

Experimental economics

Lecture 3: Research question and hypotheses

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References:

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Empirical research

- The empirical cycle consists of five elements:
 - 1. Background
 - 2. Question
 - 3. Theory
 - 4. Research
 - 5. Conclusions
- Despite its second place in the order of things, the question you are answering is the most important of the five elements. Your research answers a research question that emerges from a background of societal issues and previous research, develops ideas that could be the answer to your question, and presents data analyses that are relevant for this question. Furthermore, your research will contribute new insights to revise theories that answer the question and to design policies that change the reality that formed the background to your question. At that point, the cycle has completed one round. The changed reality, in turn, may form the background of future research.

Empirical research process

- 1. Formulate an initial version of your research question
- 2. Then start gathering previous research and read it. Identify the state of the art in the literature on your research problem
- 3. Having identified the gaps in the literature, reformulate your research question and ask for feedback
- 4. Write a first draft of the introduction, describing the research question, the relevance of your study, and a very brief description of the research design
- 5. Determine whether an ethics review is required for your research, and if so, apply
- 6. Next, formulate hypotheses and design your research
- 7. Collect data, analyze them and describe the results
- 8. Write the conclusion and discussion
- 9. Write the summary or abstract
- 10. Finally, write the preface (for thesis) and lay-out your document
- 11. Check-check: go over your text and correct errors.
- 12. Check-check double-check: let someone else go over your text and suggest improvements.

Finding a research question

- Economists view the world through the lens of efficiency, starting from the assumption that individuals behave rationally and focusing on the problem of allocating scarce resources. From this common analytical perspective, economists study a wide range of topics, involving the behavior of individuals, organizations and nations. The economic approach can be applied so broadly that choosing a topic to write on can be difficult. Indeed, once you start looking at the world through the eyes of an economist, almost anything can be analyzed in terms of choice under constraint.
- A good term paper will ask an interesting question and offer a plausible answer. It should be plausible in that it is (probably) true, but also not obviously or patently true; and it should be supportable in that it is subject to factual observation or logical demonstration.
- Though there is no one way to find a topic, thinking of the issues that interest you is a great place to begin. While the range of possible topics is large, there are some well-defined fields in economics, and your own interests are likely to fit into one of these.
- In addition to finding something that interests you, you will also need a project that can be done within the parameters of the assignment (for example, length, due date, access to research materials). If the topic doesn't interest you, you probably won't put in the effort needed to do a good job or ask the right questions along the way. On the other hand, a profoundly interesting topic may not be manageable given the time and other constraints that you face.

Finding a research question

- A very common issue at the beginning of research projects among many students, PhD candidates Early Career Researchers (ECRs) and even among senior academics is uncertainty about the question that the project should answer. A good research question addresses an important problem, the answer to which contributes to both societal needs and to science. Your contribution to science and society should answer a question that is both unresolved and important. It should be a question that we do not yet have the answer to or an incorrect answer, and it should be a question that matters.
- If you write a sentence like ‘This research deals with aspects of Corporate Social Responsibility’ or ‘In this paper, I explore Corporate Social Responsibility from the perspective of theories on communication’ you do not ask a question. It is better to have a specific question than to have a broad topic. The problem with not asking a question is that you do not force yourself to say what you are really trying to research and create too much room for diversions and side tracks. A lack of focus is not merely a problem for yourself, but also for readers like your supervisor. The solution to this problem is to think in terms of questions, and also write in terms of questions. It may seem obvious, but a research question is literally a sentence that ends with a question mark (“?”).
- Perhaps it is obvious, but it is worth stating explicitly: make sure that your research in fact answers the question that you state in the beginning. If you do not answer the question you raise, readers will be disappointed. The implication is that you should adapt your research question to the research design of your study. When you work with existing data, make sure that the research question can be answered with the data at hand. When you have the opportunity to collect new data, make sure that you actually measure the concepts in the research question.

Finding a research question

- You should focus on a single, manageable question. In any case, it has to be:
 - Relevant - has to deal with some real (economic) issue
 - Important - the issue (e.g. inefficiency) it is dealing with has to be significant
 - Interesting - has to have an audience - there has to be somebody who should be interested in / benefitting from your findings
 - Testable - there has to be a way to answer your question
 - Novel - there has to be some novelty involved, so that you are contributing to the advances in the field
- As a rule of thumb, I think the question is potentially good if it is a “Yes/No + Why” question. That is, you can answer your research question with either “Yes” or “No”, and you can also show the mechanism of the answer - why is it a Yes OR why is it a No.

Imagine that you want to know more about why students in your class are late for lectures...

1. “The relationship between student life and class attendance.”
 - Not a great RQ... I mean... it is not even a question :)
2. “What factors influence the student class attendance?”
 - Also not great... even if you find a couple of factors, how can you be sure that these are all? Maybe there are thousands of more important ones you have not identified...
3. “Does the way of how students manage their time influence their class attendance?”
 - Better. You can answer with yes/no. But.. what is “time management”? Your variable is too vague, very unspecific.
4. “Do reminders have an effect on class attendance?”
 - Good one - for empirical research. You can say yes/no, and also have a mechanism - reminders as a counterstrategy for forgetting/procrastination etc.
 - However, if you want to also show causality, then your problem will be that the main variable of interest (setting reminders) is out of your control.
5. “Do teacher e-mail reminders have an effect on class attendance?”
 - If you want to do experiments, here is your research question. For example, you can send reminders to half of the class and do not send reminders for the rest and then count what percentage of each group shows up.

Research question sources

- Look for...
 - **Curiosity** - maybe you have read/heard about something and you are wondering -> *How does that work?*
 - **Ineffectiveness** - sometimes you may find yourself pissed about something that does not work very well.. -> *Why are they doing it that way? Is there a better way?*
 - **Searching for truth** - sometimes you may feel that somebody is just wrong... -> *I don't believe what they are saying! Is it really how they say it is?*
 - **Competing conclusions** - sometimes there are two ideas/theories that contradict each other... -> *Who/what is lying and who/what is telling the truth?*
 - **New theories** - sometimes you find an attractive theory making clear predictions, but nobody tested the theory yet... -> *Is that a good theory?*
 - **New applications of theories/insights...** -> *Does it also work in my environment? Does it also apply here?*
 - **Papers that really need replication study** - maybe because of small sample sizes or obsolete methodology -> *Your hypotheses, my design/data - will your results still hold?*

Presentation of your research question

- When presenting your research question, you should give the answers to at least 3 questions to your audience:
 - What? - what is your topic/question?
 - So what? - why is it important? Why should we care?
 - Now what? - how do you plan to do your research and find the answer to your question?
- Don't forget about main assumptions, concepts and theories in economics - the assumption that people respond to incentives, the assumption of rationality, the law of supply and demand, the problem of scarcity and opportunity costs, the marginal principle, the notion of spillovers or externalities...
- Also, when making economic arguments, don't forget that economists prefer:
 - evidence on what people actually do, rather than on what they say
 - large numbers of observations
 - random samples

Societal relevance

- The societal relevance of your research is determined by the implications that your results have for public debates and choices by citizens and policy makers. Simply stated: the societal relevance paragraph answers the question: “SO WHAT?”
- There are two types of societal relevance: the relevance for social issues and the practical or policy relevance. If your research tells you that people are happier when they pay others to outsource household tasks they dislike, for instance, citizens can take that as an advice to examine their household budget and the tasks they are not outsourcing to see which ones they dislike. This result is of practical relevance.
- An example of policy relevance is the conclusion that donations to charity are more effectively encouraged by price reductions in the form of rebates than by matches. The result suggests that income tax deductions for charitable donations are suboptimal. The question you should answer in the paragraph about the societal relevance is: “Who will be interested in your research and why?”. Or in other words: whose minds are you going to change about what?
- When you try to sell your research, think about what kind of audience may be interested, and address that audience. To identify your audience, ask yourself: who cares? Groups of actors that may be interested in your research include: policy makers, in government or in organizations; politicians; consumers; patients; voters; volunteers; donors. Certainly those who are in a position to change the behavior of people and the policies that affect that behavior are part of your audience. But the audience may be much broader: perhaps mankind as a whole should be interested.

Scientific relevance

- The question you should answer in the paragraph about the scientific relevance is: “What will this new research add to the existing body of literature, and why is that an important addition?”. In other words: what is the innovation in your research?
- Prototypical arguments about scientific relevance are:
 - 1. You will Discover: there are no data available in previous research about the phenomenon that you study.
 - 2. You will Replicate: previous research has concluded that X influences Y. You will check whether the same relationship can be found in another set of observations.
 - 3. You will resolve an Anomaly: there are observations that seem to reject existing hypotheses or theories. Your research will clarify what is going on.
 - 4. You will solve a Mystery: we do not (fully) know how to explain Y. Your research will add to a piece to the puzzle.
 - 5. You will follow Leads: we think we know that X influences Y, but we are not sure. Your research will show to what extent X influences Y.
 - 6. You will open a Black Box: we do not know how to explain the correlation between X and Y. Your research will show how X influences Y, through which intermediary variables.
 - 7. You will use Better Methods: previous research has relied on research designs that are not fully adequate to answer the research questions. Your research will use more refined, sophisticated, and stringent data and methods.
 - 8. You will Reopen a Closed Case: previous research has concluded that X influences Y, but there are reasons to doubt this conclusion. Your research will show to what extent X really influences Y.
 - 9. You will Generalize: previous research about X and Y was about context A, but you study context B.

Literature review

- Once you have well-defined research question, it is time for a literature review - a short “essay” about previous research that is relevant to your research question - what has already been done? What has already been found? How does my research question connect to & expand the literature?
- Literature review will also help you by stopping you from doing things that are not worth your time (if it has already been done a million times and everybody knows what the results will be) and on the other hand, will help you find gaps that are worth digging into. Really good papers actually include ideas for future research/expansion in the discussion section.
- Finally, literature review will provide you good guidance on the methodology/design and analysis of data . If everybody in your field uses same methodology and statistical analysis techniques, there is a good chance that you should use what they use - because there is probably a reason why they use what they use.
- Please use as good sources as possible. That means, you should strive for citing quality peer-reviewed journals only. No wikipedia or “internet” sources.
- Things to try: Google Scholar for paper search, Mendeley for citations and bibliography

So you have your research question...

- What do you do after figuring out your research topic (motivation), doing your literature review and narrowing down your research questions?
 - Propose a suitable explanation for the phenomena you are interested in (the “why” of your research question)
 - Formulate testable hypotheses
 - Define the concepts identified in the hypotheses (what exactly it is that you will measure and analyse)
- Write the theory section with hypotheses first, before you have collected or analyzed your data to avoid HARKING: Hypothesizing After Results are Known (Kerr, 1989). It is all too easy to paint a target after you have fired your guns and then claim you were 100% accurate. Your hypotheses are ex ante predictions based on theories, not post hoc interpretations of your data.

Proposing explanations

- Once your research question is developed, you need to propose an explanation (e.g. identify a phenomena/ concept) that may provide you with the answer. Often you will need to identify more phenomena and specify how they are related.
- To help clarify relationships between phenomena, scientists refer to phenomena as variables and identify several types of variables.
- A phenomenon that we think will help us explain our observations or behavior is called an **independent variable**. Independent variables 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 cannot be used to investigate a relationship.

Formulating Hypotheses

- A hypothesis is an explicit statement that indicates how a researcher thinks phenomena of interest (variables) are related. It proposes a relationship that subsequently will be tested with empirical observations of the variables.
- A hypothesis is a guess (but of an educated nature) 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 and not supported by the empirical evidence.
- 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 the meaning of any findings.
- 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.

Good hypothesis is...

1. Empirical statement - open question, proposing a relationship that can be empirically observed. Not a normative statement (opinions, preferences).
2. General - it should propose a relationship pertaining to many occurrences of a phenomenon rather than just to one occurrence.
3. Plausible - there should be some logical reason for thinking that it might be confirmed.
4. Specific - it should not simply state that variables are associated; rather, it should indicate the direction of the expected relationship (positive - if X increases then Y increases, or negative - if X increases then Y decreases) between two or more variables. Also, it must be clear what variables X and Y mean (it must be easy to say how to measure variables).
5. Testable - it must be possible and feasible to obtain data that will allow one to test the hypothesis.

Developing your theory section

- The goal of formulating a hypothesis is not to maximize the chance that the analysis will confirm it, but to maximize the implications of testing it. By only formulating a hypothesis when there is a strong theoretical foundation for it, a rejection of the hypothesis by an empirical test is more informative. When the foundation for a hypothesis is shaky to begin with, we do not learn much from a rejection.
- In the opening of your theory section, present a causal model that represents how you think the phenomena that you are studying are related. You can think of a causal model as a simplification of the chain of events that leads to a certain outcome. The core of any causal model is a relationship between a cause X and its effect Y. Take the example of a campfire that results from striking a match in a small pyramid of dry wood. Striking the match (X) caused the wood to catch fire (Y).
- Select your dependent variable (Y). The dependent variable is the phenomenon you are trying to understand or explain, by relating it to the conditions in which it occurs, the characteristics of people who are involved, how it changed over time, or how it varies between groups or nations. The name 'dependent variable' implies that it depends on something else, and that it can vary. A characteristic that does not vary – such as birth year – is not a variable, but a constant.
- Pick your main independent variable (X). The independent variable is a cause of the phenomenon that you are trying to explain. In time, the independent variable precedes the dependent variable. The change or the event that you think is a cause must have happened before the outcome occurred.

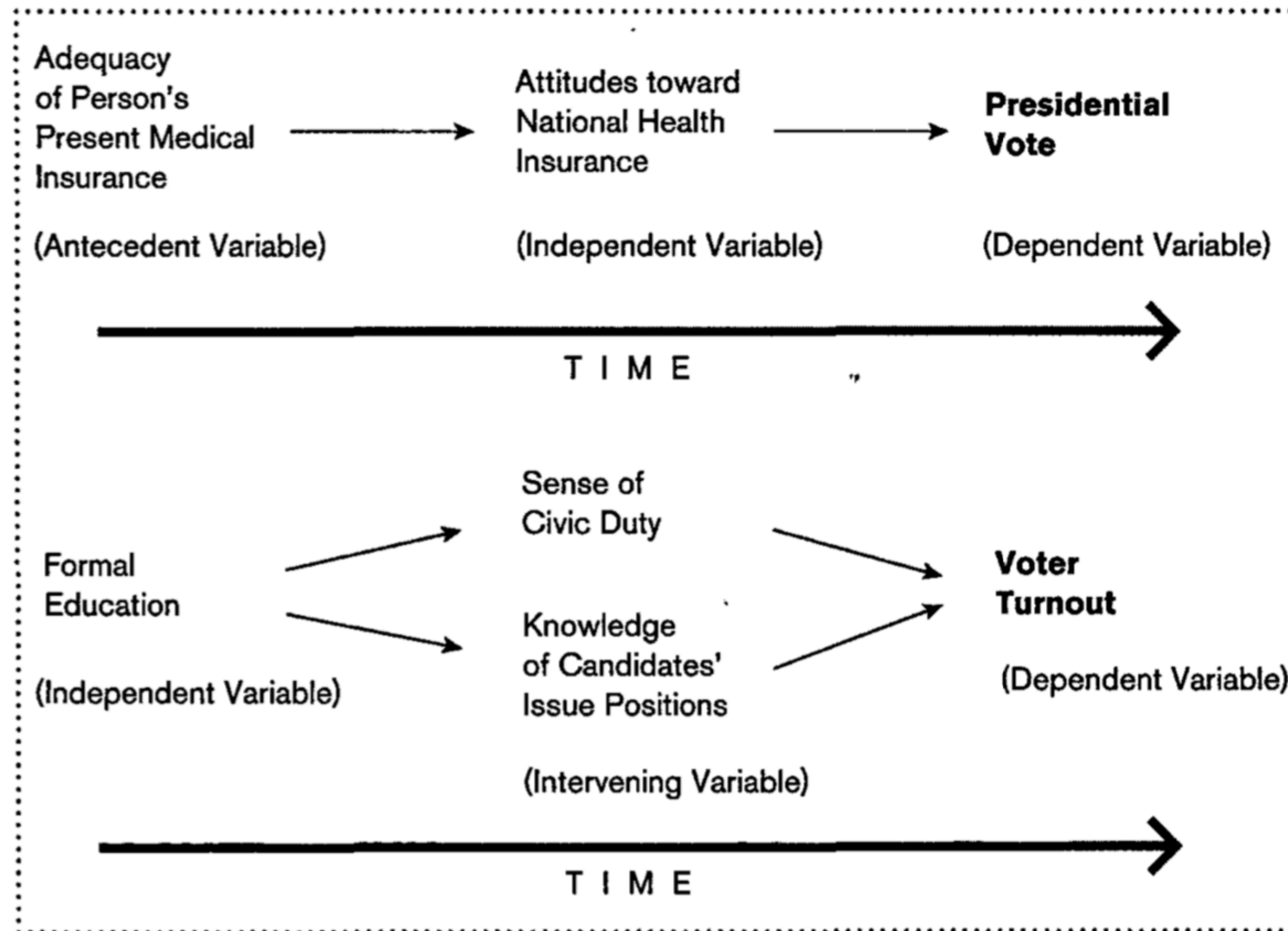
Variables

- Sometimes, in addition to proposing that independent variables are related to the dependent variable, researchers propose relationships between the independent variables.
- In particular, we might want to determine which independent variables occur 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.

Arrow diagram

- 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.
- 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.
- 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, the variables may be associated or correlated, but the relationship is indirect, not causal.
- Note that 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.
 - Also, 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.

FIGURE 4-1 Arrow Diagram of Adequacy of Medical Insurance and Voter Turnout Examples



Conclusion

- 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 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?