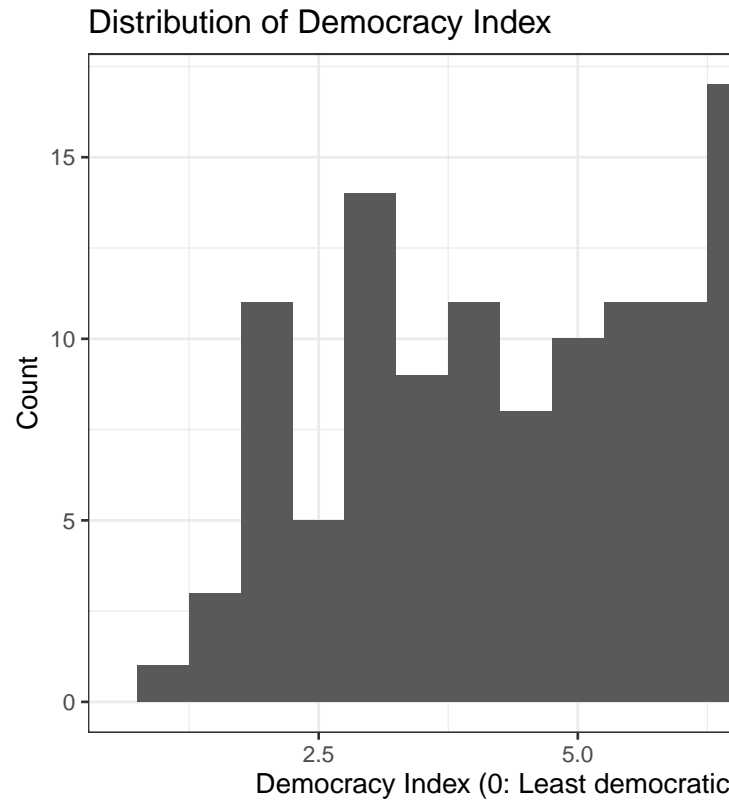
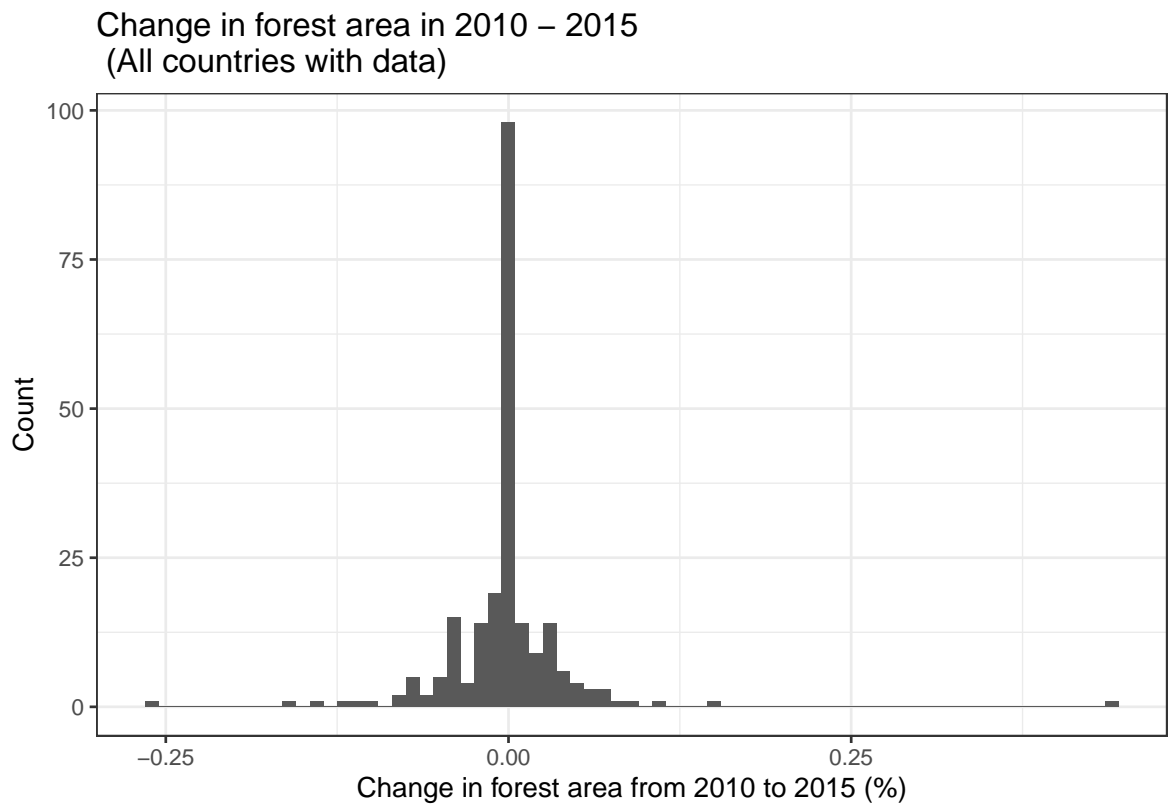


Effect of Democratization on Deforestation

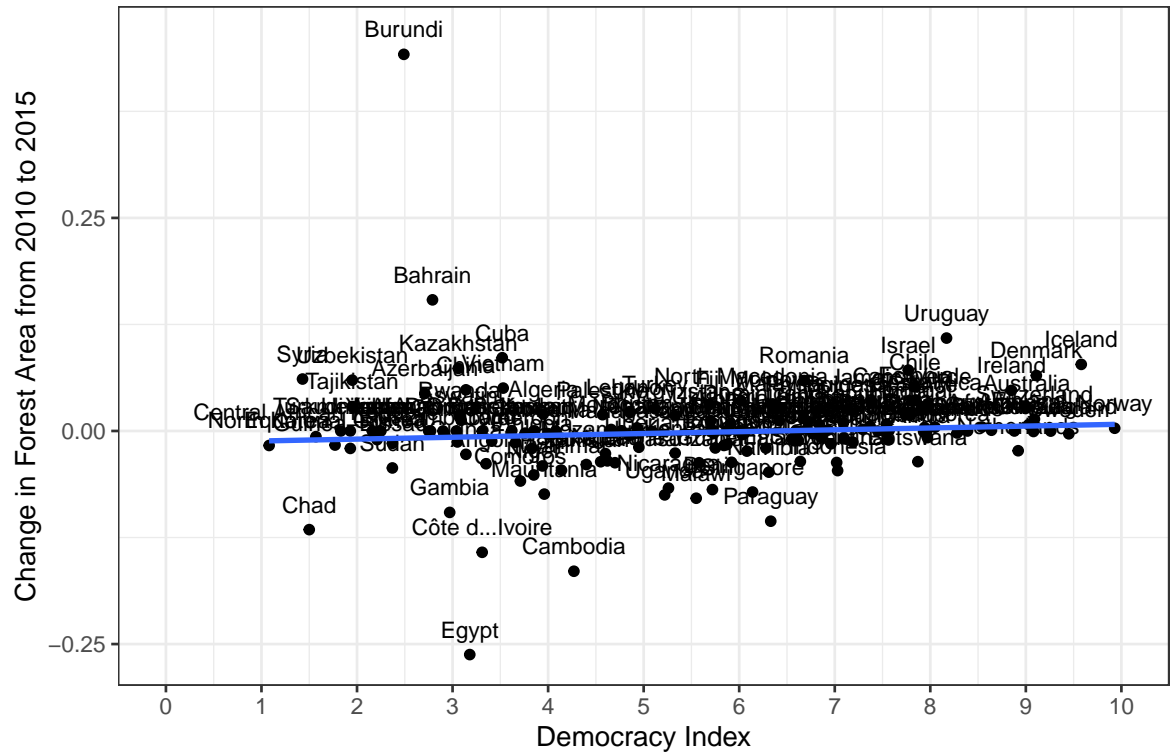
Students: Albert Yao and Takeo Tokunari



1. Effect of democratization on deforestation (all countries)

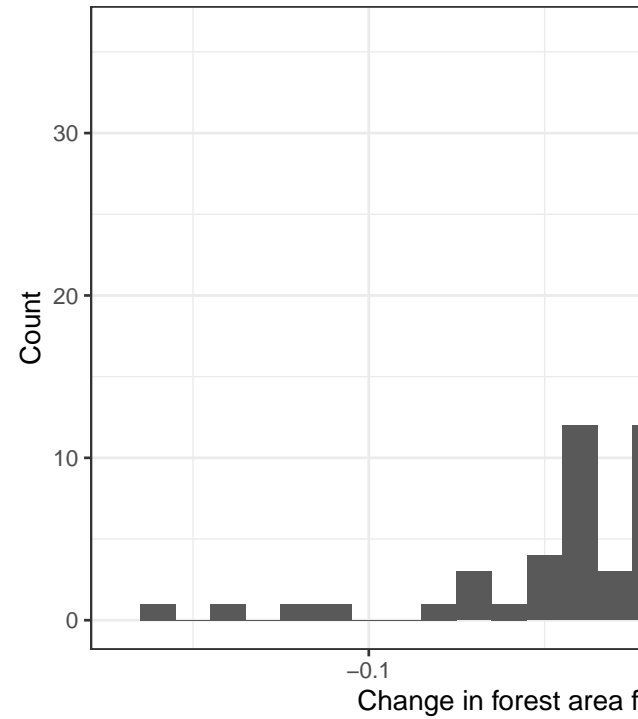


Democratization's Effect on Deforestation, 2015



	Model 1
Intercept	-0.014 (0.012)
Democracy Index in 2015	0.002 (0.002)
Num.Obs.	159
R2	0.007
R2 Adj.	0.001
* p < 0.1, ** p < 0.05, *** p < 0.01	

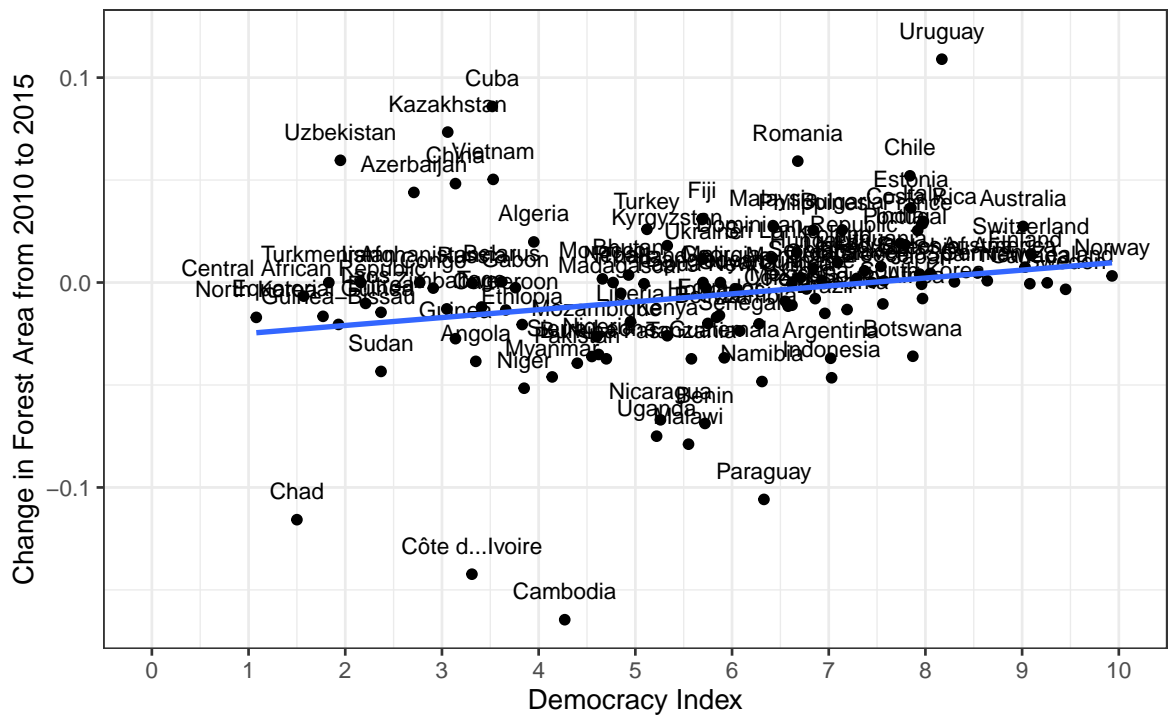
Change in forest area in 2010 – 2015
(Countries with forest land over 1 mill



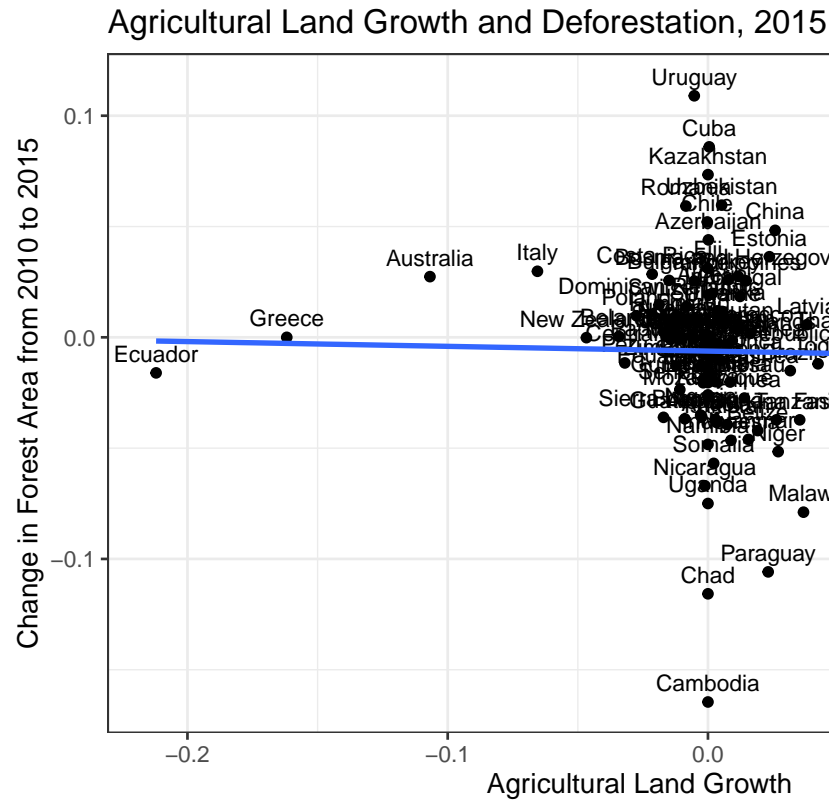
2. Effect of democratization on deforestation (countries with forest)

Democratization's Effect on Deforestation, 2015

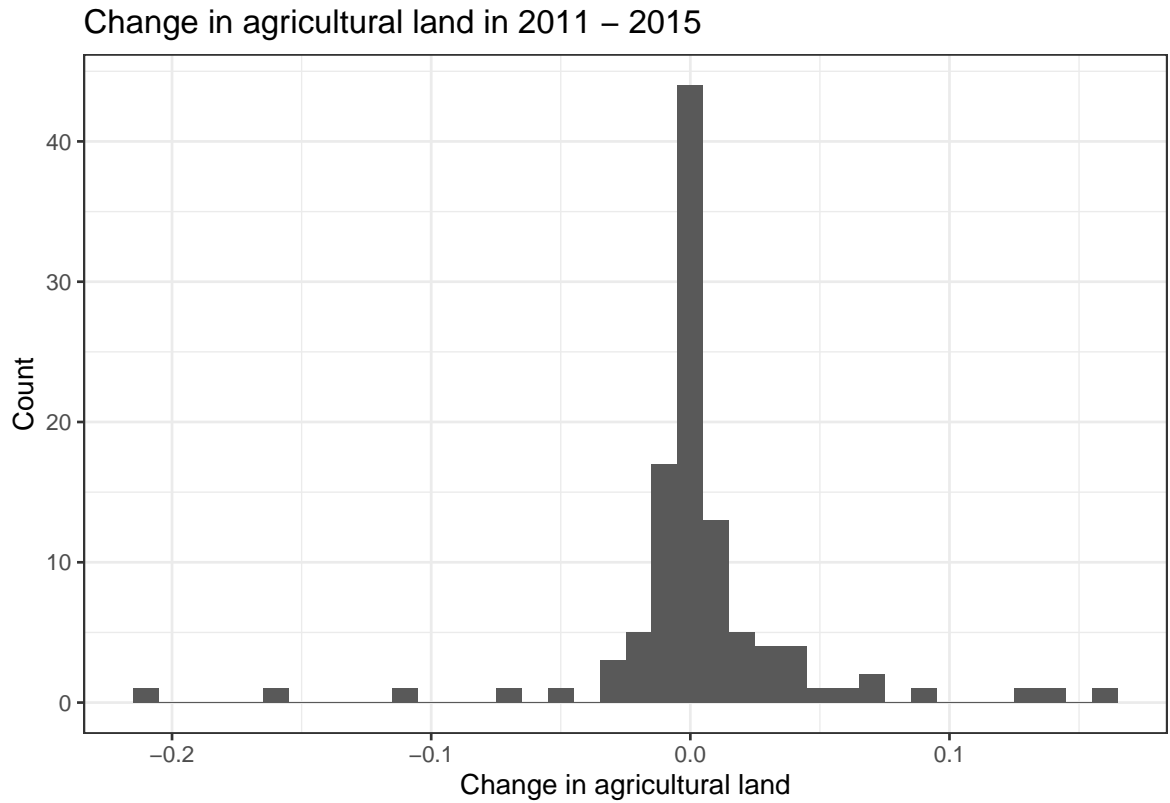
Countries with forest land over one million hectares



	Model 1
Intercept	-0.029*** (0.010)
Democracy Index in 2015	0.004** (0.002)
Num.Obs.	115
R2	0.044
R2 Adj.	0.036
* p < 0.1, ** p < 0.05, *** p < 0.01	



3. Agricultural land growth (countries with forest)

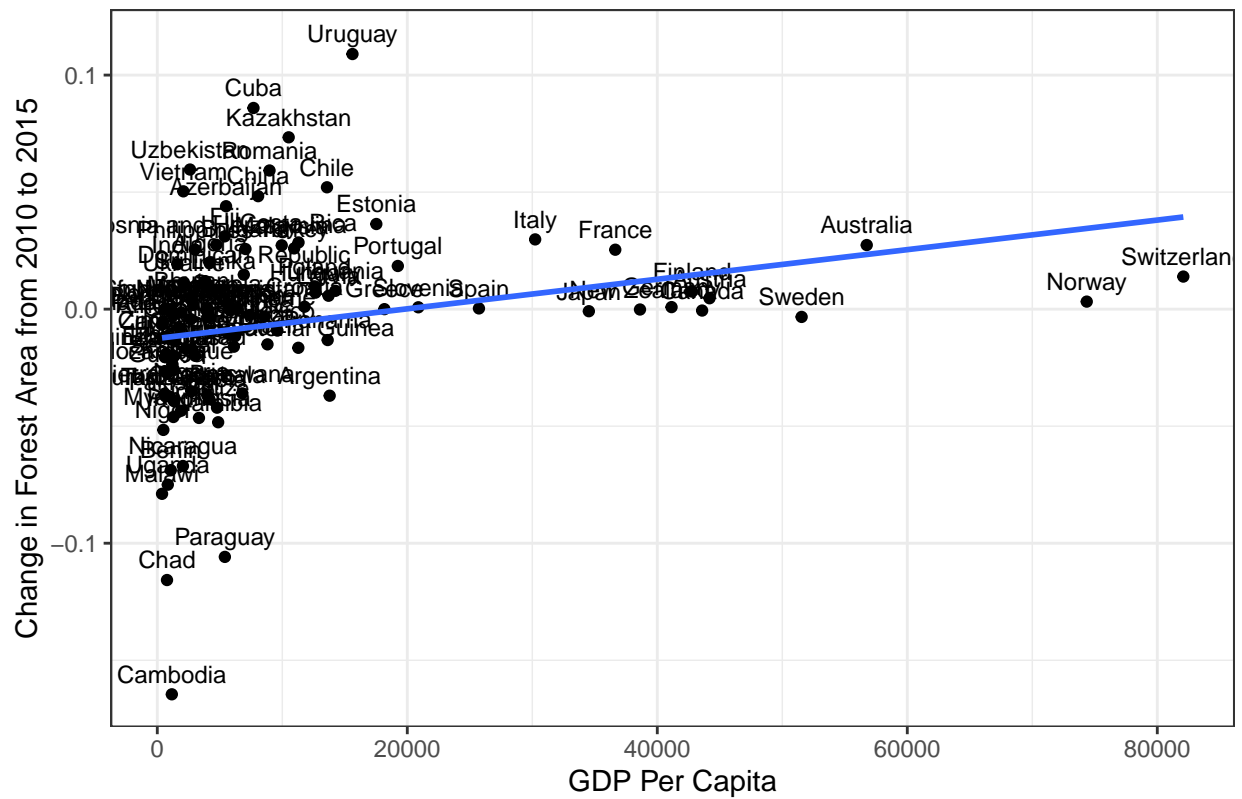


	Model 1
Intercept	-0.006* (0.004)
Change in agricultural land	-0.021 (0.087)
Num.Obs.	108
R2	0.001
R2 Adj.	-0.009
* p < 0.1, ** p < 0.05, *** p < 0.01	

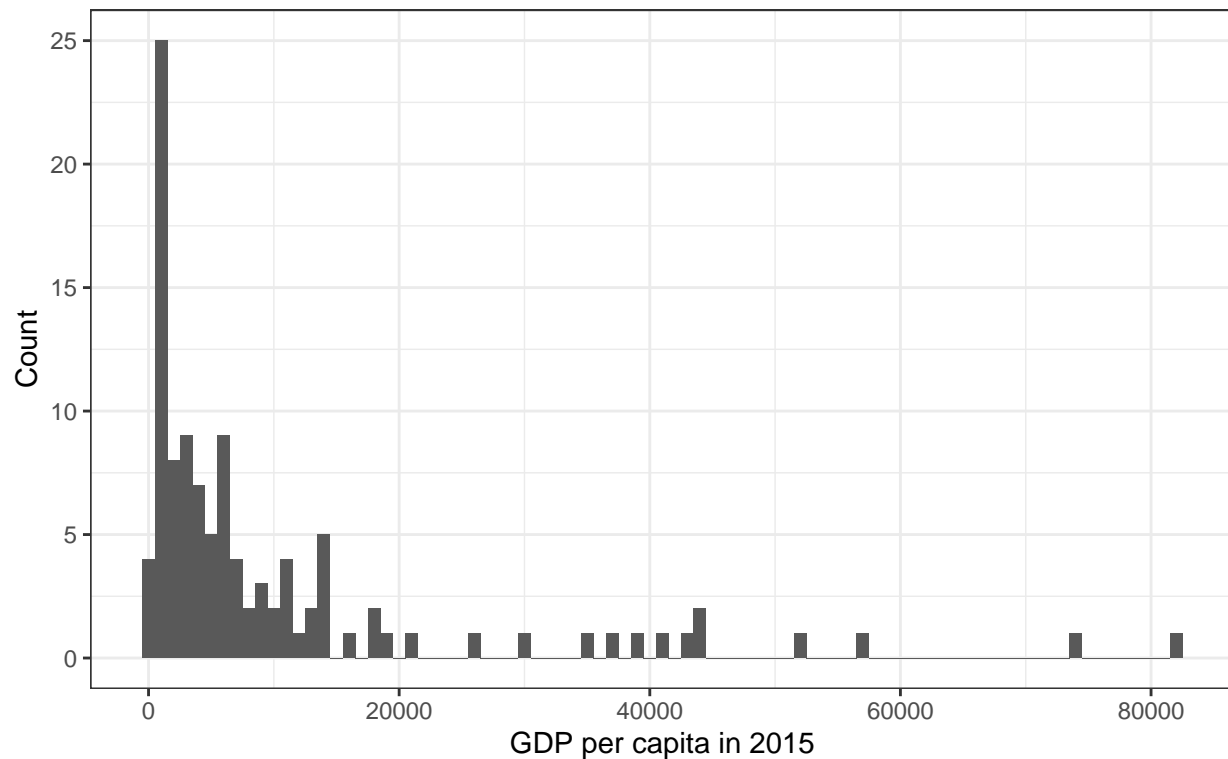
4. GDP per capita growth (countries with forest)

	Model 1
Intercept	-0.012*** (0.004)
GDP per capita in 2015	0.000*** (0.000)
Num.Obs.	108
R2	0.064
R2 Adj.	0.056
* p < 0.1, ** p < 0.05, *** p < 0.01	

GDP Per Capita and Deforestation, 2015



GDP per capita in 2015 (All countries with data)



5. GDP per capita (countries with forest and with less than US\$20,000 GDP per capita)

```
gdp_less_20000 <- read_csv("WB_GDPperCapita_Cleaned.csv",
  col_types = cols(GDPcap_2015 = col_double())) %>%
  filter(GDPcap_2015 < 20000) %>%
  select('Country Name', 'Country Code', 'GDPcap_2015') %>%
  rename("Country" = "Country Name") %>%
  right_join(for_big)
```

Joining, by = "Country"

```
gdp_less_20000_lm <- lm(change2015_big ~ GDPcap_2015, data = gdp_less_20000)
coefs <- c(
  "(Intercept)" = "Intercept",
  "GDPcap_2015" = "GDP per capita in 2015"
)
```

```
modelsummary::modelsummary(gdp_less_20000_lm, coef_map = coefs, gof_omit = "AIC|BIC|Log.Lik.|F", stars = )
```


	Model 1
Intercept	-0.027*** (0.006)
GDP per capita in 2015	0.000*** (0.000)
Num.Obs.	94
R2	0.195
R2 Adj.	0.186
* p < 0.1, ** p < 0.05, *** p < 0.01	

```
gdp_less_20000 %>%
  ggplot(aes(x = GDPcap_2015, y = change2015_big, label = Country)) +
  geom_point() +
  geom_text(vjust = 0, nudge_y = 0.005, size = 3) +
  geom_smooth(method = "lm", se = FALSE) +
  labs(
    title = "GDP Per Capita and Deforestation, 2015",
    x = "GDP Per Capita",
    y = "Change in Forest Area from 2010 to 2015"
  ) +
  theme_bw()
```

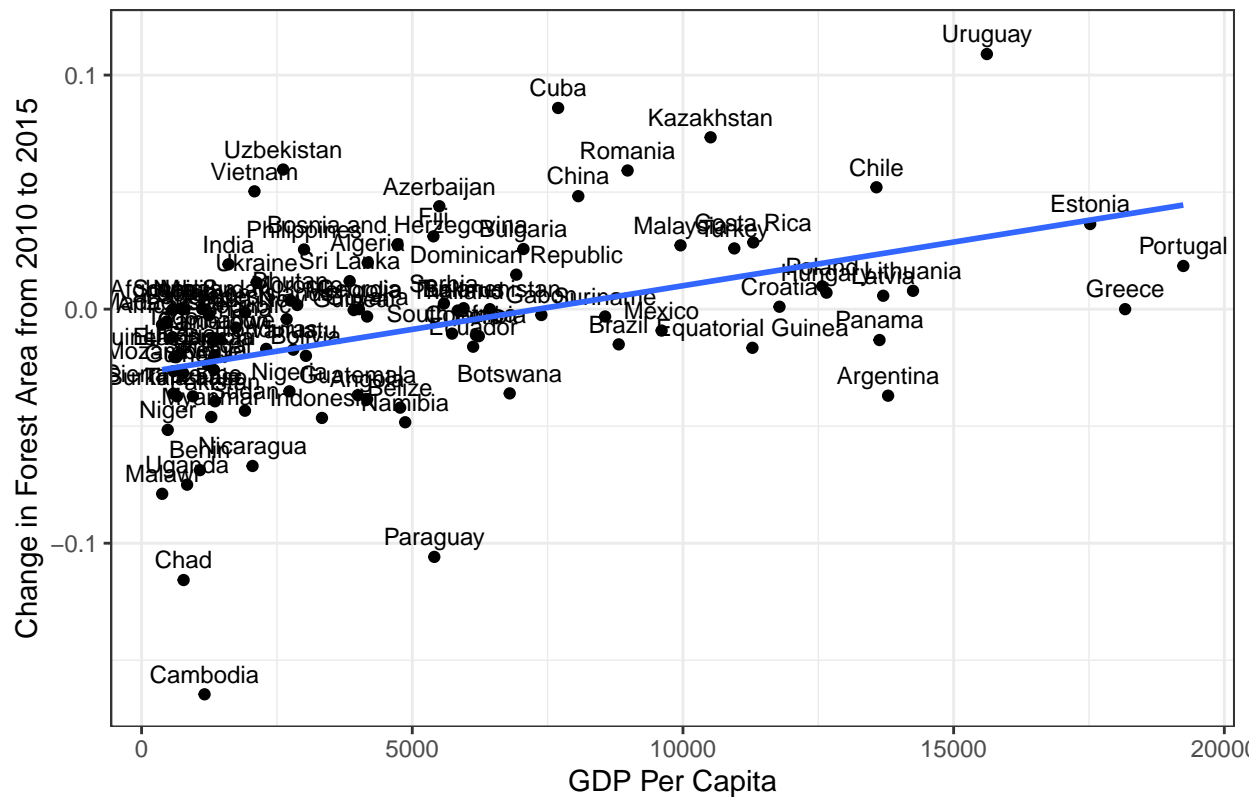
```
## 'geom_smooth()' using formula 'y ~ x'
```

```
## Warning: Removed 30 rows containing non-finite values (stat_smooth).
```

```
## Warning: Removed 30 rows containing missing values (geom_point).
```

```
## Warning: Removed 30 rows containing missing values (geom_text).
```

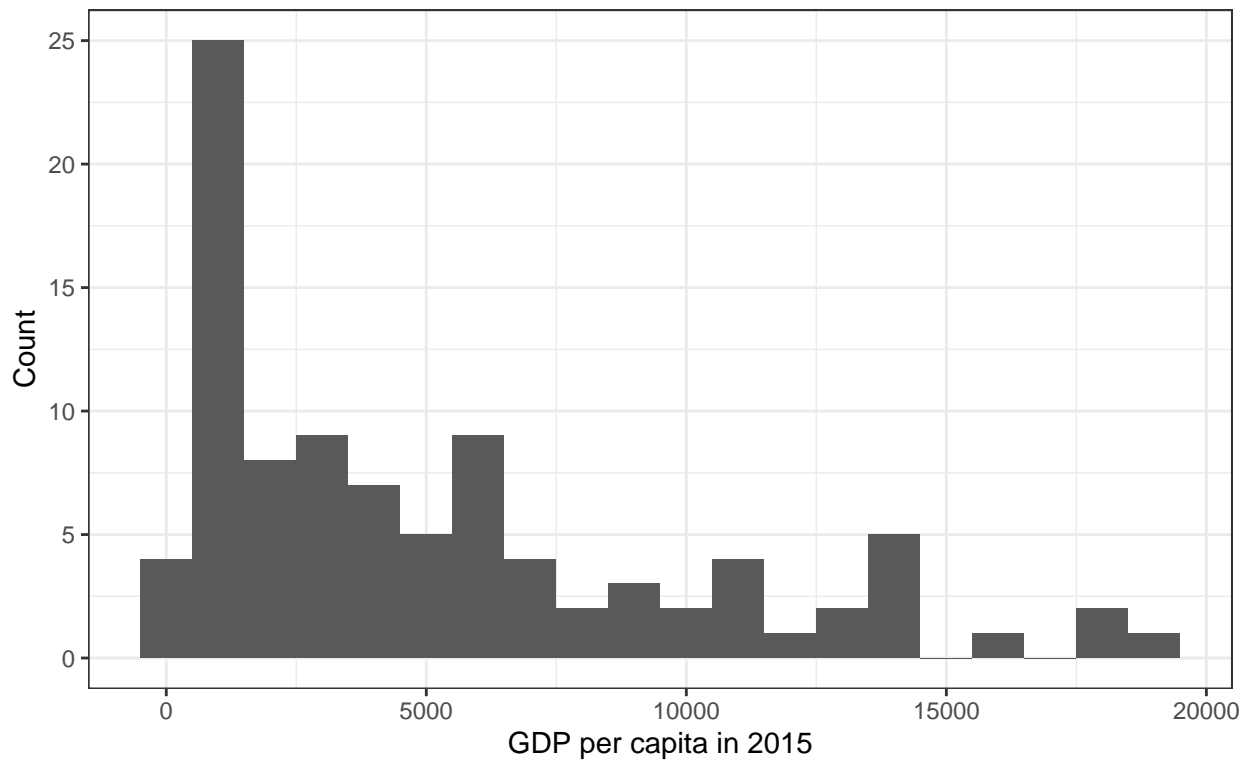
GDP Per Capita and Deforestation, 2015



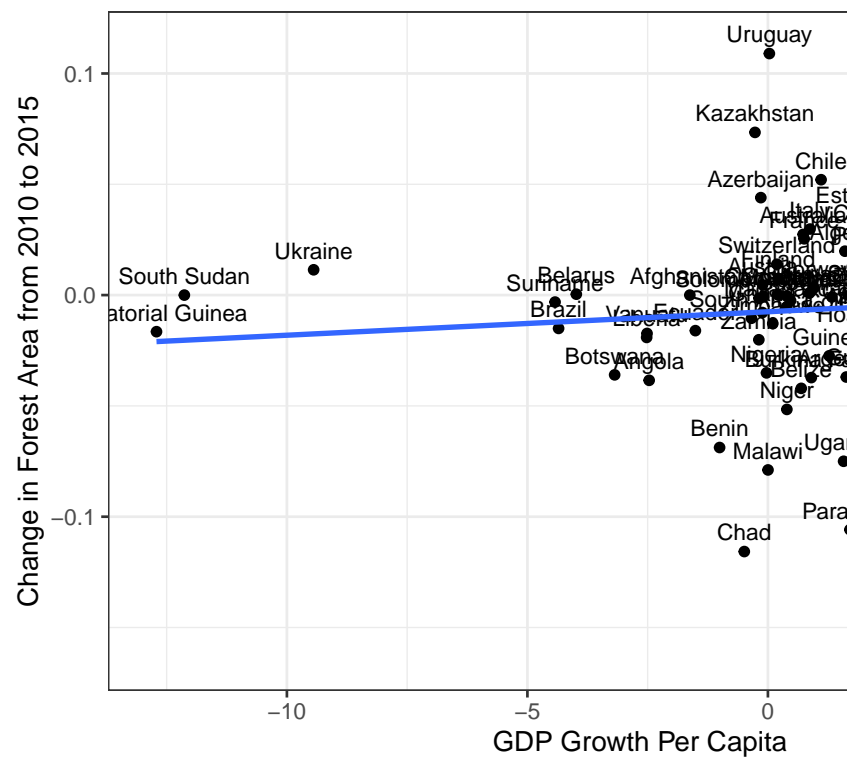
```
gdp_less_20000_hist <- gdp_less_20000 %>%
  ggplot(aes(x = GDPcap_2015)) +
  geom_histogram(binwidth = 1000) +
  labs(title = "GDP per capita in 2015 \n (Countries with less than $20,000 per capita)", x = "GDP per capita")
  theme_bw()
gdp_less_20000_hist
```

```
## Warning: Removed 30 rows containing non-finite values (stat_bin).
```

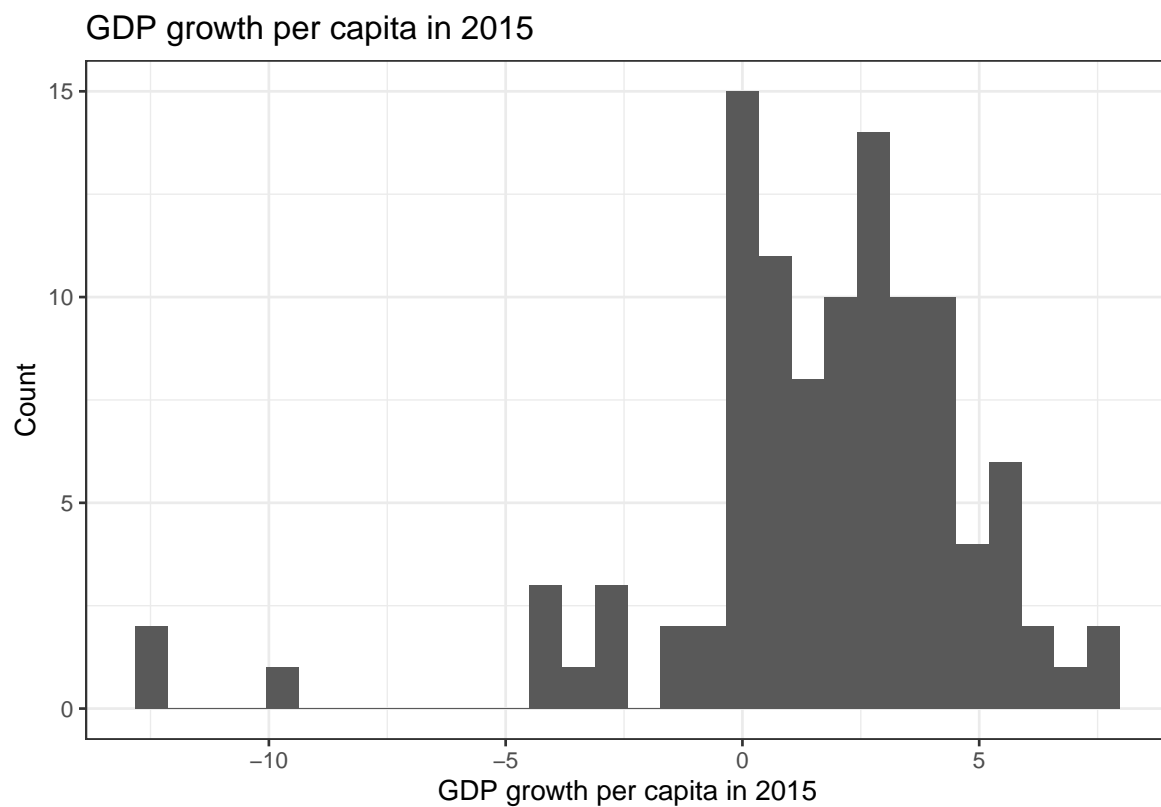
GDP per capita in 2015
(Countries with less than \$20,000 per capita)



GDP Growth Per Capita and Deforestation, 2015



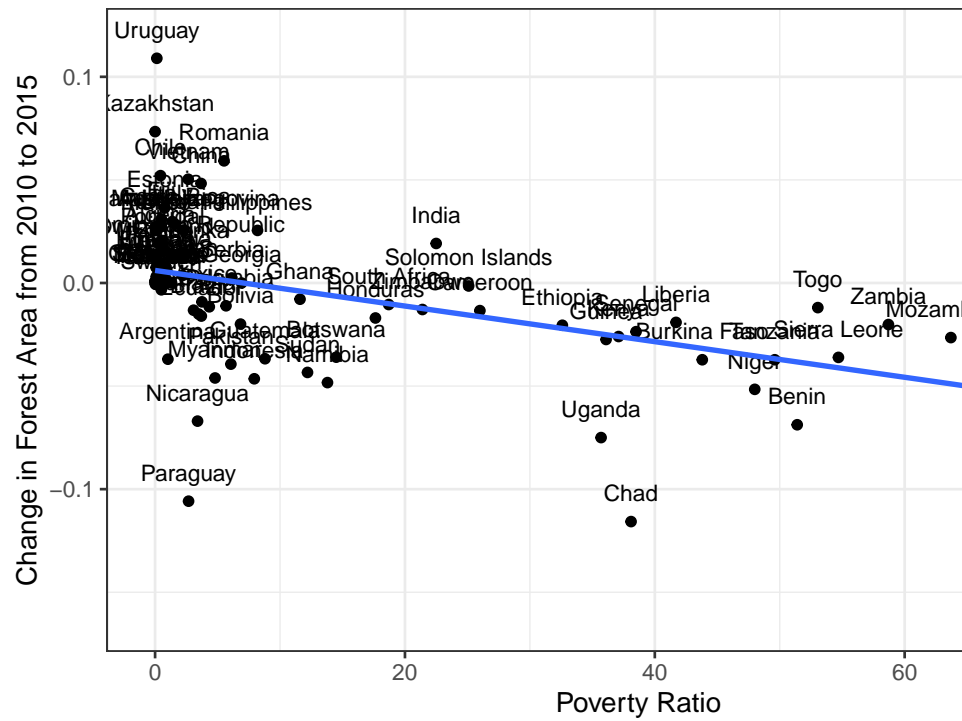
6. GDP growth per capita (countries with forest)



	Model 1
Intercept	-0.008* (0.004)
GDP growth per capita in 2015	0.001 (0.001)
Num.Obs.	107
R2	0.009
R2 Adj.	-0.001

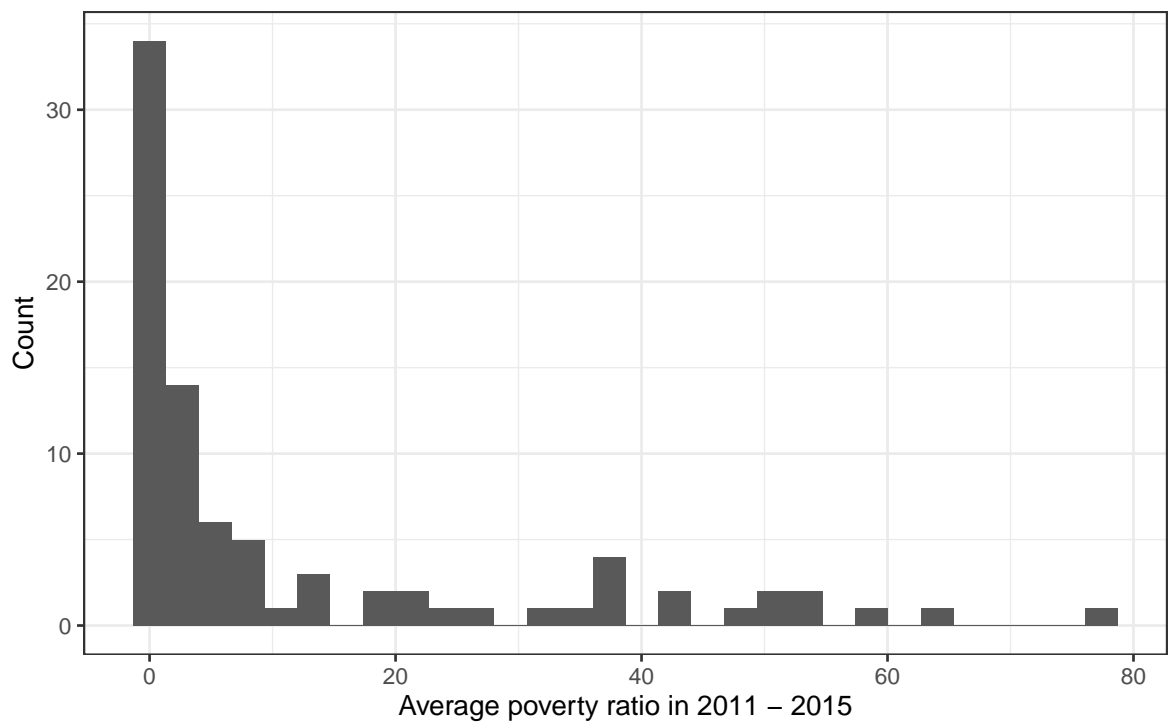
* p < 0.1, ** p < 0.05, *** p < 0.01

Poverty Ratio and Deforestation, 2011–2015 average
(All countries with data)



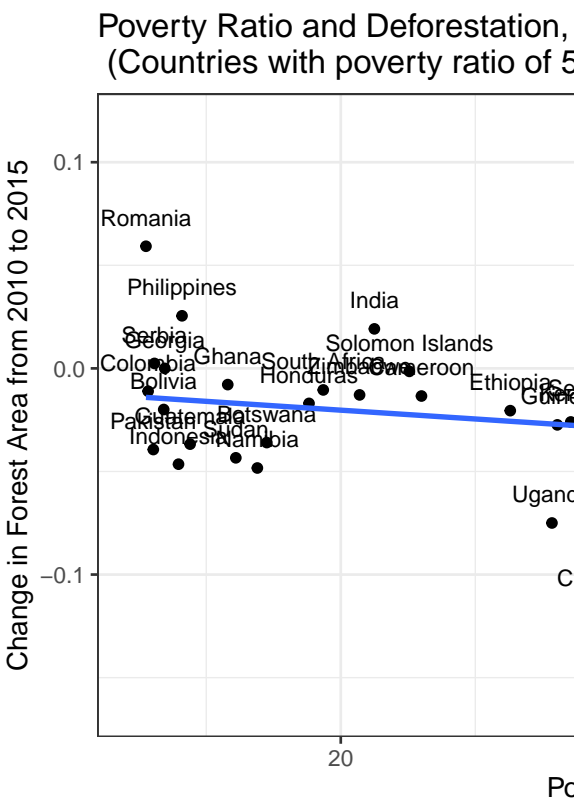
7. Poverty ratio (countries with forest)

Average poverty ratio in 2011 – 2015
(All countries with data)



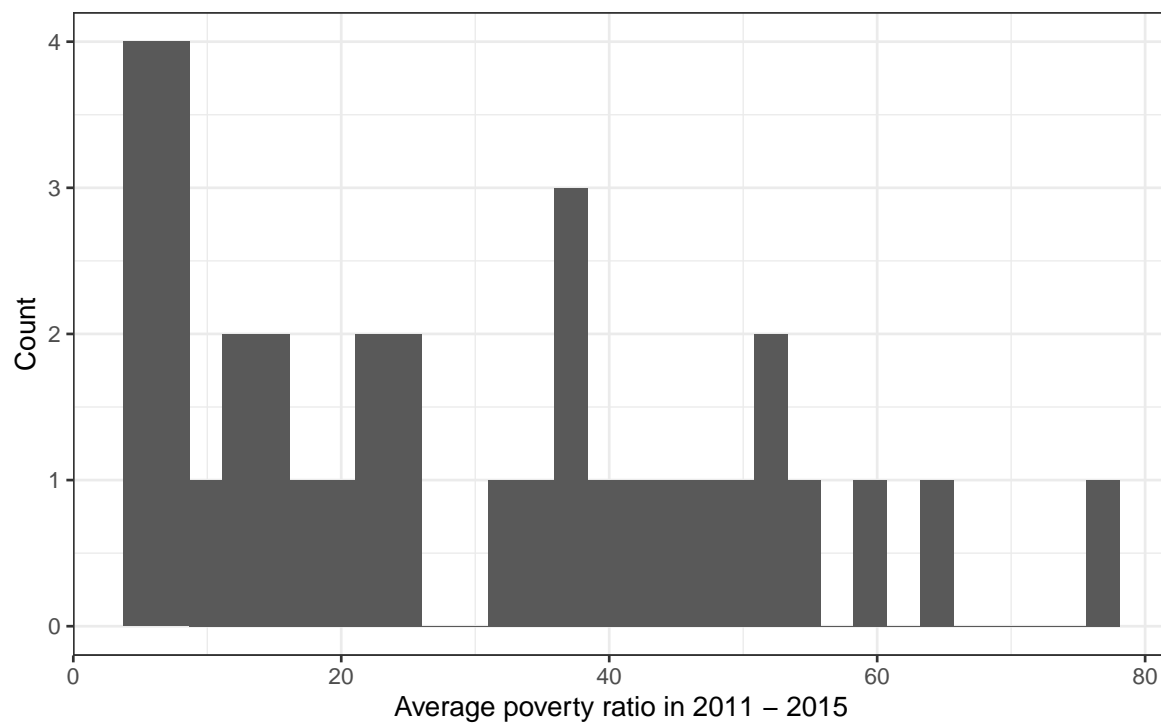
	Model 1
Intercept	0.006 (0.004)
Poverty ratio (2011-2015 average)	-0.001*** (0.000)
Num.Obs.	85
R2	0.209
R2 Adj.	0.200

* p < 0.1, ** p < 0.05, *** p < 0.01



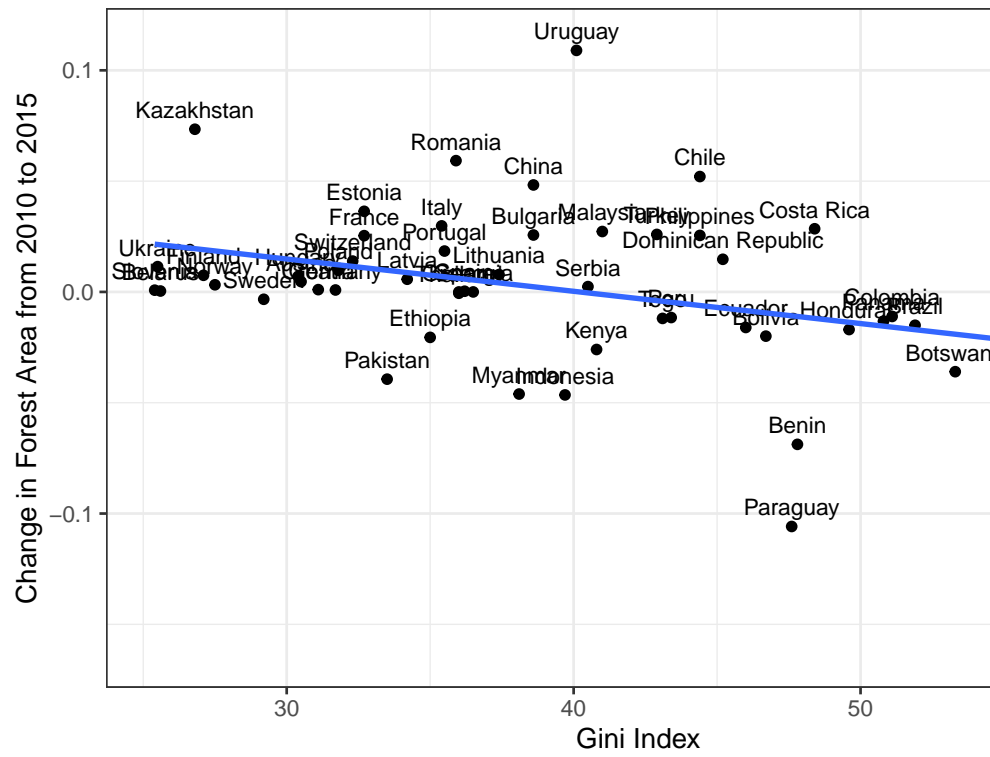
8. Poverty ratio (countries with forest and poverty ratio of 5% or higher)

Average poverty ratio in 2011 – 2015
(Countries with poverty ratio of 5% or higher))



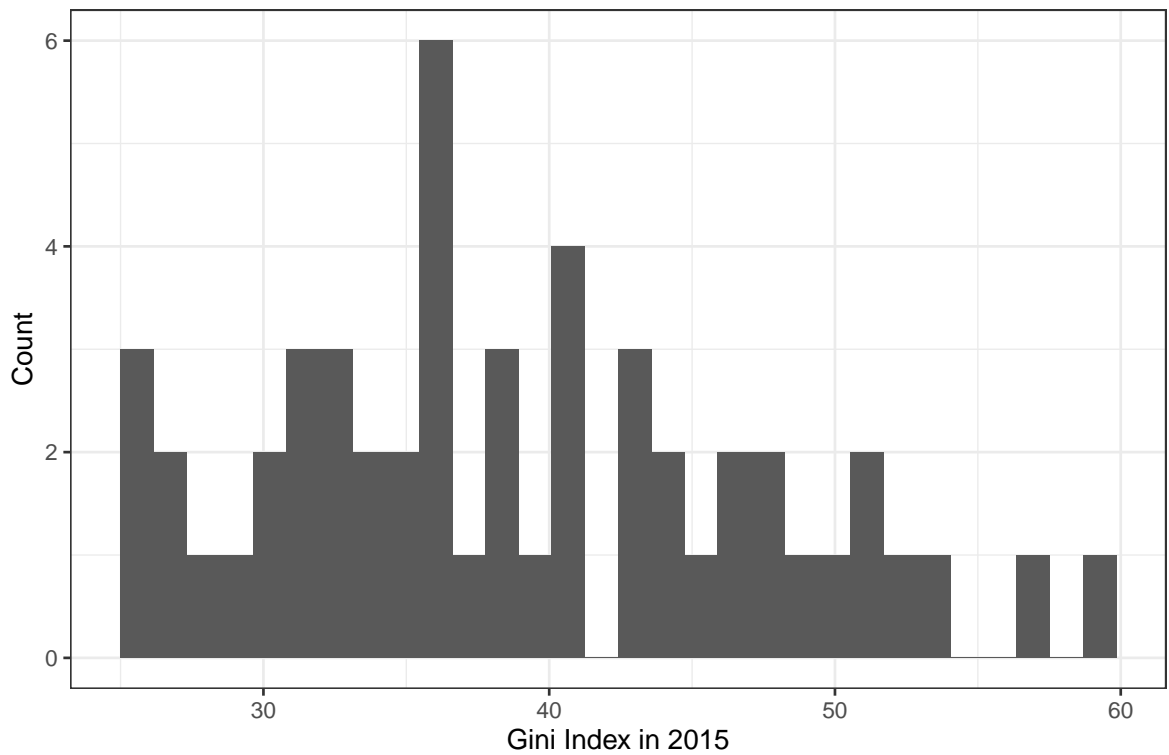
	Model 1
Intercept	-0.012 (0.009)
Poverty ratio (2011-2015 average)	0.000* (0.000)
Num.Obs.	35
R2	0.080
R2 Adj.	0.052
* p < 0.1, ** p < 0.05, *** p < 0.01	

Gini Index and Deforestation, 2015



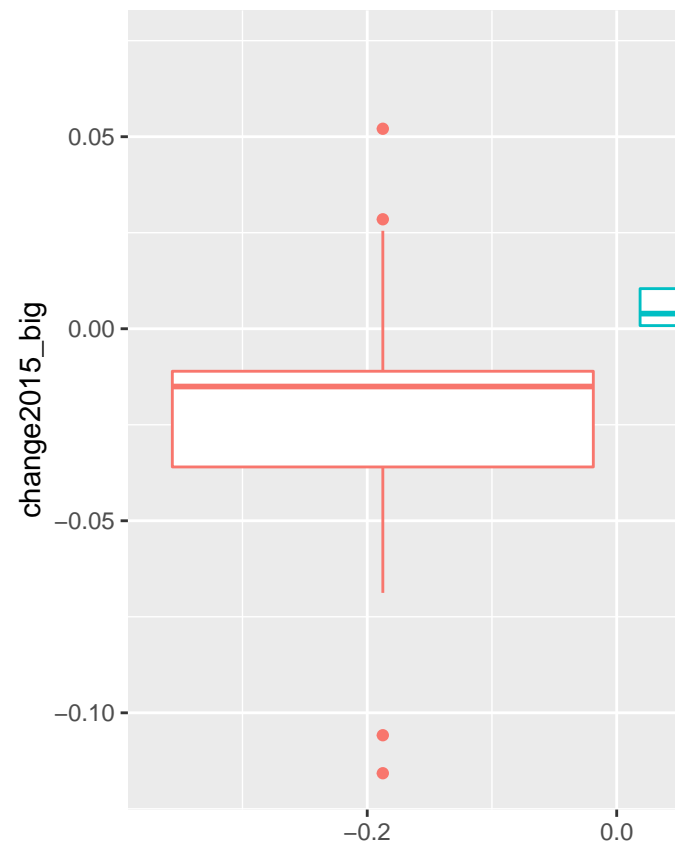
9. Gini Index (countries with forest)

Gini Index in 2015



	Model 1
Intercept	0.059*** (0.022)
Gini Index in 2015	-0.001** (0.001)
Num.Obs.	52
R2	0.125
R2 Adj.	0.108
* p < 0.1, ** p < 0.05, *** p < 0.01	

10. Does Gini Index explain the difference in the effect of democratization on deforestation?



Model 1: average treatment effect of Gini Index as a binary variable

Model 2: multivariable linear regression

	Model 1
(Intercept)	0.246** (0.099)
Democracy.Index.in.2015	-0.028* (0.014)
Gini.Index.in.2015	-0.007** (0.003)
Democracy.Index.in.2015 × Gini.Index.in.2015	0.001** (0.000)
Num.Obs.	52
R2	0.215
R2 Adj.	0.166

* p < 0.1, ** p < 0.05, *** p < 0.01

Model 3: multivariable linear regression for all variables at once

Code

```
knitr::opts_chunk$set(echo = TRUE)
library(tidyverse)
library(readxl)
library(knitr)
library(modelsummary)

di <- read_excel("Democracy-Index-2019.xlsx") %>%
  rename("Country" = "2019") %>%
  rename("2019" = "...4") %>%
  select(c("Country", "2019", "2015", "2010"))

di_hist <- di %>%
  ggplot(aes(x = "2015")) +
  geom_histogram(binwidth = 0.5) +
  labs(title = "Distribution of Democracy Index", x = "Democracy Index (0: Least democratic, 10: Most democratic)") +
  theme_bw()
di_hist

forest <- read_excel("Forest Area.xlsx", sheet = 2) %>%
  select(c("Country and Area",
           "Forest Area, 2010",
           "Forest Area, 2015",
           "Forest Area, 2020")) %>%
  rename("Country" = "Country and Area")

for_change <- forest %>%
  group_by(Country) %>%
  summarize(change2015 = ("Forest Area, 2015" - "Forest Area, 2010")/"Forest Area, 2010",
            change2020 = ("Forest Area, 2020" - "Forest Area, 2015")/"Forest Area, 2015")

for_change_hist <- for_change %>%
  ggplot(aes(x = change2015)) +
```

```

    geom_histogram(binwidth = 0.01) +
    labs(title = "Change in forest area in 2010 - 2015 \n (All countries with data)", x = "Change in forest area") +
    theme_bw()
for_change_hist

di_forest <- di %>%
  right_join(for_change)

df2015 <- di_forest %>%
  select(Country, '2015', change2015)
df2015_lm <- lm(change2015 ~ '2015', data = df2015)

df2015 %>%
  ggplot(aes(x = '2015', y = change2015, label = Country)) +
  geom_point() +
  geom_text(vjust = 0, nudge_y = 0.02, size = 3) +
  geom_smooth(method = "lm", se = FALSE) +
  scale_x_continuous(breaks = c(0:10), labels = c(0:10), limits = c(0, 10)) +
  labs(
    title = "Democratization's Effect on Deforestation, 2015",
    x = "Democracy Index",
    y = "Change in Forest Area from 2010 to 2015"
  ) +
  theme_bw()

coefs <- c(
  "(Intercept)" = "Intercept",
  "'2015'" = "Democracy Index in 2015"
)
modelsummary::modelsummary(df2015_lm, coef_map = coefs, gof_omit = "AIC|BIC|Log.Lik.|F", stars = TRUE)

for_big <- forest %>%
  filter('Forest Area, 2010' >= 1000) %>%
  group_by(Country) %>%
  summarize(change2015_big = ('Forest Area, 2015' - 'Forest Area, 2010')/'Forest Area, 2010')

di_forest_big <- di %>%
  right_join(for_big)

di_for_big_hist <- di_forest_big %>%
  ggplot(aes(x = change2015_big)) +
  geom_histogram(binwidth = 0.01) +
  labs(title = "Change in forest area in 2010 - 2015 \n (Countries with forest land over 1 million hectares)") +
  theme_bw()
di_for_big_hist

df2015_big <- di_forest_big %>%
  select(Country, '2015', change2015_big)
df2015_big_lm <- lm(change2015_big ~ '2015', data = df2015_big)

df2015_big %>%
  ggplot(aes(x = '2015', y = change2015_big, label = Country)) +

```

```

geom_point() +
geom_text(vjust = 0, nudge_y = 0.01, size = 3) +
geom_smooth(method = "lm", se = FALSE) +
scale_x_continuous(breaks = c(0:10), labels = c(0:10), limits = c(0, 10)) +
labs(
  title = "Democratization's Effect on Deforestation, 2015",
  subtitle = "Countries with forest land over one million hectares",
  x = "Democracy Index",
  y = "Change in Forest Area from 2010 to 2015"
) +
theme_bw()

coefs <- c(
  "(Intercept)" = "Intercept",
  "'2015'" = "Democracy Index in 2015"
)

modelsummary::modelsummary(df2015_big_lm, coef_map = coefs, gof_omit = "AIC|BIC|Log.Lik.|F", stars = TRUE)

agri <- read_csv("WB_Agri_Land_Cleaned.csv") %>%
  group_by('Country Name') %>%
  summarize(agri_change = (Agri_2015 - Agri_2011)/Agri_2011) %>%
  rename("Country" = 'Country Name') %>%
  right_join(for_big)
agri_lm <- lm(change2015_big ~ agri_change, data = agri)

agri %>%
  ggplot(aes(x = agri_change, y = change2015_big, label = Country)) +
  geom_point() +
  geom_text(vjust = 0, nudge_y = 0.005, size = 3) +
  geom_smooth(method = "lm", se = FALSE) +
  labs(
    title = "Agricultural Land Growth and Deforestation, 2015",
    x = "Agricultural Land Growth",
    y = "Change in Forest Area from 2010 to 2015"
  ) +
  theme_bw()

agri_hist <- agri %>%
  ggplot(aes(x = agri_change)) +
  geom_histogram(binwidth = 0.01) +
  labs(title = "Change in agricultural land in 2011 - 2015", x = "Change in agricultural land", y = "Count")
  theme_bw()
agri_hist

coefs <- c(
  "(Intercept)" = "Intercept",
  "agri_change" = "Change in agricultural land"
)

modelsummary::modelsummary(agri_lm, coef_map = coefs, gof_omit = "AIC|BIC|Log.Lik.|F", stars = TRUE)

```

```

gdp <- read_csv("WB_GDPperCapita_Cleaned.csv",
  col_types = cols(GDPcap_2015 = col_double())) %>%
#   filter(GDPcap_2015 < 20000) %>%
  select('Country Name', 'Country Code', 'GDPcap_2015') %>%
  rename("Country" = "Country Name") %>%
  right_join(for_big) %>%
  filter(!is.na(GDPcap_2015))
gdp_lm <- lm(change2015_big ~ GDPcap_2015, data = gdp)
coefs <- c(
  "(Intercept)" = "Intercept",
  "GDPcap_2015" = "GDP per capita in 2015"
)

modelsummary::modelsummary(gdp_lm, coef_map = coefs, gof_omit = "AIC|BIC|Log.Lik.|F", stars = TRUE)

gdp %>%
  ggplot(aes(x = GDPcap_2015, y = change2015_big, label = Country)) +
  geom_point() +
  geom_text(vjust = 0, nudge_y = 0.005, size = 3) +
  geom_smooth(method = "lm", se = FALSE) +
  labs(
    title = "GDP Per Capita and Deforestation, 2015",
    x = "GDP Per Capita",
    y = "Change in Forest Area from 2010 to 2015"
  ) +
  theme_bw()

gdp_hist <- gdp %>%
  ggplot(aes(x = GDPcap_2015)) +
  geom_histogram(binwidth = 1000) +
  labs(title = "GDP per capita in 2015 \n (All countries with data)", x = "GDP per capita in 2015", y =
  theme_bw()
gdp_hist

gdp_less_20000 <- read_csv("WB_GDPperCapita_Cleaned.csv",
  col_types = cols(GDPcap_2015 = col_double())) %>%
  filter(GDPcap_2015 < 20000) %>%
  select('Country Name', 'Country Code', 'GDPcap_2015') %>%
  rename("Country" = "Country Name") %>%
  right_join(for_big)
gdp_less_20000_lm <- lm(change2015_big ~ GDPcap_2015, data = gdp_less_20000)
coefs <- c(
  "(Intercept)" = "Intercept",
  "GDPcap_2015" = "GDP per capita in 2015"
)
modelsummary::modelsummary(gdp_less_20000_lm, coef_map = coefs, gof_omit = "AIC|BIC|Log.Lik.|F", stars =

gdp_less_20000 %>%
  ggplot(aes(x = GDPcap_2015, y = change2015_big, label = Country)) +
  geom_point() +
  geom_text(vjust = 0, nudge_y = 0.005, size = 3) +
  geom_smooth(method = "lm", se = FALSE) +

```

```

labs(
  title = "GDP Per Capita and Deforestation, 2015",
  x = "GDP Per Capita",
  y = "Change in Forest Area from 2010 to 2015"
) +
theme_bw()

gdp_less_20000_hist <- gdp_less_20000 %>%
  ggplot(aes(x = GDPcap_2015)) +
  geom_histogram(binwidth = 1000) +
  labs(title = "GDP per capita in 2015 \n (Countries with less than $20,000 per capita)", x = "GDP per c
  theme_bw()
gdp_less_20000_hist

gdp_growth <- read_csv("WB_GDP_Growth_per_Capita_Cleaned.csv") %>%
  select('Country Name', 'Country Code', 'GrowthCap_2015') %>%
  rename("Country" = "Country Name") %>%
  right_join(for_big) %>%
  filter(Country != "Sierra Leone")
gdp_growth_lm <- lm(change2015_big ~ GrowthCap_2015, data = gdp_growth)

gdp_growth %>%
  ggplot(aes(x = GrowthCap_2015, y = change2015_big, label = Country)) +
  geom_point() +
  geom_text(vjust = 0, nudge_y = 0.005, size = 3) +
  geom_smooth(method = "lm", se = FALSE) +
  labs(
    title = "GDP Growth Per Capita and Deforestation, 2015",
    x = "GDP Growth Per Capita",
    y = "Change in Forest Area from 2010 to 2015"
  ) +
  theme_bw()

gdp_growth_hist <- gdp_growth %>%
  ggplot(aes(x = GrowthCap_2015)) +
  geom_histogram() +
  labs(title = "GDP growth per capita in 2015", x = "GDP growth per capita in 2015", y = "Count") +
  theme_bw()
gdp_growth_hist

coefs <- c(
  "(Intercept)" = "Intercept",
  "GrowthCap_2015" = "GDP growth per capita in 2015"
)
modelsummary::modelsummary(gdp_growth_lm, coef_map = coefs, gof_omit = "AIC|BIC|Log.Lik.|F", stars = TR

pov_ratio <- read_csv("World_Bank_Poor_Ratio_Cleaned.csv") %>%
# filter('Average_2011-2015' > 5) %>%
  rename("Country" = 'Country Name') %>%
  select(Country, 'Average_2011-2015') %>%
  right_join(for_big)

```

```

pov_ratio %>%
  ggplot(aes(x = 'Average_2011-2015', y = change2015_big, label = Country)) +
  geom_point() +
  geom_text(vjust = 0, nudge_y = 0.01, size = 3) +
  geom_smooth(method = "lm", se = FALSE) +
  labs(
    title = "Poverty Ratio and Deforestation, 2011-2015 average \n (All countries with data)",
    x = "Poverty Ratio",
    y = "Change in Forest Area from 2010 to 2015"
  ) +
  theme_bw()

pov_ratio_hist <- pov_ratio %>%
  ggplot(aes(x = 'Average_2011-2015')) +
  geom_histogram() +
  labs(title = "Average poverty ratio in 2011 - 2015 \n (All countries with data)", x = "Average poverty")
  theme_bw()
pov_ratio_hist

pov_lm <- lm(change2015_big ~ 'Average_2011-2015', data = pov_ratio)
coefs <- c(
  "(Intercept)" = "Intercept",
  "'Average_2011-2015'" = "Poverty ratio (2011-2015 average)"
)
modelsummary::modelsummary(pov_lm, coef_map = coefs, gof_omit = "AIC|BIC|Log.Lik.|F", stars = TRUE)

pov_ratio_5 <- read_csv("World_Bank_Poor_Ratio_Cleaned.csv") %>%
  filter('Average_2011-2015' > 5) %>%
  rename("Country" = 'Country Name') %>%
  select(Country, 'Average_2011-2015') %>%
  right_join(for_big)

pov_ratio_5 %>%
  ggplot(aes(x = 'Average_2011-2015', y = change2015_big, label = Country)) +
  geom_point() +
  geom_text(vjust = 0, nudge_y = 0.01, size = 3) +
  geom_smooth(method = "lm", se = FALSE) +
  labs(
    title = "Poverty Ratio and Deforestation, 2011-2015 average \n (Countries with poverty ratio of 5% or higher)",
    x = "Poverty Ratio",
    y = "Change in Forest Area from 2010 to 2015"
  ) +
  theme_bw()

pov_ratio_5_hist <- pov_ratio_5 %>%
  ggplot(aes(x = 'Average_2011-2015')) +
  geom_histogram() +
  labs(title = "Average poverty ratio in 2011 - 2015 \n (Countries with poverty ratio of 5% or higher)")
  theme_bw()
pov_ratio_5_hist

pov_lm_5 <- lm(change2015_big ~ 'Average_2011-2015', data = pov_ratio_5)

```

```

coefs <- c(
  "(Intercept)" = "Intercept",
  "'Average_2011-2015'" = "Poverty ratio (2011-2015 average)"
)
modelsummary::modelsummary(pov_lm_5, coef_map = coefs, gof_omit = "AIC|BIC|Log.Lik.|F", stars = TRUE)

gini <- read_csv("WB_Gini_Cleaned.csv") %>%
  select('Country Name', 'Country Code', Gini_2015) %>%
  slice(1:169) %>%
  rename("Country" = "Country Name") %>%
  right_join(for_big)

gini_lm <- lm(change2015_big ~ Gini_2015, data = gini)

gini %>%
  ggplot(aes(x = Gini_2015, y = change2015_big, label = Country)) +
  geom_point() +
  geom_text(vjust = 0, nudge_y = 0.005, size = 3) +
  geom_smooth(method = "lm", se = FALSE) +
  labs(
    title = "Gini Index and Deforestation, 2015",
    x = "Gini Index",
    y = "Change in Forest Area from 2010 to 2015"
  ) +
  theme_bw()

gini_hist <- gini %>%
  ggplot(aes(x = Gini_2015)) +
  geom_histogram() +
  labs(title = "Gini Index in 2015", x = "Gini Index in 2015", y = "Count") +
  theme_bw()
gini_hist

coefs <- c(
  "(Intercept)" = "Intercept",
  "Gini_2015" = "Gini Index in 2015"
)
modelsummary::modelsummary(gini_lm, coef_map = coefs, gof_omit = "AIC|BIC|Log.Lik.|F", stars = TRUE)

gini_avg <- read_csv("WB_Gini_Cleaned_1.csv") %>%
  select('Country Name', 'Country Code', 'Gini_2011-2015') %>%
  slice(1:169) %>%
  filter(!is.na('Gini_2011-2015'))

gini_avg_best <- gini_avg %>%
  arrange('Gini_2011-2015') %>%
  slice(1:30) %>%
  mutate(gap = 1)

gini_avg_worst <- gini_avg %>%
  arrange(desc('Gini_2011-2015')) %>%

```



```

slice(1:30) %>%
mutate(gap = 0)

gini_bw <- gini_avg_best %>%
  rbind(gini_avg_worst) %>%
  rename("Country" = "Country Name") %>%
  right_join(for_big) %>%
  filter(!is.na(change2015_big)) %>%
  filter(!is.na(gap)) %>%
  group_by(gap) %>%
  summarize(
    for_mean = mean(change2015_big),
    for_se = sd(change2015_big)/sqrt(n())
  ) %>%
  pivot_wider(names_from = gap, values_from = c(for_mean, for_se)) %>%
  mutate(
    for_diff = for_mean_1 - for_mean_0,
    for_diff_se = sqrt(for_se_1 ^ 2 + for_se_0 ^ 2),
    ci_lower = for_diff - 1.96 * for_diff_se,
    ci_upper = for_diff + 1.96 * for_diff_se
  )
for_diff_z <- (gini_bw$for_diff - 0)/gini_bw$for_diff_se
for_diff_p <- 2 * pnorm(abs(for_diff_z))

gini_bw_boxplot <- gini_avg_best %>%
  rbind(gini_avg_worst) %>%
  rename("Country" = "Country Name") %>%
  right_join(for_big) %>%
  filter(!is.na(change2015_big)) %>%
  filter(!is.na(gap)) %>%
  mutate(gap = as.factor(gap)) %>%
  group_by(gap) %>%
  ggplot(aes(y = change2015_big, col = gap)) +
  geom_boxplot()
gini_bw_boxplot

all_data <- di_forest %>%
  left_join(gini) %>%
  left_join(gdp_growth) %>%
  left_join(gdp) %>%
  left_join(pov_ratio) %>%
  filter(!is.na(Gini_2015)) %>%
  filter(!is.na(GrowthCap_2015)) %>%
  filter(!is.na(GDPcap_2015)) %>%
  filter(!is.na('Average_2011-2015')) %>%
  rename("Democracy.Index.in.2015" = '2015') %>%
  rename("Gini.Index.in.2015" = 'Gini_2015') %>%
  select(!'2019')

all_lm <- lm(change2015 ~ Democracy.Index.in.2015 + Gini.Index.in.2015 + Gini.Index.in.2015 * Democracy

# I do not seem to understand how to show the interaction term

```

```

coefs <- c(
  "(Intercept)" = "Intercept",
  "'2015'" = "Democracy Index in 2015",
  "Gini_2015" = "Gini Index in 2015",
  "'2015' × Gini_2015" = "test"
)
#modelssummary::modelssummary(all_lm, coef_map = coefs, gof_omit = "AIC/BIC/Log.Lik./F", stars = TRUE)

modelssummary::modelssummary(all_lm, gof_omit = "AIC/BIC/Log.Lik./F", stars = TRUE)
#Didn't work. I gave up!
#real_all_data <- di_forest %>%
#  left_join(gini) %>%
#  left_join(gdp_growth) %>%
#  left_join(gdp) %>%
#  left_join(pov_ratio) %>%
#  left_join(agri) %>%
#  filter(!is.na(Gini_2015)) %>%
#  filter(!is.na(GrowthCap_2015)) %>%
#  filter(!is.na(GDPcap_2015)) %>%
#  filter(!is.na('Average_2011-2015')) %>%
#  filter(!is.na(agri_change)) %>%
#  rename("Democracy.Index.in.2015" = '2015') %>%
#  rename("Gini.Index.in.2015" = 'Gini_2015') %>%
#  rename("GDP.Growth.per.Capita.in.2015" = 'gdp_growth') %>%
#  rename("GDP.per.Capita.in.2015" = 'gdp') %>%
#  rename("Poverty.Ratio.in.2015" = 'pov_ratio') %>%
#  rename("Agricultural.Land.Growth.in.2015" = '2015') %>%
#  select(!'2019')

#real_all_lm <- lm(change2015 ~ Democracy.Index.in.2015 +
#  #
#    Gini.Index.in.2015 +
#  #
#    gdp_growth[,1] +
#  #GDP.per.Capita.in.2015 +
#  #Agricultural.Land.Growth.in.2015 +
#  #Poverty.Ratio.in.2015 +
#  #
#    Gini.Index.in.2015 * Democracy.Index.in.2015, data = real_all_data)

# I do not seem to understand how to show the interaction term
coefs <- c(
  "(Intercept)" = "Intercept",
  "'2015'" = "Democracy Index in 2015",
  "Gini_2015" = "Gini Index in 2015",
  "'2015' × Gini_2015" = "test"
)
#modelssummary::modelssummary(all_lm, coef_map = coefs, gof_omit = "AIC/BIC/Log.Lik./F", stars = TRUE)

#modelssummary::modelssummary(real_all_lm, gof_omit = "AIC/BIC/Log.Lik./F", stars = TRUE)

```