

Introduction to International Relations

Lecture 1: The Scientific Method

Professor Branislav L. Slantchev

Department of Political Science, University of California - San Diego

April 19, 2005

Overview. We begin by defining our basic method for the study of international relations. We shall place a premium on explaining events, not simply describing them. To this end, we need to know what constitutes a valid explanation, how to construct it, and how to evaluate it.

OUTLINE OF LECTURE 1: THE SCIENTIFIC METHOD

1. Why theories?

- everyone uses them
- better to be explicit

2. What is a theory?

- simplification of reality
- relationship between variables
- explanatory and dependent variables
- causal mechanism
- assumptions
- causes and consequences
 - a) necessary and sufficient conditions
 - b) probabilistic causality and tendencies

3. Evaluating theories

- logical consistency
 - a) assumptions not mutually contradictory
 - b) conclusions follow from premises
- empirical validity
 - a) falsifiability
 - b) experiments
 - c) statistical analysis
 - d) case studies

4. Selecting a theory

- comparative theory evaluation
- do not discard without an alternative
- explains more
- fewer auxiliary assumptions

1 Why Do We Need Theories?

The real world is too complicated. Without some way of simplifying it, we would not be able to function in our day to day life. Even as simple task of describing an event requires us to pick which facts to include and which facts to omit. We are guided by theories internally every time we must make a decision because theories connect causes with consequences. One of the purposes of education is to teach you (the students) how to “think” and by this I mean “give you a method to evaluate the world around you in some meaningful way.”

In everyday language, the word “theory” has a peculiar connotation. How often have you heard someone disagree with another by saying, “Well, that’s just a theory.” This presumably is taken to imply that the assertion in question has no empirical validity because it does not correspond to anything observable in the real world. As such, it is dismissed as irrelevant.

Today we shall learn the scientific meaning of the word “theory” and we shall see that it is a necessary ingredient of any explanation of any event. We shall learn what constitutes a proper theory, we shall also learn how to evaluate competing theories by using the scientific method. We shall learn to distinguish between scientific theory and faith. You may be surprised how often assertions that some call “theories” are really articles of faith.

As political scientists, we want to explain various interesting events. In particular, we want to explain the strategic interaction among various actors in the international environment. Some people seem to feel that you do not need a theory to explain adequately given events; all you need are the facts. This is absolutely false and here’s why.

Suppose we want to explain the outbreak of the Second World War. The people who see no need for theories would presumably bring all the facts to the table to do so. But how do we get to select these facts? Some are trivially related, such as Germany attacking Poland in September of 1939. But which other facts should we pick?

Selecting the facts requires a judgment about their relevance. Do we include the appeasement at Munich a year earlier as a fact? If so, why? Presumably because it demonstrated to Hitler that Britain and France would not make a stand in the defense of a small central European country. Do we include the German rearmament in defiance of the Versailles Treaty that ended the First World War? If we do, it is presumably because we think that without arming the Germans would have been unable to challenge the status quo established by that treaty. Do we include the horrible inflation that brought down the democratic Weimar Republic and catapulted the Nazis to power? If we do, it’s presumably because we think that public support for Hitler’s foreign policies was important in his decision to attack. Do we include the Winter War between the Soviet Union and Finland? If we do, we presumably do so because we think it might have emboldened the Germans to launch Barbarossa against what they might have considered inferior Soviet military forces. And so on and so forth.

The point is that even a seemingly simple thing as selecting the facts requires

one to make a judgment about their relevance, and making this judgment requires one to have a theory that connects causes to consequences. It is worth emphasizing again that every time you (or policy makers) choose a course of action, you are guided by some implicit theory (or faith) that connects causes with consequences.

It is therefore worth making sure that our theories make sense. If we are guided by a false theory (and we shall see what this means precisely in a little bit), then our decisions, our conclusions, and our explanations, will be wrong. In world politics, this may mean disastrously wrong.

2 What is a Theory?

A theory is a set of statements about expected relationships between variables. That is, a theory tells us that a change in variable *A* is likely to produce a change in variable *B* in some particular way. The theory effectively “connects” the two variables. Variable *A* is called an **independent** or, a better term, an **explanatory**, variable because it explains the variation of *B*, which is called the **dependent** variable.

For example, consider a theory of war. The dependent variable is the outbreak of war. Some possible explanatory variables would be pre-war arms races, regime types of opponents, balance of military capabilities, economic resources, presence of allies, and so on. The outbreak of the Second World War, or any other particular war, is not a variable, but a *realization* of the variable “war.” That is, it is a single observation, it is a constant. The Anglo-German naval race prior to the First World War is likewise not a variable; it is the value of the variable “arms race” for the event WWI.

A theory links the variables through some **causal mechanism** that leads from the explanatory variables to the dependent one. For example, we might say that an increase in the military preponderance of one state over another decreases the probability that war between them will break out. For this to be a theoretical statement, we must specify the mechanism through which the change in the independent variable results in a change in the dependent one. One possibility would be to say that if one state is much stronger than the other, then the weaker state knows that it will lose a war, and therefore when the stronger one makes a demand, it concedes. Crises will therefore end short of war in concessions by the weaker state. This, then, specifies the causal mechanism that links military preponderance to likelihood of war.

2.1 On Assumptions

For the theory to make sense, we want this causal mechanism to be logical. How do we construct this causal mechanism. That is, how do we build a theory? Now, as I mentioned before, theories are simplifications of reality. They tell us which things one should consider when trying to explain (understand) an event (or a

class of events), and which things one can omit. No theory can even hope to be faithful representation of the real world.

Assumptions are the building blocks of theory. They are the means through which theories simplify reality. For example, a very influential theory in international relations is called neorealism, and one of its most important assumptions is that we can treat states as unitary actors, that is we can treat states as if they are rational individuals instead of complicated collections of many individuals.

Now, neorealists are not dumb. They know very well that states are not unitary actors. They assume that they can safely abstract away from this complexity. That is, they think that ignoring domestic politics will not distort their conclusions about how states behave internationally. (I should point out that another crucial assumption here is that states are the relevant actors to study.) In other words, the neorealists make a bet that they can produce meaningful explanations of international events while ignoring the composition of states.

Note that assumptions are neither true nor false in the normal sense of the words. Actually, in the normal sense, they are almost always “false” because they simplify reality, and as such they do not represent it completely (whatever that means). Instead, assumptions are to be judged on their usefulness. That is, we very pragmatically want to know if a given assumption helps us explain some behavior that we are interested in.

It is best to treat assumptions as “as if” statements. In the example above, it is not that neorealists are saying that states are unitary actors, but rather that we can treat states as if they were unitary actors and be able to adequately explain their behavior. When we disagree with an assumption, we do not do so on the grounds that it is “unrealistic” (although this is something one commonly hears), but because we think that it introduces distortions in the arguments and makes the theory inadequate.

There is plenty of evidence, for example, that one cannot treat states as unitary rational actors. There are some theoretical complications, but, more importantly, there are some empirical ones as well. For example, a well-established empirical regularity is that democratic states do not fight each other. Neorealist theory cannot explain this because it cannot refer to the regime type of states. Through its lens, all states are “fundamentally the same.”

The point here is that we can challenge an assumption only if we think that it does not contribute to our understanding of the phenomena we want to explain. We cannot challenge it because we don’t like it, or because it’s empirically untrue. Of course, if I assume that the earth is flat and then deduce conditions for world peace, one may well doubt the validity of that theory. Still, we do not throw out an assumption just because it’s false. Only when you show me that this assumption produces wrong predictions would I agree that it needs to be replaced.

2.2 Causes and Consequences: Necessary and Sufficient Conditions

What do I mean by “predictions”? These are the statements of the theory. For example, a theory of war might predict that if the balance of military capabilities moves toward parity, the probability that war will occur will decline. In other words, a prediction is a statement about the consequences following from changes in the explanatory variables.

Sometimes, a particular condition must occur in order for the dependent variable to acquire a particular value. For example, if the theory says that war occurs only when there is an approximate equality of military capabilities, then we should not observe war between countries with big differences in their military power. The equality military power is a **necessary condition** for war to occur in this theory. Put another way, every time we observe war, we also must necessarily observe equality in military power. If we observe war and disparity in power, the theory is falsified because its prediction is not empirically true. It is not possible to observe war unless there is equality in power, that is, it is not possible to observe war if there is disparity in power. Necessity is a pretty strong claim.

The theory might instead only state that equality in military power is a **sufficient condition** for war to occur. That is, if we observe such equality, then we also observe war. However, we can also observe war without this equality because this condition is no longer necessary, merely sufficient. Note too, that when military parity is a sufficient condition for war, war is a necessary condition for military parity. It is worth spending some time getting these claims straight.

If A is a necessary condition for B , then every time we observe B , we also must observe A . Thus, B is a sufficient condition for A . It is not possible to observe B without A . However, it is possible to observe A without B . If A is a sufficient condition for B , then every time we observe A , we also must observe B . Thus, B is a necessary condition for A . It is possible to observe B without A , but it is not possible to observe A without B . The strongest claim a theory can make is that A is both necessary and sufficient for B . That is, whenever A occurs, B must occur, and whenever B occurs, A must occur as well.

A theory then makes a set of claims about the expected relationship between variables. It identifies necessary and/or sufficient conditions for particular changes in the dependent variable. In other words, it states how changes in the explanatory variables translate into changes in the dependent variable. A **causal mechanism** is the way the explanatory variables influence the dependent variable. Again, we require our causal mechanism to make sense. The causal mechanism also determines whether the relationship is one of necessity, or sufficiency, or both.

Most of our theories do not make sharp statements, however. Because the real world is so complex, our theories of social behavior will always be incomplete and partial. Therefore, they will not take into account all factors that jointly determine particular outcomes. Our theories will only predict *tendencies*; that

is, they will only tell us whether particular configurations of factors are more or less likely to produce certain outcomes. For example, a theory may tell us that preponderance of power will generally lead to a peaceful resolution of a crisis, but that does not mean that all crises between a weak and a strong state will end short of war. Indeed, as the two wars with Iraq show, this is manifestly untrue.

However, this does not necessarily make the theory incorrect. Indeed, it may be the case that these are instances where the tendency predicted by the theory (weak states concede because they know they will lose) may be overwhelmed by other tendencies (e.g. Saddam Hussein hoping to inflict large casualties on the Americans causing them to stop short of victory) in producing the outcome. We have to be very careful when evaluating theories because disconfirming evidence may sometimes cause us to “throw the baby out with the bath water.”

In addition, sometimes our theories may have uncertainty built into them. That is, a variation in an explanatory variable only sometimes causes variation in the dependent variable, and we can specify the probability of it doing so. This is sometimes called *probabilistic causality* and is pretty complicated to define, and even more difficult to test. For example, suppose our theory says that actors will sometimes bluff during a crisis: they will pretend to be stronger than they really are and will press for more concessions even though they would be unwilling to resort to force in the end. This means that all else equal, actors will sometime demand a lot, and sometimes will accept far less (when they choose not to bluff). The problem is that now we have a variation in the dependent variable (their demands) without variation in any of the explanatory variables (like military capabilities). This type of uncertainty is induced by the actors themselves, and may make it difficult to determine if a theory’s predictions hold or not.

3 How to Evaluate Theories?

Let’s go back to our theories of war. Recall that one of the explanatory variables was military power. Consider now the following three statements.

1. Here’s a statement: “when there is a big discrepancy in military power between two states, both agree that the chances that the stronger one will win a war are great, and hence the weaker state would tend to submit to the demands of its stronger opponent (or not challenge the stronger opponent) without fighting.” This comes from an old theory of international relations called the *power transition theory*.
2. How about the following: “when there is a relative parity in military power between two states, neither feels threatened by the other, and war is not likely to break out because both states are secure.” This comes from an even older theory called the *balance of power theory*.
3. Or perhaps this one: “the distribution of military power only matters in relation to the distribution of benefits: if the use of force is expected to yield more than living with the status quo, then war becomes more likely.”

This comes from a recent argument from the rational choice school and the bargaining theories of war.

4. Or this statement: “the relative military capabilities are irrelevant to whether war will break out once a crisis is initiated because when states choose whether to challenge each other, they take these capabilities into account, and once a challenge is initiated, these capabilities are no longer relevant to determine how the challenge will be resolved.” This is a more recent argument from the rational choice school.

In other words, we have four statements that relate military capabilities to the outbreak of war, and they all contradict each other. One claims that preponderance of power leads to peace and parity to war; the other claims the exact opposite; the third claims that by themselves military capabilities cannot determine the probability of war; and the fourth claims military capabilities are irrelevant. How do we evaluate them?

We shall use two basic criteria: **logical consistency** and **empirical validity**. First, we shall require that the theory that produces the statement is internally correct in the sense that its assumptions do not contradict each other. Then we shall subject the theory to empirical tests to see how well it holds up compared to real world events.

3.1 Logical Consistency

We really want our theories to meet two logical criteria: (i) we want its different assumptions not to contradict each other; and (ii) we want the claims to follow logically from the premises.

An assumption is neither true nor false. A set of assumptions, however, can be false in an important logical sense. If assumptions contradict each other, then the theory is said not to be logically consistent.

For example, a very influential theory in international relations is Morgenthau’s **realism**. In one place its author assumes that all states always try to acquire the maximum amount of power, and in another place he assumes that there are status quo powers that are satisfied with what they have and do not seek more power. Taken separately, each assumption can be made (and has been made) and there is no logical problem. Taken together, however, they result in a contradiction because it cannot be the case that all states maximize power and some do not. So one of the assumptions has to go for the theory to remain logically consistent.

You will be surprised how often this mistake is made. It is not that people intentionally construct false theories. It’s just that sometimes it is very hard to figure out what exactly they assume in different parts of their argument. The strategic choice approach we take in this class, with its emphasis on formal mathematical specification of the assumptions is excellent in this regard: It never buries assumptions out of sight. Although it is possible to assume contradictory things in game theory, you will either get no results from the models you

construct or (because the assumptions are plain to see), either you or someone else will soon notice the problem.

Why do we insist that assumptions do not contradict each other? Let's say we observe some state does not acquire power when it can. It behaves like a status quo power, as the theory would assume, and its behavior is consistent with the theory's prediction. However, it contradicts the assumption that all states maximize power, which is necessary for the theory to work in the first place. So in the end, the theory says nothing about this observation.

I should note that it is impossible to save this theory by jettisoning the assumption of all states being power maximizers. In this case, the theory, although logically consistent, predicts behavior that is clearly at odds with reality. The modified theory fails the other test, that of empirical validity.

Now, a theory is also not logically consistent if the conclusions do not follow from the assumptions in a logically coherent way. This is a really hard problem to notice, correct, and sometimes even avoid. Sometimes people make additional assumptions along the way to construct a plausible causal mechanism, and it may not be clear at all where their logic fails. All three statements about the relationship between military power and war seem plausible, and in fact many smart people have written about them for years.

However, when subjected to careful rigorous analysis some long-standing notions, intuitions, and seemingly logical results fall apart. We shall see a great many of "counter-intuitive" behavior; that is, behavior one would probably fail to anticipate unless one thinks extremely carefully about the problem. We shall see how sometimes actors fail to do what's best for them and how doing so can be absolutely the perfectly rational and sensible thing to do. In this respect also, formal analysis will help quite a bit because it simplifies tracing the logic, especially when there are many factors to consider. Believe it or not, game theory makes this reasoning a lot more simpler than if you had to do it without the benefit of simple math.

Logical consistency is a necessary condition for a good theory. But it is not sufficient. We also require the theory to actually tell us something non-trivial.

3.2 Empirical Validity

This is where we ask, "Is the theory useful? Does it predict events correctly?" If a logically consistent theory fails to predict reliably events that interest us, then it is not useful; it is trivial, and therefore it is a "bad" theory. This is a difficult criterion to apply. Sometimes a theory is manifestly trivial in that it simply always makes the wrong predictions. More often, however, this is not the case. Sometimes the theory seems to work, but other times it fails. How are we to evaluate its usefulness?

3.2.1 Falsifiability

Before we can assess the empirical validity of a theory, we must make sure that the theory can, at least in principle, be **falsified**. That is, unless there are conditions under which they theory might fail, our theory really is an article of faith because it can never be proven wrong.

This requires some more thought, so let me repeat. A theory that is not falsifiable, is not theory but faith. For example, belief in God cannot be falsified because we cannot imagine any circumstances that would demonstrate that God does not exist. As such, belief in God is not a theory, but a matter of faith.

Scientific theories can all be falsified. “But wait a second,” you might say, “how can a true theory be falsified?” A true theory (one that makes good predictions) will by definition predict correctly all the time, and so the observed events will not falsify it. This is what we want. But the theory should be in principle falsifiable. That is, we should be able to imagine an alternative set of events that would make the theory false. For example, the Earth rotates around the sun. Every time we make an observation, this is going to be true. However, it is a falsifiable claim. If, for instance, you get out in space and observe that the sun rotates around the earth (as Ptolemaic astronomy had it for a millennium), then the hypothesis would be disproved.

We shall deal exclusively with falsifiable theories in this course. If a theory cannot be disproved even in principle, we can never be sure that the theory is actually correct. If it cannot be proven wrong, it may be entirely wrong and we can never know it. We do not want to base our decisions on things that might be absolutely wrong.

Perhaps surprisingly, some well-regarded theories in international relations are not falsifiable, and so not useful. Realism, for example, cannot be falsified because no matter what we observe, we can conclude that one of its assumptions is met, and the behavior is therefore consistent with the theory. For example, suppose you observe a state that does not attempt to maximize its power. Then you would conclude that it must have been a status quo state. This is consistent with the assumptions of realism. On the contrary, suppose you observe a state that does attempt to do it. Then you would conclude that it must have been a revisionist state. This is also consistent with the assumptions. In other words, there are no circumstances you can imagine (states either maximize power or they do not) that would falsify realism.

3.2.2 Case Studies and Statistical Tests

Let’s discuss two common ways of judging the empirical validity of a theory. We shall then talk a little bit about how one can select between two competing theories on the basis of their empirical performance (assuming, of course, that they are all logically consistent).

In international relations we seldom get the opportunity to run experiments like scientists do in the physical sciences. After all, regardless of how much I

whine about it, the US government just would not start a small war in order to test my theory of war. There are some experiments, of course, in which people use undergraduate students or retired government bureaucrats, but these are of limited usefulness.

We are forced to rely on the historical record to evaluate the empirical validity of our theories. We can either use detailed historical case studies or statistical analysis of big data sets with many observations. Both methods are useful and both have their shortcomings.

In the case study empirical test, we analyze a bunch of cases selected for variation on the explanatory variables (if we select on the dependent variable, we have no variation in what we're trying to explain, so our conclusions prove nothing). The researcher would then carefully trace the causal mechanism specified by the theory and demonstrate evidence that the variables are linked by this mechanism. Case studies are often interesting to read, but they are too easy to manipulate (excluding disconfirming evidence, for example) and so too easy to abuse. Still, they are invaluable in establishing the plausibility of the theoretical relationship between the variables.

Statistical tests, on the other hand, are much less subtle and less precise in the sense that they only produce correlations between variables. With a statistical test, we can see how much the change in one of the explanatory variables is correlated with changes in the dependent variable. Correlations do not establish causality, and so even if the statistical tests demonstrate that variable *A* is positively related to variable *B*, as the theory predicts, we are still not quite sure that the theory is valid. The reason, of course, is that the correlation can be spurious (that is, there might be some third variable causing these two to move in such direction), or the causal mechanism could be completely misspecified by the theory. This is where case studies might help. Statistical analysis, however, is invaluable if we want to see how much we can generalize our predictions. For example, we can use a couple of cases to gain insight and construct a theory, which we could then subject to statistical tests with many more cases.

To recap, case studies are good for tracing the causal mechanism of the theory, and statistical tests are good for testing how general the predictions are across many different cases.

I should mention that constructing theories is a very iterative process, which combines elements of induction and deduction. For example, to construct a good deductive theory, that is a theory where we begin from assumptions and logically derive propositions about behavior, we often have to use our knowledge of the real world to make modeling choices along the way. In this way we proceed inductively to construct a deductive theory. The problem should be evident: If we then turn around and use the same historical record to test our deductive theory, it is likely that our theory will find confirmation. But since we used the record to construct the theory in the first place, this confirmation is absolutely meaningless! We need independent verification of the theory. This is why case studies are suspect when testing theories... All too often researchers

use the same case studies to construct the theory they then purport to test. Of course, since the theory is made to fit these studies, the confirming results are not surprising. Ditto for statistical analysis.

3.3 Theory Selection

Let's say we've done our case studies and we've run our statistical tests. Still, we are left with more than one theory that does a seemingly adequate job at explaining events. That is, theory *A* does well in many cases, and theory *B* does as well. Which one do we use? This is especially relevant if the two theories are mutually contradictory and/or exclusive, and so we cannot use both at the same time.

We use the scientific method to evaluate theories. First, we never discard a theory even if there is some disconfirming evidence against it unless we have a better theory. This is very simple: something is better than nothing. This is a principle you should probably apply elsewhere as well. Do not reject something unless you have something better to hold onto.

Second, competing arguments must be evaluated for their logical consistency. A logically inconsistent theory can never replace a logically consistent one even if it does predict reality better. This is because its predictions are really nonsensical, as we saw above, and so do not explain anything.

Third, we require that the rival theory explain more than the existing one. That is, we don't want the rival theory to explain just events that our existing theory does not. We also want it to explain things our existing theory explained as well. Generally, we want the new theory to explain everything we could explain so far plus novel phenomena that we cannot explain with our existing theory.

Fourth, we want to avoid adding an excessive number of the so-called "auxiliary assumptions" just to save a theory. These auxiliary assumptions are just patches to make the theory "explain" facts it cannot account for. For example, Marxism claims that the working classes in different countries would refuse to fight in an interstate war which was contrary to their class interests. When the First World War showed that the working classes were not only willing but quite enthusiastic about fighting their foreign "comrades," Marxists saved the theory by postulating an auxiliary assumption; namely, they claimed that the working classes were brainwashed by the ruling capitalists, and so had a "false class consciousness" that prevented them from recognizing their true interests and acting accordingly. Clearly, the new "development" was just a patch for the theory which could not explain how nationalism overcame class interests. Note that it also makes the theory non-falsifiable: if workers rise against the capitalists, then the theory is vindicated; if they do not, then they must have had false consciousness, and the theory is vindicated again.

4 Summary

- we need theories to make sense of reality
- theories are statements about expected relationships between variables
- they simplify reality by making various assumptions
- assumptions are neither true nor false, but may be more or less useful
- theories connect variables through causal mechanisms
- theories establish necessary or sufficient conditions for changes in the dependent variable
- theories must be logically consistent (no contradictory assumptions, statements follow from assumptions logically)
- theories must be falsifiable and empirically valid
- we only abandon a theory when we have a better one that is logically consistent and explains more

In this class, we shall use several assumptions to construct theories in an effort to explain a wide range of phenomena in international relations. We shall be quite explicit about our assumptions, and we shall dedicate a lot of time to developing the logic of the causal mechanisms in order to ensure we have coherent explanations. Our theories will share the same set of assumptions. We do not want a separate theory of every possible subject we want to study. Next time, we begin outlining our approach to international politics, the rational actor model.