Concepts and Computation: A Few Notes on Research Methods in Political Science

Carlisle Rainey

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Chapter 1

Questions

> "The best scientists and explorers have the attributes of kids! They ask questions and have a sense of wonder. They have curiosity. 'Who, what, where, why, when, and how!' They never stop asking questions, and I never stop asking questions, just like a five year old." —Sylvia Earle, marine biologist

See also a relevant xkcd comic.

In political science, we ask a lot of questions about politics, such as these questions about marriage equality:

- Should gay and lesbian couples have the same right to marry as heterosexual couples?
- What percent of the public supports marriage equality for gays and lesbians?
- What explains the recent increase in support for marriage equality?

Or these questions about income inequality:

- Should the government redistribute wealth?
- Is income inequality higher or lower in the U.S. than France?
- What are the consequences of income inequality?

In answering these questions, we might make *claims* about politics. Claims are just answers to questions. We might make the following claims about marriage equality:

- Gay and lesbian couples should have the same right to marry as heterosexual couples.
- 54% of the public supports marriage equality.
- Court decisions explain the recent increase in support for marriage equality.

Or we might make these claims about income inequality:

- The government should not redistribute wealth.
- Income inequality is higher in the U.S. than France.
- Income inequality causes a slower growth rate.

Political science is all about *asking* and *answering* questions. But the best approach to answering a question depends on the type of question.

I break the questions we might ask (or claims we might make) about politics into three types: normative, descriptive, and causal. Answering each type question requires a different approach.

Type	Description	Marriage Example	Inequality Example	Approach
normative	How *should* the world look? Asks for a moral judgement.	Should gay and lesbian couples have the same right to marry as heterosexual couples?	Should the government redistribute wealth?	logic and reasoning
descriptive	How *does* the world look? Asks for an empirical observation.	What percent of the public supports marriage equality for gays and lesbians?	Is income inequality higher or lower in the U.S. than France?	observation and measurement
causal	*Why* does the world look the way it does? What *influences* X? Asks for a *cause*-and-*effect* relationship or an *explanation*.	What explains the recent increase in support for marriage equality?	What are the consequences of income inequality?	observation and measurement, plus clever design

1.1 Normative Questions

Normative questions ask: "What *should* the world look like?"

In my experience, most people associate political science with normative questions. When I tell people that I'm a political scientist, they tend to ask me normative questions.

1. "You don't think we should invade Iran, do you?" (Asking for a moral judgement about foreign policy.)
2. "What do you think about the breakdown of the family in the U.S?" (Implicitly asking for a moral judgement about social policy, i.e., "Shouldn't the government adopt more pro-family policies?")
3. "Don't you think we're rewarding laziness?" (Implicitly asking for a moral judgement about economic policy, i.e., "We shouldn't be doing that, should we?".)

These are normative questions, if perhaps somewhat ill-formed. They are important questions. Some political scientists, called "political philosophers" or "normative political theorists," focus on these types of questions.

Some important questions asked by normative political theorists include:

1. Should the state redistribute wealth?
2. Under what conditions is war justified?
3. What types of behavior should the state regulate?
4. How should states make policy?

We will not focus on these types of questions.

However, we all bring normative views with us, and these views are helpful. Normative views can motivate us to focus on certain descriptive and causal questions. For example, perhaps you believe that democracy is the most normatively desirable form of government. This might lead you to describe how well democracy works in the U.S. (descriptive) or explain why some countries remain authoritarian (causal). Perhaps you believe that governments should not torture. This might lead you to describe the extent to which certain states use torture (descriptive) or the types of institutional arrangements (independent courts?) that reduce torture (causal).

Reversing the cycle, answers to descriptive and causal questions might inform our normative views. For example, if you know that a majority of the U.S. public supports marriage equality, then you might think the U.S. should allow gays and lesbians to marry. If you know that income equality reduces economic growth, then perhaps you think the U.S. should adopt a more redistributive economic policy.

Normative questions can motivate descriptive and causal questions. Descriptive and causal questions can inform normative debates. But it is important to draw a sharp distinction between normative questions and descriptive/causal questions, because the two require completely different approaches.

For this class, we'll not focus at all on normative questions. Instead, we'll focus on descriptive and causal questions.

1.2 Descriptive Questions

Descriptive questions ask: "What *does* the world look like?"

Descriptive questions ask for simple observations—a description of the world.

For example, we might want to ask the following questions:

1. How many chambers does the Swedish legislature have?
2. What percent of voters voted for Barack Obama in 2008?
3. How many political parties are there in the United Kingdom?
4. What percent of countries today are democracies? How has this changed over time?
5. What percent of eligible voters actually voted in the U.S. in 2010? How does this compare with turnout in other countries?
6. What percent of states allow same-sex marriage?
7. How polarized is the U.S. Congress? How has this changed over time?

Answering these questions requires some sort of conceptualization (i.e., what do we mean by "polarized"?) and measurement (i.e., how can we quantify "polarization"?). But all that is required is observation. All we need to do make the appropriate measurements (i.e., gather data).

1.3 Causal Questions

Causal questions ask: "*Why* does the work look the way it does?"

Causal questions ask about a cause or an effect. They ask for an explanation–*why* did something happen? We might be interested in the following causal questions:

1. Why is income inequality so high in the U.S.? Why is it growing so fast at the moment?
2. What causes war between two countries?
3. Why do some states become democratic while others remain authoritarian?
4. What is the effect of an independent court of last resort?
5. What explains low turnout in the U.S.?
6. Why do some countries have many political parties and other countries have few?
7. Why does policy change rapidly in some times and/or places, but slowly in others?
8. Does presidentialism cause democratic failure?

Causal questions and claims are about action. We have one variable acting on another. There are lots of verbs that summarize action: causes, influences, affects, changes, increases, decreases, etc. Causal questions ask us to use these sorts of verbs to describe the way the world works.

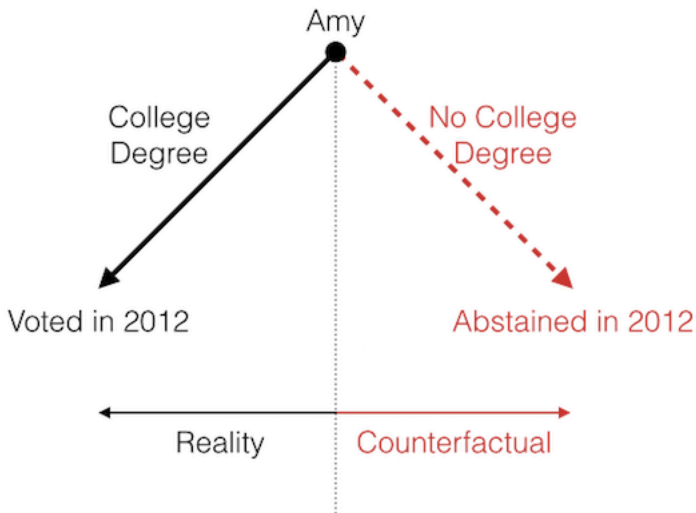

Figure 1.1: Effect of education on turning out to vote.

1.3.1 Meaning

We use the word "cause" quite a bit in everyday language. We might say, for example, that smoking *causes* cancer. In making causal claims about politics, we might say things like "wealth *causes* democracy" or "education *causes* turnout."

But what do these causal claims really mean? What does it mean for something to *cause* something else?

The idea of causation relies on the counterfactual. The counterfactual requires us to imagine a world that does not exist (i.e., runs counter to fact).

For example, suppose Amy has a college degree and voted in 2012. But we want to know if the college degree caused Amy to vote. In order to answer that question, we simply need to consider the counterfactual world in which Amy did not receive a college degree.

We might imagine rewinding time and simply removing Amy's opportunity to attend college (but nothing else), then letting time move forward to 2012 and observing whether Amy votes. If Amy does not vote in the counterfactual world, then we say that the college degree caused Amy to vote. If Amy does vote in the counterfactual world, then we say that the college degree did not cause Amy to vote.

Chapter 2

Models

2.1 The Scientific Method

Most of us learned the scientific method as a rote process, something like the following:

- Question
- Hypothesis
- Experiment
- Analysis
- Conclusion

But I don't think that's how any science, especially social science, really works. Science is imaginative. It's creative. It's much more like abstract painting or song-writing or poetry than replacing books in the library (the coldest, most mechanical task I can think of).

So if science isn't rote hypothesizing and experimenting, what is it?

Let's look at Albert Einstein. Here are some things he said about his approach to science:

> When I examine myself and my methods of thought, I come close to the conclusion that the gift of imagination has meant more to me than any talent for absorbing absolute knowledge.
>
> All great achievements of science must start from intuitive knowledge. I believe in intuition and inspiration…. At times I feel certain I am right while not knowing the reason.
>
> Imagination is more important than knowledge.
>
> I have no special talent. I am only passionately curious.

In a 1961, the influential political scientist wrote the following:

> …I should like to suggest that empirical political science had better find a place for speculation. It is a grave though easy error for students of politics impressed by the achievements of the natural sciences to imitate all of their methods save the most critical one: the use of the imagination… surely it is imagination that has generally marked the intelligence of the great scientist, and speculation—often-times foolish speculation, it turned out later–has generally preceded great advances in scientific theory.

The scientific method is (sometimes serendipitous) interaction between speculation and observation.

My version of the scientific method is

- Concepts
- Models
- Measurements
- Comparisons

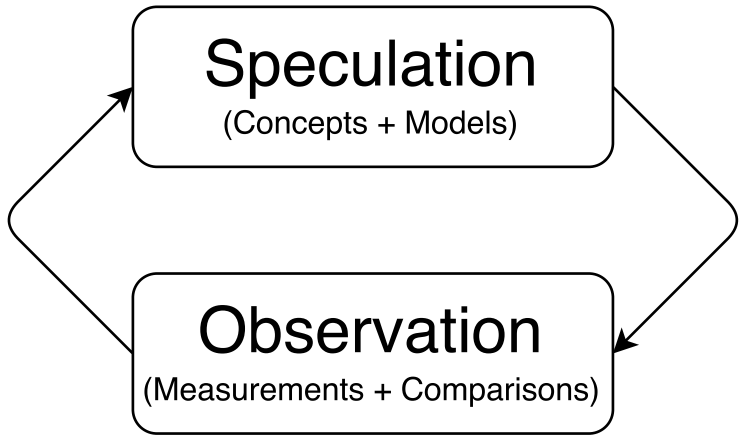

Figure 2.1: A figure illustrating the relationship importance of speculation and imagination in science.

The first two components, concepts and models, we might refer to as "speculation." I like this term, because it emphasizing the carefree, creative nature scientific notions. Many students are too afraid of being wrong. "speculation" frees us up to use our imagination.

2.1.1 Concepts

Concepts are simply mental constructs. For our purposes, concepts are words that we use to describe political entities. For example, we can use the concept of "democracy" and describe the United States as a democracy. We can use the concept of "liberal" and refer to Nancy Pelosi as a liberal.

Concepts are important because they allow us to communicate and reason precisely and accurately about political events. In general, ambiguous concepts need work. We need precise, well-defined concepts. They will never be perfect, but we should always push ourselves toward more precision and clarity.

Some concepts are easier to define precisely than others, for example. "Vote share"" is easy to define. "Democracy" and "ideology" are not so easy.

To illustrate, answer the following question: What is a democracy? This is harder than it seems.

Concepts in political science tend to be more abstract and ill-defined. But it is essential to define our concepts as precisely as possible. Before we can answer questions about our concepts, we must know what our concepts mean!

Does negativity cause an increase or a decrease in turnout? To answer this, we certainly need to know if "The incumbent voted for Obamacare" is considered negativity.

2.1.2 Models

A model is simply a tentative explanation of observed phenomena, used to better understand the world. Models need not be accurate in every respect. A model is sometimes referred to as a theory, explanation, or story.

Models connect concepts in a causal fashion. One minimal model, for example, is that increasing the level of democracy in a country leads to more economic growth. In this case, we have two concepts, democracy and economic growth, connected causally. Of course, we'd want to elaborate a bit and flesh this model out into a fuller explanation. Why is it, exactly, that democracy causes growth?

We can also think of models as logical defenses or justifications of causal claims. For example, we might take two or three basic principles or axioms as given, and deduce causal claims from this. For example, we might assume that people behave in a way that benefits them most financially. We might also assume that the Republicans tend to adopt lower tax rates than Democrats. Therefore, it seems reasonable to conclude that an increase in one's wealth makes them more likely to vote Republican.

2.1.3 Measurements and Comparisons

We'll spend some time later in the semester talking about measurements and comparisons. But for now, simply note that measurements are simply quantifications of our concepts. In order to study a phenomenon systematically, we often want to assign numbers to the entities of interest. If we are interested in the concept of economic growth, for example, then the percent change in GDP is a good way to quantify that concept. Similarly, if we are interested in democracy, then we might develop a process for assigning each country a score from -10 to 10, where -10 represents the least democratic countries and 10 represents the most democratic countries.

Once we have these measures, we'll want to make the appropriate comparisons. For example, we might want to compare the average economic growth in democracies and non-democracies.

2.2 Building Models

But how do you build a model? How do you put together a compelling logical defense of a causal claim?

A model of the model-building process:

- Step 1: Observe some facts. If these facts are puzzling, even better. (e.g., a large percentage of people vote, countries fight wars—notice that our models are what make these facts puzzling)
- Step 2: Look at the facts as though they were the end result of some unknown process (model). Then speculate about the process that might have produced such a result. We're thinking in terms of causation here
- Step 3: Deduce other results (implications, hypotheses, or predictions) from the model.
- Step 4: Then ask yourself whether these other implications are true and produce new models if necessary.

Some rules of thumb for model-building:

- Rule 1: Think "process." In particular, think about causality. One thing leads to another, which causes two changes, which both affect the concept we care about.
- Rule 2: Develop interesting implications. An interesting implication might be one that would otherwise (i.e., in the absence of the model) be counterintuitive. It might also be an implication for which we have the appropriate data.
- Rule 3: Look for generality. If you start with a theory about US voter behavior, can you generalize it to voting behavior in other places? Finding generalizations usually involves generalizing nouns.
- Rule 4: Realize that model-building is a slow process
- Rule 5: Talk about your ideas.

2.3 Evaluating Models

Truth

- Are the implications of the model correct?
  - What about the assumptions? In practice, we don't worry much about the assumptions for a few reasons. Assumptions are usually simplifications (e.g., politicians are office-seeking). Many good models are based on simple, but incorrect assumptions.
    * Assumptions sometimes cannot be observed directly.

    * Testing assumptions distracts your attention from the implications of the model. Get it the habit of exploring and evaluating the range of implications of the model.
    * That said, all else equal, we would prefer a model based on correct assumptions.
- In particular, the model should allow us to make predictions (note that we can have a predictive model, that is not necessarily causal. However, causal models should be predictive of future observations.)

Question: How could we evaluate the truth of our model of ACA opinions?

- Beware of circular or tautological models (e.g., people do what is in their self interest)
- Find critical experiments. The ideal approach is to compare alternative models. When we have two competing models, we'd like to find a situation in which the two model produce different implications. This is a powerful situation, because only one of the models can be correct.
- To the extent possible, always think in terms of alternative models, as opposed to a single model being right or wrong.

Beauty (e.g., Downs)

- Simplicity (office-seeking) - some assert that simpler models are more likely to be correct.
- Fertility (produces many implications)
- Surprise (why is turnout so high?)

Justice - does the model advance normative goals?

2.4 Review Exercises

1. Describe (my view of) the scientific method. How do concepts, models, measurements, and comparisons all fit together.
2. Summarize my model of the model-building process.
3. What are the five rules of thumb for model-building?
4. How do we evaluate models? Which of the three criteria do you feel are most and least important?
5. What is a critical test and why is it important?

Chapter 3

Proportions and Percents

We can imagine lots of lists do not contain numbers. Instead of number, these lists contain not-numbers. We sometimes refer to not-numbers as "qualitative" (as opposed to "quantitative") values. We might have a list that contains the class standing of each student in our class. Rather than numbers, this list of not-numbers contains qualitative values like "Freshman," "Sophomore," "Junior," and "Senior."

Similarly, at the end of the semester, I have two lists of grades. The first lists numbers that represent each student's points in the class. This list of quantitative values ranges from 0 to 100. But you care more about the second list, which contains each student's letter grade in the class. This list of not-numbers contains the qualitative values A, B, C, D, and F.

Exercise: Similarly, we might have lists that contains partisanships, ideologies, regime types, and so on. What qualitative values might we find in a list of partisanships? Ideologies? Regime types?

When we deal with lists that contain qualitative values, **we cannot use the average** because we cannot sum the not-numbers.

Instead of an averarge, we use *proportions*. We choose a particular qualitative values and compute the proportion of the list that falls has that value. Note that this "particular category" might contain several values, such as freshman or sophomore (underclassmen) or A, B, or C (passing grades). For example, we say a certain proportion of the class are freshman. Or we say that a certain proportion of a class received an A, B, or C.

3.1 Calculating Proportions

To calucate a proportion, simply count the number of entries in the list that fall in the particular category and divide that number by the total number of entries.

$$\text{proportion in the category} = \frac{\text{number of entries that fall into the category}}{\text{total number of entries}}$$

3.2 Converting Proportions to Percents

Proportions serve an important purpose–they make math easy. However, the scale makes proportions difficult to write or talk about. To make the math easy, we use proportions. To make the interpretation easy, we use percents.

To convert a proportion to a percent, we simply multiply the proportion times 100%.

Table 3.1: Class standing and letter grades of 15 hypothetical students.

Name	Class	Grade
Jean	Junior	B
Demetrius	Senior	B
John	Senior	B
Agnes	Senior	C
Ethelene	Sophomore	A
James	Freshman	B
Madden	Sophomore	C
Ruben	Junior	A
Tia	Junior	D
Damon	Senior	D
Alberta	Freshman	B
Robert	Freshman	D
Dolores	Junior	B
Mary	Freshman	C
Joe	Sophomore	B

$$\text{percent in the category} = \text{proportion in the category} \times 100\%$$

.

As a general rule of thumb, I recommend that you convert proportions to percents, but only *after you complete all calculations.*[1]

Example: Compute the percent of sophomores in the class from the data in Table 3.1.

> First count the number of sophomores in the list. We have 3. Next, count the number of total students in the class. We have 15. Finally, divide the number of sophomores by total number of students. We have $\frac{3}{15} = 0.2$.
>
> To convert the proportion 0.2 to a percent, we simply multiply it by 100%. This gives $0.2 \times 100\% = 20\%$. We can then say "20% of the students in the class are sophomores."

Exercises

1. Compute the percent of students in the class that are sophomores. Compute the percent that are juniors or seniors.
2. Compute the percent of students that received an F. Compute the percent that received an A or a B.
3. Compute the percent of seniors that received an A. Compute the percent of freshmen that received an A.

3.3 The Mathematics of Proportions

The approach I describe above to compute a proportion works perfectly. However, it does not clearly connect to the past (or future) discussion of averages.

If we can connect proportions and averages, then we reduce our work later. By thinking of a proportion as a special kind of average, we can apply the same ideas to two concepts, cutting the ideas we need to learn and understand in half.

[1] Sometimes, calculation that work for proportions also work for percents. However, sometimes they do not. Because of these, I recommend doing all calculations with proportion and convert the final answer into a percent.

Table 3.2: Class standing and letter grades of 15 hypothetical students.

Name	Class	Grade	0-1 List*
Zachery	Junior	B	0
William	Senior	B	0
Gary	Senior	B	0
Lela	Senior	C	0
Douglas	Sophomore	A	1
Frances	Freshman	B	0
Taylor	Sophomore	C	1
Justyn	Junior	A	0
Phyllis	Junior	D	0
Joseph	Senior	D	0
Clayton	Freshman	B	0
Fred	Freshman	D	0
Dot	Junior	B	0
Rudolph	Freshman	C	0
Harry	Sophomore	B	1

* 1 indicates sophomores and 0 indicates not-sophomores.

To see that a proportion is a special type of average, we can simply convert the list of not-numbers into a list of numbers. To create the new list of numbers, assign the number 1 to the entries that fall into the particular category and assign the number 0 to the other entries. This creates a new list of numbers that contains only 0s and 1s. I call this type of list a 0-1 list. The proportion is simply the average of this 0-1 list.

Important: We can think of a proportion as an average of a 0-1 list.

Example: Using a 0-1 list, compute the proportion of students in Table 3.1 that are sophomores.

> Create a 0-1 list where 1 indicates sophomores and 0 indicates. Table 3.2 includes this 0-1 list. Now simply average the 0-1 list. We have $\frac{\text{sum of 0-1 list}}{\text{number of entries in 0-1 list}} = \frac{3}{15} = 0.2$.

Exercise: Suppose I want to evaluate the graduate admissions process at a university, so I put together a list containing the gender of the admitted graduate students and obtain M, M, F, F, M, M, M, M, F, M, and M. Try two ways to calculating the proportion of women admitted. First, use inital method I described: count the number of women in the list and divide that by the total number of entries. Next, use the more mathematical way I described: write down the implied 0-1 list (replace F with 1 and everything else with 0) and then average the list. Are these two approaches different or the same? Can you explain why the results are identical?

3.4 SD of a 0-1 List

If we convert a list of not-numbers into a 0-1 list, then we can compute the SD of the new list. Just like with other lists of numbers, the SD of a 0-1 list is the R.M.S. of the deviations from average. We can compute the SD the usual way. But, as you well know, the usual way takes time. If we have a 0-1 list, though, we can use a shortcut.

$$\text{SD of a 0-1 list} = \sqrt{\text{ave. of list} \times (1 - \text{ave. of list})}$$

Notice that the average of a 0-1 list (the proportion) determines the SD *exactly*. If the average of a 0-1 list is 0.25, then the SD is exactly $\sqrt{0.2 \times 0.8} = 0.4$. If the average of a 0-1 list is 0.5, then the SD is exactly $\sqrt{0.5 \times 0.5} = 0.5$.

Because of this, we usually pay little attention to variation when working with lists of qualitative values–the proportion (or percent) contains all the information we need.

However, this shortcut will help us later, so remember it.

Exercise: Suppose a 0-1 list that contains 6 0s and 4 1s. What is average of this list? What proportion are 1s? What is the SD of the list?

3.5 Two Facts about Proportions and Percents

We can say two things about proportions and percents:

1. A proportion is at least 0 and at most 1. Similarly, the percent is at least 0% and at most 100%. If none of the entries fall into the category, then the top (numerator) of the formula for a proportion equals 0, and therefore the whole proportion equals 0. If all of the entries fall into the category, then the top of the formula for the proportion proportion (numerator) equals the bottom of the proportion (denominator), and thefore the whole proportion equals 1.
2. The proportion that do not fall into a particular category is 1 minus the proportion that fall into that category. It turns out that the percent that do not fall into a particular category is 100% minus the percent that fall into that category.

Exercises

1. In a Gallup poll conducted in late December of 2017, 39% of respondents said they "approve" of the job that Donald Trump is doing as president. What percent did not say they approve? In the same survey, 55% said they "disapprove" of the job that Donald Trump is doing as president. How is this possible?
2. I wrote a computer program to analyze a data set. I found that 120% of citizens living in a district received contact from a political campaign. Did I do something wrong?

3.6 Review Exercises

1. Table 3.3 shows the partisan control of each branch of the 49 U.S. states (excluding Nebraska) in 2011. Compute the proportion of states with a Republican governor. Repeat for house and senate. Is the proportion of Democratic governors, houses, and senates necessarily 1 − proportion Republican? Why or why not? Which party has most control in the U.S. states? Can you think of any ways that control of state governments affect national politics?

2. Obtain a copy of Gerber, Green, and Larimer's 2008 article "Social Pressure and Voter Turnout: Evidence from a Large-scale Field Experiment" published in the *American Political Science Review* (Volume 102, Issue 1, pp. 33-48). Complete the following tasks:

   a. Read the introduction, pp. 33-34 though "Social Norms, The Calculus of Voting, and Prior Research." What question interests the authors? What type of question is it (normative, descriptive, causal)? Would you say that the question matters? Why?
   b. Read the section "Experimental Design," pp. 36-38 though "Results". Briefly describe the design of the study. When and where was the student conducted? Who was included in or excluded from the study? How did the researchers assign the subjects to the treatment and control groups?
   c. Examine the four mailers reproduced on pp. 43-46. Using your intuition about voter psychology and behavior, rank these mailers from most effective to least effective. Which mailer do you suspective makes the recipient most likely to vote? Least likely? Do you suspect any of the

Table 3.3: The partisan control of each branch of the 49 (excluding Nebraska) state governments in 2011.

state	governor	house	senate
Alabama	Republican	Republican	Republican
Alaska	Republican	Republican	Split
Arizona	Republican	Republican	Republican
Arkansas	Democrat	Democrat	Democrat
California	Democrat	Democrat	Democrat
Colorado	Democrat	Republican	Democrat
Connecticut	Democrat	Democrat	Democrat
Delaware	Democrat	Democrat	Democrat
Florida	Republican	Republican	Republican
Georgia	Republican	Republican	Republican
Hawaii	Democrat	Democrat	Democrat
Idaho	Republican	Republican	Republican
Illinois	Democrat	Democrat	Democrat
Indiana	Republican	Republican	Republican
Iowa	Republican	Republican	Democrat
Kansas	Republican	Republican	Republican
Kentucky	Democrat	Democrat	Republican
Louisiana	Republican	Republican	Democrat
Maine	Republican	Republican	Republican
Maryland	Democrat	Democrat	Democrat
Massachusetts	Democrat	Democrat	Democrat
Michigan	Republican	Republican	Republican
Minnesota	Democrat	Republican	Republican
Mississippi	Republican	Democrat	Democrat
Missouri	Democrat	Republican	Republican
Montana	Democrat	Republican	Republican
Nevada	Republican	Democrat	Democrat
New Hampshire	Democrat	Republican	Republican
New Jersey	Republican	Democrat	Democrat
New Mexico	Republican	Democrat	Democrat
New York	Democrat	Democrat	Republican
North Carolina	Democrat	Republican	Republican
North Dakota	Republican	Republican	Republican
Ohio	Republican	Republican	Republican
Oklahoma	Republican	Republican	Republican
Oregon	Democrat	Split	Democrat
Pennsylvania	Republican	Republican	Republican
Rhode Island	Non-Major Party	Democrat	Democrat
South Carolina	Republican	Republican	Republican
South Dakota	Republican	Republican	Republican
Tennessee	Republican	Republican	Republican
Texas	Republican	Republican	Republican
Utah	Republican	Republican	Republican
Vermont	Democrat	Democrat	Democrat
Virginia	Republican	Republican	Democrat
Washington	Democrat	Democrat	Democrat
West Virginia	Democrat	Democrat	Democrat
Wisconsin	Republican	Republican	Republican
Wyoming	Republican	Republican	Republican

Table 3.4: The numbers of experimental subjects in each condition and the number of subjects in each condition that voted in Gerber, Green, and Larimer's (2008) experiment.

Condition	Number of Subjects in Condition	Number of Subjects in Condition that Voted	Percent of Subject in Condition that Voted	Average Treatment Effect (in Percentage Points)
Control	191243	56730		Not Applicable
Civic Duty	38218	12021		
Hawthorne	38204	12316		
Self	38218	13191		
Neighbors	38201	14438		

mailers have a negative effect (i.e., receiving the mailer makes the recipient less likely to vote than if she had received no mailer at all)?

d. Table 3.4 contains the data set `social-pressure`. Use these data to re-compute the percentages that the authors present in their Table 2 on p. 38. Fill these in the appropriate colum in Table 3.4.
e. Estimate the average treatment effect by subtracting the proportion that voted in the control group from the proportion that voted in each treatment group (i.e., groups that received a mailer). Convert these changes in proportions to changes in percentages by multiplying by 100%.[2] According to these estimates, what treatment is most effective? Least effective? Do any treatments have a negative effect? Does the treatment effects match your guesses about the rankings?
f. Comment on the ethics of this study? Would you describe this study as unethical? Why or why not?

[2]We must take care when discussing changes in percentages. A 10% increase in 50%, could mean either (a) $0.5 + 0.1 = 0.6 = 60\%$ or (b) $0.5 + (0.5 \times 0.1) = 0.5 + 0.05 = 0.55 = 55\%$. To make the change clear, we usually talk about changes in "percentage points," which clearly refers to (a). Thoughout these notes, I always describe changes in percents using percentage point changes (a).

Bibliography