Topics Discuss in this Module

- Experimental Designs
  - random assignment
  - laboratory experiment
  - field experiment
- Controlled Comparisons
  - 3 scenarios
    - Spurious Relationships
    - Additive Relationships
    - Interaction Relationships

Opening Anecdote: The “famous surgeon” p78

At the end of the lecture, a young student at the back of the room timidly asked, “Do you have any controls?” Well, the great surgeon drew himself up to his full height, hit the desk, and said, “Do you mean did I not operate on half of the patients?” The hall grew very quiet then. The voice at the back of the room very hesitantly replied, “Yes, that’s what I had in mind.” Then the visitor’s fist really came down as he thundered, “Of course not. That would have doomed half of them to their death.” God, it was quiet then, and one could scarcely hear the small voice ask, “Which half?”

Questions

- Why was the surgeon's claim about the efficacy of his surgical procedure not supported?
- What would the surgeon need to do in order to test for the efficacy of his procedure?

Test Group

- Group that receives a treatment (independent variable) the researcher thinks affects the dependent variable.
  - The surgeon's test group was the group of patients who received the surgical procedure.
  - The surgeon believed the procedure (independent variable) would affect survival rates (dependent variable).

Control Group

- The group that does not receive the treatment.
- The control group provides a basis of comparison for the treatment group.
  - The surgeon did not have a control group (a group of patients who did not receive the surgical procedure).
  - Without a control group, it is impossible to know whether the independent variable affects the dependent variable.

Rival Explanations

- Other variables, besides the independent variable, might affect the dependent variable.
  - Perhaps patients in the test group are younger or are in better general health than patients in the control group.
- To rule out rival explanations, the treatment group and control group must be *identical* in every way, *except* for the independent variable.

Research design

- An overall set of procedures for evaluating the effect of an independent variable on a dependent variable.
  - Experimental design
  - Controlled comparison design

Experimental Design

- Ensures that the test group and the control group are the same in every way, except one —the independent variable.
- Any differences on the dependent variable can be attributed to the independent variable.
- Experimental designs are strong because they control for the possible effects of all rival explanations, even rivals the investigator has not thought of or those he or she does not care about.

Controlled Comparison Design

- Allows the researcher to observe the effect of the independent variable on the dependent variable while holding constant other plausible causes of the dependent variable.
- In controlled comparisons, the investigator can make sure to control for known or suspected rivals, but unknown factors can affect the dependent variable and contaminate the results.

Two Experimental Designs

- Laboratory experiment
  - The control group and the test group are studied in an environment created wholly by the investigator.
- Field experiment
  - The control and test groups are studied in their normal surroundings, living their lives as they naturally do, probably unaware that an experiment is taking place.

Random Assignment

- All experiments use random assignment.
- Random assignment occurs when every prospective participant—every individual that the investigator wants to study—has an equal chance of ending up in the control group or the test group.

Selection Bias

- Selection bias occurs when nonrandom processes determine the composition of the test and control groups.
- These compositional differences, in turn, affect the dependent variable.
- Random assignment defeats selection bias.
- Random assignment ensures that there are not compositional differences between the test and control groups.

Laboratory Experiments

- random assignment of individuals to test group and control group
- pre-measurement of dependent variable
- test group receives treatment, control group does not
- post-measurement of dependent variable

Agenda-setting by media: Iyengar and Kinder

- *Random assignment*: Individuals were randomly assigned test group or control group.
- *Premeasurement*: Both groups were asked to rank, in descending order of importance, a list of problems facing society.

Agenda-setting by media: Iyengar and Kinder

- *Treatment*: Test group was shown doctored newscasts that emphasized the importance of certain problems. Control group was shown normal newscasts.
- *Post-measurement*: Both groups were asked to rank, in descending order of importance, a list of problems facing society.

Agenda-setting by media: Iyengar and Kinder

- “The results were stunning. Compared with the control subjects, whose rankings did not change appreciably from beginning to end, individuals who had been shown the doctored newscasts dramatically altered their lists of priorities. For example, in one instance in which the investigators had inter-spliced stories about defense preparedness, test subjects promoted defense from sixth to second place, whereas control subjects reported no change in their assessments of the importance of this national problem.” p82

Interval Validity

- Within the conditions created artificially by the researcher, the effect of the independent variable on the dependent variable is isolated from other plausible explanations.
- Laboratory experiments have high internal validity.

External Validity

- The results of a study can be generalized—that is, its findings can be applied to situations in the non-artificial, natural world.
- Laboratory experiments tend to have lower external validity than do field experiments.

Field Experiments

- are conducted in the real world
- use random assignment
- may pre-measure the dependent variable
  - Pre-measurement is less common in field experiments than in laboratory experiments.
- have high external validity
- may suffer from problems of internal validity

GOTV and Turnout: Gerber and Green

- *Random assignment*: Prior to an election, 29,000 individuals in a metropolitan area were randomly assigned to 3 treatment groups and 1 control group.
- *Treatment*: The 3 treatment groups received GOTV contact: personal canvassing, direct mail, or telephone calls. The control group did not receive any GOTV contact.

GOTV and Turnout: Gerber and Green

- *Post-measurement*: Following the election, the investigators obtained post-measurements by consulting voting records to see who had voted and who had stayed home.
- Personal canvassing GOTV had the largest effect, followed by mail. The phone-call group were no more likely to turn out than were individuals in the control group.

Experiments: Limitations

- Field experiments sometimes have internal validity problems, because not all individuals in the test group can be measured.
- Many characteristics of interest to researchers, such as sex or race, cannot be experimentally manipulated.

Controlled Comparisons: The "How Else?" Question

- "How else, other than the independent variable, are the groups I am comparing not the same?"
- A controlled comparison is accomplished by examining the relationship between an independent and a dependent variable, while holding constant other variables suggested by rival explanations and hypotheses.

Partisanship and gun opinions revisited

- In a comparison of individuals, Democrats are more likely to favor gun control than are Republicans.
- 64 percent of Democrats favor gun control, compared with only 25 percent of Republicans.
- Ask, “How else, besides partisanship, are Democrats and Republicans not the same?”

Compositional Differences

- A **compositional difference** is any characteristic that varies across categories of an independent variable.
- Democrats and Republicans may differ in income, race, gender…or in many other ways that we have not thought of.
- If a compositional difference is a cause of the dependent variable, then changes in the dependent variable may be plausibly attributed to the compositional difference, not the independent variable.

X, Y, and Z

- The independent variable is X, the dependent is Y. A rival causal variable is Z.
- In the partisanship explanation, party identification is X, and gun control opinion is Y.
- Gender represents a potential rival causal variable, Z.

Controlling for Z

- If individuals have different values on X but share the same value on Z, then changes in Y across the values of X cannot be caused by Z, because Z is held constant.
  - Compare female Democrats with female Republicans, and compare male Democrats with male Republicans.
- That is the elemental logic of controlled comparison. We neutralize the effects of a rival cause by holding it constant—by not permitting it to operate.

Three Scenarios
1). Spurious

- In a **spurious relationship** the control variable, Z, defines a *large compositional difference* across values of the independent variable, X.
- Further, this compositional difference is a cause of the dependent variable, Y.
- After holding Z constant, the empirical association between X and Y turns out to be completely coincidental—not causal at all.

Three Scenarios
2). Additive

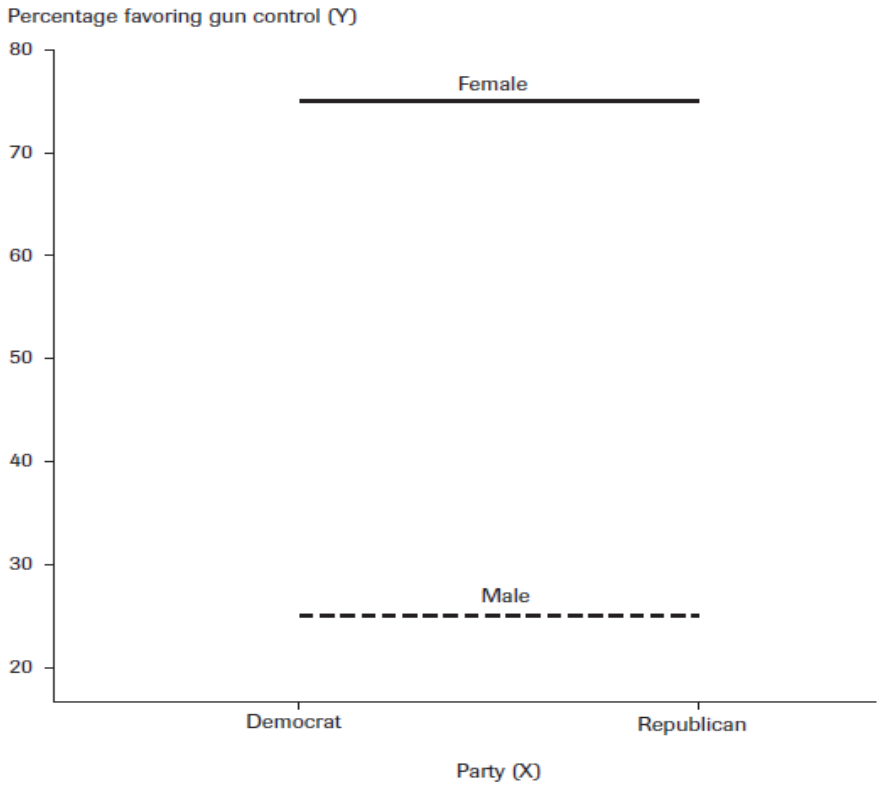
- In an **additive relationship**, the control variable is a cause of the dependent variable but defines a *small compositional difference* across values of the independent variable.
- Because the relationship between X and Z is weak, X retains a causal relationship with Y after controlling for Z.
- In the additive scenario, the control variable, Z, also helps to explain the dependent variable.

Three Scenarios
3). Interaction

- In an **interaction relationship**, the relationship between the independent variable and the dependent variable *depends on the value of the control variable*.
- For example, for one value of Z, the X-Y relationship might be stronger than for another value of Z.

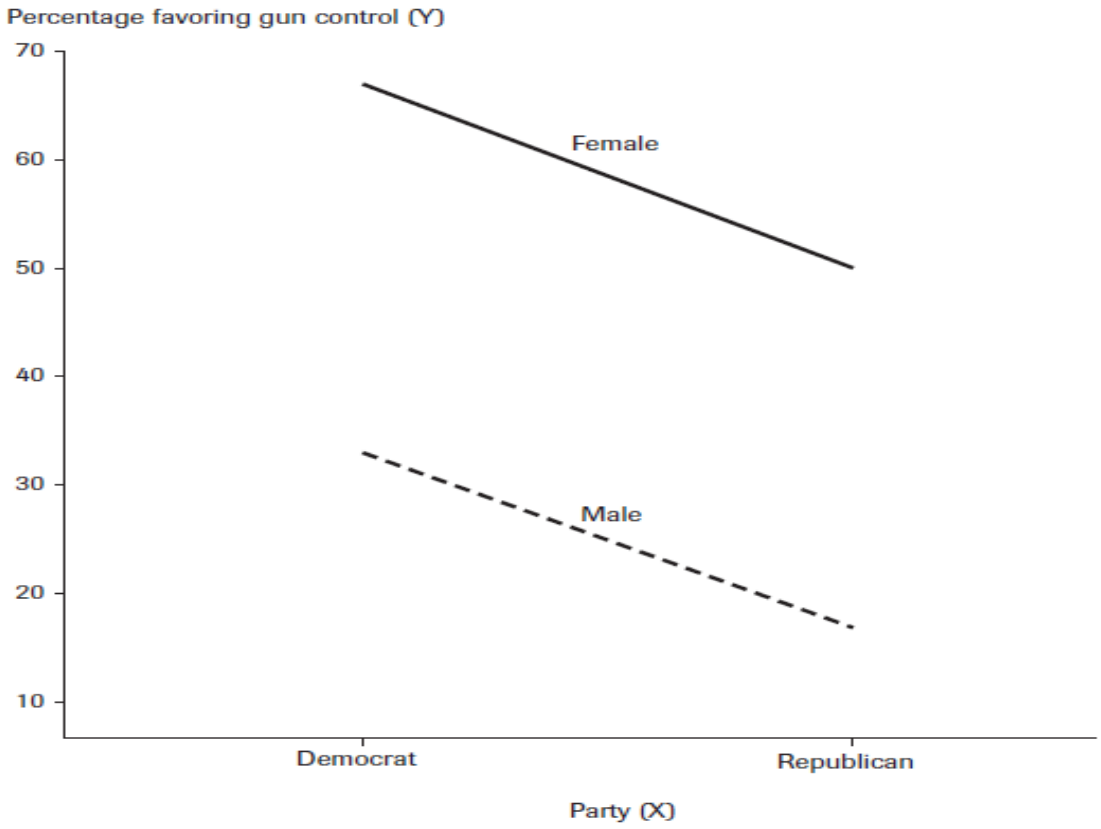
Spuriousness: Line chart

Figure 4-3 Spurious Relationship between Partisanship and Gun Control Opinions (line chart)



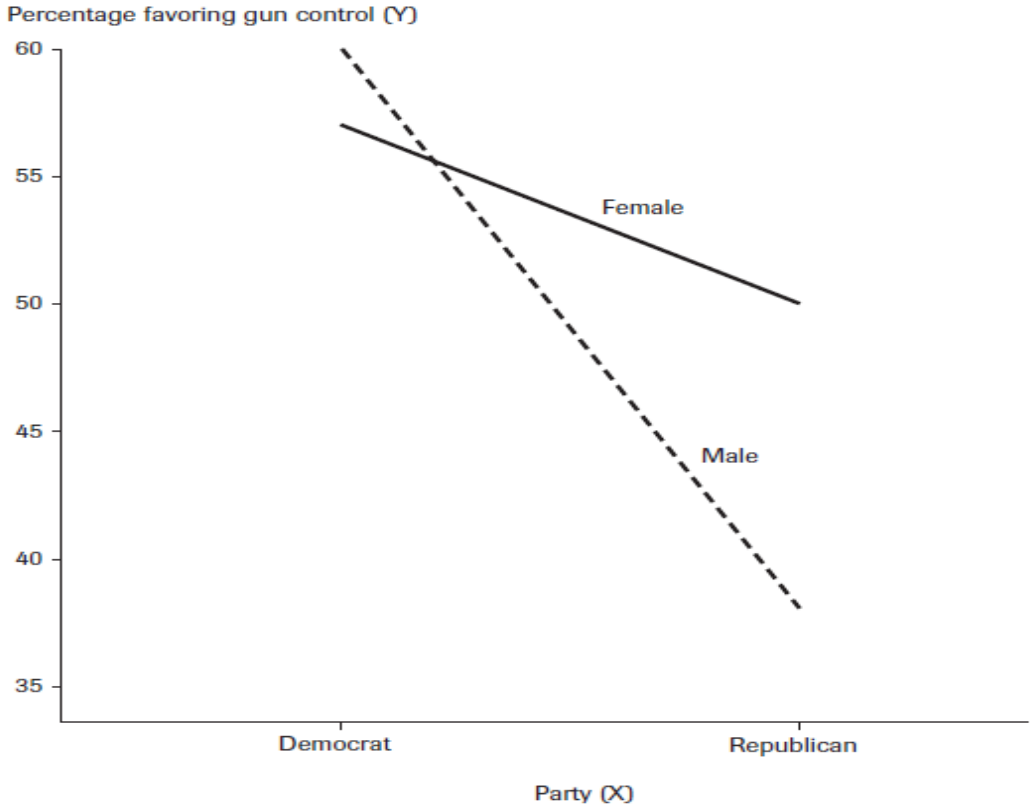
Additive: Line chart

Figure 4–5 Additive Relationships between Partisanship, Gender, and Gun Control Opinions (line chart)



Interaction: Line chart

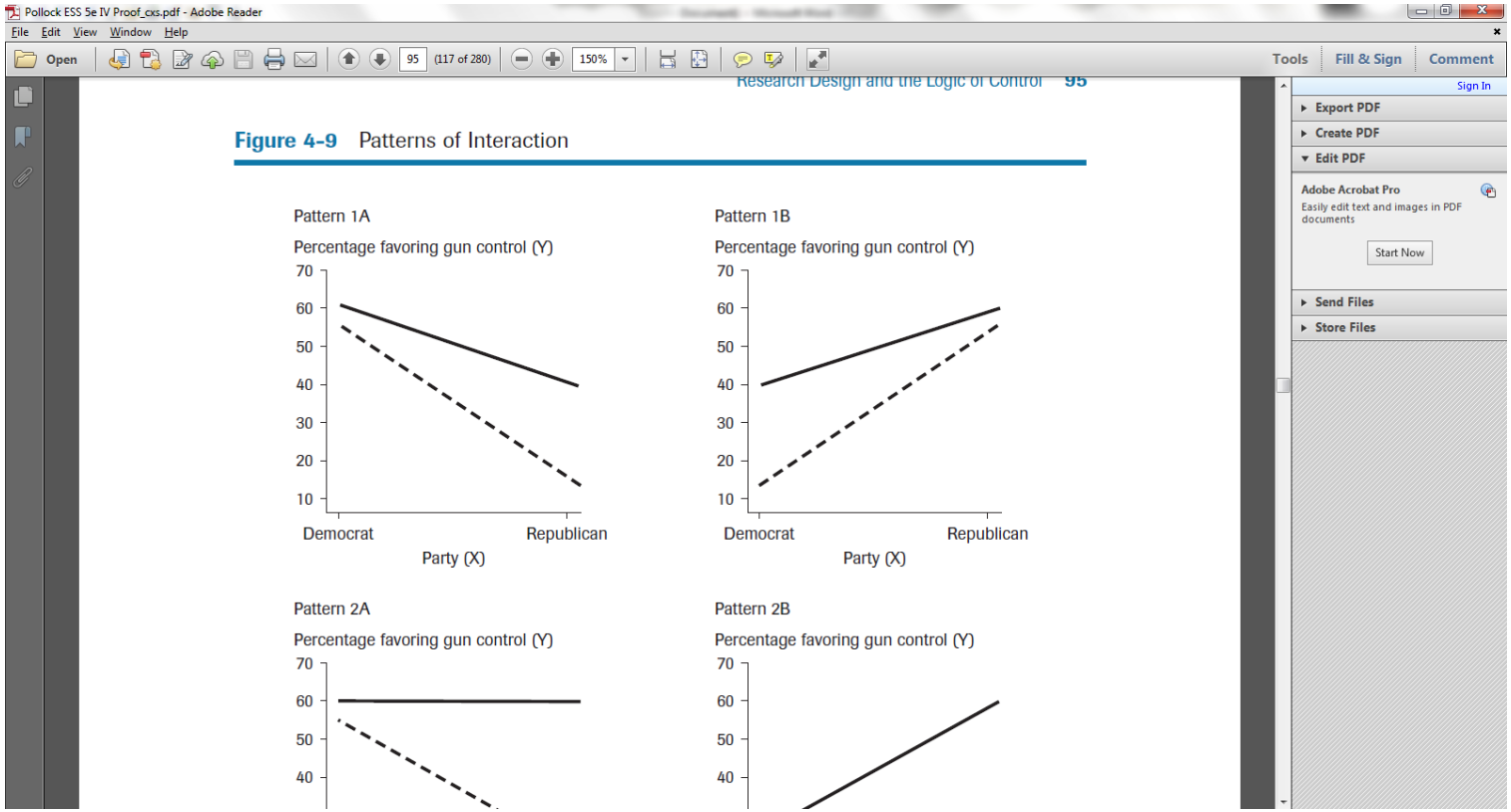
Figure 4–8 Interaction Relationships between Partisanship, Gun Control Opinions, and Gender (line chart)



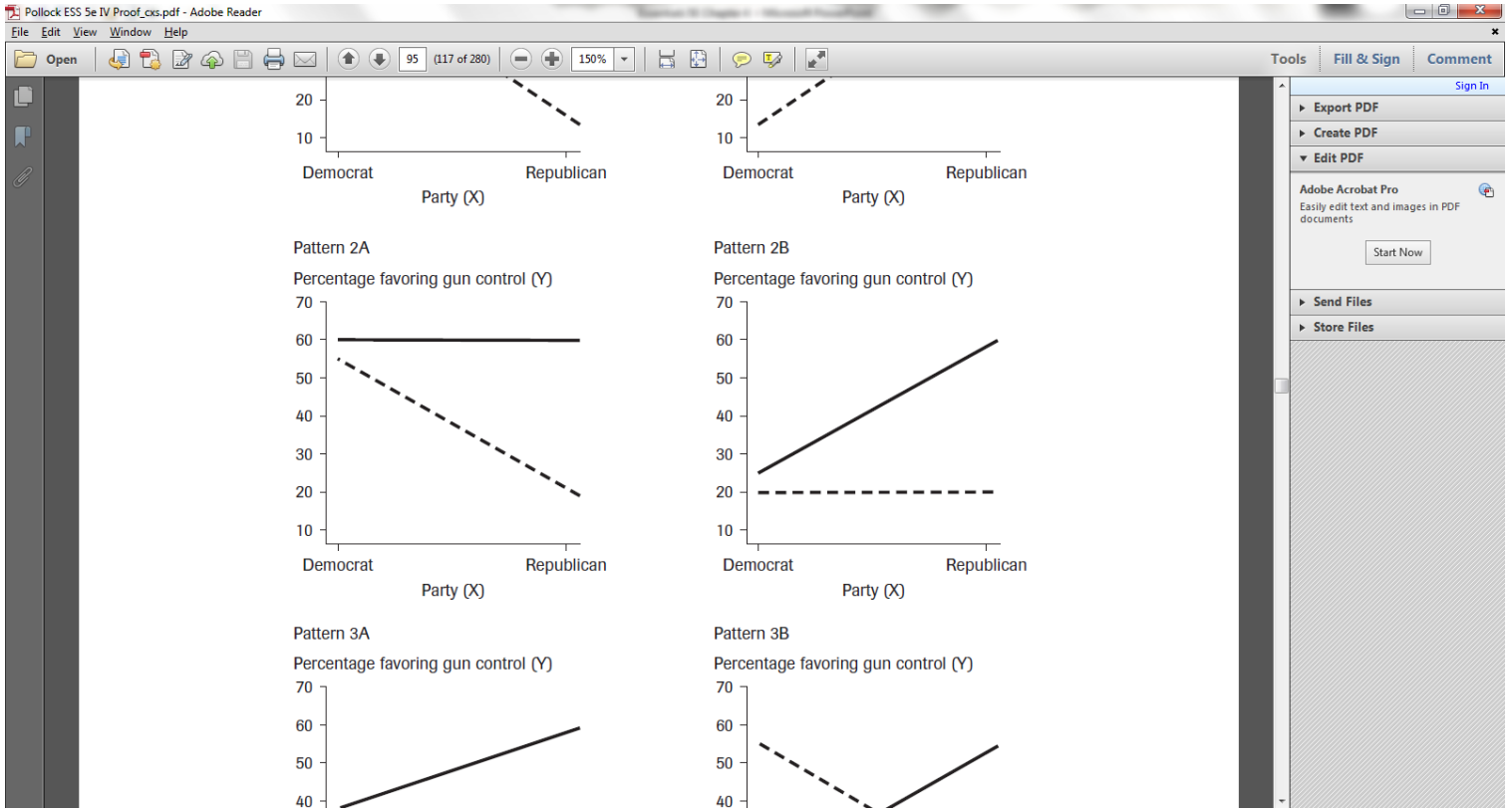
Interaction: The Identity

- Interaction does not have a single underlying dynamic.
- Interaction has one identity: The effect of X on Y depends on the value of Z.
  - This means that interaction can assume several different forms.

The many faces of interaction



The many faces of interaction



The many faces of interaction