Homework for Chapter 9: Finding Front Doors

1. Which of the following describes when randomization of treatment occurs without a researcher controlling the randomization?
   1. Exogenous variation
   2. Natural experiment
   3. Instrumental variable
   4. Randomized experiment
2. Necessary conditions:
   1. What needs to be true about the variation we need to isolate when we’re trying to isolate front door paths?
   2. How do we know that the variation we get from a randomized controlled experiment fulfills the condition(s) from part a?
3. Describe the four major differences between randomized experiments and natural experiments discussed in the chapter. As a bonus, there’s a fifth difference described in the chapter having to do with sample size and representativeness.
4. Provide an example of a of research question that is causal in nature but cannot be feasibly answered by a randomized experiment. Explain your reasoning.
5. Define the concept of exogenous variation.
6. Provide an example of a natural experiment. It could be an idea of your own, from the book, or from a study you read.
   1. Draw a causal diagram using 5-10 variables.
   2. List the paths from the source of exogenous variation to the outcome.
   3. Which paths need to be closed?
   4. Is it believable in this context that you haven’t missed any paths and that you can close all the paths you need? Why or why not?
7. Which of the following best explains how “using exogenous variation to predict treatment, and then using the prediction instead of the treatment itself” lets you isolate just the front door from treatment to outcome?
   1. Because it allows you to control for treatment assignment
   2. Because the exogenous variation has no back doors, so nothing it predicts can have back doors either
   3. Because it takes the relationship between treatment and outcome and, by controlling for the exogenous variation, removes the back doors
   4. It can’t unless the treatment itself is also exogenously assigned
8. Consider the following natural experiment design: in 2019, United States president Donald Trump increased tariffs on Chinese imports considerably. This made United States consumers want to switch to non-Chinese sources of imports. If you are an exporter to the US, like Brazil, then demand for your products just went up *if* China is a competitor of yours. So Brazilian manufacturers of machinery saw their exports increase by a lot, but Brazilian pop musicians didn’t. You want to know whether exporting to a country makes you like it more. You plan to isolate the variation in Brazilian exports driven by the tariffs to see if industries with more exports have a higher opinion of the United States.
   1. What potential back doors might remain between the tariffs and the opinion of the United States?
   2. If someone told you that they performed this study as described, and found that increased exports had no effect on opinion of the US, would you believe the result? Why or why not?