028)	-0.019 (0.029)
dom2	0.198 (0.139)	0.179 (0.157)		0.206 (0.322)	-0.024 (0.062)	-0.019 (0.080)	-0.014 (0.081)
usally2	-0.914 (0.772)	-0.475 (0.871)		-0.999 (3.402)	-0.127 (0.318)	-0.320 (0.406)	-0.352 (0.409)
lnaid.1			0.196*** (0.040)				
lnreserve1			0.016 (0.072)				
lnGDPpc.1			-0.143 (0.353)				
growth.1			0.050 (0.036)				
I(lnFDI.1/10)			0.149 (0.240)				
trade.de.1			3.574* (2.112)				
polity.1			0.125* (0.067)				
ln-dom.1			0.104 (0.065)				
usally.1			0.579 (2.683)				
Constant	-4.529** (2.215)	-5.229** (2.571)	5.678** (2.359)	12.359*** (4.441)	-0.975 (0.944)	-0.727 (1.193)	-0.939 (1.196)
Observations	125	125	588	49	125	125	125
R ²				0.327			
Adjusted R ²				0.192			
Log Likelihood	-55.845	-45.328	-1,736.433		-192.343	-281.428	-282.201
theta					2.028*** (0.753)	0.564*** (0.114)	0.549*** (0.110)
Akaike Inf. Crit.	129.689	108.656	3,498.866		402.687	580.856	582.402
Bayesian Inf. Crit.			3,555.764				
Residual Std. Error				3.280 (df = 40)			
F Statistic				2.427** (df = 8; 40)			

Note:

* p<0.1; ** p<0.05; *** p<0.01

Figure 1:

```
1 ## Figure 1 ##
2 china <- c(2320, 2520, 2736, 3047, 3115, 3394, 3722, 4120, 4216, 4452, 4766,
3           4859, 5262, 5771, 6740, 6945, 7500, 7860, 7994, 8306, 9317, 9867, 10367,
4           10756) # Oil consumption in China
5 partner <- c(1, 2, 3, 4, 8, 10, 11, 12, 15, 16, 20, 27, 37, 42, 42, 44, 45,
6             45, 46, 49, 53)
7 aid <- c(0.000, 0.000, 0.000, 0.000, 0.000, 0.000, 0.000, 2139.329, 2337.245,
8          2263.108, 3358.809, 3511.384, 6038.058, 9772.522, 21791.729, 5688.162,
9          11030.539, 10553.253, 14588.756, 12069.544, 23181.475)
10 year <- c(1993:2013)
11
12 par(mar=c(4,3,1,3), mfrow=c(1, 2))
13 plot(c(1990:2013), china, type="l", lwd=4, ylim=c(0, 11000), axes=F, xlab="",
14       ylab="")
15 axis(1, at=c(1990:2013), label=c(1990:2013), cex.axis=1.2)
16 axis(2, at=c(0, 2000, 4000, 6000, 8000, 10000), label=c(0, 2000, 4000, 6000,
17               8000, 10000), cex.axis=1.2)
18 par(new=T)
19 plot(year, partner, type="l", lwd=4, lty=6, axes=F, xlim=c(1990, 2013), ylim=c(
20       0, 70), xlab="", ylab="")
21 axis(4, at=c(0, 10, 20, 30, 40, 50, 60), label=c(0, 10, 20, 30, 40, 50, 60),
22       cex.axis=1.2)
23 box()
24 legend("topleft", c("China's oil consumption (KBPD)", "# of China's
25                     partnerships"), cex=1.3, lwd=4, lty=c(1, 6))
26 mtext(side=1, "Year", line=2.5, cex=1.5)
27
28 plot(year, china[4:24], type="l", lwd=4, ylim=c(0, 11000), axes=F, xlab="",
29       ylab="")
30 axis(1, at=year, label= year, cex.axis=1.2)
31 axis(2, at=c(0, 2000, 4000, 6000, 8000, 10000), label=c(0, 2000, 4000, 6000,
32               8000, 10000), cex.axis=1.2)
33 par(new=T)
34 plot(year[8:21], aid[8:21], type="l", lwd=4, lty=9, axes=F, xlab="", xlim=c(
35       year[1], 2013), ylim=c(0, 35000), ylab="")
36 axis(4, at=c(0, 10000, 20000, 30000), label=c(0, 10000, 20000, 30000), cex.
37       axis=1.2)
38 box()
39 legend("topleft", c("China's oil consumption (KBPD)", "Chinese aid to Africa (
40                     millions)"), cex=1.3, lwd=4, lty=c(1, 9))
41 mtext(side=1, "Year", line=2.5, cex=1.5)
```

(I chose to include screenshots from R deliberately to show that this is my replication, not a copy-paste of the identical graphical figures from the paper itself...)

Figure 2:

```

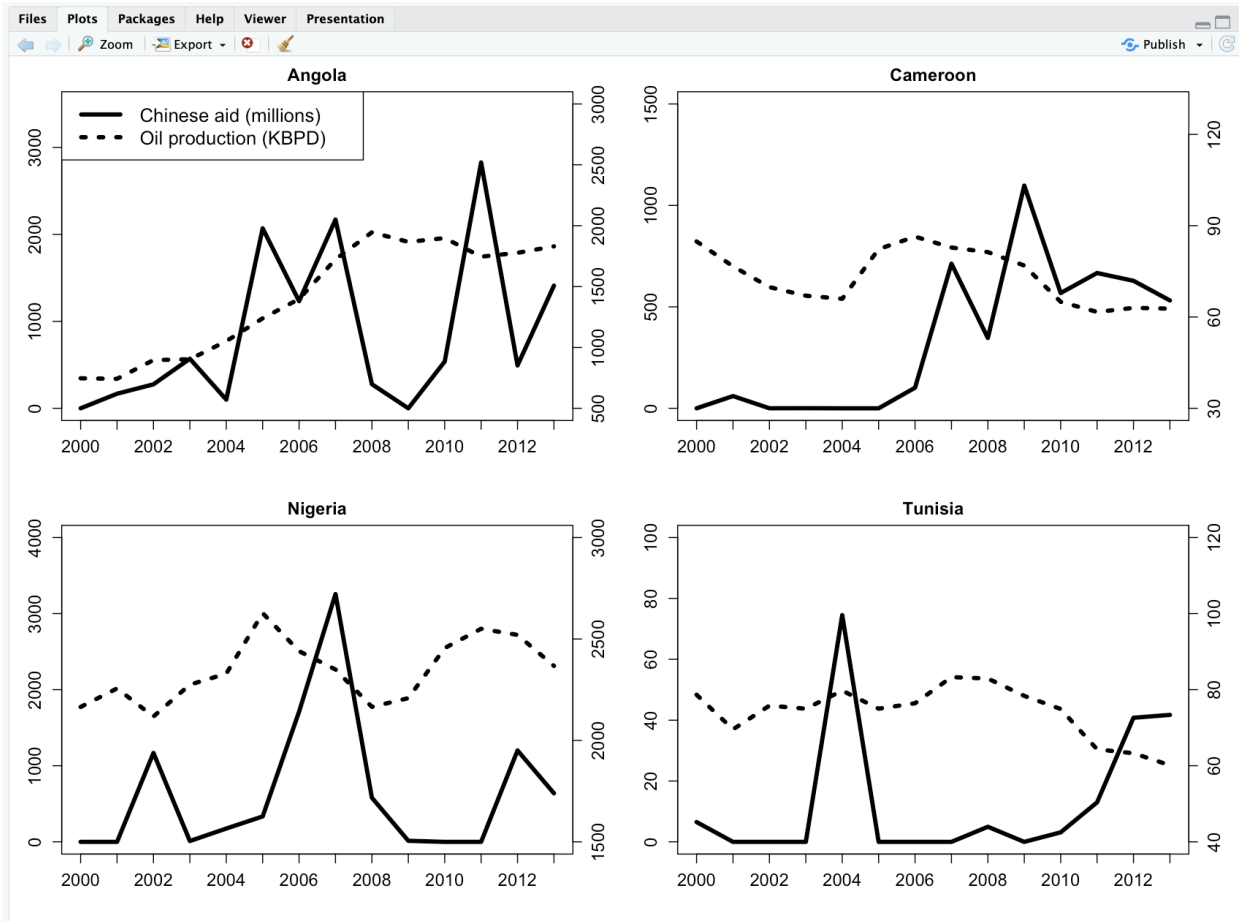
1 ## Figure 2 ##
2 africa <- subset(data_TSCS, africa==1 & year>1999)
3 africa <- cbind(africa["country"], africa["year"], africa["china_aid"], africa
  ["production2"])
4 africa$china_aid <- ifelse(is.na(africa$china_aid)==T, 0, africa$china_aid)
5 africa <- africa[order(africa$country, africa$year), ]
6
7 Tunisia <- subset(africa, country=="Tunisia")
8 Nigeria <- subset(africa, country=="Nigeria")
9 Angola <- subset(africa, country=="Angola")
10 Cameroon <- subset(africa, country=="Cameroon")
11
12 par(mar=c(4,3,2,3), mfrow=c(2, 2))
13 plot(Angola$china_aid/1000000 ~ Angola$year, type="l", lwd=4, xlab="", ylab=""
  , ylim=c(0, 3500), axes=F, main="Angola")
14 axis(1, at= Angola$year, label= Angola$year, cex.axis=1.2)
15 axis(2, at=c(0, 1000, 2000, 3000, 4000), label=c(0, 1000, 2000, 3000, 4000),
  cex.axis=1.2)
16 #mtext(side=2, "Chinese aid", line=2.5, cex=1.5)
17 par(new=T)
18 plot(Angola$production2 ~ Angola$year, type="l", lwd=4, lty=9, xlab="", ylab=""
  , ylim=c(500, 3000), axes=F)
19 axis(4, at=c(500, 1000, 1500, 2000, 2500, 3000), label=c(500, 1000, 1500,
  2000, 2500, 3000), cex.axis=1.2)
20 box()
21 legend("topleft", c("Chinese aid (millions)", "Oil production (KBPD)"), cex
  =1.3, lwd=4, lty=c(1, 9))
22

```

```

23 plot(Cameroon$china_aid/1000000 ~ Cameroon$year, type="l", lwd=4, xlab="",
      ylab="", ylim=c(0, 1500), axes=F, main="Cameroon")
24 axis(1, at= Cameroon$year, label= Cameroon$year, cex.axis=1.2)
25 axis(2, at=c(0, 500, 1000, 1500), label=c(0, 500, 1000, 1500), cex.axis=1.2)
26 #mtext(side=2, "Chinese aid", line=2.5, cex=1.5)
27 par(new=T)
28 plot(Cameroon$production2 ~ Cameroon$year, type="l", lwd=4, lty=9, xlab="",
      ylab="", ylim=c(30, 130), axes=F)
29 axis(4, at=c(30, 60, 90, 120), label=c(30, 60, 90, 120), cex.axis=1.2)
30 box()
31
32 plot(Nigeria$china_aid/1000000 ~ Nigeria$year, type="l", lwd=4, xlab="", ylab=
      "", ylim=c(0, 4000), axes=F, main="Nigeria")
33 axis(1, at= Nigeria$year, label= Nigeria$year, cex.axis=1.2)
34 axis(2, at=c(0, 1000, 2000, 3000, 4000), label=c(0, 1000, 2000, 3000, 4000),
      cex.axis=1.2)
35 #mtext(side=2, "Chinese aid", line=2.5, cex=1.5)
36 par(new=T)
37 plot(Nigeria$production2 ~ Nigeria$year, type="l", lwd=4, lty=9, xlab="", ylab=
      "", ylim=c(1500, 3000), axes=F)
38 axis(4, at=c(1500, 2000, 2500, 3000), label=c(1500, 2000, 2500, 3000), cex.
      axis=1.2)
39 box()
40
41 plot(Tunisia$china_aid/1000000 ~ Tunisia$year, type="l", lwd=4, xlab="", ylab=
      "", ylim=c(0, 100), axes=F, main="Tunisia")
42 axis(1, at=Tunisia$year, label= Tunisia$year, cex.axis=1.2)
43 axis(2, at=c(0, 20, 40, 60, 80, 100), label=c(0, 20, 40, 60, 80, 100), cex.
      axis=1.2)
44 #mtext(side=2, "Chinese aid", line=2.5, cex=1.5)
45 par(new=T)
46 plot(Tunisia$production2 ~ Tunisia$year, type="l", lwd=4, lty=9, xlab="", ylab=
      "", ylim=c(40, 120), axes=F)
47 axis(4, at=c(40, 60, 80, 100, 120, 140), label=c(40, 60, 80, 100, 120, 140),
      cex.axis=1.2)
48 box()

```



2 References

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>

Lee, C. (2023). "Replication data for 'China's Energy Diplomacy: Does Chinese Foreign Policy Favor Oil Producing Countries?'" [Data set]. Harvard Dataverse. <https://doi.org/10.7910/DVN/7E305P>, V1, UNF:6:x+exuF4WVfknqWQhUWz4MQ== [fileUNF].