

# Earthquakes, Volcanic Eruptions, and Country Voting within the United Nations General Assembly

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# Introduction

- What influences voting behavior?
  - Diplomatic relations
  - External factors
- United Nations General Assembly utilizes country voting extensively
- What factors cause more solidarity among U.N. member states?

# Literature Review

- Natural disasters
  - Socio-economic disturbance
- Manage macroeconomic consequences
  - Mobilization of resources
  - Favorable financial conditions
- Foreign aid → soft power
- U.S. provides aid based on voting behavior
  - Apply this relationship

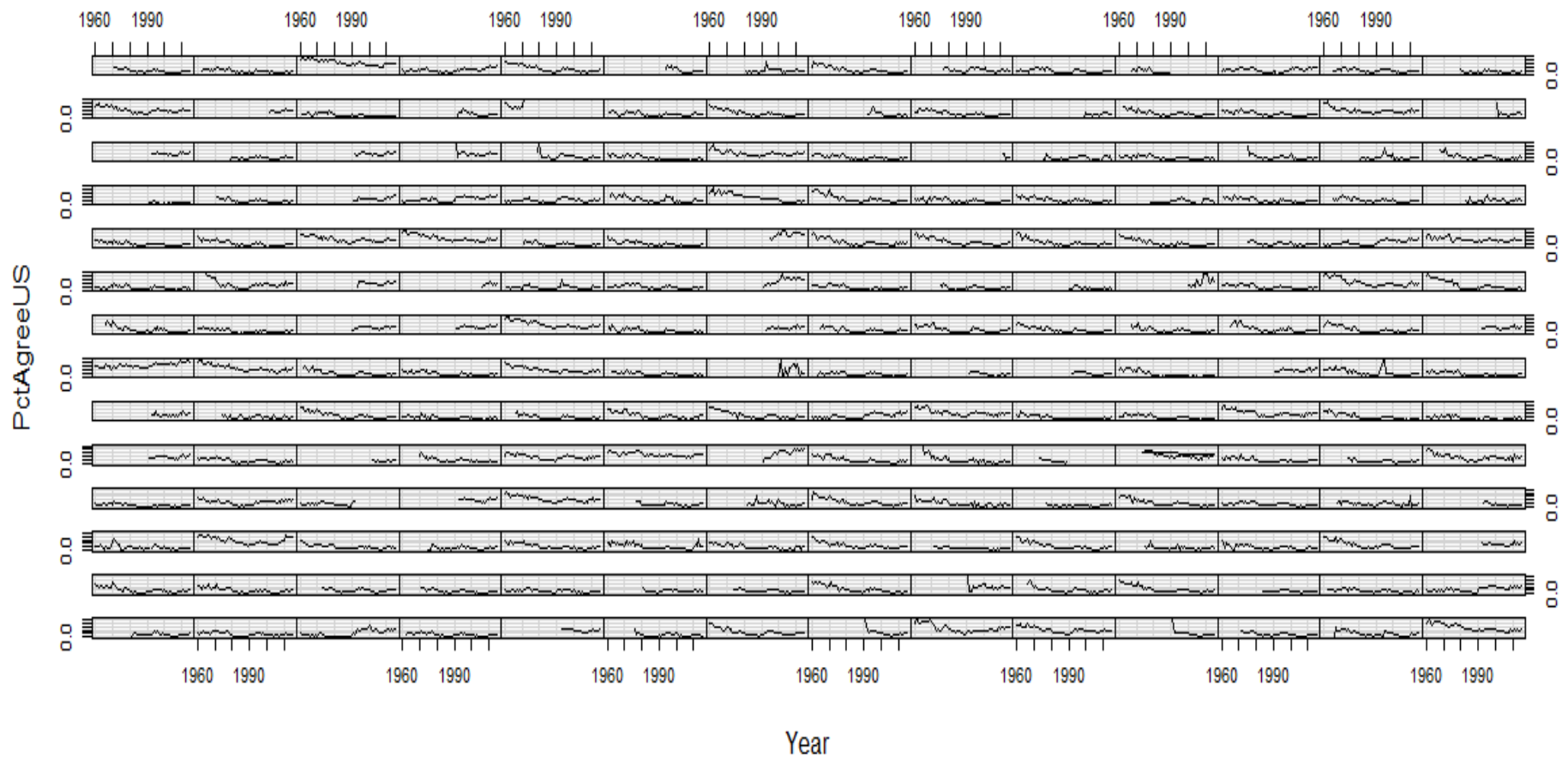
# Research Statement

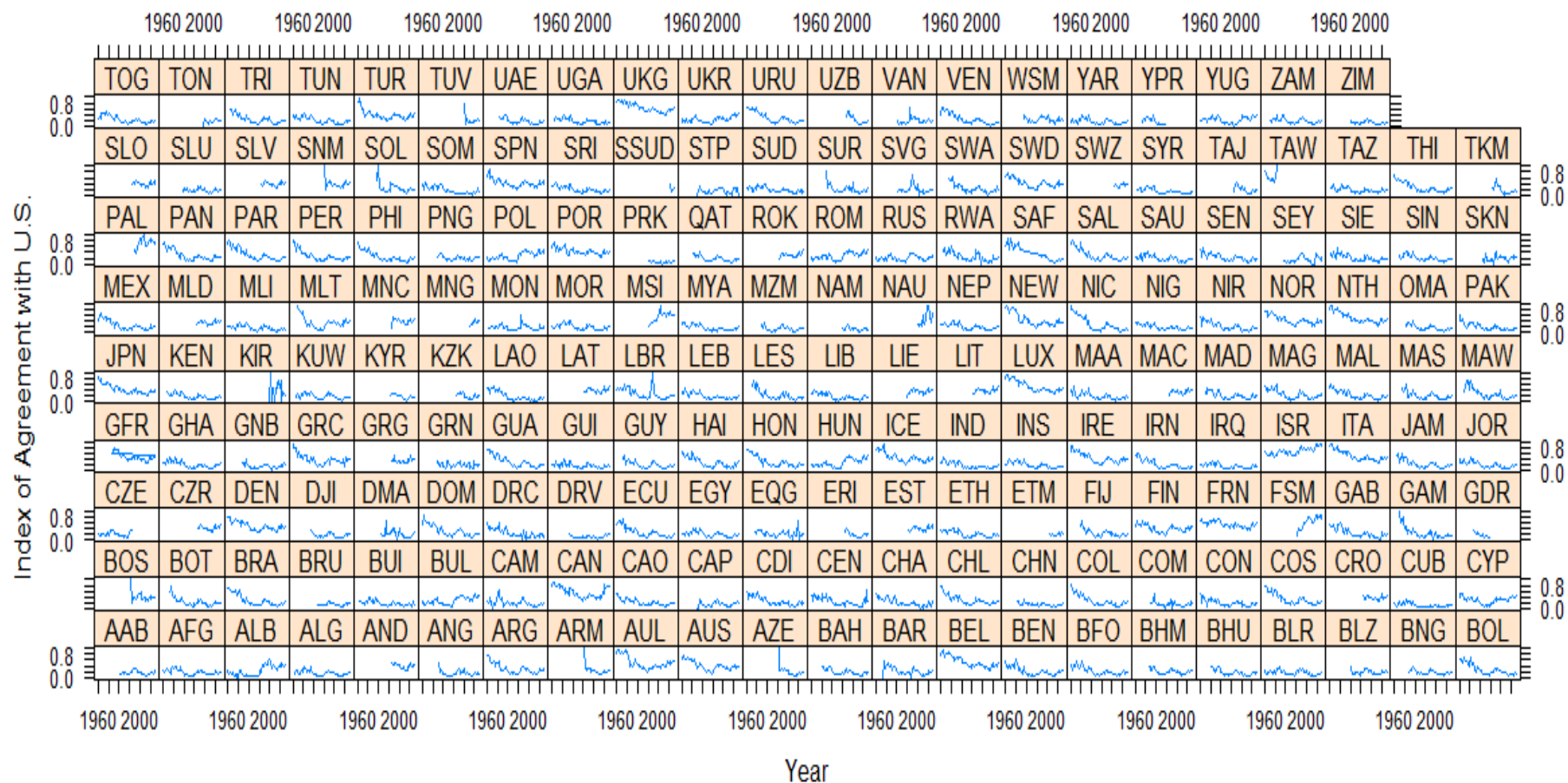
- Hypothesis 1:
  - U.N. member states that experience significant earthquakes and/or volcanic eruptions will be more likely to vote with the United States in the U.N. General Assembly during the same year.
    - Based on assumption that they need foreign aid

# Panel Data

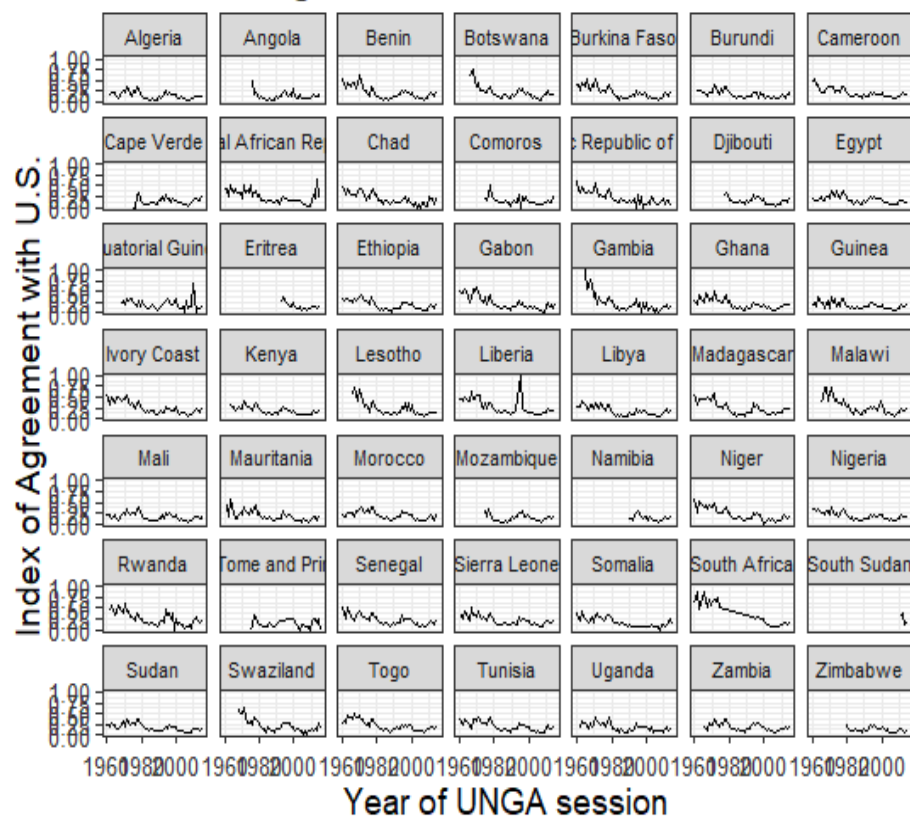
- Time: 1960-2015
- 196 U.N. member states
- Dependent variable:
  - Lijphart's index of agreement between a state & U.S.
- Independent variables:
  - Occurrence of a natural disaster(s) per year
    - Significant earthquakes and volcanic eruptions
- Control variables:
  - Polity score
  - GDP per capita
  - ODA donated by the U.S.

# Testing Data Visualization Methods

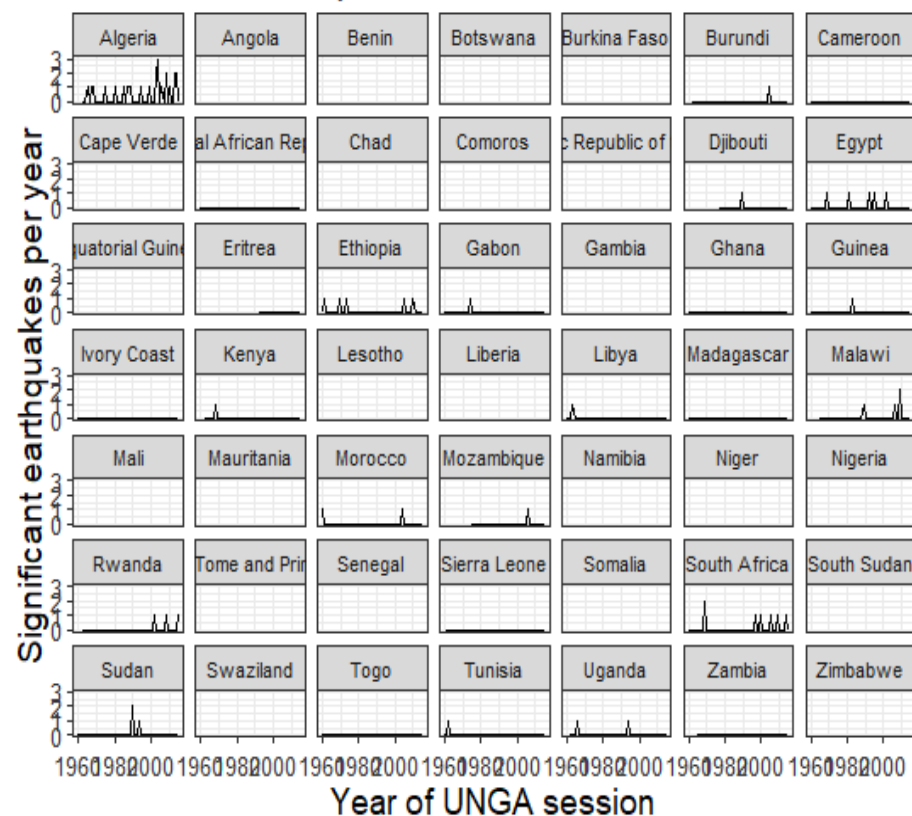




**A** Observed agreement of African states over time

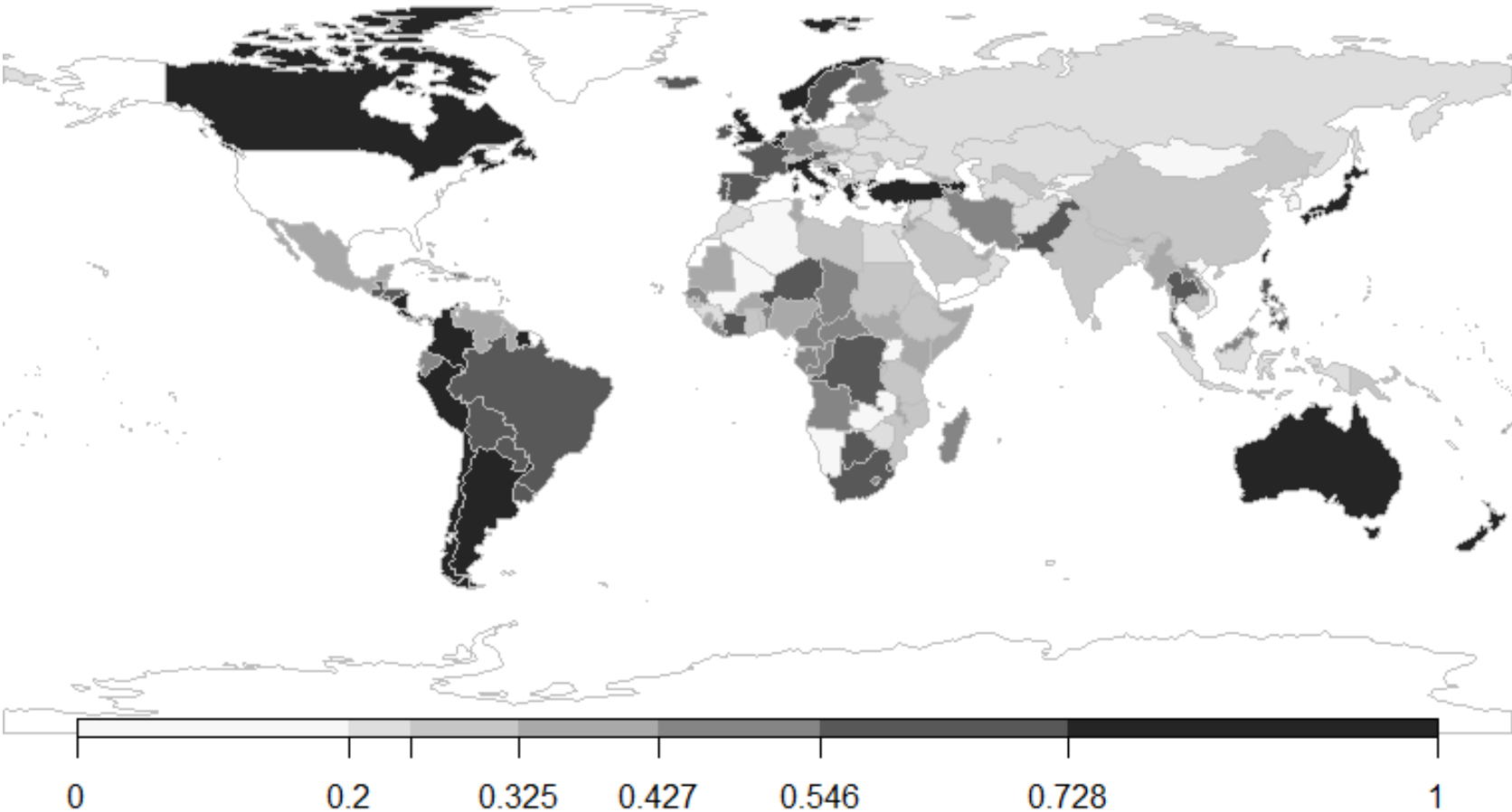


**B** Observed earthquakes in African states over time



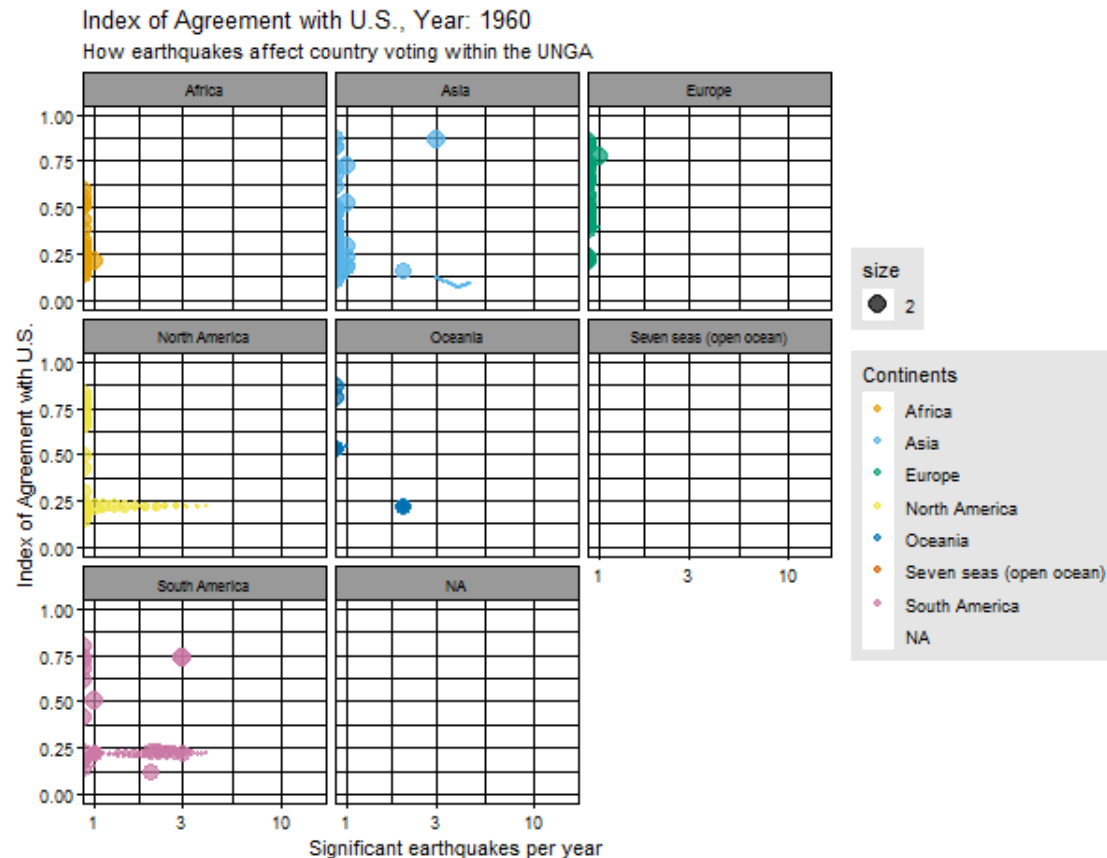


## PctAgreeUS



# Data Visualization Method

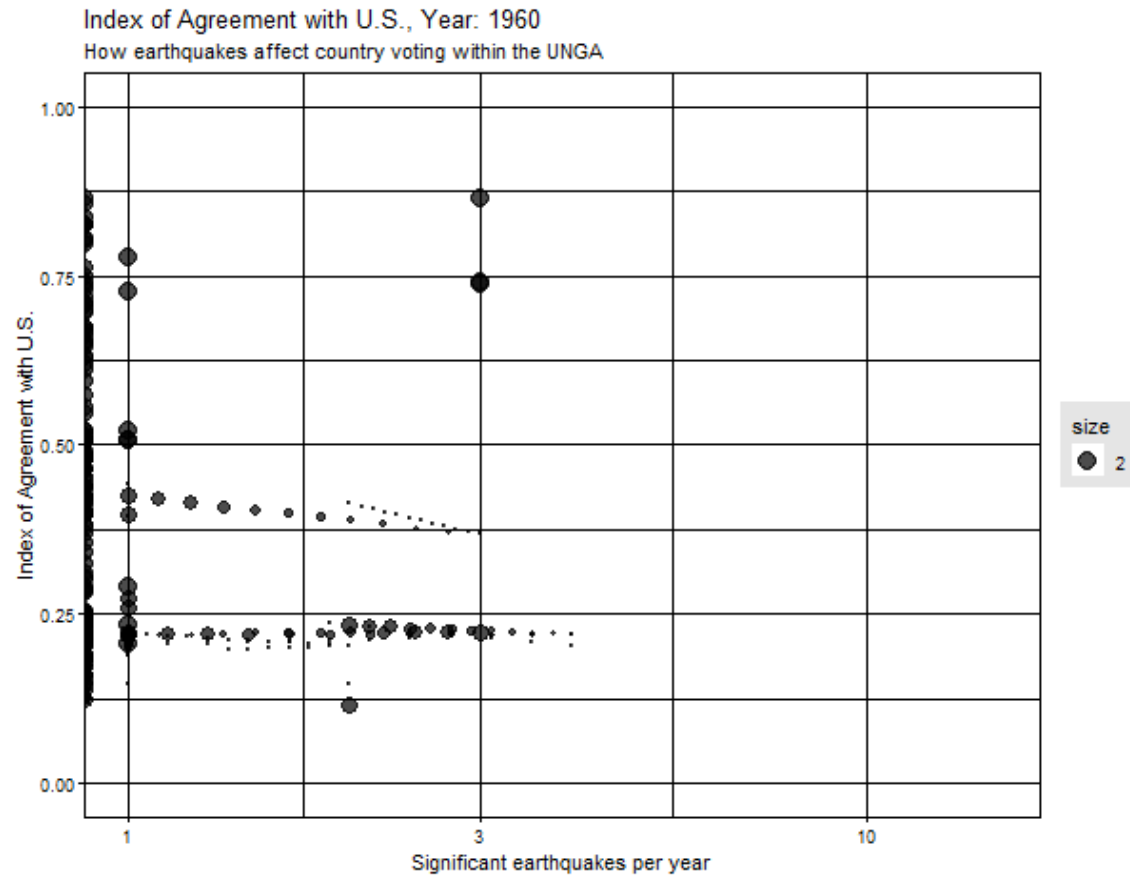
- Animate graphics



Data Sources:

National Geophysical Data Center / World Data Service (NGDC/WDS): Significant Earthquake Database (n.d.).  
Voeten, E., A. Strezhnev, and M. Bailey (2009).

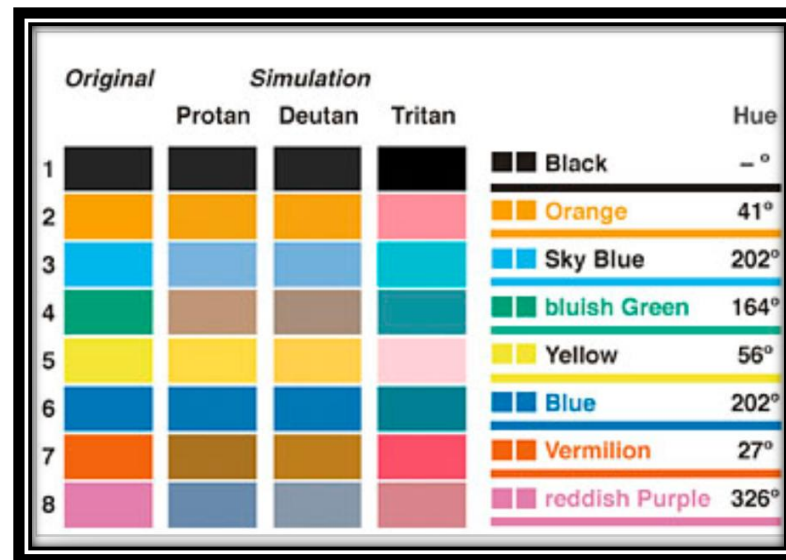
# Data Visualization Method



Data Sources:  
National Geophysical Data Center / World Data Service (NGDC/WDS): Significant Earthquake Database (n.d.).  
Voeten, E., A. Strezhnev, and M. Bailey (2009).

# Why this method?

- Customizable
  - Exclude continents to see overall relationship
  - Color-blind-friendly palette
    - Unordered hues
      - Source: [http://www.cookbook-r.com/Graphs/Colors\\_\(ggplot2\)/](http://www.cookbook-r.com/Graphs/Colors_(ggplot2)/)



# Why this method?

- Animation creates a compelling visualization
- Eye movement
  - Smooth-pursuit movements
  - Include preceding frames with gradual falloff
  - Easy to follow
    - Determine relationship between variables
- Visibility with size of shapes
- Include caption and sources

# Data Visualization Method

- Example of old version split by continents:

[https://raw.githubusercontent.com/svmariya/svmariya.github.io/master/dv\\_presentations/gganim\\_weq.gif](https://raw.githubusercontent.com/svmariya/svmariya.github.io/master/dv_presentations/gganim_weq.gif)

- Final Versions per variable:

[https://raw.githubusercontent.com/svmariya/svmariya.github.io/master/dv\\_presentations/gganim\\_eq.gif](https://raw.githubusercontent.com/svmariya/svmariya.github.io/master/dv_presentations/gganim_eq.gif)

[https://raw.githubusercontent.com/svmariya/svmariya.github.io/master/dv\\_presentations/gganim\\_ve.gif](https://raw.githubusercontent.com/svmariya/svmariya.github.io/master/dv_presentations/gganim_ve.gif)

# Results

- Utilized fixed effects model which corrected for heteroskedacity and serial correlation
- Data visualization effectively portrays results

	Estimate	Std. Error	Pr(> t )
Earthquakes (eq)	-0.0048	0.0035	0.1719
Volcanic Eruptions (ve)	-0.0078	0.0086	0.3658
Polity score (pol)	-0.0006	0.0004	0.1795
GDP per capita (gdp)	-0.0000	0.0000	0.0000
ODA (oda)	-0.0002	0.0001	0.0588

Table 1: Heteroskedasticity consistent coefficients (Arellano)

# Conclusion

- Compelling animated ggplot
- Room for improvement
  - More user-friendly
  - Animated map with gradient scale
  - Animated circular visual where states move closer to center when their voting behavior supports the U.S.



# References

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# Code

```
mapping0 <- aes(x = EQ, y = PctAgreeUS, size = 2, frame = Year)
cbPalette <- c("#E69F00", "#56B4E9", "#009E73", "#F0E442", "#0072B2", "#D55E00", "#CC79A7")
anim0 <- ggplot(data1, mapping = mapping0) +
  geom_point(alpha = 0.7) +
  theme_linedraw() +
  scale_x_log10()+
  scale_color_manual(values=cbPalette)+
  theme(strip.text.x = element_text(size=8, colour="black"),
    strip.background = element_rect(fill="#999999"),
    plot.caption = element_text(face = "italic", hjust = 0))+
  labs(title = 'Index of Agreement with U.S., Year: {as.integer(frame_time)}',
    subtitle = "How earthquakes affect country voting within the UNGA",
    x = 'Significant earthquakes per year',
    y = 'Index of Agreement with U.S.',
    caption = "Data Sources:
    National Geophysical Data Center / World Data Service (NGDC/WDS): Sig-nificant Earthquake Database (n.d.).
    Voeten, E., A. Strezhnev, and M. Bailey (2009).") +
  transition_time(Year) +
  ease_aes('linear') +
  shadow_wake(wake_length = 0.05, alpha = FALSE)+
  theme(legend.background = element_rect(fill="gray90", size=.5, linetype="dotted"))
animate(anim0, fps = 30, width = 600, height = 500, duration=20,
  renderer = gifski_renderer("gganim_0.gif"))
```