14.750x: Political Economy and Economic Development

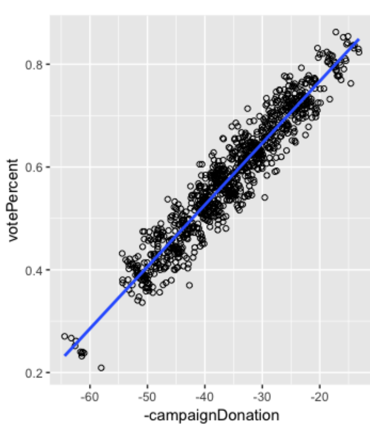
Module 7 Problem Set

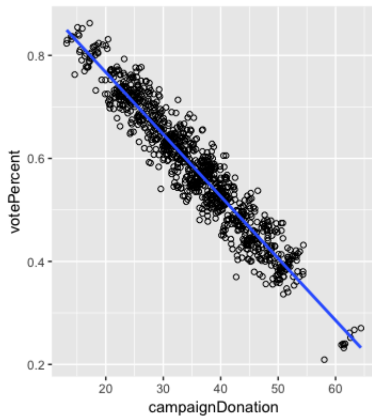
Part 1: R Exercise

Use votingData.RData for the following.

As a man of science, Bruce Wayne has decided to donate campaign contributions to random candidates in his political party in each of 100 county elections for each of the last 10 years. However, his campaign contribution amounts may vary, systematically, with the county. That is, Bruce may favor giving contributions more in some counties than in others.

1. Regress the vote percent received by Wayne's party [votePercent] on the campaign donation [campaignDonation].
   (a) What is the estimated coefficient on the campaignDonation variable in this regression? Enter a number with three places after the decimal.
   (b) What is one standard deviation in campaign donations equal to? Enter a number with two places after the decimal.
   (c) What is the effect of a one standard deviation increase in campaign donation on the share of votes received? Enter your answer in terms of percentage points, with one place after the decimal.
2. Generate a scatter plot of vote percentage against campaign donations. Which of the following graphs corresponds to your scatter plot?

(a) 



(b)

3. Regress the vote percent received by Wayne's party on the campaign donation, including fixed effects two ways:

   (a) Run the regression by including dummy variables for each county:

   $$\text{Vote Percent}_{it} = \gamma_0 + \sum_j \alpha_j \mathbf{1}_{\text{county}=j} + \beta \text{Campaign Donation}_{it} + \varepsilon_{it}$$

   What is $\hat{\beta}$? Please enter a numeric response with four places after the decimal.

   (b) Fill in the blank. A one standard deviation increase in campaign donation is associated with an increase of the vote share by _ _ . _ _ percentage points. Please enter a numeric response with two places after the decimal.

   (c) Run the regression by "de-meaning", where you subtract the average of the main variables (Vote Percent and Campaign Donation) in each time period:

   $$\text{Vote Percent}_{it} - \overline{\text{Vote Percent}}_i = \gamma_0 + \beta\left(\text{Campaign Donation}_{it} - \overline{\text{Campaign Donation}}_i\right) + \varepsilon_{it}$$

   where $\overline{X}_i$ is the average value of X for that county.

   Hint: Check out the package ***dplyr***. *Once you load this library, you can use the following line to demean a variable:*
   ```
   votingData = votingData %>% group_by(county) %>% mutate(demeaned_VariableName
   = VariableName - mean(VariableName))
   ```

   What is $\hat{\beta}$? Please enter a numeric response with four places after the decimal.

   (d) True or False. You get the same estimate of β for each regression in Questions 3a and 3c.

      i. True
      ii. False

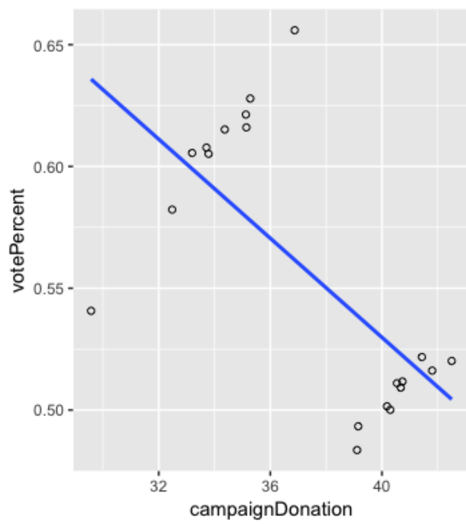
   (e) What is the difference between the regression in Question 1a and the regressions in Question 3?

      i. The regression in 1a captures between-county differences, while the regressions in 3 control for them
      ii. The regressions in 3 capture between-county differences, while the regression in 1a controls for them

4. Fill in the blank. Bruce Wayne donates ____________________, on average, in counties with lower voterPercent.

   (a) more
   (b) less
   (c) the same

5. The following is a scatter plot of vote percentage against campaign donations separately for counties 17 and 34. You can also try this for any other two counties and see that the main pattern holds.



   Fill in the blank. Overall, the relationship between the vote share and campaign donation is ______. Within counties, the relationship is ______.

   (a) First blank: positive, negative, zero
   (b) Second blank: positive, negative, zero

Part 2: Theoretical Problem

Imagine that voters and politicians play the following game. A politician who is in office has to decide how much effort e to apply to affect the outcome of some policy. The policy output x has two states, indicated by 1 or 0 respectively. In particular, when the politician applies effort e, we have

$$x = \begin{cases} 1 & \text{with probability } e \\ 0 & \text{with probability } 1 - e \end{cases}$$

Moreover, the politician dislikes applying effort, and faces a cost $c(e) = \frac{1}{2}ce^2$. Before the politician takes a decision, voters tell the politician that they will contribute h to the re-election campaign if $x = 1$ and l if $x = 0$. Both the voters and the politicians are risk-neutral. Finally, if the politician does not like the contract setup, he can walk away and just get some payoff m. The timing of the game is as follows:

- Voters offer a take-it-or-leave-it contract $\{h, l\}$ and politician chooses to accept or not. If not, his outside option is m.

- Then politician applies hidden effort $e \in [0, 1]$.
- After this, x is realized.
- Voters pay $w(x) \in \{h, l\}$ and keep $x - w(x)$.
- The utility of voters is u_v and the utility of politicians is u_p.
- Specifically, payoffs are

$$u_v(x) = x - w(x) \text{ and } u_p(w) = w - \frac{1}{2}ce^2.$$

1. First, assume that voters cannot commit to paying the declared $w(x)$. This is because after politicians apply their effort and the outcome x is realized, voters can change their mind. Then what is the equilibrium level of effort by the politician?

   (a) $e* = 0$
   (b) $e* = 0.5$
   (c) $e* = 1$
   (d) It depends

   Now suppose that voters can commit to reciprocating outcomes by paying $w(x)$. Given this information, solve the following problems.

2. Voters wish to maximize their expected utility, which is the expectation of the outcome ($x = 1$ or 0) minus the payment to the campaign contribution (h or l). Write the expected utility of the voters $\pi(h, l, e)$.
   Select the one component from each of the three choices below to form the expression (e.g., selecting "e", "", and "l" would form the expression "e*l").*

   First term: $e\,(1 - h)$, $e - h$, $l - e$, $l\,(1 - e)$
   Second term: +, -, *, /
   Third term: $e\,(1 - h)$, $e - h$, $l - e$, $l\,(1 - e)$

3. One constraint the voters have to keep in mind is that they cannot contribute negative amounts to the campaign. What does this mean for h and l? Select all that apply.

   (a) Both must be non-negative
   (b) h must be greater than l
   (c) l must be greater than h

4. Another constraint the voters have to keep in mind is that they must make sure that the politician wants to join the arrangement. Therefore, the expected payoffs to the politician minus the cost of effort need to be at least as much as his outside option. In the following questions, write/select the components of the mathematical condition.

   (a) Expected payoffs:
   Select the one component from each of the three choices below to form the expression for expected payoffs (e.g., selecting "e", "", and "l" would form the expression "e*l").*

   First term: eh, el, $e(1 - h)$, $e(1 - l)$, m
   Second term: +, -, *, /
   Third term: $(1 - e)h$, $(1 - e)l$, $(1 - e)(1 - h)$, $(1 - e)(1 - l)$, m

(b) Cost of effort:

   i. $\frac{1}{2}ce^2$
   ii. $\frac{1}{2}ce^2 + m$
   iii. $\frac{1}{2}ce^2 - m$
   iv. $\frac{1}{2}ce^2 m$

(c) Outside option:

   i. $\frac{1}{2}ce^2$
   ii. $\frac{1}{2}ce^2 + m$
   iii. $\frac{1}{2}ce^2 - m$
   iv. m

(d) Given your answers in 4a, b, and c, select the correct terms to form the entire condition:
Select the one component from each of the five choices below to form the expression for entire condition (e.g., selecting "Outside option", "", and "Outside option" would form the expression "Outside option * Outside option").*

First term: expected payoffs, cost of effort, outside option
Second term: -, *
Third term: expected payoffs, cost of effort, outside option
Fourth term: $\geq$, $\leq$, $=$
Fifth term: expected payoffs, cost of effort, outside option

(e) Finally, the voters need to keep in mind that the politician will choose an effort level that maximizes his own expected utility. Solve for $e(h, l)$, the optimal effort level as a function of h, l.
Select the one component from each of the three dropdowns below to form the expression (e.g., selecting "e", "", and "l" would form the expression "e*l").*

First term: h, l, $h + l$, $h - l$ hl
Second term: +, -, *, /
Third term: $\frac{1}{2}c$, c, $2c$, $\frac{1}{2}c^2$, c^2, $2c^2$