POLS 7012: Midterm

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This tweet made the rounds on Political Science Twitter over the past few weeks:

The notion that too much democracy can be antithetical to liberty and prospefity is, of course, not original to Senator Lee. Indeed, the history of our republic is a series of struggles between those seeking to expand democracy and those concerned that newly enfranchised groups will threaten the liberty and prospefity of everyone else.

In this midterm, we will interrogate the tweet's central **positive** (as opposed to normative) claim. Is it true that more democratic nations are less free or prosperous than non-democratic nations? In Problem 1, you will solve a formal model of the economic incentives faced by leaders across different political regimes.[1] In Problem 2, you will use your new skills importing, tidying, visualizing, and analyzing data to investigate the cross-national relationship between democracy and liberty.

Problem 1

Suppose that, in order to retain power, a political leader must receive the support of W people, where W represents the size of the **winning coalition**. In democracies, W is nominally equal to 50% of the electorate, while in dictatorships W is much, much smaller (perhaps a handful of high-ranking generals and party officials).

To maintain the support of his winning coalition, the political leader must allocate tax revenue between public goods (g), which benefit everyone in the country, and private goods (x), which are shared only by members of the winning coalition (e.g. patronage, kleptocracy). Members of the winning coalition have the following **utility function**, representing the value they receive from an allocation of public vs. private goods.

$$U(x) = \sqrt{1-x} + \sqrt{\frac{x}{W}}$$

[1] This problem is loosely adapted from The Logic of Political Survival.

The first term represents utility from public goods $(1 - x)$ and the second term represents utility from a $\frac{1}{W}$ share of the private goods.

If the political leader wanted to **maximize** the support of his winning coalition, what fraction of tax revenue would he devote to private goods (x)? Is that fraction increasing or decreasing in the size of the winning coalition (W)?

Solution

To maximize utility, set the derivative of the utility function equal to zero and solve. First, remember that $\sqrt{x} = x^{\frac{1}{2}}$

$$U(x) = \left(\frac{x}{W}\right)^{\frac{1}{2}} + (1 - x)^{\frac{1}{2}}$$

To take the derivative, you can use the **chain rule** (or Wolfram Alpha).

$$\frac{\partial U}{\partial x} = \frac{1}{2W}\left(\frac{x}{W}\right)^{-\frac{1}{2}} - \frac{1}{2}(1 - x)^{-\frac{1}{2}} = 0$$

Set equal to zero and rearrange.

$$\frac{1}{2W}\left(\frac{x}{W}\right)^{-\frac{1}{2}} = \frac{1}{2}(1 - x)^{-\frac{1}{2}}$$

Cancel out some terms.

$$\left(\frac{x}{W}\right)^{-\frac{1}{2}} = W(1 - x)^{-\frac{1}{2}}$$

Raise each side to the -2 power.

$$\frac{x}{W} = W^{-2}(1 - x)$$

Rearrange the Ws.

$$Wx = 1 - x$$

Solve for x.

$$\begin{aligned} Wx + x &= 1 \\ (W + 1)x &= 1 \\ x &= \frac{1}{W + 1} \end{aligned}$$

As W increases (and thus the country becomes more democratic), the share of resources going to private patronage decreases and the share going to public goods increases.

Problem 2

The Freedom House organization keeps a long-running dataset called **Freedom in the World** (FIW) in which experts score countries on the basis of political rights and civil liberties on a scale of 0 to 100. You can download the complete dataset here, and you can find an example of how the subindices are scored here.

1. Load the FIW data into `R`.

```
library(readxl)
FIW <- read_xlsx(path = 'data/2020_All_Data_FIW_2013-2020.xlsx', skip = 1, sheet = 'FIW13-20')
```

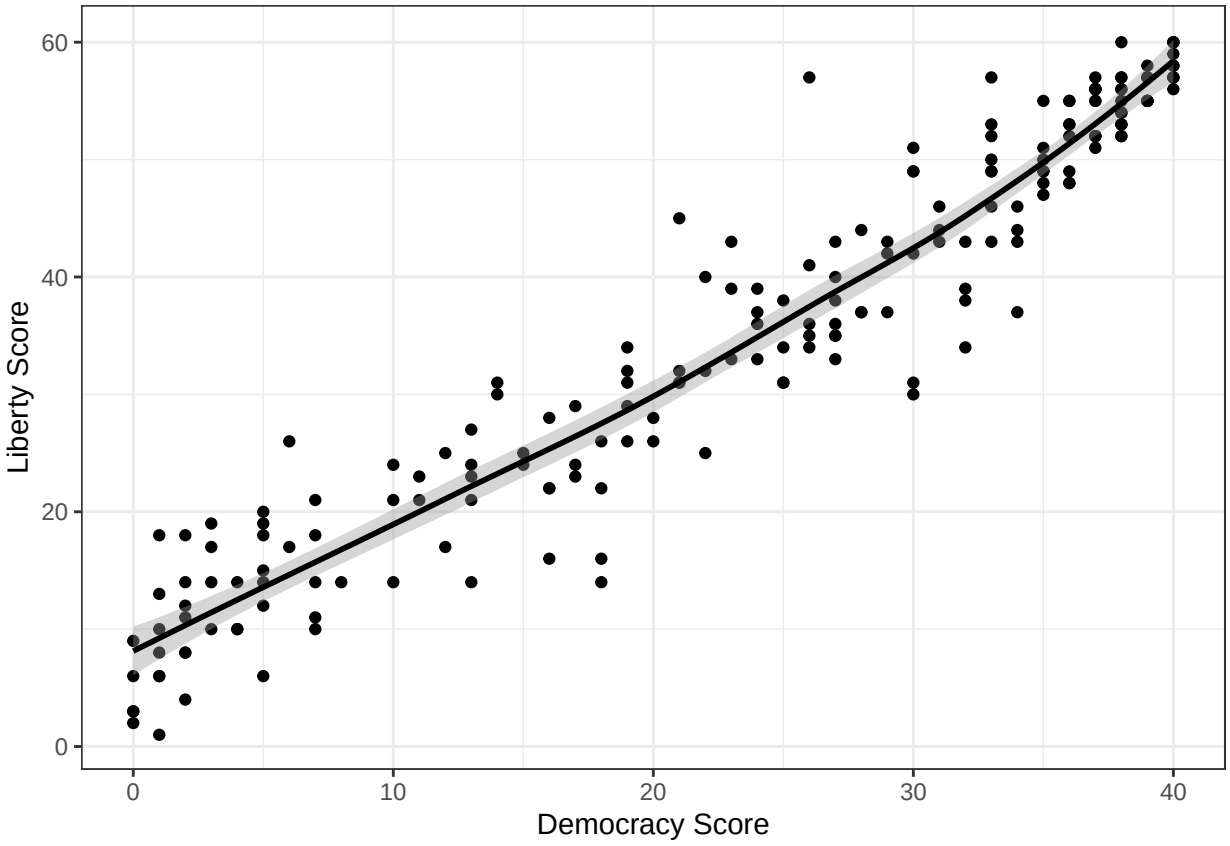
2. Keep only the most recent year of data. Keep only the countries (not the territories).

3. Of the 25 questions, some are about **democracy** (i.e. are political leaders elected?) and others are about **freedom/liberty** (i.e. can people practice their religion without fear of persecution? is there a free and independent media? etc.). Create one variable called `democracy_score`, equal to the sum of all the scores on questions related to democracy, and another variable called `liberty_score`, equal to the sum of all the scores on questions related to liberty.

```
FIW <- FIW %>%
  filter(`C/T` == 'c',
         Edition == 2020) %>%
  mutate(democracy_score = A1 + A2 + A3 + B1 + B2 + B3 + B4 + C1 + C2 + C3,
         liberty_score = D1 + D2 + D3 + D4 + E1 + E2 + E3 + F1 + F2 + F3 + F4 + G1 + G2 + G3 + G4)
```

4. Visualize the relationship between liberty and democracy.

```
ggplot(FIW) +
  geom_point(mapping = aes(x=democracy_score, y = liberty_score)) +
  geom_smooth(mapping = aes(x=democracy_score, y = liberty_score), color = 'black') +
  theme_bw() +
  labs(x='Democracy Score', y = 'Liberty Score')
```



5. Split the countries into democratic and non-democratic (your choice where you split) and conduct a bivariate hypothesis test. Are the democratic countries more free on average than the non-democratic countries?

```r
FIW %>%
  mutate(democratic = if_else(democracy_score > 20, 1, 0)) %>%
  t.test(liberty_score ~ democratic, data = .)
```

```
##
##  Welch Two Sample t-test
##
## data:  liberty_score by democratic
## t = -23.712, df = 170.1, p-value < 2.2e-16
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -32.24832 -27.29168
## sample estimates:
## mean in group 0 mean in group 1
##        17.34667        47.11667
```