CHAPTER 3

The Building Blocks of Social Scientific Research:

Hypotheses, Concepts, and Variables

In Chapters 1 and 2 we discussed what it means to acquire scientific knowledge and presented examples of political science research intended to produce this type of knowledge. In this chapter we consider the initial steps in an empirical research project. We emphasize explaining or exploring relationships between political phenomena. These steps require us to (1) specify the question or problem with which the research is concerned; (2) propose a suitable explanation for the phenomena under study; (3) formulate testable hypotheses; and (4) define the concepts identified in the hypotheses. Although we discuss these steps as if they represent a logical sequence, the actual order may vary. All the steps must be taken eventually, however, before such a research project can be completed successfully. The sooner the issues and decisions involved in each of the steps are addressed, the sooner the other portions of the research project can be completed.

Specifying the Research Question

One of the most important purposes of social scientific research is to answer questions about social phenomena. The research projects summarized in Chapter 1, for example, attempt to answer questions about some important political attitudes or behaviors: Why is wealth distributed more equally among the population in some countries than in others? Why do some people vote in elections while others do not? Why do Supreme Court justices reach the decisions they do on the cases before them? Do Supreme Court decisions affect people's opinions on issues and people's support of the Supreme Court? Under what circumstances are people most likely to support U.S. involvement in foreign affairs? How sensitive is the American public to combat casualties, and does the number of casualties affect public support for the war in Iraq? Does negative campaign advertising have any impact on the electorate? Do partisan divisions in Congress and between Congress and the White House

affect the design of new federal agencies and do variations in the structure of agencies affect the ability of Congress and the White House to influence them? In each case the researchers identified a political phenomenon that interested them and tried to answer questions about that phenomenon.

The phenomena investigated by political scientists are diverse and are limited only by whether they are significant (that is, would advance our understanding of politics and government), observable, and political. Political scientists attempt to answer questions about the political behavior of individuals (voters, citizens, residents of a particular area, Supreme Court justices, members of Congress, presidents), groups (political parties, interest groups, labor unions, international organizations), institutions (state legislatures, city councils, bureaucracies, district courts), and political jurisdictions (cities, states, nations).

Most students, when confronting a research project for the first time, will start by saying, "I'm interested in X," where X may be the Supreme Court, media coverage of the war in Iraq, campaign finance policy, the response to Hurricane Katrina, or some other political phenomenon. Thus the first major task in a research effort often is to translate a general topic into a research question or series of questions or propositions with which the research is concerned. The framing of an engaging and appropriate research question will get a research project off to a good start by limiting the scope of the investigation and determining what information has to be collected. A poorly specified question inevitably leads to wasted time and energy. Any of the following questions would probably lead to a politically significant and informative research project:

Why is the voter turnout for local elections higher in some cities than in others?

Why is the rate of recycling higher in some communities than in others?

Why did some members of Congress vote for legislation creating a prescription drug benefit under Medicare, whereas others opposed it?

Why do some states have laws strongly regulating the activities of lobbyists, while other states do not?

Why does the amount spent per pupil by school districts in the state of Pennsylvania vary?

Why has public support for the war in Iraq declined since the start of the war?

Does public support for war generally or always decline over time?

Why are some judges more protective of the rights of the accused than others?

Why do some nations have higher levels of human rights abuses than others?

Why does the cost of medical malpractice insurance vary among the states?

Why do some nations support setting specific targets for limiting carbon dioxide emissions, while others do not?

A research project will get off on the wrong foot if the question that shapes it fails to address a political phenomenon, is unduly concerned with discrete facts, or is focused on reaching normative conclusions. Although the definition of political phenomena is vague, it does not include the study of all human characteristics or behavior.

Research questions, if they dwell on discrete or narrow factual issues, may limit the significance of a research project. Although important, facts alone are not enough to yield scientific explanations. What is missing is a **relationship**—that is, the association, dependence, or covariance of the values of one variable with the values of another. Researchers are generally interested in how to advance and test generalizations relating one phenomenon to another. In the absence of such generalizations, factual knowledge of the type called for by the following research questions will be fundamentally limited in scope:

How many seats in the most recent state legislative elections in your state were uncontested (had only one contestant)?

How many states passed budgets last year that were more than 10 percent lower than the previous year's?

How many members of Congress had favorable environmental voting records in the last session of Congress?

How many trade disputes have been referred to the World Trade Organization (WTO) for resolution in the past five years?

What percentage of registered voters voted in the most recent U.S. Senate elections?

How many cabinet members have been replaced in each of the past three presidential administrations?

Who were the ten largest contributors to the Democratic presidential primary candidates prior to the Iowa caucus? How much did they contribute?

How many people are opposed to affirmative action?

Factual information, however, may lead a researcher to ask "why?" questions. For example, if a researcher has information about the number of uncontested seats and notes that this number varies substantially from state to

state, the research question "Why are legislative elections competitive in some states and not in others?" forms the basis of an interesting research project. Alternatively, if one had data from just one state, one could investigate the question "Why do some districts have competitive elections and not others?" This would involve identifying characteristics of districts and elections that might explain the difference.

Or someone might notice that the number of trade disputes referred to the WTO has varied from year to year. What explains this situation? In collecting data on the number of disputes, it might be noticed that the complaints originate in many different countries. It would be interesting then to find out how the disputes are resolved. Is there any pattern to their resolution in regard to which countries benefit or the principles and arguments underlying the decisions? Why? Similarly, the environmental voting records of members of Congress differ. Why? Is political party a likely explanation? Is ideology? Or is some other factor responsible?

Sometimes important research contributions come from descriptive or factual research because the factual information being sought is difficult to obtain or, as we discuss later in this chapter and in Chapter 4, disagreement exists over which information or facts should be used to measure a concept. In this situation a research effort will entail showing how different ways of measuring a concept have important consequences for establishing the facts.

Questions calling for normative conclusions also are inconsistent with the research methods discussed in this book. (Refer to Chapter 2 for the distinction between normative and empirical statements.) For example, questions such as "Should the United States give preference in reconstruction contracts to those nations that supported going to war in Iraq?" or "Should a new federal agency be placed within the Executive Office of the President?" or "Should states give tax breaks to new businesses willing to locate within their borders?" are important and suitable for the attention of political scientists (indeed, for any citizen), but they, too, are inappropriate as framed here. They ask for a normative response, seeking an indication of what is good or of what should be done. Although scientific knowledge may be helpful in answering questions like these, it cannot provide the answers without regard for an individual's personal values or preferences. What someone ultimately likes or dislikes, values or rejects, is involved in the answers to these questions.

Normative questions, however, may lead you to develop an empirical research question. For example, a student of one of the authors felt that Pennsylvania's method of selecting judges using partisan elections was not a good way to choose judges. To contribute to an informed discussion of this issue, she collected data on the amount of money raised and spent by judicial candidates, the amount of money spent per vote cast in judicial races compared with other state elections, and the voter turnout rate in judicial races compared

with other races. This information spoke to some of the arguments raised against partisan judicial elections. She discovered that it was very difficult to collect empirical evidence to answer the interesting question of whether reliance on campaign contributions jeopardized the independence and impartiality of judges.

Students sometimes have difficulty formulating interesting and appropriate questions. What constitutes an appropriate research topic will vary, depending on the circumstances. Often the choices will be constrained by the content of a course for which a research paper is required. Choosing an appropriate research topic requires the investment of some time to familiarize oneself with the scope and substance of previous research. You should be prepared to cast a fairly broad net in looking for a topic; although some effort will be spent learning about topics that will not be chosen, the time is not wasted, and the reward is being able to select a topic that is closest to your interests.

In general, it is useful to submit your research question to the "so what?" test: Will the answer to it make a significant contribution to the accumulation of our understanding of and knowledge about political phenomena? Will it be useful for practitioners and policymakers? Will it provide an interesting test of a theory?

Where do the research questions of political scientists originate? There are many answers to this question. Some researchers become interested in a topic because of personal observation or experience. For example, a researcher who works for a candidate who loses a political campaign may wonder what factors are responsible for electoral success, and a researcher who fled her country of birth during a period of civil unrest may be drawn to conducting research on the causes of political disorder. Some researchers are drawn to a topic because of the research and writing of others. A scholar familiar with studies of congressional decision making may want to investigate the reasons for the success and failure of different public policy proposals. Still others select a research topic because of their interest in some broader social theory, as the researcher whose fascination with theories of rational decision making prompted the study of federal bureaucrats' behavior. Simi-

HOW TO COME UP WITH A RESEARCH TOPIC

1. Get started early.
2. Pose a "how many" question. Where possible, collect data for more than one time (e.g., year, election) or for more than one case (e.g., more than one city, state, nation, primary election). Do any patterns emerge? What might explain these patterns? Is it difficult to find information to answer your question? Why? Do you think that the ways in which other researchers have measured what you are interested in are adequate? Are there any validity or reliability problems with the measures? (Measurement validity and reliability are discussed in Chapter 4).
3. Find an assertion or statement in the popular press or a conclusion in a research article that you believe to be incorrect. Look for empirical evidence so that you can assess the statement or examine the evidence used by the author to see if any mistakes were made that could have affected the conclusion.
4. Find two studies that reach conflicting conclusions. Explain or try to reconcile the conflict.
5. Same as No. 1.

Note: We wish to thank one of our anonymous reviewers for suggesting that we include tips for coming up with paper topics and for suggesting these tips.

larly, researchers concerned in general with democratic theory often conduct research on what causes people to participate in politics. Finally, researchers select research topics for practical reasons: because grant money for a particular subject is available or because demonstrating expertise in a particular area will advance their professional career objectives.

Proposing Explanations

Once a researcher has developed a suitable research question or topic, the next step is to propose an explanation for the phenomenon the researcher is interested in understanding. Proposing an explanation involves identifying other phenomena that we think will help us account for the object of our research and then specifying how and why these two (or more) phenomena are related.

In the examples referred to in Chapter 1, the researchers proposed explanations for the political phenomena they were studying. David Bradley and his coauthors thought that the distribution of income among households in a nation would be affected by whether or not a leftist political party was in control of the government. Stephen C. Poe and C. Neal Tate investigated whether governments' violation of their citizens' human rights was related to rapid population growth, military regimes, colonial history, and level of economic development. B. Dan Wood and Richard W. Waterman investigated the activities of federal agencies to see if they changed in response to attempts by presidents and Congress to influence them. And Stephen D. Ansolabehere and his colleagues thought that voter turnout would be affected by the tone of campaign advertising.

A phenomenon that we think will help us explain the political characteristics or behavior that interests us is called an **independent variable.** Independent variables are the measurements of the phenomena that are thought to influence, affect, or cause some other phenomenon. A **dependent variable** is thought to be caused, to depend upon, or to be a function of an independent variable. Thus, if a researcher has hypothesized that acquiring more formal education will lead to increased income later on (in other words, that income may be explained by education), then years of formal education would be the independent variable and income would be the dependent variable. As the word *variable* connotes, we expect the value of the concepts we identify as variables to vary or change. A concept that does not change in value is called a constant and will not make a suitable phenomenon to investigate as part of the research process we focus on in this book. Unfortunately, sometimes a concept is expected to vary and thus be suitable for inclusion in a research project, only for a researcher to discover later on that the concept does not vary. For example, a student working on a survey to be distributed

to her classmates wanted to see if students having served in the military or having a family member in the military had different attitudes toward the war in Iraq than students without military service connections. She discovered that none of the students had any military service connections: having military service connections was a constant.

Proposed explanations for political phenomena are often more complicated than the simple identification of one independent variable that is thought to explain a dependent variable. More than one phenomenon is usually needed to account adequately for most political behavior. For example, suppose a researcher proposes the following relationship between state efforts to regulate pollution and the severity of potential harm from pollution: the higher the threat of pollution (independent variable), the greater the effort to regulate pollution (dependent variable). The insightful researcher would realize the possibility that another phenomenon, such as the wealth of a state, might also affect a state's regulatory effort. The proposed explanation for state regulatory effort, then, would involve an alternative variable (wealth) in addition to the original independent variable. As another example, remember from Chapter 1 that Lane Kenworthy and Jonas Pontusson thought that larger changes in market inequality would cause larger changes in redistribution, but that changes in redistribution would also be affected by turnout rates in national elections. It is frequently desirable to compare the effect of each independent variable on the dependent variable. This is done by "controlling for" or holding constant one of the independent variables so that the effect of the other may be observed. This process is discussed in more detail in Chapters 12 and 13.

Sometimes researchers are also able to propose explanations for how the independent variables are related to each other. In particular, we might want to determine which independent variables come before other independent variables and indicate which ones have a more direct, as opposed to indirect, effect on the phenomenon we are trying to explain (the dependent variable). A variable that occurs prior to all other variables and that may affect other independent variables is called an **antecedent variable.** A variable that occurs closer in time to the dependent variable and is itself affected by other independent variables is called an **intervening variable.** The roles of antecedent and intervening variables in the explanation of the dependent variable differ significantly. Consider these examples.

Suppose a researcher hypothesizes that a person who favored national health insurance was more likely to have voted for John Kerry in 2004 than a person who did not favor such extensive coverage. In this case the attitude toward national health insurance would be the independent variable and the presidential vote the dependent variable. The researcher might wonder what causes the attitude toward national health insurance and might propose that those people who have inadequate medical insurance are more apt to favor

national health insurance. This new variable (adequacy of a person's present medical insurance) would then be an antecedent variable, since it comes before and affects (we think) the independent variable. Thinking about antecedent variables pushes our explanatory scheme further back in time and, we hope, will lead to a more complete understanding of a particular phenomenon (in this case, presidential voting). Notice how the independent variable in the original hypothesis (attitude toward national health insurance) becomes the dependent variable in the hypothesis involving the antecedent variable (adequacy of health insurance). Also notice that in this example adequacy of health insurance is thought to exert an indirect effect on the dependent variable (presidential voting) via its impact on attitudes toward national health insurance.

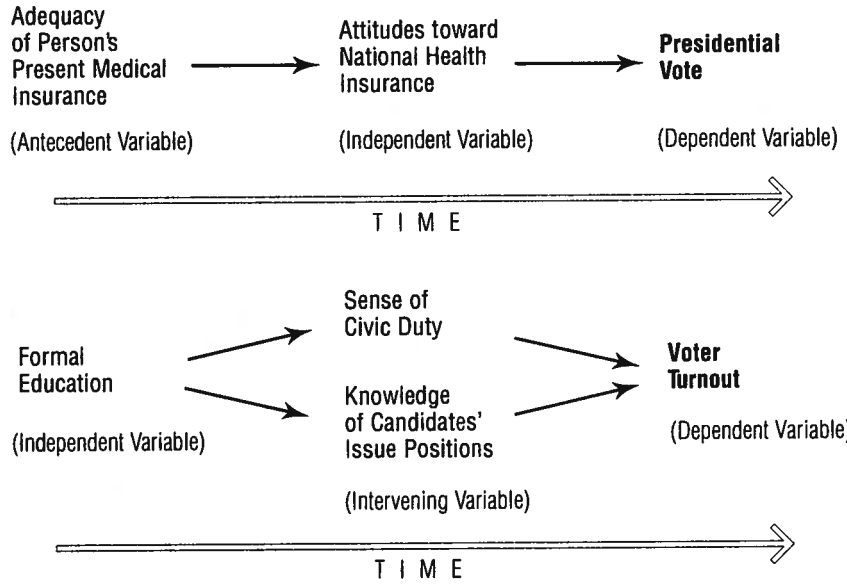
Now consider a second example. Suppose a researcher hypothesizes that a voter's years of formal education affect her or his propensity to vote. In this case, education would be the independent variable and voter turnout the dependent variable. If the researcher then begins to think about what it is about education that has this effect, he or she has begun to identify the intervening variables between education and turnout. For example, the researcher might hypothesize that formal education creates or causes a sense of civic duty, which in turn encourages voter turnout, or that formal education causes an ability to understand the different issue positions of the candidates, which in turn causes voter turnout. Intervening variables come between an independent variable and a dependent variable and help explain the process by which one influences the other.

Explanatory schemes that involve numerous independent, alternative, antecedent, and intervening variables can become quite complex. An **arrow diagram** is a handy device for presenting and keeping track of such complicated explanations. The arrow diagram specifies the phenomena of interest; indicates which variables are independent, alternative, antecedent, intervening, and dependent; and shows which variables are thought to affect which other ones. In Figure 3-1 we present arrow diagrams for the two examples we just considered.

In both diagrams the dependent variable is placed at the end of the time line, with the independent, alternative, intervening, and antecedent variables placed in their appropriate locations to indicate which ones come first. Arrows indicate that one variable is thought to explain or be related to another; the direction of the arrow indicates which variable is independent and which is dependent in that proposed relationship.

Figure 3-2 shows two examples of arrow diagrams that have been proposed and tested by political scientists. Both diagrams are thought to explain presidential voting behavior. In the first diagram the ultimate dependent variable, Vote, is thought to be explained by Candidate Evaluations and Party

FIGURE 3-1
Arrow Diagram of Adequacy of Medical Insurance and Voter Turnout Examples

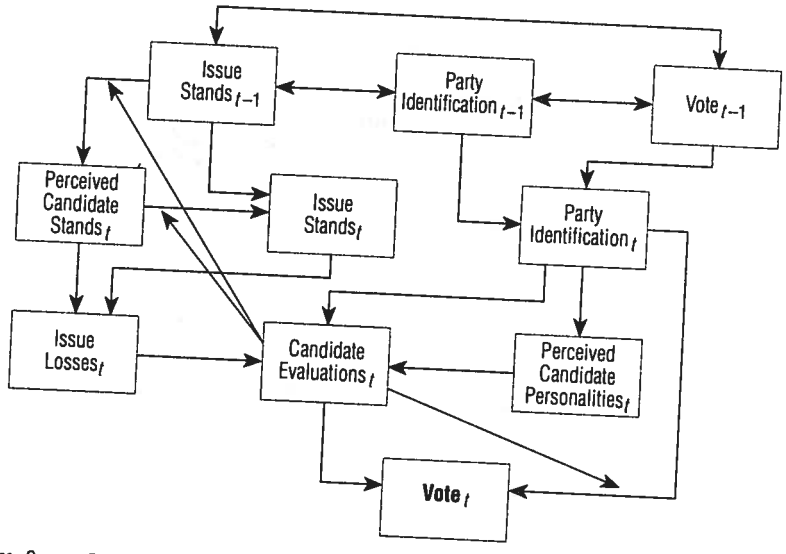


Identification. The Candidate Evaluations variable, in turn, is explained by the Issue Losses, Party Identification, and Perceived Candidate Personalities variables. These, in turn, are explained by other concepts in the diagram. The variables at the top of the diagram tend to be antecedent variables (the subscript $t - 1$ denotes that these variables precede variables with subscript t, where t indicates time); the ones in the center tend to be intervening variables. Nine independent variables of one sort or another figure in the explanation of the vote.

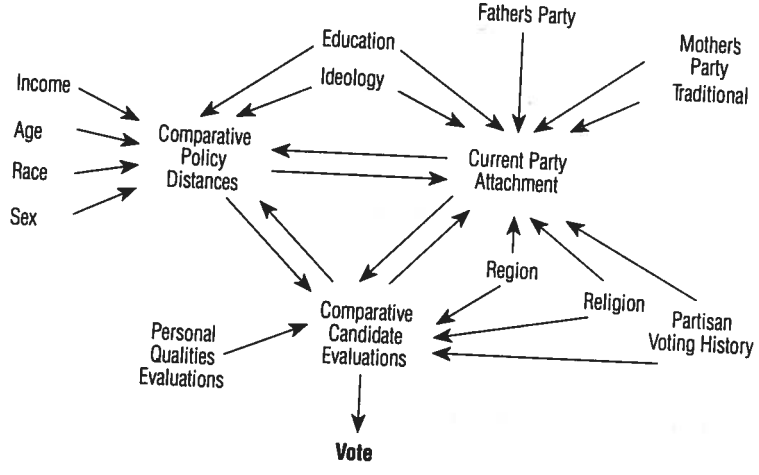
The second diagram also has Vote as the ultimate dependent variable, which is explained directly by only one independent variable, Comparative Candidate Evaluations. The latter variable, in turn, is dependent upon six independent variables: Personal Qualities Evaluations, Comparative Policy Distances, Current Party Attachment, Region, Religion, and Partisan Voting History. In this diagram sixteen variables figure, either indirectly or directly, in the explanation of the Vote variable, with the antecedent variables located around the perimeter of the diagram and the intervening variables closer to the center. Both of these diagrams clearly represent complicated and extensive attempts to explain a dependent variable.

FIGURE 3-2

Two Causal Models of Vote Choice



Source: Gregory B. Markus and Philip E. Converse, "A Dynamic Simultaneous Equation Model of Electoral Choice," *American Political Science Review* 73 (December 1979): 1059. Reprinted with permission of Cambridge University Press.



Source: Benjamin I. Page and Calvin C. Jones, "Reciprocal Effects of Policy Preferences, Party Loyalties and the Vote," *American Political Science Review* 73 (December 1979): 1083. Reprinted with permission of Cambridge University Press.

Note that arrow diagrams show hypothesized causal relationships. A one-headed arrow connecting two variables is a shorthand way of expressing the proposition "*X* directly causes *Y*." If arrows do not directly link two variables, they may be associated or correlated, but the relationship is indirect, not causal. As we discuss in greater depth in Chapter 5, when we assert *X* causes *Y*, we are in effect making three claims. One is that *X* and *Y* covary—a change in one variable is associated with a change in the other. Second, we are claiming that a change in the independent variable (*X*) *precedes* the change in the dependent variable (*Y*). Finally, we are stating that the covariation between *X* and *Y* is not simply a coincidence or spurious—that is, due to change in some other variable—but is direct.

We have discussed the first two steps in the research process—asking a question and then proposing an explanation—as occurring in this order, but quite often this is not the case. In Chapter 2 we pointed out that researchers might start out with a theory and make deductions based on it. Thus researchers often start with an explanation and look for an appropriate research question that the theory might answer. Theory is an important aspect of explanation, for in order to be able to argue effectively that something causes something else, we need to be able to supply a reason or, to use words from the natural sciences, to identify the *mechanism* behind the relationship. This is the role of theory.

Formulating Hypotheses

Thus far we have discussed two stages in the research process: identifying the research question and proposing explanations for the phenomena of interest. By this point, then, the researcher is ready to state what his or her hypotheses are. A **hypothesis** is an explicit statement that indicates how a researcher thinks the phenomena of interest are related. A hypothesis is a guess (but of an educated nature) that represents the proposed explanation for some phenomenon and that indicates how an independent variable is thought to affect, influence, or alter a dependent variable. Since hypotheses are proposed relationships, they may turn out to be incorrect.

Characteristics of Good Hypotheses

For a hypothesis to be tested adequately and persuasively, it must be stated properly. It is important to start a research project with a clearly stated hypothesis because it provides the foundation for subsequent decisions and steps in the research process. A poorly formulated hypothesis often indicates confusion about the relationship to be tested or can lead to mistakes that will limit the value or meaning of any findings. Many students find it quite chal-

lenging to write a hypothesis that precisely states the relationship to be tested: it takes practice to write consistently well-worded hypotheses. A good hypothesis has six characteristics: (1) It is an empirical statement, (2) it is stated as a generality, (3) it is plausible, (4) it is specific, (5) it is stated in a manner that corresponds to the way in which the researcher intends to test it, and (6) it is testable. The following discussion of these six characteristics will alert students to some common mistakes to avoid.

First, hypotheses should be empirical statements. They should be educated guesses about relationships that exist in the real world, not statements about what ought to be true or about what a researcher believes should be the case. Consider someone who is interested in democracy. If the researcher hypothesizes "Democracy is the best form of government," he or she has formulated a normative, nonempirical statement that cannot be tested. The statement communicates the preference of the researcher; it does not explain a phenomenon. By now, this researcher ought to have defined the central concept—in this case, democracy—and those concepts thought to be related to democracy (such as literacy, size of population, geographical isolation, and economic development). Therefore, to produce an acceptable hypothesis, the researcher ought to make an educated guess about the relationship between democracy and another of these concepts, for example: "Democracy is more likely to be found in countries with high literacy than in countries with low literacy." This hypothesis now proposes an explanation for a phenomenon that can be observed empirically. Or, one might think that democracy is preferable to other systems because it produces higher standards of living. We cannot prove that one thing is preferable to another, but we could certainly compare countries on numerous measures of well-being, such as health status. The conclusion might then be, "Compared with people living under dictatorships, citizens of democracies have higher life expectancies." Whether the hypothesis is confirmed empirically is not necessarily related to whether the researcher thinks the phenomenon (in this case, democracy) is good or bad.

In some cases, empirical knowledge can be relevant for normative inquiry. Often, people reach normative conclusions based on their evaluation of empirical relationships. Someone might reason, for example, that negative campaign ads cause voters to become disgusted with politics and not vote in elections, and because low turnout is bad, negative campaign ads are bad as well. The first part of the assertion is an empirical statement, which could be investigated using the techniques developed in this book, whereas the next two (low turnout and negative ads being bad) are normative statements.

Normative thinking is useful because it forces an individual to clarify his or her values, and it encourages research on significant empirical questions. For example, a normative distaste for crime encourages empirical research on the

causes of crime or on the effectiveness of particular sentencing policies. Consequently, the two modes of inquiry—normative and empirical—should be viewed as complementary rather than contradictory.

A second characteristic of a good hypothesis is generality. It should explain a general phenomenon rather than one particular occurrence of the phenomenon. For example, one might hypothesize that the cause of World War II was economic upheaval in Germany. If the hypothesis were confirmed, what would be the extent of our knowledge? We would know the cause of one war. This knowledge is valuable, but it would be more useful to know if economic upheaval ***in general*** causes wars. That would be knowledge pertaining to many occurrences of a phenomenon (in this case, many wars), rather than knowledge about just one occurrence. A more general hypothesis, then, might be, "Countries experiencing economic upheaval are more likely to become involved in a war than countries not experiencing economic upheaval." Knowledge about the causes of particular occurrences of a phenomenon could be helpful in formulating more general guesses about the relationships between concepts, but with a general hypothesis we attempt to expand the scope of our knowledge beyond individual cases. Stating hypotheses in the plural form, rather than the singular, makes it clear that testing the hypothesis will involve more than one case.

The four hypotheses in the left column below are too narrow, whereas the four hypotheses in the right column are more general and more acceptable as research propositions:

Senator X voted for a bill because it is the president's bill and they are both Democrats.	Senators are more likely to vote for bills sponsored by the president if they belong to the same political party as the president.
The United States is a democracy because its population is affluent.	Countries with high levels of affluence are more likely to be democracies than countries with low levels of affluence.
The United States has more murders than other countries because so many people own guns there.	Countries with more guns per capita will experience more murders per capita than countries with fewer guns.
Joe is a liberal because his mother is one, too.	People tend to adopt political viewpoints similar to those of their parents.

A third characteristic of a good hypothesis is that it should be plausible. There should be some logical reason for thinking that it might be confirmed. Of course, since a hypothesis is a guess about a relationship, whether it will be confirmed cannot be known for certain. Any number of hypotheses could be thought of and tested, but many fewer are plausible ones. For example, if a researcher hypothesized that "People who eat dry cereal for breakfast are more likely to be liberal than people who eat eggs," we would question his or her logic even though the form of the hypothesis may be perfectly acceptable. It is difficult to imagine why this hypothesis would be confirmed.

But how do we make sure that a hypothesis has a good chance of being confirmed? Sometimes the justification is provided by specific instances in which the hypothesis was supported (going from specific to general knowledge in the manner discussed in Chapter 2—that is, using induction). For example, a researcher may have observed a particular election in which a hotly contested primary campaign damaged the eventual nominee's chances of winning the general election. The researcher may then have concluded that "The more difficult it is for candidates to secure their party's nomination, the more poorly those candidates will do in the general election."

And, as we pointed out earlier in our discussion of proposing explanations, a hypothesis also may be justified through the process of deduction. A researcher may deduce from more general theories that a particular hypothesis is sensible. For example, there is a general psychological theory that frustration leads to aggression. Some political scientists have adapted this general theory to the study of political violence or civil unrest and hypothesized that civil unrest occurs when a civilian population is frustrated. A population may feel frustrated when many people believe that they are economically or politically worse off than they should be, than they used to be, or than other people like themselves are. This feeling, as we now know, is called relative deprivation, and it has figured prominently in hypotheses seeking to explain civil unrest. In this way the general frustration-aggression theory led to a more specialized, deduced hypothesis for the occurrence of civil unrest.

Formulating plausible hypotheses is one of the reasons why researchers conduct a literature review early in their research projects. Literature reviews (discussed in more detail in Chapter 6) can acquaint researchers both with general theories and with specific hypotheses advanced by others. In either case, reading the literature on a subject can improve the chances that a hypothesis will be confirmed. There are no hard and fast rules to ensure plausibility, however. After all, people used to think that "germs cause diseases" was an implausible hypothesis and that "dirt may be turned into gold" was a plausible one.

The fourth characteristic of a good hypothesis is that it is specific. The researcher should be able to state a **directional hypothesis**—that is, he or she should be able to specify the expected relationship between two or more variables. Following are examples of directional hypotheses that specify the nature of the relationship between concepts:

Median family income is higher in urban counties than in rural counties.

States that are characterized by a "moralistic" political culture will have higher levels of voter turnout than will states with an "individualistic" or "traditionalistic" political culture.

The first hypothesis indicates which relative values of median family income are related to which type or category of county. Similarly, the second hypothesis predicts a particular relationship between specific types of political culture (the independent variable) and voter turnout (the dependent variable).

The direction of the relationship between concepts is referred to as a **positive relationship** if the concepts are predicted to increase in size together or decrease in size together. The following are examples of hypotheses that predict positive relationships:

The more education a person has, the higher his or her income.

As the percentage of a country's population that is literate increases, the country's political process becomes more democratic.

The older people become, the more likely they are to be conservative.

People who read the newspaper more are more informed about current events than are people who read the newspaper less.

The lower a state's per-capita income, the less money the state spends per pupil on education.

If, however, the researcher thinks that as one concept increases in size or amount, another one will decrease in size or amount, then a **negative relationship** is suggested, as in the following examples:

Older people are less tolerant of social protest than are younger people.

The more income a person has, the less concerned about mass transit the person will become.

More affluent countries have less property crime than poorer countries.

In addition, the concepts used in a hypothesis should be defined carefully. For example, a hypothesis that suggests "There is a relationship between person-

ality and political attitudes" is far too ambiguous. What is meant by personality? Which political attitudes? A more specific reformulation of this hypothesis might be, "The more self-esteem a person has, the less likely the person is to be an isolationist." Now personality has been narrowed to self-esteem, and the political attitude has been defined as isolationism, both more precise concepts, although not precise enough. Eventually even these two terms must be given more precise definitions when it comes to measuring them. (We return to the problem of measuring concepts in Chapter 4.) As the concepts become more clearly defined, the researcher is better able to specify the direction of the hypothesized relationship.

Following are four examples of ambiguous hypotheses that have been made more specific:

How a person votes for president depends on the information he or she is exposed to.	The more information favoring candidate X a person is exposed to during a political campaign, the more likely that person is to vote for candidate X.
A country's geographical location matters for the type of political system it develops.	The more borders a country shares with other countries, the more likely that country is to have a nondemocratic political process.
A person's capabilities affect his or her political attitudes.	The more intelligent a person is, the more likely he or she is to support civil liberties.
Guns do not cause crime.	People who own guns are less likely to be the victims of crimes than are persons who do not own guns.

A fifth characteristic of a good hypothesis is that it is stated in a manner that corresponds to the way in which the researcher intends to test it—that is, it should be "consistent with the data."[1] For example, although the hypothesis "Higher levels of literacy are associated with higher levels of democracy" does state how the concepts are related, it does not indicate how the researcher plans to test the hypothesis. In contrast, the hypothesis "As the percentage of a country's population that is literate increases, the country's political process becomes more democratic" suggests that the researcher is proposing to use a time series design by measuring the literacy rate and the amount of democracy for a country or countries at several different times to see if increases in democracy are associated with increases in literacy (that is, if changes in one concept lead to changes in another). If, however, the researcher plans to test

the hypothesis by measuring the literacy rates and levels of democracy for many countries at one point in time to see if those with higher literacy rates also have higher levels of democracy, it would be better to rephrase the hypothesis as "Countries with higher literacy rates tend to be more democratic than countries with lower literacy rates." This way of phrasing the hypothesis reflects that the researcher is planning to use a cross-sectional research design to compare the levels of democracy in countries with different literacy rates. This differs from comparing a country's level of democracy at more than one point in time to see if it changes in concert with changes in literacy.

Finally, a good hypothesis is testable. It must be possible and feasible to obtain data that will indicate whether the hypothesis is defensible. Hypotheses for which either confirming or disconfirming evidence is impossible to gather are not subject to testing and hence are unusable for empirical purposes.

Consider this example of a promising yet untestable hypothesis: "The more a child is supportive of political authorities, the less likely that child will be to engage in political dissent as an adult." This hypothesis is general, plausible, fairly specific, and empirical, but in its current form it cannot be tested because no data exist to verify the proposition. The hypothesis requires data that measure a set of attitudes for individuals when they are children and a set of behaviors when they are adults. Survey data do exist that include the political attitudes and behavior of seventeen- and eighteen-year-olds and their parents in 1965 and many of the same people in 1973.[2] These data lack childhood measures for the parents, however, and for the others there are only late adolescent and early adulthood (mid-twenties) measures. Consequently, a frustrating practical barrier prevents the testing of an otherwise acceptable hypothesis. Students in one-semester college courses on research methods often run up against this constraint. A semester is not usually long enough to collect and analyze data, and some data may be too expensive to acquire. Many interesting hypotheses go untested simply because researchers do not have the resources to collect the data necessary to test them.

Hypotheses stated in tautological form are also untestable. A **tautology** is a statement linking two concepts that mean essentially the same thing: for example, "The less support there is for a country's political institutions, the more tenuous the stability of that country's political system." This hypothesis would be difficult to disconfirm because the two concepts—support for political institutions and stability of a political system—are so similar. To provide a fair test one would have to measure independently—in different ways—the support for the political institutions and the stability of the political system.

Poe and Tate's study of government maltreatment of citizens defined human rights abuses as coercive activities (such as murder, torture, forced disappearance, and imprisonment of persons for their political views) designed to induce

compliance.[3] Other researchers have included lack of democratic processes and poor economic conditions in their definitions of human rights abuses, but Poe and Tate did not include these concepts because they wanted to use democratic rights and economic conditions as independent variables explaining variation in human rights abuses by governments.

There are many hypotheses, then, that are not formulated in a way that permits an informative test of them with empirical research. Readers of empirical research in political science, as well as researchers themselves, should take care that research hypotheses are empirical, general, plausible, specific, consistent with the data, and testable. Hypotheses that do not share these characteristics are likely to cause difficulty for the researcher and reader alike and make a minimal contribution to scientific knowledge.

Specifying Units of Analysis

In addition to proposing a relationship between two or more variables, a hypothesis also specifies the types or levels of political actor to which the hypothesis is thought to apply. This is called the **unit of analysis** of the hypothesis, and it also must be selected thoughtfully.

As noted in Chapter 2, political scientists are interested in understanding the behavior or properties of all sorts of political actors and events: individuals, groups, states, government agencies, organizations, regions, nations, elections, wars, conflicts. The particular type of actor whose political behavior is named in a hypothesis is the unit of analysis for the research project. In a legislative behavior study, for example, the individual members of the House of Representatives might be the units of analysis in the following hypothesis:

> *Members of the House who belong to the same party as the president are more likely to vote for legislation desired by the president than are members who belong to a different party.*

In the following hypothesis, a city is the unit of analysis, since attributes of cities are being explored:

> *Northeastern cities are more likely to have mayors, while western cities have city managers.*

Civil wars are the units of analysis in this hypothesis:

> *Civil wars that are halted by negotiated peace agreements are less likely to re-erupt than are those that cease due to the military superiority of one of the parties to the conflict.*

Elections are the unit of analysis in this example:

Elections in which the contestants spend the same amount of money tend to be decided by closer margins of victory than elections in which one candidate spends a lot more than the other candidate(s).

Finally, consider this proposition:

The more affluent a country is, the more likely it is to have democratic political institutions.

Here the unit of analysis is the country. It is the measurement of national characteristics—affluence (the independent variable) and democratic political institutions (the dependent variable)—that are relevant to testing this hypothesis. In sum, the research hypothesis indicates the researcher's unit of analysis and the behavior or attributes that must be measured for that unit.

Cross-level Analysis: Ecological Inference and Ecological Fallacy

Sometimes researchers conduct what is called **cross-level analysis.** In this type of analysis, researchers use data collected for one unit of analysis to make inferences about another unit of analysis. Christopher H. Achen and W. Phillips Shively point out that "[f]or reasons of cost or availability, theories and descriptions referring to one level of aggregation are frequently testable only with data from another level."[4] A discrepancy between the unit of analysis specified in a hypothesis and the entities whose behavior is empirically observed can cause problems, however.

A frequent goal of cross-level analysis is making **ecological inference,** the use of aggregate data to study the behavior of individuals.[5] Data of many kinds are collected for school districts, voting districts, counties, states, nations, or other aggregates in order to make inferences about individuals. The relationship between schools' average test scores and the percentage of children receiving subsidized lunches, national poverty and child mortality rates, air pollution indexes and the incidence of disease in cities, and the severity of state criminal penalties and crime rates are examples of relationships explored using aggregate data. The underlying hypotheses of such studies are that children who receive subsidized lunches score lower on standardized tests, that poor children are more likely to die of childhood diseases, that individuals' health problems are due to their exposure to air pollutants, and that harsh penalties deter individuals from committing crimes. Yet, if a relationship is found between group indicators or characteristics, it does not necessarily mean that a relationship exists between the characteristics for individuals in the group. Using information that shows a relationship for groups to infer that the same relationship exists for individuals when in fact there is no such relationship at the individual level is called an **ecological fallacy.**

Let's take a look at an example to see how an ecological fallacy might be committed as a result of failing to be clear about the unit of analysis. Suppose a researcher wants to test the hypothesis "African Americans are more likely to support female candidates than are Italian Americans." Individuals are the unit of analysis in this hypothesis. If the researcher selects an election with a female candidate and obtains the voting returns as well as data on the proportions of African Americans and Italian Americans in each election precinct, the data are aggregate data, not data on individual voters. If it is found that female candidates received more votes in precincts with a higher proportion of African Americans than in the precincts with a higher proportion of Italian Americans, the researcher might take this as evidence in support of the hypothesis. There is a fundamental problem with this conclusion, however. Unless a district is 100 percent African American or 100 percent Italian American, the researcher cannot necessarily draw such a conclusion about the behavior of individuals from the behavior of election districts. It could be that a female candidate's support in a district with a high proportion of African American voters came mostly from non–African Americans, and that most of the female candidate's votes in the Italian American districts came from Italian Americans. If this is the case, then the researcher would have committed an ecological fallacy. What is true at the aggregate level is not true at the individual level.

Let us take two hypothetical election precincts to illustrate how this fallacy could occur. Suppose we have Precinct 1, classified as an "African American" district, and Precinct 2, an "Italian American" district. If the African American district voted 67 percent to 33 percent in favor of the female candidate, and the Italian American district voted 53 percent to 47 percent in favor of the female candidate, we might be tempted to conclude that African Americans as individuals voted more heavily for the female candidate than did Italian Americans.

But imagine we peek inside each of the election precincts to see how individuals of different ethnicities behaved; that is, suppose we obtain information about individuals within the districts. The data in Table 3-1 show that in the African American district, African Americans split 25–25 for the woman, Italian Americans voted 18–2 for her, and others voted 24–6 for her. This resulted in the 67–33 percent edge for the woman in Precinct 1. In the Italian American district, Precinct 2, African Americans voted 16–24 against the woman, Italian Americans split 30–20 for her, and others voted 7–3 in her favor. This resulted in the 53–47 percent margin for the woman in Precinct 2. When we compare the percentage of African Americans, Italian Americans, and others voting for the female candidate, the difference in the voting behavior of the ethnic groups becomes clearer. In both precincts, the percentage of African Americans voting for the female candidate was lower than that of the two other groups of voters. In Precinct 1, 50 percent of the African Americans voted for the female candidate, compared with 90 percent of the Italian American voters and 80 percent of the

TABLE 3-1
Voting by African Americans, Italian Americans, and Others for a Female Candidate

	Raw Vote			*Percent Vote*	
Ethnicity	Number	For Male	For Female	For Male	For Female
Precinct 1					
African Americans	50	25	25	50.0	50.0
Italian Americans	20	2	18	10.0	90.0
Other	30	6	24	20.0	80.0
Total	100	33	67	33.0	67.0
Precinct 2					
African Americans	40	24	16	60.0	40.0
Italian Americans	50	20	30	40.0	60.0
Other	10	3	7	30.0	70.0
Total	100	47	53	47.0	53.0
Voting of Individuals					
African Americans	90	49	41	54.4	45.6
Italian Americans	70	22	48	31.4	68.6
Other	40	9	31	22.5	77.5
Total	200	80	120	40.0	60.0

Note: Hypothetical data.

others. In Precinct 2, only 40 percent of the African Americans voted for the female candidate, compared with 60 percent of the Italian Americans and 70 percent of the other voters. In other words, Italian Americans as individuals were more likely to have voted for the woman candidate than were African Americans as individuals in both precincts. Knowing only the precinct-level totals gave the opposite impression. When the results for both districts are combined and broken down by ethnicity, we see that, overall, 68.6 percent of Italian Americans and 45.6 percent of African Americans voted for the female candidate.

In the research by Ansolabehere and his colleagues reported on in Chapter 1, the tone of campaign advertising and the roll-off rates were measured in thirty-four Senate races, and states with races characterized by a negative tone had higher roll-off rates than states with positive campaigns. The inference is that those individuals exposed to negative campaign ads are less likely to vote than are those exposed to positive campaign ads. But the researchers lacked data that showed the relationship between actual exposure to campaign ads of individuals and their voting behavior in the Senate elections. Remember, however, that the researchers examined and reported on individual-level data obtained from experiments, so they did not rely just

on aggregate data to test their hypotheses about individuals. Use of aggregate data to examine hypotheses that pertain to individuals may be unavoidable in some situations because individual-level data are lacking. Achen and Shively point out that before the development of survey research, aggregate data generally were the only data available and were used routinely by political scientists.[6] Several statistical methods have been developed to try to adjust inferences from aggregate-level data, although a discussion of these is beyond the scope of this book.[7]

Another mistake researchers sometimes make is to mix different units of analysis in the same hypothesis. "The more education a person has, the more democratic his country is" doesn't make much sense because it mixes the individual and country as units of analysis. However, "The smaller a government agency, the happier its workers" concerns an attribute of an agency and an attribute of individuals, but in a way that makes sense. The size of the agency in which individuals work may be an important aspect of the context or environment in which the individual phenomenon occurs and may influence the individual attribute. In this case the unit of analysis is clearly the individual, but a phenomenon that is experienced by many cases is used to explain the behavior of individuals, some of whom may well be identically situated.

In short, a researcher must be careful about the unit of analysis specified in a hypothesis and its correspondence with the unit measured. In general, a researcher should not mix units of analysis within a hypothesis.

Defining Concepts

Clear definitions of the concepts of interest to us are important if we are to develop specific hypotheses and avoid tautologies. Clear definitions also are important so that the knowledge we acquire from testing our hypotheses is transmissible and empirical.

Political scientists are interested in why people or social groupings (organizations, political parties, legislatures, states, countries) behave in a certain way or have particular attributes or properties. The words that we choose to describe these behaviors or attributes are called concepts. Concepts should be accurate, precise, and informative.

In our daily life we use concepts frequently to name and describe features of our environment. For example, we describe some snakes as poisonous and others as nonpoisonous, some politicians as liberal and others as conservative, some friends as shy and others as extroverted. These attributes, or concepts, are useful to us because they help us observe and understand aspects of our environment, and they help us communicate with others.

Concepts also contribute to the identification and delineation of the scientific disciplines within which research is conducted. In fact, to a large extent a

discipline maintains its identity because different researchers within it share a concern for the same concepts. Physics, for example, is concerned with the concepts of gravity and mass (among others); sociology, with social class and social mobility; psychology, with personality and deviance. By contrast, political science is concerned with concepts such as democracy, power, representation, justice, and equality. The boundaries of disciplines are not well defined or rigid, however. Political scientists, developmental psychologists, sociologists, and anthropologists all share an interest in how new members of a society are socialized into the norms and beliefs of that society, for example. Nonetheless, because a particular discipline has some minimal level of shared consensus concerning its significant concepts, researchers can usually communicate more readily with other researchers in the same discipline than with researchers in other disciplines.

A shared consensus over those concepts thought to be significant is related directly to the development of theories. Thus a theory of politics will identify significant concepts and suggest why they are central to an understanding of political phenomena. Concepts are developed through a process by which some human group (tribe, nation, culture, profession) agrees to give a phenomenon or property a particular name. The process is ongoing and somewhat arbitrary and does not ensure that all peoples everywhere will give the same phenomena the same names. In some areas of the United States, for example, a *soda* is a carbonated beverage, while in other areas it is a drink with ice cream in it. Likewise, the English language has only one word for *love,* whereas the Greeks have three words to distinguish between romantic love, familial love, and generalized feelings of affection.[8] Concepts disappear from a group's language when they are no longer needed, and new ones are invented as new phenomena are noticed that require names (for example, computer *programs* and *software, cultural imperialism,* and *hyperkinetic* behavior).

Some concepts—such as *car, chair,* and *vote*—are fairly precise because there is considerable agreement about their meaning. Others are more abstract and lend themselves to differing definitions—for example, *liberalism, crime, democracy, equal opportunity, human rights, social mobility,* and *alienation.* A similar concept is *orange.* Although there is considerable agreement about it (orange is not usually confused with purple), the agreement is less than total (whether a particular object is orange or red is not always clear). Or when orange blends into red and ceases to be orange.

Many interesting concepts that political scientists deal with are abstract and lack a completely precise, shared meaning. This hinders communication concerning research and creates uncertainty regarding the measurement of a phenomenon. Consequently, a researcher must explain what is meant by the concept so that a measurement strategy may be developed and so that those reading and evaluating the research can decide if the meaning accords with

their own understanding of the term. Although some concepts that political scientists use—such as *amount of formal education, presidential vote,* and *amount of foreign trade*—are not particularly abstract, other concepts—such as *partisan realignment, political integration,* and *regime support*—are far more abstract and need more careful consideration and definition.

Suppose, for example, that a researcher is interested in the kinds of political systems that different countries have and, in particular, why some countries are more democratic than others. *Democracy* is consequently a key concept and one that needs definition and measurement. The word contains meaning for most of us; that is, we have some idea what is democratic and what is not. But once we begin thinking about the concept, we quickly realize that it is not as clear as we thought originally. To some, a country is democratic if it has "competing political parties, operating in free elections, with some reasonable level of popular participation in the process."[9] To others, a country is democratic only if legal guarantees protect free speech, the press, religion, and the like. To others, a country is democratic if the political leaders make decisions that are acceptable to the populace. And to still others, democracy implies equality of economic opportunity among the citizenry. If a country has all these attributes, it would be called a democracy by any of the criteria and there would be no problem classifying the country. But if a country possesses only one of these attributes, its classification would be uncertain, since by some definitions it would be democratic but by others it would not be. Different definitions require different measurements and may result in different research findings. Hence, defining one's concepts is important, particularly when the concept is so abstract as to make shared agreement difficult.

Concept definitions have a direct impact on the quality of knowledge produced by research studies. Suppose, for example, that a researcher is interested in the connection between economic development and democracy, the working hypothesis being that countries with a high level of economic development will be more likely to have democratic forms of government. And suppose that there are two definitions of economic development and two definitions of democracy that might be used in the research. Finally, suppose that the researcher has data on twelve countries (A–L) included in the study. In Table 3-2 we show that the definition selected for each concept has a direct bearing on how different countries are categorized on each attribute. By definition 1, countries A, B, C, D, E, and F are economically developed; however, by definition 2, countries A, B, C, G, H, and I are. By definition 1, countries A, B, C, D, E, and F are democracies; by definition 2, countries D, E, F, J, K, and L are.

This is only the beginning of our troubles, however. When we look for a pattern involving the economic development and democracy of countries, we find that our answer depends mightily on how we have defined the two concepts. If we use the first definitions of the two concepts, we find that all economically

TABLE 3-2

Concept Development: The Relationship between Economic Development and Democracy

Is the country economically developed?			
		By definition 1:	
		Yes	*No*
By definition 2:	*Yes*	A,B,C	G,H,I
	No	D,E,F	J,K,L
Is the country a democracy?			
		By definition 1:	
		Yes	*No*
By definition 2:	*Yes*	D,E,F	J,K,L
	No	A,B,C	G,H,I

developed countries are also democracies (A, B, C, D, E, F), which supports our hypothesis. If we use the first definition for economic development and the second for democracy (or vice versa), half of the economically developed nations are democracies and half are not. If we use the second definitions of both concepts, none of the economically developed countries is a democracy, whereas all of the undeveloped countries are (D, E, F, J, K, L). In other words, because of our inability to formulate a precise definition of the two concepts, and because the two definitions of each concept yield quite different categorizations of the twelve countries, our hypothesis could be either confirmed or disconfirmed by the data at hand. Our conceptual confusion has put us in a difficult position.

Consider another example. Suppose a researcher is interested in why some people are liberal and some are not. In this case we need to define what is meant by liberal so that those who are liberal can be identified. *Liberal* is a frequently used term, but it has many different meanings: one who favors change, one who favors redistributive income or social welfare policies, one who favors increased government spending and taxation, or one who opposes government interference in the political activities of its citizens. If a person possesses all these attributes, there is no problem deciding whether or not he or she is a liberal. A problem arises, however, when a person possesses some of these attributes but not others.

The examples here illustrate the elusive nature of concepts and the need to define them. The empirical researcher's responsibility to define terms is a necessary and challenging one. Unfortunately, many of the concepts used by

political science researchers are fairly abstract and require careful thought and extensive elaboration.

Researchers can clarify the concept definitions they use simply by making the meanings of key concepts explicit. This requires researchers to think carefully about the concepts used in their research and to share their meanings with others. Other researchers often challenge concept definitions, requiring researchers to elaborate upon and justify their meanings.

Another way in which researchers get help defining concepts is by reviewing and borrowing (possibly with modification) definitions developed by others in the field. This is one of the reasons why researchers conduct literature reviews of pertinent research, a task we take up in detail in Chapter 6. For example, a researcher interested in the political attitudes and behavior of the American public would find the following definitions of key concepts in the existing literature:

> *Political participation.* Those activities by private citizens that are more or less directly aimed at influencing the selection of government personnel, the actions they take, or both.[10]
>
> *Political violence.* All collective attacks within a political community against the political regime, its actors—including competing political groups as well as incumbents—or its policies.[11]
>
> *Political efficacy.* The feeling that individual political action does have, or can have, an impact upon the political processes—that it is worthwhile to perform one's civic duties.[12]
>
> *Belief system.* A configuration of ideas and attitudes in which the elements are bound together by some form of constraint or functional interdependence.[13]

Each of these concepts is somewhat vague and lacks complete shared agreement about its meaning. Furthermore, it is possible to raise questions about each of these concept definitions. Notice, for example, that the definition of *political participation* excludes the possibility that government employees (presumably "nonprivate" citizens) engage in political activities, and that the definition of *political efficacy* excludes the impact of collective political action on political processes. Consequently, we may find these and other concept definitions inadequate and revise them to capture more accurately what we mean by the terms.

Over time a discipline cannot proceed very far unless some minimal agreement is reached about the meanings of the concepts with which scientific research is concerned. Researchers must take care to think about the phenomena named in a research project and make explicit the meanings of any problematic concepts.

Conclusion

In this chapter we discussed the beginning stages of a scientific research project. A research project must provide—to both the producer and the consumer of social scientific knowledge—the answers to these important questions: What phenomenon is the researcher trying to understand and explain? What explanation has the researcher proposed for the political behavior or attributes in question? What are the meanings of the concepts used in this explanation? What specific hypothesis relating two or more variables will be tested? What is the unit of analysis for the observations? If these questions are answered adequately, then the research will have a firm foundation.

Notes

1. This term is used by Susan Ann Kay, *Introduction to the Analysis of Political Data* (Englewood Cliffs, N.J.: Prentice-Hall, 1991), 6.
2. For a description of this data set, see M. Kent Jennings and Richard G. Niemi, *Generations and Politics* (Princeton: Princeton University Press, 1981).
3. Steven C. Poe and C. Neal Tate, "Repression of Human Rights to Personal Integrity in the 1980s: A Global Analysis," *American Political Science Review* 88 (December 1994): 853–872.
4. Christopher H. Achen and W. Phillips Shively, *Cross-Level Inference* (Chicago: University of Chicago Press, 1995), 4.
5. Ibid.
6. Ibid., 5–10.
7. For example, see Gary King, *A Solution to the Ecological Inference Problem* (Princeton: Princeton University Press, 1997); Achen and Shively, *Cross-Level Inference;* and Barry C. Burden and David C. Kimball, *Why Americans Split Their Tickets: Campaigns, Competition, and Divided Government* (Ann Arbor: University of Michigan Press, 2002), chap. 3.
8. Kenneth R. Hoover, *The Elements of Social Scientific Thinking* (New York: St. Martin's, 1980), 18–19.
9. W. Phillips Shively, *The Craft of Political Research* (Englewood Cliffs, N.J.: Prentice-Hall, 1980), 33.
10. Sidney Verba and Norman H. Nie, *Participation in America* (New York: Harper and Row, 1972), 2.
11. Ted Robert Gurr, *Why Men Rebel* (Princeton: Princeton University Press, 1970), 3–4.
12. Angus Campbell, Gerald Gurin, and Warren E. Miller, *The Voter Decides* (Evanston, Ill.: Row, Peterson, 1954), 187.
13. Philip E. Converse, "The Nature of Belief Systems in Mass Publics," in David E. Apter, ed., *Ideology and Discontent* (New York: Free Press, 1964), 207.

Terms Introduced

ANTECEDENT VARIABLE. An independent variable that precedes other independent variables in time.

ARROW DIAGRAM. A pictorial representation of a researcher's explanatory scheme.

CROSS-LEVEL ANALYSIS. The use of data at one level of aggregation to make inferences at another level of aggregation.

Dependent variable. The phenomenon thought to be influenced, affected, or caused by some other phenomenon.

Directional hypothesis. A hypothesis that specifies the expected relationship between two or more variables.

Ecological fallacy. The fallacy of deducing a false relationship between the attributes or behavior of individuals based on observing that relationship for groups to which the individuals belong.

Ecological inference. The process of inferring a relationship between characteristics of individuals based on group or aggregate data.

Hypothesis. A tentative or provisional or unconfirmed statement that can (in principle) be verified.

Independent variable. The phenomenon thought to influence, affect, or cause some other phenomenon.

Intervening variable. A variable coming between an independent variable and a dependent variable in an explanatory scheme.

Negative relationship. A relationship in which the values of one variable increase as the values of another variable decrease.

Positive relationship. A relationship in which the values of one variable increase (or decrease) as the values of another variable increase (or decrease).

Relationship. The association, dependence, or covariance of the values of one variable with the values of another variable.

Tautology. A hypothesis in which the independent and dependent variables are identical, making it impossible to disconfirm.

Unit of analysis. The type of actor (individual, group, institution, nation) specified in a researcher's hypothesis.

Suggested Readings

Achen, Christopher H., and W. Phillips Shively. *Cross-Level Inference.* Chicago: University of Chicago Press, 1995.

King, Gary. *A Solution to the Ecological Inference Problem.* Princeton: Princeton University Press, 1997.