

SPECIAL ISSUE ARTICLE

Evaluating Causal Relations in State-Centered Research with an Emphasis on Van Evera's Tests

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Extended Abstract

Introduction and Objectives

In social and historical analysis, researchers draw on a range of methods to understand causal relationships between phenomena, and process tracing has become one of the more prominent of these tools. Unlike approaches that rely mainly on quantitative models and statistical inference, process tracing examines the particularities of each case in detail, tracing causal relationships through a close reading of within-case evidence rather than through cross-case correlation. Researchers working in this tradition draw on precise, qualitative evidence to reconstruct complex causal relationships across fields as different as history, political science, and economics. A central feature of the method is that it can weigh several competing hypotheses at once, testing the validity of each against the same body of evidence through structured empirical tests. This study examines how such tests are applied in analyzing causal relationships, with particular attention to complex processes as they play out in case studies such as the 1898 Fashoda crisis and the 2003 American invasion of Iraq. Its aim is to clarify how process tracing operates and what its distinctive features look like in practice, so that researchers can identify the mechanisms underlying the phenomena they study with greater precision and

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avoid some of the more common analytical errors. The paper also considers the methodological challenges that process tracing raises in the social sciences, particularly in historical and single-case research, and works toward a more careful account of how the method should be applied there.

Method

This paper treats process tracing as a method for analyzing causal relationships in social and historical inquiry, one developed and refined since Alexander George first applied it to historical case evidence in 1979. In contrast to quantitative approaches built around statistical models, it works instead through detailed, qualitative analysis of historical and social evidence within a single case or a small number of cases. Rather than fitting cases to a general model, the method proceeds by breaking a causal claim into a sequence of smaller steps and searching for evidence relevant to each one, an approach that yields finer-grained mechanisms within social, historical, or political processes. Three variants of process tracing are distinguished here: theory-testing, which asks whether a hypothesized mechanism actually operates in a given case; theory-building, which works inductively from case evidence toward a new causal account, as Janis did in identifying the mechanism of "groupthink" from the Bay of Pigs decision; and outcome-explaining, which aims not at generalizable theory but at a full account of one particular result, of the kind Schimmelfennig offers for the eastward enlargement of the European Union. In each variant, several competing hypotheses are held up against the evidence at once through Van Evera's four empirical tests, which lets the analysis distinguish stronger explanations from weaker ones with more confidence than a single narrative account would allow. Particular attention falls on the sequence and timing of events, since the credibility of any causal claim rests on showing not just that one thing followed another, but how and why it did.

Results

Having examined the different variants of process tracing and their distinguishing features, the study turns to how the four Van Evera tests function in practice. Each test carries a different evidentiary weight. Hoop tests rely on evidence that is certain but not unique, and so they serve mainly to rule hypotheses out rather than to confirm them: in Schultz's analysis of the Fashoda crisis, for instance, both the neorealist and the normative explanations fail this test, since neither can account for why the crisis dragged on for two months or why the two sides came to the brink of war. Smoking-gun tests, by contrast, rest on evidence that is unique but not certain, and passing one can strongly confirm an explanation even though its absence cannot rule the explanation out; the collapse of the official justifications for the 2003 Iraq war, together with the failure of neoconservative predictions about "bandwagoning," functions in this study as evidence of exactly that kind.

Doubly-decisive tests demand evidence that is both unique and certain, sufficient on its own to confirm or refute a hypothesis outright, though such evidence proved unavailable for either of the two cases examined here. Straw-in-the-wind tests, finally, offer only indirect support: no single piece is decisive, but several together can shift confidence toward one explanation and away from its rivals, as with the pre-existing interest in regime change among American neoconservatives well before 2003. Taken together, these tests give researchers a basis for comparing rival explanations against the same evidence, rather than simply accumulating support for a single preferred account.

Discussion and Conclusions

The case studies examined here point to a broader pattern in how process tracing gets used. Researchers tend to lean more heavily on confirming evidence, of the kind smoking-gun and straw-in-the-wind tests supply, than on the disconfirming evidence hoop tests are built to provide; Schultz's own analysis of Fashoda, for example, rules out two rival hypotheses through the hoop test before turning to a smoking gun to confirm his preferred account, but stops short of the doubly-decisive standard, since he is not trying to eliminate every competing explanation outright. This asymmetry is less a flaw in the method than a reflection of how demanding doubly-decisive evidence is to come by in historical and social material, where competing explanations rarely admit of a clean, simultaneous refutation. The study's central conclusion is that using all four tests in a deliberate, balanced way, rather than favoring confirmation over disconfirmation, sharpens the internal validity of causal claims and gives a more realistic picture of how governance decisions and political outcomes actually come about. Process tracing, on this account, is not merely a supplement to correlational methods; it is what allows a researcher to move from observing that X and Y are related to showing how X produced Y, case by case, evidence by evidence.

Table (1) - Van Evera's Tests

Test	Characteristics	Application
Hoop	The evidence in this test is certain but not unique. Passing it can offer supporting evidence for the hypothesis, but it is not sufficient on its own to confirm it.	Used to rule out hypotheses and eliminate rival explanations. Failing it can lead to the rejection of a hypothesis.
Smoking gun	The evidence in this test is unique, but not sufficient on its own to establish the result with certainty. Passing it, however, can provide strong confirmation of an explanation.	Used to strengthen confidence in a hypothesis, though the absence of such evidence does not necessarily lead to its rejection.

Test	Characteristics	Application
Doubly decisive	The evidence is both unique and certain, and is regarded as necessary and sufficient for confirming or rejecting hypotheses.	Used to confirm or reject hypotheses with certainty, since its evidence is both necessary and sufficient.
Straw in the wind	The evidence is indirect, neither unique nor certain, and not sufficient on its own for a definitive conclusion.	Used to strengthen the probability of a particular explanation through indirect evidence, though this evidence alone is not enough for a conclusive judgment.

Keywords: Causal relations, case study, process tracing, empirical test, Van Evera, state.

Introduction

In recent years, process tracing has become one of the key tools in qualitative research and in-depth case studies for analyzing causal relationships and complex mechanisms in historical and social contexts. The spread of this method, however, has not necessarily been accompanied by methodological transparency, and in many studies process tracing has been applied intuitively, without reliance on coherent inferential frameworks. This can lead to serious errors in causal inference and weaken the validity of the explanations offered.

Part of the problem lies in the seemingly self-evident, natural character of causal inference in historical analysis, where researchers often move from a chain of events to a causal conclusion without specifying clear criteria for evaluating evidence. Important theories and theoretical frameworks such as historical institutionalism and game theory emphasize the role of timing, interaction effects, and context in shaping causal outcomes (Hall, 2003), yet the absence of precise methodological tools for tracing these elements can result in the oversimplification of complex processes. Process tracing was proposed precisely to address this challenge, but the method itself faces practical ambiguities.

The main gap in this area is especially visible at the level of "evidence evaluation" and "testing causal hypotheses". Although the methodological literature stresses the importance of using inferential tests in process tracing, how these tests are applied in practice is often not systematically formulated. Tests such as "straw in the wind", "doubly decisive", "smoking gun," and the "hoop test", each of which offers a different logic for weighing evidence, tend to be either mentioned in a scattered way or applied without a precise account of the criteria governing their use in empirical analysis. As a result, the boundary between strong and weak evidence, between necessary and sufficient evidence, and the role each test plays in strengthening or weakening a causal inference, remains unclear (Gerring, 2007: 173–184).

At a deeper level, this gap can be traced to the lack of a coherent link between ontological debates and the practical tools of process tracing. Configurational thinking, and attention to the totality of processes over time, as Ragin (2008) and Goertz and Mahoney (2012) emphasize, requires the simultaneous analysis of multiple factors and their interactions; process-tracing tests, however, are often applied without regarding this complexity. Process tracing is thus reduced, in many studies, to a tool for reinforcing the internal validity of explanations based

on covariation, rather than serving as an independent method for uncovering and reconstructing causal mechanisms.

On this basis, the central problem addressed by the present study is the absence of a coherent framework for formulating and applying process-tracing tests in qualitative analysis. The core question is how the various process-tracing tests can be used within an organized analytical framework to evaluate evidence and strengthen causal inferences, and what the capacities and limitations of each are when confronting complex historical and social processes. By focusing on this gap, the present study seeks to contribute to the methodological clarification of process tracing and to improve the precision of causal inference in qualitative research. A number of studies have already been carried out in this area, each approaching process tracing from a different angle; their focus, however, has mainly been on explaining the method in general terms or on its application in individual cases, and a systematic treatment of the process-tracing tests and the evidentiary logic underlying them remains limited.

Bril-Mascarenhas, Maillet, and Mayo (2017) argue that process tracing combines inductive and deductive inputs, and that these two approaches should not be treated as separate. Researchers draw on both methods in sequence, and this interplay contributes to valid causal inferences. They raise several criticisms of the Bayesian approach, on the grounds that it diminishes the role of induction. Examining two case studies, in Argentina and Bolivia, they show that the two approaches arrive at similar results. The authors propose an integrated framework for process tracing that supports transparency and replicability.

Beach (2016) argues that the primary aim of process tracing is to identify and analyze the causal mechanisms that connect the causal variable (X) to the outcome (Y). He stresses that the lack of a precise definition of mechanisms in the methodological literature has left many studies unable to fully explain causal processes. The article highlights the need for careful theorizing about mechanisms and proposes that these mechanisms be fully disaggregated and analyzed so that causal relationships can be examined with greater precision. Beach also points to the analytical challenges involved in the practical application of process tracing, and offers a framework for evaluating evidence about mechanisms grounded in informal Bayesian logic. He states that evaluating theories through empirical evidence requires three steps: 1) predicting the empirical effects of the mechanism, 2) collecting and evaluating evidence, and 3) assessing the degree of confidence warranted by that evidence. Despite this precise analytical framework, the article devotes relatively little attention to the four process-tracing tests. Its

heavy emphasis on causal mechanisms, moreover, may limit the method's practical applicability in case studies that lack access to strong evidence. The article also offers insufficient discussion of the practical challenges involved in implementing Bayesian logic, and of its feasibility in qualitative research more broadly.

Bennett and Checkel (2012) introduce and examine the process-tracing approach as used in contemporary social science. The article's main aim is to consolidate the use of process tracing and causal mechanisms in social research. Rather than opening new empirical territory or advancing novel theories, the authors focus mainly on operational and methodological issues that aid an accurate understanding of complex processes. They stress that effective use of process tracing requires attention to broader social, ethical, and structural contexts. The article concludes that process tracing, particularly given its practical applications in the social sciences, is an effective tool for both generating and testing theories. Its use, however, requires care in understanding social and structural context, and the method should be combined with other research techniques to achieve optimal scientific results.

Mohammadreza Taleban (2023) analyzes the logics of causal inference in the quantitative and qualitative approaches within the social sciences. Some scholars hold that, despite apparent differences, the logic of causal inference is essentially the same across both approaches, and that the differences are merely superficial. Others point to more fundamental differences between the two, arguing that each rests on a distinct logic of causal inference. A third group concludes that historical and single-case studies follow yet another inferential logic, so that the logic of causal inference in social research is neither singular nor dual but threefold. The article sets out these logics and criticizes the mistaken ways in which they have been compared with one another.

The Relationship between Causation and Process Tracing

Causation is one of the foundational concepts in historical and social analysis. It examines the relationships between causes and effects among phenomena and seeks to uncover the internal mechanisms underlying those relationships. Causation shows why a phenomenon occurs and how various factors combine to make an event possible. To understand precisely the relationship between causation and process tracing, it is first necessary to clarify the nature and place of each.

At a deeper level, causation is a philosophical and ontological concept concerned with the nature of reality and the fundamental relationships that govern the world, that is, with whether one phenomenon

is genuinely capable of producing another. The question of causation is fundamentally an ontological one concerning how reality is constituted; consequently, the ultimate aim of historical and social inquiry is to illuminate these underlying mechanisms and account for events.

In the social sciences and history, causation takes several forms, reflecting the complexity of the relationships among phenomena:

- Necessary cause: A condition whose absence makes the outcome impossible.
- Sufficient cause: A condition whose presence guarantees the outcome.
- Necessary and sufficient cause: A factor whose presence is both required for the outcome and guarantees its occurrence.
- INUS causes: Factors that are not sufficient on their own but, in combination with other conditions, form a causal complex that is, taken together, sufficient for the outcome. This concept carries great weight in complex historical and social analysis (Mackie, 1980: 62).

The most complex and most common form of causation is the INUS cause. This type of causation directs analysis toward causal combinations and shows that phenomena rarely stem from a single cause; rather, a network of factors jointly brings about the outcome. It is here that the weakness of methods relying solely on observed correlation becomes apparent. To move from correlation to causal inference, the researcher must identify the causal mechanism, that is, the chain of intervening processes that explains "how" and "why" the cause (X) leads to the effect (Y).

Against this philosophical objective, process tracing is a methodological and epistemological tool that belongs to the practical level of research. It provides a protocol for empirically testing hypotheses about causal mechanisms, particularly in case studies. Through close analysis of within-case evidence, process tracing pins down the occurrence and functioning of each link in a chain of intervening processes within a given causal sequence, and in doing so it responds directly to INUS causation. This method reveals how factors interact within a complex causal set, and it sharply increases the validity of causal inference (Taleban, 2015).

Causation, then, forms the foundational question of research, while process tracing, as a powerful methodology, makes it possible to test causal mechanisms empirically and to arrive at a reliable, systematic explanation of social and historical events.

What Process Tracing is, and Where it Comes From

The term process tracing emerged in American cognitive psychology in the late 1960s or early 1970s, where it was used to analyze the intermediate stages of mental and cognitive processes. It was originally proposed as a tool for studying individual decision-making, but in 1979 the political scientist Alexander L. George applied the concept to the analysis of evidence in historical case studies. Despite these roots in political psychology, George increasingly argued that the method could also be used for macro-level historical and structural explanations. This development points to the flexibility of process tracing, which has expanded from the analysis of individual decisions to more complex forms of analysis at the macro and historical level (George & Bennett, 2005: 142).

As an analytical tool, process tracing draws causal inferences from diagnostic evidence, and it is usually examined within the temporal sequence of events or phenomena. Through its focus on in-depth case study, the method plays a key role in advancing several distinct research goals:

(a) the systematic identification and description of new phenomena in the social and political sciences; (b) the evaluation of existing hypotheses, and the discovery and testing of new causal relationships; (c) the examination of causal mechanisms that explain the link between independent and dependent variables; (d) providing an alternative to conventional methods such as regression analysis and statistical models when confronting challenges like reciprocal causation, spurious variables, and selection bias.

Qualitative tools, in this sense, can complement quantitative analysis and strengthen causal inference in small-N designs based on the comparison and matching of cases. Such designs, despite their considerable importance, require in-depth within-case analysis for precise causal inference, and process tracing can fill this gap (Collier, 2011: 824). In one sense, process tracing is a method in which researchers, in order to understand the causal relationships between variables, break these relationships down into smaller steps and then search for evidence bearing on each step. By applying this method, researchers become able to identify the intervening factors that lie between cause and effect (Gerring, 2010: 45). Process tracing is an attempt to identify the intervening causal process, including the causal chain and mechanism linking the independent variable to the outcome of the dependent variable. A metaphor helps illustrate the point: If fifty dominoes are lined up in order on a table, standing upright, how can one determine whether the fall

of the first domino caused the fall of the last through a "domino process", or whether some other force, such as wind or a jolt to the table, caused them all to fall? The answer lies in evidence bearing on the intervening processes that yield alternative explanations. Was the sound of the dominoes falling one after another heard, for instance? Does the final position of the fallen dominoes reveal how they fell? Such evidence plays a decisive role in identifying the true cause (Bennett & Checkel, 2012: 8).

A question that arises in the social sciences is whether X caused Y, or the reverse. Process tracing, which centers on the sequence of events and on information about who knew what, when, and how they responded, can help address this question. It can determine, for example, whether an arms race led to war, or whether the expectation of war gave rise to the arms race. A further challenge process tracing addresses is the problem of spurious causation. If X and Y are correlated, does this mean X caused Y, or has some third variable influenced both? Process tracing can help trace the chain linking the various stages between X and Y, and it can also examine whether there is evidence for other variables that may have influenced both X and Y (Bennett, 2010).

Process tracing evaluates the causal relationships underlying a phenomenon by examining observable evidence. Its aim is to confirm or reject these relationships on logical and empirical grounds. The researcher examines whether the causal processes one would expect actually occurred in reality.

Process tracing, broadly speaking, emphasizes understanding the mechanisms of causal relationships. Rather than focusing solely on the outcomes and consequences of causal relationships. In other words, the method is concerned more with how and through what process such relationships come about. The credibility of any causal claim, that is, of showing that one phenomenon leads to another, depends on the researcher's ability to demonstrate how that relationship came into being and was sustained. Put simply, process tracing does not merely seek evidence that a causal relationship exists; it seeks to clarify the details of the process and the mechanisms that produce it.

Process tracing involves examining "diagnostic evidence" in a given case, evidence that can help confirm or rule out alternative explanatory hypotheses (Lorentzen, Fravel & Paine, 2017: 477).

One central concern of the method is the analysis of sequences and of evolving mechanisms within hypothesized causal processes. The researcher looks for observable implications within the framework of alternative hypotheses, typically examining them at a more precise and analytical level than the one at which the original theory was stated. The

goal is to determine whether the events or processes within the case align with the predictions of the competing hypotheses (Bennett, 2010).

This kind of analysis broadly resembles a detective's effort to solve a crime: examining clues and suspects and assembling a convincing account grounded in careful evidence bearing on means, motives, and opportunity. It can also be compared to a physician working toward a diagnosis, weighing a patient's history and symptoms and using diagnostic tests to distinguish, say, a viral infection from a bacterial one.

In the social sciences, researchers draw on a range of approaches to understand causal relationships, approaches that fall along a spectrum from deductive to inductive reasoning. Process tracing, as a hybrid approach, draws on both, with one or the other coming to predominate depending on the specific circumstances of the research. Where existing theories are capable of explaining a given phenomenon, the researcher relies on deductive reasoning to test hypotheses and predict causal relationships; in the absence of a suitable theory, the analysis instead proceeds inductively, and the researcher works to uncover new causal relationships from empirical data and observations, proposing new hypotheses in the process. This hybrid character gives researchers flexibility in choosing the approach best suited to the particular features of the phenomenon under study (Bennett & Checkel, 2012: 22–23).

1. Types of Process Tracing

Process tracing falls into three main categories, each with its own features and objectives. This classification allows researchers to tailor their approach more precisely to the type of problem at hand and the kind of information the research requires.

1.1. Theory-testing process tracing

This is a deductive method of inquiry that examines whether a hypothesized causal mechanism is in fact present in a given case. At its core lies a structured empirical test that determines whether evidence exists showing that the hypothesized causal mechanism actually operates. This type of process tracing is typically used when prior research has already shown a strong empirical correlation between an independent variable (X) and a dependent variable (Y), but it remains unclear whether a specific causal mechanism truly links X to Y. Here, causal mechanisms are treated as middle-range theories, expected to be present across a set of cases whenever the scope conditions that trigger them hold. In theory-testing process tracing, we already know the variables X and Y; we either have conjectures about a plausible causal mechanism, or we can derive

one straightforwardly from existing theory. Conceptualizing the mechanism is, in this approach, a deductive process: through logical reasoning, we formulate a causal mechanism by which X produces Y. In practice, though, the method also contains inductive elements, particularly at the stage of operationalizing the empirical tests, where existing empirical studies are drawn on to generate case-specific empirical predictions and to check whether the observed evidence matches the theory. How much logical work is required to spell out a causal mechanism depends on whether existing theories merely point to a correlation between X and Y (X:Y), or propose plausible causal links between them (for instance, through intervening variables), or already offer a fully articulated causal mechanism. In most cases, we know X and Y, but the process through which X brings about Y has not been explicitly conceptualized. Where no such mechanism has already been worked out, the first step in theory-testing process tracing is to conceptualize a plausible causal mechanism, focusing on the parts of that mechanism considered necessary for producing Y (Beach & Pedersen, 2011: 7).

Empirical studies show a correlation between democracy and international peace, but establishing a causal relationship requires process tracing. In democratic systems, public and media scrutiny discourages politicians from going to war. A culture of negotiation likewise reduces the likelihood of military conflict. To examine this mechanism, one might study the Cuban Missile Crisis. Analysis of documents and reports can show whether the American decision was shaped by domestic pressures. If the evidence shows that American leaders avoided war because of public pressure, the mechanism is confirmed; if not, the theory needs revision. Process tracing helps us move beyond mere correlation to examine the actual mechanism at work (Bennett and Checkel, 2012: 30).

1.2. Theory-Building Process Tracing

Theory-building process tracing takes an inductive approach: rather than testing a predetermined theory, it seeks to identify and formulate new causal mechanisms out of empirical data. In this method, the researcher works through close examination of a particular case to uncover unrecognized causal relationships and to present them as part of a new theory. Unlike theory testing, where the causal structure is fixed in advance, here the researcher is looking to discover new relationships and to build a theoretical framework that accounts for the observed phenomena. This approach is therefore useful when existing theories cannot fully explain the causal mechanisms at work, or when they prove inadequate in particular cases (Beach & Pedersen, 2011: 16–18).

One example of theory-building process tracing is Janis's book *Groupthink*. Rather than drawing on a predetermined theory, Janis uses empirical data from the study of foreign-policy crises to identify a new causal mechanism, which he calls "groupthink". Through close examination of decision-making in small groups, such as the Bay of Pigs crisis, he tries to show how pressures toward conformity within a group can produce flawed and, at times, disastrous decisions. Through careful analysis of the available data and evidence, Janis uncovers new mechanisms and presents them as a new theory of group processes and faulty decision-making (Janis, 1982).

1.3. Outcome-Explaining Process Tracing

Outcome-explaining process tracing pursues a different goal: it is not concerned with testing or building theory, but with providing a full and adequate explanation of a particular outcome. In this approach, the researcher tries to identify the set of factors that produced a specific result and to show how these factors interacted to bring the event about. Because the aim here is to offer a valid explanation of one particular outcome, there is no need for the identified causal relationships to generalize. For this reason, the approach is typically used in studies focused on the analysis of a single case, and it can support a deeper understanding of individual phenomena. Rather than generalizing findings to other, similar cases or generalizing the causal relationships themselves, the researcher concentrates specifically on one event or outcome. The goal is to identify precisely, and explain, the complex processes and various causal relationships that produced that outcome; such explanations attend closely to the details of the process, to timing, and to the interactions among different factors. This approach works well for studies focused on a particular situation or event. A researcher might, for instance, want to examine why a particular political crisis occurred in a given country, or why a particular social change took place in a given society. In such cases, process tracing offers a deep, precise analysis of the events and factors that produced these changes.

One of the most important studies in the area of outcome-explaining process tracing is Schimmelfennig's (2001) article on the eastward enlargement of the European Union. He uses three inferential steps to examine the causal process behind this development. In the first step, he examines rational and sociological mechanisms and shows that the rational mechanism alone cannot account for the final decision. In the second step, he examines the sociological mechanism on its own, but this analysis, too, fails to explain the negotiation process. Finally, by combining the two mechanisms into what he calls a "multiple combination", Schimmelfennig

succeeds in explaining the complex interplay between national preferences and collective norms. The study shows how process tracing can support a precise, sophisticated analysis of political decisions.

These three types of process tracing differ considerably in their focus, in the kind of evidence they draw on, and in the inferences they can yield. In theory-testing and theory-building process tracing, for example, the focus falls mainly on matching theory against real-world data, whereas in outcome-explaining process tracing the focus is on providing a precise, detailed explanation of one particular event. These differences allow each method to be chosen according to the specific needs of a given research project, so as to arrive at a deeper understanding of both causal processes and their outcomes (Beach, 2020: 30–31).

2. The Four Tests

To analyze evidence bearing on primary and rival hypotheses precisely within process tracing, researchers draw on Van Evera's tests. These tests help the researcher evaluate evidence effectively and reach more reliable conclusions. Process-tracing tests are recognized as an important tool in qualitative research. They rest on the principle that observations bearing on causal processes can offer evidence of varying strength for confirming or ruling out causal hypotheses. Van Evera proposed four types of empirical tests in this connection, each serving a different role in evaluating hypotheses (Bennett, 2010). These are the straw-in-the-wind, hoop, smoking-gun, and doubly decisive tests, each applied to the data according to how certain and how unique the evidence it relies on is. Process-tracing tests matter because they allow several hypotheses to be examined at once and rival hypotheses to be weighed against one another. Researchers can thus use these tests not only to assess the validity of their primary hypothesis, but also to evaluate the empirical evidence bearing on the soundness and strength of alternative explanations. This feature moves the tests beyond a purely confirmatory approach and turns them into a comparative tool, one in which different causal hypotheses are tested against the empirical data (Van Evera, 1997: 30–31).

These process-tracing methods, moreover, are applied across a wide range of fields and are by no means confined to the social sciences. In the field of history, for instance, the method is used to reconstruct chains of events and to analyze the causal relationships among them. In political science, it can help examine political decision-making processes and how various factors shape policy. In economics, the approach is used to analyze how macroeconomic variables affect the behavior of economic actors. Even in medicine and biology, process tracing aids in understanding disease

mechanisms, treatment pathways, and the complex interactions among biological factors.

Because the method rests on close analysis of data and causal reasoning, the choice of which tests to apply, and how, has a direct bearing on the quality of the research findings. Different tests can yield different levels of evidence and certainty, and in some cases combining several complementary tests gives a fuller picture of the causal processes at work. Applying these tests properly, as a result, not only sharpens the precision and credibility of the research but also deepens understanding of the underlying mechanisms of the phenomena under study. The four tests proposed by Van Evera are examined below:

1. **Hoop tests** rely on evidence that is certain but not unique. While failing a hoop test definitively eliminates an explanation, passing it does not, in itself, substantially increase confidence in that hypothesis. Hoop tests are therefore used mainly to eliminate rival hypotheses. Van Evera frames one such test this way: "Was the accused in the state on the day in question?" Failing this hoop test rules out the hypothesis, since if the accused was not in the state, he cannot be the murderer. Passing the hoop test can offer some evidence in favor of the hypothesis, but how strong that evidence is depends on how naturally the conditions for passing tend to occur (Mahoney, 2012: 7). In the example, if the accused is nearly always in the state, the probability of failing the hoop test is close to zero, so passing it does not conclusively demonstrate the hypothesis. Moreover, the more other suspects who were also in the state at the time of the murder, the lower the probability that any particular one of them is the murderer.
2. **"Smoking gun" tests** rely on evidence that is unique but not certain. Passing a smoking-gun test is sufficient to strongly confirm an explanation, though it is not necessary for raising confidence in it. In Van Evera's example, finding a recently fired gun in the suspect's hand immediately after the murder strongly implicates him, but the absence of such a weapon cannot clear him. Smoking-gun tests are therefore typically used to confirm a hypothesis. Their strength depends on how naturally and how often the relevant conditions occur (Mahoney, 2012: 8–9).
3. **"Doubly decisive" tests** rely on evidence that is both unique and certain, or, put differently, both necessary and sufficient for raising confidence in an explanation. Van Evera offers the example of a bank camera that records the face of everyone involved in a robbery: to convict a given person, showing that his face matches the recorded

image is both necessary and sufficient, and to clear him, showing that his features do not match the footage is likewise both necessary and sufficient.

4. Finally, tests that are neither unique nor certain, neither necessary nor sufficient, are known as "**straw in the wind**" tests. These carry little decisive weight on their own, but a number of them together, as pieces of indirect evidence, may raise confidence in one explanation while lowering it in others, much as a suspect might be convicted on the strength of several pieces of circumstantial evidence (Mahoney, 2012: 15). One example of straw-in-the-wind evidence would be evidence that strengthens confidence in a particular explanation without being sufficient, on its own, to confirm or rule out the hypothesis, evidence that points indirectly to a person's likely involvement in a crime but is not, by itself, enough to establish guilt. If several witnesses report having seen the suspect near the scene at the time and place of the crime, for instance, or that he had had a past conflict with the victim, this evidence points indirectly toward the likelihood that he committed the crime, but it cannot on its own prove his involvement. Such evidence functions as "straw in the wind": it may strengthen confidence in a given explanation, but it is not enough for a definitive judgment.

Table 1. Van Evera's Tests

Test	Characteristics	Application
Hoop	The evidence in this test is certain but not unique. Passing it can offer supporting evidence for the hypothesis, but it is not sufficient on its own to confirm it.	This test is used to rule out hypotheses and eliminate rival explanations. Failing it can lead to the rejection of a hypothesis.
Smoking gun	The evidence in this test is unique, but not sufficient on its own to establish the result with certainty. Passing it, however, can provide strong confirmation of an explanation.	Used to strengthen confidence in a hypothesis, though the absence of such evidence does not necessarily lead to its rejection.
Doubly decisive	The evidence is both unique and certain, and is regarded as necessary and sufficient for confirming or rejecting hypotheses.	Used to confirm or reject hypotheses with certainty, since its evidence is both necessary and sufficient.
Straw in the wind	The evidence is indirect, neither unique nor certain, and not sufficient on its own for a definitive conclusion.	Used to strengthen the probability of a particular explanation through indirect evidence, though this evidence alone is not enough for a conclusive judgment.

Each type of empirical test plays a distinct role in the process-tracing procedure and bears differently on the credibility of competing explanations. Hoop tests, though capable of ruling hypotheses out, cannot on their own establish that an explanation is correct; they are most useful for eliminating alternative options. Smoking-gun tests, by contrast, provide unique evidence and can substantially raise confidence in a hypothesis, though they cannot confirm it with certainty. Doubly decisive tests draw on evidence that is both unique and certain, and are therefore regarded as necessary and sufficient for confirming or rejecting hypotheses. Straw-in-the-wind tests, finally, offer indirect evidence that, while it can strengthen confidence in a particular explanation, is not on its own enough to reach a definitive conclusion. Broadly speaking, which test is appropriate depends on the type of hypothesis and the evidence at hand, and the right choice can aid researchers in analyzing and interpreting causal relationships.

Choosing the right test in the process-tracing procedure depends on the type of hypotheses and the available evidence, since each test carries its own distinct features and uses. If the aim of the analysis, for example, is to reject or confirm a specific hypothesis, tests such as the doubly decisive test, which offers evidence both unique and certain, may be the appropriate choice. Where the aim is merely to eliminate rival hypotheses, hoop tests, which provide certain evidence for ruling explanations out, may prove more useful. Where the available evidence points only indirectly toward an explanation, straw-in-the-wind tests can be of help (Collier, 2010: 4).

Ultimately, the evidence at hand and the level of confidence the analysis and conclusions require serve as the criteria for selecting the appropriate test. Making this choice well can sharpen the precision of empirical analysis and support a more accurate, more reliable understanding of causal relationships. In what follows, we will examine the American invasion of Iraq and the Fashoda crisis.

The American Invasion of Iraq

The decision of the George W. Bush administration to invade Iraq in 2003 stands as one of the most contested episodes in the history of American foreign policy. Despite the absence of conclusive evidence for weapons of mass destruction or an operational link to al-Qaeda, and in the face of strong opposition from the realist community, the United States chose to pursue regime change in Baghdad. The central hypothesis here is that the decision for war originated not from strategic necessity, but from the influence and insistence of a small group of prominent neoconservatives

within the cabinet who had already been pursuing a regime-change agenda.

The Straw-in-the-Wind Test

The straw-in-the-wind test is used to identify early, indirect, directional clues, evidence that neither proves the central hypothesis nor rules it out on its own, but that raises the likelihood of its plausibility. In the case of the American decision to invade Iraq, a body of evidence suggests that the desire for regime change had ideological roots predating 2003 and independent of any immediate threat.

A Pre-existing Interest

Influential neoconservatives, well before joining the Bush administration, had openly lobbied for a military strategy built around regime change in Iraq. This evidence suggests that the idea of invading Iraq was not a product of the post-September 11 emergency, but rather the reflection of an already-established political priority. Although this alone does not establish the cause of the decision to go to war, it does push the analysis in the direction of the ideological-influence hypothesis (Schmidt & Williams, 2008: 193).

The Framework of the Bush Doctrine

The Bush Doctrine, generally regarded as synonymous with neoconservative foreign policy, emphasized preserving American global hegemony and the legitimacy of preventive attack, an approach that stood in tension with the realist principles of containment and deterrence. This intellectual framework supplied the ideological groundwork needed to justify unilateral action against a country that, from a realist standpoint, could plausibly have been contained. Within the logic of the straw-in-the-wind test, this convergence between official doctrine and the neoconservatives' prior preferences counts as a meaningful signal reinforcing the central hypothesis, without functioning as decisive evidence (Schmidt & Williams, 2008: 192).

Summary of the Straw-in-the-Wind Test

Taken together, the evidence bearing on the pre-existing interest in regime change and on the framework of the Bush Doctrine makes the neoconservative-influence hypothesis more plausible and gives the analysis a clearer direction, without being sufficient, on its own, to establish it. This evidence accordingly belongs at the straw-in-the-wind

level, and it sets the stage for applying stronger tests, such as the hoop test and the smoking-gun test.

The Hoop Test

The hoop test asks whether the hypothesis that "neoconservative influence drove the decision to invade Iraq" can pass through a set of necessary conditions, or whether it must be discarded. If the hypothesis is correct, one would expect to find, at key stages of the decision-making process, signs of institutional control, the elimination of alternative options, and the entrenchment of the regime-change agenda; failing that, the hypothesis will not clear the hoop test.

Placement at Key Decision-making Nodes

If neoconservative influence had been the decisive factor behind the decision to go to war, the key figures of this current would need to have occupied positions allowing them to shape the agenda and steer the American response after September 11. Historical evidence shows that figures such as Cheney, Rumsfeld, and Wolfowitz occupied central decision-making nodes within the Bush administration. The absence of such placement would have ruled out the neoconservative-influence hypothesis at this very first stage; this necessary condition is met, then, and the hypothesis clears this hoop.

The Marginalization of Formal Constraining Mechanisms

If the hypothesis is correct, one would expect the institutional processes capable of blocking or moderating the decision to go to war, such as multilateral consensus-building within the UN Security Council, to have been weakened or bypassed in practice. The Bush administration's decision to move toward unilateral action, despite widespread international opposition, shows that the decision-making process proceeded along an internal logic that did not require the approval of external constraining institutions. Had these mechanisms played a decisive role, the neoconservative-influence hypothesis would have failed at this stage; the evidence, however, shows that this hoop, too, has held.

The Entrenchment of the Regime-change Agenda as the Dominant Framework

If the decision to go to war resulted from the influence of an ideological current already committed to regime change, one would expect alternative options, particularly the realist strategies of containment and deterrence, to have been systematically pushed off the agenda. The persistent

marginalization of realist arguments regarding Iraq's containability demonstrates that the decision-making framework was oriented toward military action from the outset. The continued dominance of this agenda is the necessary condition for the hypothesis's survival, and its confirmation shows that the hypothesis clears this hoop as well.

Summary of the Hoop Test

Since the neoconservative-influence hypothesis has managed to clear all the necessary conditions, institutional placement, the weakening of constraining mechanisms, and the entrenchment of the regime-change agenda, it is not ruled out by the hoop test. Clearing the hoop test, however, does not amount to conclusively proving the hypothesis; it merely shows that this explanation cannot be eliminated on the basis of the available evidence, and that it can be assessed further at later stages using more decisive tests.

The Smoking-Gun Test

The smoking-gun test looks for evidence that is rare, specific, and decisive: evidence that is not merely consistent with a hypothesis but directly establishes its causal mechanism, of a kind whose very existence effectively weakens or discredits rival explanations.

The Complete Collapse of the Official War Justifications

One of the most decisive pieces of evidence in this analysis is the collapse of nearly all the American government's official justifications for the invasion. Reports show that almost every official reason the administration gave for the war turned out to be demonstrably false. This is not merely an empirical inconsistency; it directly activates the causal mechanism of the neoconservative-influence hypothesis. If the claimed threats, above all the alleged weapons of mass destruction, were not real, then these reasons cannot have been the actual cause of the decision to go to war; they must instead be read as post hoc justifications for a decision already made. Such a gap between the objective facts and the official narrative decisively indicates that the political decision preceded the construction of the security narrative. This is, in effect, the smoking gun itself (Schmidt & Williams, 2008: 192).

The Failure of the Central Ideological Predictions

The second decisive piece of evidence is the failure of the neoconservatives' key predictions about the war's consequences. They had argued, on the ideological logic of "bandwagoning", that a decisive show

of American military power would compel other states to submit or fall in line. Postwar evidence showed otherwise: countries such as Iran and North Korea not only failed to submit, but moved instead toward strengthening deterrence strategies, including the pursuit of nuclear capabilities. This predictive failure is not simply a policy error; it points directly to the fact that the decision to go to war rested on flawed ideological assumptions rather than a realist analysis of the balance of power and state behavior. Such a failure decisively exposes the cognitive and ideological mechanism driving the decision-makers, and it therefore meets the criteria of the smoking-gun test (Schmidt & Williams, 2008: 196).

Summary of the Smoking-Gun Test

Taken together, the collapse of the official war justifications and the failure of the neoconservatives' central predictions provide evidence that is not merely consistent with the hypothesis of neoconservative ideological influence, but that directly reveals its causal mechanism. This evidence, accordingly, functions as a "smoking gun" and lends decisive support to the hypothesis, at a level of inference that goes beyond the hoop test.

The Doubly Decisive Test

The doubly decisive test holds only when a hypothesis is not merely confirmed decisively, but when all rival hypotheses are simultaneously ruled out so thoroughly that they can no longer be defended as valid explanations. In the case of the American decision to invade Iraq, although postwar evidence severely undermines many of the rival hypotheses, this evidence does not fully meet the strict criteria of doubly decisive proof.

The Weapons-of-mass-destruction and Security-imperative Hypothesis (Hypothesis B)

The security-imperative hypothesis held that the existence, or likely existence, of weapons of mass destruction in Iraq made war unavoidable. Realists, however, had argued before the war that Iraq could be deterred even if it did possess such weapons. They pointed to Saddam Hussein's behavior in the 1991 war, when he refrained from using chemical weapons despite severe military pressure, and to the absence, after the war, of credible evidence that weapons of mass destruction actually existed. This evidence seriously undermines the security-imperative hypothesis, but because genuine uncertainty about the intelligence existed

at the time the decision was made, one cannot claim that the hypothesis was conclusively indefensible at that point.

The Iraq-terrorism-link hypothesis (Hypothesis C)

The hypothesis of a link between Saddam Hussein and al-Qaeda rested on the claim that the Iraqi regime might hand weapons of mass destruction over to terrorist groups. Realists rejected this hypothesis on grounds of regime-survival logic, arguing that such an act by Saddam would have guaranteed the immediate destruction of his own regime. Although postwar empirical evidence disproved this link, the possibility of misperceiving or exaggerating the threat could not be entirely ruled out in the post-September 11 climate. This hypothesis is accordingly weakened, but it is difficult to reject it in a fully decisive way (Schmidt & Williams, 2008: 196).

Summary of the Doubly Decisive Test

Taken together, although the available evidence lends strong support to the hypothesis of neoconservative influence and ideological agenda-setting, and seriously undermines the rival hypotheses, the doubly decisive test is not satisfied in the strict sense, since it was not possible to rule out all rival explanations conclusively at the time the decision was made. The combination of the hoop test and the smoking-gun test, accordingly, offers a more suitable methodological framework for analyzing this case.

The Fashoda Crisis

In his analysis of the 1898 Fashoda crisis between Britain and France, Schultz draws on process tracing to evaluate the causal mechanisms behind the avoidance of war, and offers illustrations of both the hoop test and the smoking-gun test. The crisis arose from a clash between the two countries' exploratory forces and their rivalry over control of the upper Nile valley, and it was ultimately resolved, without military conflict, by France's withdrawal from its position. Within the democratic-peace research program, which has attracted considerable attention in recent decades, the Fashoda crisis has become an important case for examining the mechanisms that prevent war between democracies. From this angle, Schultz examines three alternative hypotheses about why the crisis was resolved peacefully, and uses inferential tests to assess how much credence each deserves. In this process, the hoop test serves as a tool for checking whether the hypotheses hold up against the historical evidence,

while the smoking-gun test identifies evidence that decisively supports one particular explanation.

1. The hoop test, applied to the first hypothesis, asks whether the neorealist explanation can survive every stage of the Fashoda crisis. Under this test, a hypothesis must clear several stages of scrutiny to remain credible. Here, the neorealists argue that France was forced to withdraw because of Britain's military superiority. This hypothesis fails the hoop test, however, because it cannot account for three key issues. First, if France had known from the outset about Britain's military superiority, why did the crisis begin at all? Second, why did the crisis drag on for two months, with lengthy negotiations? Third, why, at one point in the crisis, did the two countries come to the brink of war, when the neorealist hypothesis predicts that France should have withdrawn much earlier? Because this explanation cannot withstand these three hoops, Schultz rejects it as inadequate. The hoop test shows, in this instance, that military superiority alone cannot serve as a comprehensive causal mechanism for the resolution of the Fashoda crisis.
2. Within the logic of the hoop test, a hypothesis remains valid only if it can pass through the various stages of scrutiny and continue to explain the historical evidence. The argument emphasizing the role of democratic norms and institutions in mutual restraint between Britain and France does not survive this test. Were this hypothesis correct, one would expect both countries, Britain in particular, to have managed the crisis calmly, through engagement, and to have avoided escalating tensions. The historical evidence, however, shows that British leaders not only failed to act with restraint, but responded to France, in both word and deed, with immediate and sharp reactions throughout the crisis. This shows that the normative-institutional hypothesis cannot account for every aspect of the crisis, and it runs into trouble clearing the hoops of the test. Schultz accordingly rejects this argument as well, since it cannot be fully reconciled with the actual dynamics of the Fashoda crisis.
3. Using process tracing and its inferential tests, Schultz grounds his own explanation in the role democratic institutions play in revealing private information, and in the effect this has on the credibility of coercive threats. This explanation clears the hoop test, since it can account for the various stages of the crisis in a continuous, coherent way. Under this argument, democratic

institutions impose constraints on leaders that expose their true intentions. Such disclosure blocks deception under some conditions, but under others it makes a threat to use force more credible. When domestic political elites and public opinion back a given threat, the adversary takes that threat more seriously; when domestic groups oppose resorting to force, however, the threat's credibility is undermined. The smoking-gun test applies when evidence supports a hypothesis conclusively and confirms it decisively; here, the clues do not merely raise the hypothesis's probability but establish it outright. Schultz draws on the smoking-gun test to round out his analysis. Once the hoop test has assessed the hypothesis concerning democratic institutions' effect on the credibility of coercive threats, evidence such as Lord Rosebery's public affirmation of Britain's commitment to controlling the region decisively strengthens the credibility of Britain's threats. This evidence confirms, beyond doubt, that domestic backing (here, Lord Rosebery's backing) has a serious bearing on the credibility of coercive threats. The smoking-gun test, then, decisively supports the hypothesis, and, rounding out the hoop test, supplies additional evidence showing that Britain's threats became more credible and effective because of this domestic support (Bennett, 2010).

In his analysis of the Fashoda crisis, Schultz uses process tracing to account for how the crisis was resolved without war. He draws on several inferential tests to weigh the evidence and hypotheses. He first applies the hoop test to examine the various hypotheses, and on this test he rejects both the neorealist and the normative arguments, since neither explanation can fully account for the Fashoda crisis. He then turns to the smoking-gun test, which yields decisive evidence strengthening the credibility of coercive threats; evidence such as Lord Rosebery's public affirmation of Britain's commitment to controlling the region confirms this hypothesis conclusively. By combining these two tests, Schultz shows that democratic institutions can, under particular conditions, increase the credibility of coercive threats, especially where such threats enjoy domestic support.

A question naturally arises here: given how strong its results are, why did Schultz not use the doubly decisive test? The answer is that the various hypotheses under examination cannot all be conclusively ruled out at the same time. The doubly decisive test requires that every rival hypothesis be conclusively refuted by the available evidence, so that only one hypothesis remains standing. In Schultz's analysis, though, he is

working through a set of alternative hypotheses, each of which can account for parts of the Fashoda crisis, but none of which covers every aspect of it fully. Schultz uses the hoop test and the smoking-gun test here to examine and strengthen his own hypothesis, without fully ruling out the others. In other words, Schultz aims to reinforce his explanation with evidence, not to eliminate the rival hypotheses conclusively. For this reason, the doubly decisive test does not suit this analysis. The goal here is to examine and strengthen one particular hypothesis against its rivals, not to rule out every option with certainty.

Conclusion

The findings of this study show that process tracing can, in a systematic and balanced way, improve the analysis of complex causal relationships in state-centered research. Analysis of the Fashoda crisis and the American invasion of Iraq case studies showed that researchers more commonly rely on confirming evidence to establish hypotheses. They often make insufficient use of evidence with high falsifying power to eliminate rival hypotheses. This tendency creates considerable limitations in the precision and validity of causal inferences, and it can distort the actual understanding of causal relationships. By fully applying the four tests (the hoop test, the smoking-gun test, the doubly decisive test, and the straw-in-the-wind test) researchers are able to evaluate different hypotheses simultaneously and analyze complex causal relationships in greater detail. Such an approach shows that process tracing is not merely a tool for confirming hypotheses; it also makes it possible to examine multifaceted interactions and identify hidden cause-and-effect mechanisms in the data.

These findings directly answer the research question and objective. They clarify that the systematic and balanced use of evidence-assessment tools increases the internal validity of analyses while producing a more precise and realistic understanding of the underlying mechanisms of policymaking and state behavior. As a result, process tracing, as an analytical and methodological approach, does more than strengthen the validity of qualitative research: it also enables researchers to reconstruct the complexity of causal relationships in governance and decision-making processes in a transparent and systematic way.

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