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Process Tracing: The Potential and Pitfalls for Impact Evaluation in International Development

Summary of a Workshop held on 7 May 2014

Dr Chris Barnett and Tamlyn Munslow

December 2014

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Contents

Boxes

Figures

Tables

Acknowledgements

Abbreviations

AG	Accountable Grant
CC	case-centric (process tracing)
CDI	Centre for Development Impact
CSO	Civil Society Organisation
DFID	Department for International Development
HANCI	Hunger and Nutrition Commitment Index
IDS	Institute of Development Studies
IFPRI	International Food Policy Research Institute
IV	independent variable
KKV	King, Keohane and Verba
MDSD	most different systems design
MSSD	most similar systems design
QCA	Qualitative Comparative Analysis
TB	theory-building (process tracing)
TT	theory-testing (process tracing)
UK	United Kingdom
US	United States

1   Introduction

In international development there is increasing pressure to demonstrate that aid spending is making a difference. In short, that it is having an 'impact'. During the past decade, there has been a rapid rise in the use of experimental and quasi-experimental evaluation designs – viewed by some as the 'gold standard' in evaluation methodologies. Such designs are based on a counterfactual logic of assessing causation/attribution; an approach that requires large-*n* studies and quantitative datasets in order to test the statistical difference in outcomes between the treatment and a properly constructed comparison group (the control).

There is now, however, a growing interest in exploring alternative, yet still robust, approaches to impact evaluation. This is particularly so where the nature of the intervention or the context demands a small-*n* study (such as interventions that seek to influence policy through engaging civil society actors and other initiatives). It is in this context that process tracing offers much potential; as both an established social science research methodology and one that, at its core, focuses on *investigating* causal mechanisms.

The Institute of Development Studies (IDS) is engaged in a four-year programme of work entitled Strengthening Evidence-based Policy, funded via an Accountable Grant (AG) from the Policy Division of the UK Department for International Development (DFID). The grant contributes to improving the lives of the poorest by expanding evidence-based knowledge, policy options and guidance in six major thematic areas, and a seventh theme focusing on three cross-cutting issues. As part of this work, the AG will assess the impact of its 'policy interventions' to bring evidence to bear on policy change. For many reasons, these policy interventions are not amenable to large-*n* evaluation designs, and many across the Institute and elsewhere are considering the potential of process tracing (see, for example, Barnett and Befani 2014).

1.1   Workshop objectives

This report summarises a workshop held at IDS on 7 May 2014. The vision for this one-day workshop was to initiate a dialogue between key proponents of process tracing (within political science) with researchers/evaluators operating in the field of international development (and, specifically, policy influence within this field). The majority of the sessions were led by Associate Professor Rasmus Brun Pedersen, a leading proponent of process tracing, with experience of its application in political science, particularly trade agreements. His recent book, co-authored with Associate Professor Derek Beach, has provided an important contribution to the understanding and application of process tracing (see Beach and Pedersen 2013).

The workshop aimed to support IDS and other researchers/evaluators in exploring the potential of process tracing as a qualitative social science research method that could be applied to particular evaluation contexts. This is especially relevant for the IDS AG, where a key challenge is determining the extent to which research, publication and dissemination efforts do indeed achieve policy influence – given the complex array of frameworks that attempt to describe policy processes or explain factors influencing policy change (Jones and Sumner 2011).

Figure 1.1 Workshop aims
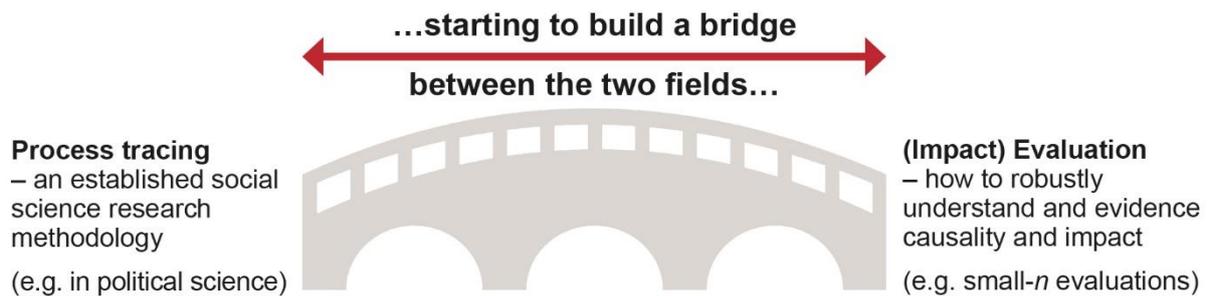
Source: Authors' own

In summary, the workshop objectives were:

1. To explore how process tracing can be appropriately applied in an evaluation context, including its potential to be applied in a number of forthcoming evaluations
2. To discuss a possible 'agenda' (and next steps) for adapting, learning and developing process tracing as a means of advancing impact evaluation methodologies used within international development.

The workshop was co-facilitated by Associate Professor Rasmus Brun Pedersen and Dr Chris Barnett. Rasmus Brun Pedersen is based at the Department of Political Science and Government, Aarhus University, Denmark. Chris Barnett is Director of the Centre for Development Impact (CDI), a joint initiative between IDS, Itad and the University of East Anglia.

Participants were selected because they had used (or were about to use) a form of process tracing in an evaluation context. A mix of researchers/academics and evaluation practitioners/consultants were invited because they offered a range of experiences that could contribute to an increased understanding about the potential of process tracing in different international contexts. A full list of participants is provided in Annex 2.

The remainder of this report sets out a summary of the workshop's key presentations and discussions. This firstly addresses the **origins and definitions** (Section 2) of process tracing, before going into the details of the methodology in two further sections: **three variants of process tracing** (Section 3) and **an introduction to theory-testing** (Section 4). The final sections turn to the application of process tracing in the field of international development, with a section on **applying process tracing** (Section 5), followed by **concluding remarks** (Section 6). The latter also explores further challenges and follow-up steps.

2   Origins and definitions

This section situates process tracing within the recent methodological debates of social science enquiry, particularly that of political science. Much of this, however, parallels similar debates that have occurred in evaluation circles for international development, particularly around the early 2000s (as summarised in Picciotto 2012: 214–15). The section then goes on to define process tracing and the key concepts it utilises, focusing on the important concept of 'causal mechanisms'.

Box 2.1   Definition of impact evaluation used for the workshop

For the purposes of the workshop, we adopted the CDI's working definition of impact evaluation. This postulates that: 'Impact evaluations are evaluations that assess the contribution of an intervention towards some outcome or goal. The contribution may be intended or **unintended, positive or negative, long-term or short-term.** Impact evaluations attempt to identify a **clear link between causes and effects**, and explain how the intervention worked and for whom'.[1] This avoids a method-driven approach to defining impact evaluation. The definition has a number of key features, including:

- Impacts can be unintended, positive or negative, long-term or short-term
- The exploration of the links between cause and effect, although importantly, this is not limited to a counterfactual framework of causal inference
- The focus is on understanding *how* the impact came about, as much as assessing the extent of the impact
- Power dynamics are considered to be important, such as who defines impact, who is affected by the impact, and who the winners and losers are.

2.1   Controversies and ontological groundings

In 1994, King, Keohane and Verba (KKV) published their seminal book *Designing Social Inquiry* (KKV 1994). The book set out a point of departure that created controversy in the social sciences, particularly because of the claim that: 'our main concern in this book is making qualitative research more scientific' (KKV 1994: 18). In essence, the book proposed a monoculture: a unified framework for all social science methodology based largely on quantitative concepts; and, one where the gold standard for all social research was the experimental ideal, covering everything from inferential logic, to designs and data. In short, KKV made the bold claim that: 'the differences between the quantitative and qualitative traditions are only stylistic and are methodologically and substantively unimportant. All good research can be understood… to derive from the same underlying logic of inference' (*ibid.*: 4). At its core, it is argued that research methodology departs from systematically testing competing hypotheses to infer causal connections. For many researchers, the set of procedures associated with the logic of inference unite both qualitative and quantitative approaches (see Caramani 2009: 41).

The response from qualitative researchers since has been varied, and can be characterised as falling into four types (see Table 2.1). As the table demonstrates, there is no single unified perspective, with different ideas about what research should look like. For some in the 'one logic' tradition, ideas from quantitative research have been imported with a key focus on the systematic process of data collection.

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[1] Presentation by Chris Barnett introducing the CDI at the IDS Annual Review, July 2013.

Process tracing, however, situates itself in terms of having a case-centric (CC) focus, which makes logical claims using 'within case' inferences. Inference is the process of using data to draw broader conclusions about the hypothesis.

These inferences are used to craft a minimally sufficient explanation to empirically support a hypothesis. Minimal sufficiency is defined by Beach and Pedersen (2013) as a situation where the presence of mechanism 'X' always produces 'Y'. Sufficiency is confirmed when all important aspects of the hypothesised outcome can be explained (Beach and Pedersen 2013: 181).

'Within case' inferences are also made by using scoping conditions to identify the parameters within which a given theory is expected to be valid (Walker and Cohen 1985). In process tracing, scoping conditions refer to the conditions under which a particular mechanism is theorised as able to be activated (Beach and Pedersen 2013: 181). This is useful for programmes like IDS' Strengthening Evidence-based Policy that seek to identify plausible pathways for policy change in very particular contexts.

Table 2.1   Different perspectives of qualitative research

	One logic	Historical/case/comparative	Meaning	Constructivism
Ontology	'Objectivity'; 'measurement'	'Objectivity'; historical process	Culture	Social constructivist; post-structuralist; none?
Epistemology	Falsification	Verification	'*Verstehen*'	
Design	Inference/ variation; selection	Inference; within case variation; ideographic	Inference?; interpretation	Inference?; analytical strategies/ theory/method
Data	Texts/information	Texts/information	Interview/ observation	Texts (in wider understanding)
Collection strategy	'Systematic data collection'	Historical sources, elite interviews	Ethnographic; interviews	Representation of texts in wider context
Analysis	Systematic data handling (texts vs numbers)	Source criticism; processes/ mechanisms	Grounded theory	Linguistic technique applied to text analysis
Advantage	Easily comparable data	Allows for complexity and contextual factors; good at understanding social processes	Interpretation is grounded in cultural understanding of the problem/concept	Takes account of the values of social actors, patterns and structures
Example	Most similar systems design (MSSD)/most different systems design (MDSD)	Historical process tracing case studies	Semi-structured interviews; ethnographic studies	Discourse analysis

Source: Beach and Pedersen (2013).

2.2 Defining process tracing

Process tracing involves research where 'the cause–effect link that connects independent variable and outcome is unwrapped and divided into smaller steps; then the investigator looks for observable evidence of each step' (Van Evera 1997: 64). In political science, process tracing has been generally used to establish a causal understanding of historical events *after the fact*. It is a methodology used to 'trace' the causal links from a known 'event' (a historical crisis, a trade agreement, etc.) in order to better understand the causal factors. According to Bennett and George (2005: 206–7), process tracing can be defined in terms of:

> attempts to identify the intervening causal processes – the causal chain and causal mechanism – between an independent variable (or variables) and the outcome of the dependent variable... process tracing forces the investigator… to consider the alternative paths through which the outcome could have occurred, and it offers the possibility of mapping out one or more potential causal paths that are consistent with the outcome and the process-tracing evidence.

Importantly though, process tracing focuses on 'within case' inferences, and so it is a *single* case study method. Cross-case inferences are only possible by using other methods, such as comparative methods like Qualitative Comparative Analysis (QCA).

Figure 2.1   Tracing causation
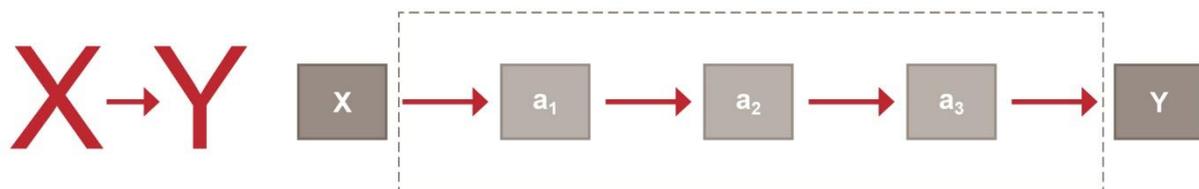
Source: Beach and Pedersen (2013).

The type of process tracing used in political science differs from many evaluation situations, as typically process tracing is used to trace causation backwards from a *known outcome* (such as a key historical event). In impact evaluation, there is often a need to design the methodology for a not-entirely-known outcome (as it occurs sometime in the future), while data collection commences before/alongside the implementation of the intervention. Even for *ex post* evaluations there may be no single, standout outcome (i.e. that parallels a historic event), and the pressure is often to focus on the intervention's stated outcomes (objectives) and provide confirmatory evidence of the project's contribution – rather than a more open-ended enquiry about understanding the range of different causal factors, where the intervention may be insignificant.

In evaluation terms, it is also important to distinguish process tracing as distinct from 'process evaluation'. The latter is an evaluation type that focuses on assessing how a policy or programme is delivered, i.e. the quality of implementation. Process evaluation is often contrasted with impact evaluation. The former focuses on questions about how a policy or intervention was delivered. The latter focuses on whether the policy or intervention met its objectives, or made a difference (HM Treasury 2011). Here, we are considering process tracing as a potential methodology to answer impact evaluation questions – and in particular, whether the policy or intervention made a difference/impact, and the evidence of causation.

2.3　What are we tracing?

There is, nevertheless, no consensus within the literature about what process tracing really is; although it is frequently referred to as a methodology for testing hypotheses in the social sciences and a fundamental tool of qualitative analysis in comparative politics and international relations (see Mahoney 2012 and Collier 2011). Views differ in the literature about what constitutes process tracing (see Table 2.2), including:

- **Tracing 'events'** (descriptive narratives)
- **Investigating the effects of intervening variables** (Gerring 2005; KKV 1994)
- **Case study test types** (Goertz 2003; Mahoney 2000)
- **Causal pathways** (Mahoney 2000)
- **Tracing causal mechanisms between X and Y** (Beach and Pedersen 2013; Waldner 2012; Checkel 2008; Bennett 2004).

Table 2.2　Different views about what constitutes process tracing

Tracing 'events'	Intervening variables between X and Y	Causal pathways	Causal mechanisms
X occurs → event 1 → event 2 → event 3 → Y occurs. In the form of narrative, i.e. descriptive inference (what happened? Not a causal theory of *why* it happened).	X → IV → Y Variation is good, as it is important to investigate the difference that values of IV make to the value of Y, holding X constant. But, it does not capture the 'process'.	If X → Y, then a 'fingerprint' will manifest itself repeatedly between the occurence of X and Y. But a congruence case study and *not* process tracing. Only a temporal process; does not theorise causal mechanism between X and Y. See Tannenwald example.[2]	Focus on what links X and Y together (the causal story). Focuses on a greater understanding of *how* X contributes to produce Y. Stronger causal inference that X is the cause of Y and it is possible to trace a causal mechanism inbetween.

Note: IV: independent variable.
Source: Beach and Pedersen (2013).

Beach and Pedersen's (2013) perspective on process tracing focuses on the causal mechanisms, making it distinct from the other forms outlined above.

2.4　What are causal mechanisms?

A mechanism can be described as 'a set of interacting **parts** – an assembly of elements producing an effect not inherent in any one of them. A mechanism is not so much about "nuts and bolts" as about "cogs and wheels"… – the wheelwork or **agency** by which an effect is produced' (Hernes 1998: 78). Or it can be defined as, an agent or entity that has the capacity to alter its environment because it possesses an imminent property that, in specific contexts transmits either a physical force or information that influences the behaviour of other agents or entities (based on Waldner 2012: 65–84).

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[2] For example, Tannenwald (1999) on taboo talk: X (norms) → Y (behaviour, i.e. the non-use of atomic weapons). Here, the research investigates whether taboo talk is to be found at t_0, t_1...t_n in the process of decision-makers to decide whether to use nuclear weapons. But this only looks at temporal processes, and *not* the causal mechanisms between X and Y.

Mechanisms are composed of:

- **Parts**: These are factors that are *individually necessary* parts of the mechanism, composed of entities that engage in activities (not intervening variables)
- **Entities:** These are objects/actors/institutions engaging in activities (**noun**)
- **Activities:** These are producers of change or what transmits causal forces through causal mechanisms, for example, institutions (**verbs**).

Mechanisms are dependent on scoping conditions (see Section 2.1)

Figure 2.2   The parts, entities and activities that make up a causal mechanism

Beach and Pedersen (2013) recognise causal mechanisms as both systems that transmit causal forces from X to Y, and empirical events between the occurrence of X and Y. In order to break down the causal complexity, the researcher/evaluator must identify relevant actors at different stages – those who engage in activities to produce or influence the outcome. Entities that engage in activities include objects, actors, institutions and structures. Whilst process tracing typically focuses upon the former (objects and actors) it can also be used to analyse the latter (institutions and structures).

The study of causal mechanisms begs the question of whether the researcher can observe causal mechanisms in action or only indirectly observe the implications of their existence. For example, is the study of causal mechanisms best placed at the micro-actor level, or is there also traction at the macro-structural level that cannot be reduced to micro-level entities? If causal mechanisms are interpreted as a theory of a system of interlocking parts that transmit causal forces from X to Y, then instead of testing the strength of the relationship between the independent variable and the dependent variable, the focus becomes centred on *how* X links and contributes to the production of Y.

Process tracing is useful for policy interventions with multiple paths to influence. Stronger causal inference is achieved using a variety of supporting evidence. Evidence should be gathered from the 'whole system' in order to increase the inferential value of the explanation being crafted.

3 Three variants of process tracing

There are different designs of process tracing that allow us to study causal mechanisms in different research situations. The three strands of process tracing include (as defined by Beach and Pedersen 2013):

1. Theory-testing (TT)   (X → Y)   Deductive
2. Theory-building (TB)   (X ? Y)   Inductive
3. Case-centric (CC)   (? → Y)   Either inductive or deductive.

Plus, there is a possibility that a fourth one is needed for many evaluation situations, where the intervention is known but not always the outcome, i.e. (X → ?). The three variants are summarised in Table 3.1 and Figure 3.1.

Table 3.1   Three variants of process tracing

	Theory-testing	Theory-building	Explaining outcome
Ambitions of study	Nomothetic (theory-centric)	Nomothetic (theory-centric)	Ideographic (case-centric), usually with some nomothetic ambitions
Purpose of analysis	Test whether causal mechanism linking X with Y is present in the case	Identify potential causal mechanism linking X with Y or to formulate mechanism that produced Y in deviant case	Build minimally sufficient theoretical explanation of particular outcome
Example	Owen (1994) study of the democratic peace	Janis (1982) study of groupthink	Schimmelfennig (2001) study of Eastern enlargement

Source: Beach and Pedersen (2013).

Figure 3.1 Comparing the different variants of process tracing (TT, TB, CC)
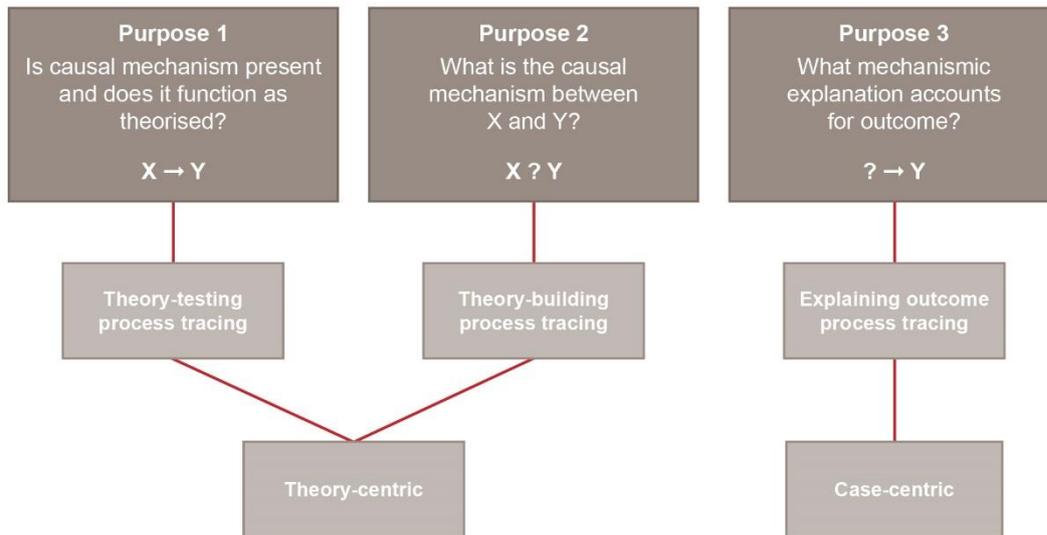
3.1 Variant 1: Theory-testing

Theory-testing (TT) is the only strand that uses a deductive logic to understand the causal linkage. The assumption is that the researcher knows both the cause (X) and the outcome (Y), and has postulated a theory about how X and Y are connected. The focus of the research/evaluation enquiry is upon building evidence to test this claim: whether the theorised mechanism is actually present, and whether the mechanisms function as expected. It is, however, harder to align an inductive research enquiry with the TT variant because it relies on testing existing theory – and thus does not test competing causal explanations.

Figure 3.2 Theory-testing designs
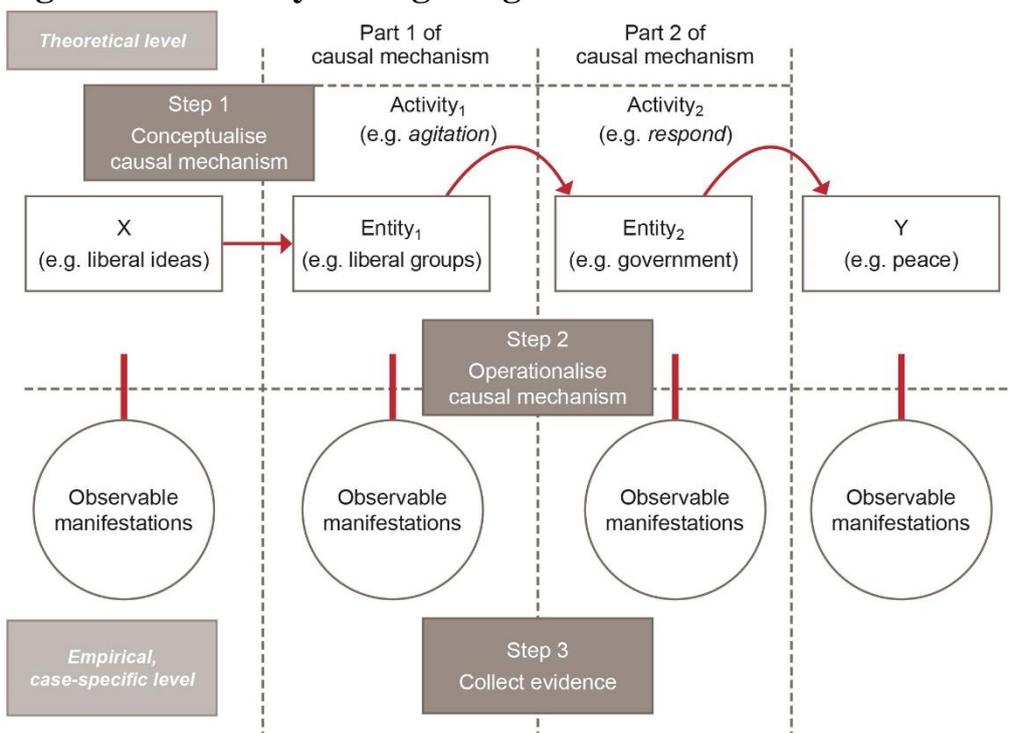
3.2   Variant 2: Theory-building

Theory-building (TB) and case-centric (CC) strands, on the other hand, use an inductive logic to unpack the causal mechanism. The assumption is that the researcher does not understand the link between the cause (X) and outcome (Y), or that the cause is not known. TB starts with the empirical data and crafts a theory, based on this data. For example, Janis's (1982) study of groupthink in the US administrations (for instance, in relation to the decision for the US to support the invasion of the Bay of Pigs).

TB process tracing starts with the empirical material and utilises structural analysis to induce a plausible hypothetical causal mechanism whereby X is linked with Y. This involves starting with a descriptive narrative of a case, and then tries to construct a theory by inferring the existence of manifestations, and then the inference of causal mechanisms.

TB process tracing is used in two different research situations: the first is when we know that a correlation exists between X and Y but are 'in the dark' regarding the potential mechanisms linking the two (X–Y-centric TB), i.e. as we have no theory to guide us. The second is when we know an outcome (Y) but are unsure about the causes (X) (Y-centric TB). In the latter, the analysis first traces backward from Y to undercover a plausible X, turning the study into a X–Y-centric analysis.

Figure 3.3   Theory-building designs
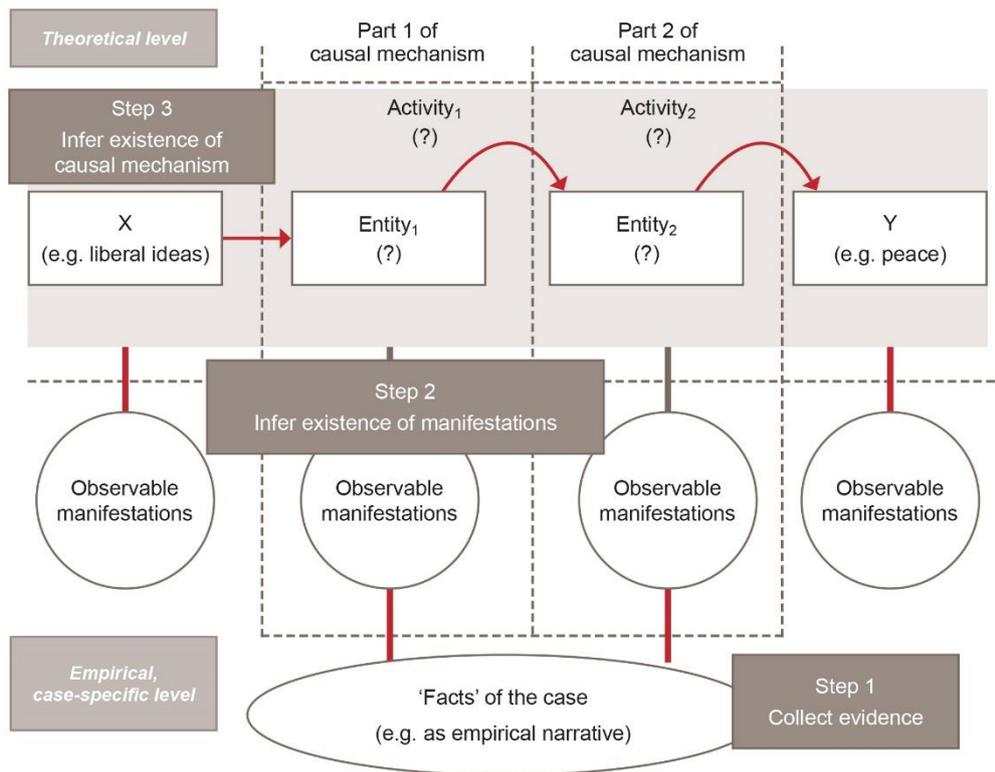
Source: Beach and Pedersen (2013).

3.3   Variant 3: Case-centric designs

The **CC** variant seeks to explain the outcome (Y) when the independent variable is not yet known. Although it resembles TB, the CC variant builds an explanation that is inclusive of all necessary outcomes with no redundant paths. It is, therefore, a less structured approach to the enquiry.

In CC process tracing we do not know the causal mechanism or variable that accounts for the outcome (Y). This suggests a CC (ideographic) process – only focusing on one particular case. Historians in particular like this approach, for example Schimmelfennig's (2001) study of Eastern enlargement.

The ambition is to craft a minimally sufficient explanation, where sufficiency is defined as an explanation that accounts for all of the important aspects of an outcome with no redundant parts. This marks a significant departure from the two theory-centric variants: it is not just focused on a single mechanism, but rather all the mechanisms in play to produce an outcome. It is an iterative process, moving back and forth between theory and evidence. Whereas TB process tracing has the ambition of generating theory that can be transported to other cases, CC process tracing is entirely case driven. The studies can be done either deductively or inductively.

Figure 3.4   Case-centric designs

Source: Beach and Pedersen (2013).

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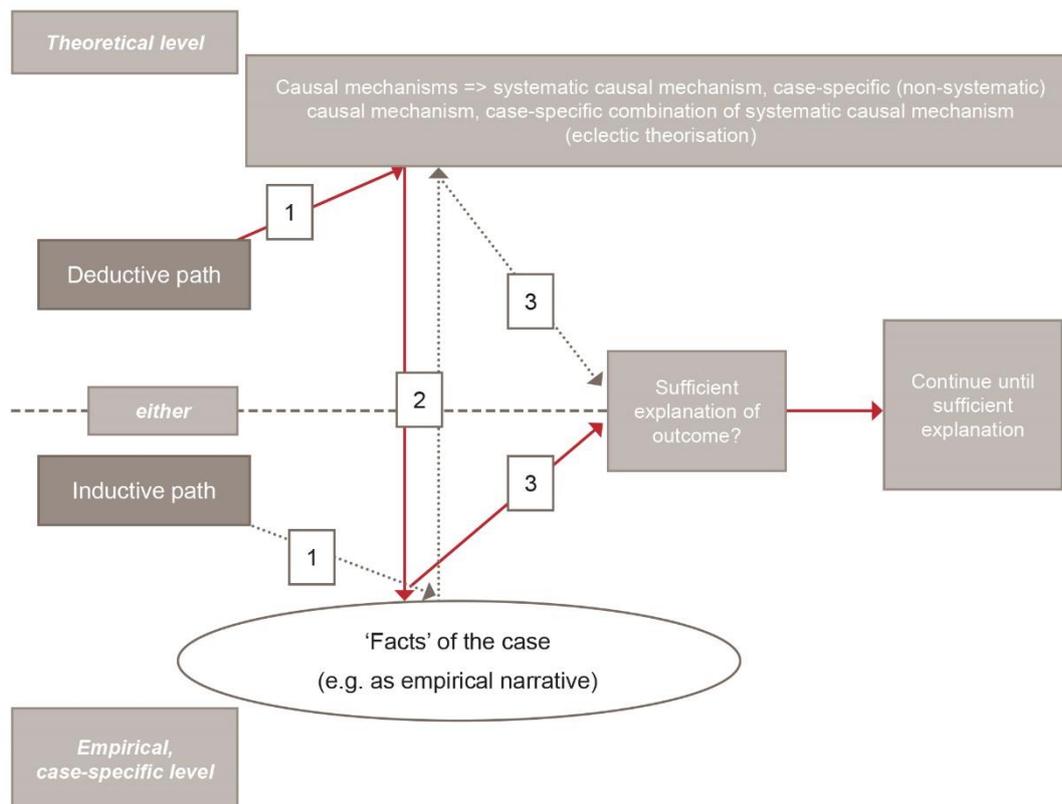
4 Guidelines for TT process tracing

In this session, we explored TT process tracing in more depth, with a particular focus on how it is conducted in practice. The TT variant was selected because it was considered to be of most relevance for evaluation practitioners. This is because many impact evaluations in international development draw upon theory-based designs – whether in combination with experimental or quasi-experimental designs (as outlined by White 2009), or as part of theory-based evaluations that utilise other methodologies (see Carter 2012 and Stern *et al.* 2012 for a fuller discussion). This has been particularly so in more recent years, as 'theories of change' have become increasingly used as a 'tool' in project/programme design (Stein and Valters 2012; Vogel 2012), and as evaluations have sought to unpack the evidence across the causal chain.

Indeed, the principle focus of TT process tracing is on unpacking the 'black box' between X and Y, and identifying different actors (nouns) and events/activities (behaviours/actions). In short, the combination of the actor (A1) and the event (E1) leads to the next actor/event combination (A2 and E2), and so on, until one reaches Y. The next stage is to collect empirical evidence of each combination of As and Es. The key questions being answered are: (1) Does the theory work as expected? (2) Does the programme work as expected? and (3) Do we see the expected causal effects in our case?

4.1 Unpacking the 'black box'

The 'conceptualisation' stage is about translating a descriptive narrative into a causal model. This necessitates a back and forth between higher-level concepts, and more systematised, case-specific concepts (a version of moving up and down the 'ladder of abstraction').[3] This helps ensure concepts have a high level of validity.

There are four main steps. **Firstly**, there is a general background concept or theory from which to start. Sometimes, but not always, it is a causal theory. This can be specified as *deterministic* (X will always lead to Y) or *probabilistic* (X is likely to lead to Y). **Secondly**, it is necessary to turn this into a specific, systematised concept or mechanism. This basically involves unpacking the 'black box' between X and Y. This is a process whereby we try to identify the necessary parts of the theory. **Thirdly**, there needs to be a move down to an empirical level, including developing some specific empirical conditions or indicators (i.e. what would each thing look like if it was present?). This is about translating the different parts into something that can be observed in a specific case. And **fourthly**, there is the scoring of the empirical observations – to assess critically whether the observations are evidence (see Adcock and Collier 2001).

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[3] The ladder of abstraction is a concept created by American linguist S.I. Hayakawa in his original book *Language in Action* (updated in Hayakawa and Hayakawa 1991).

Figure 4.1 Conceptualisation and measurement: levels and tasks

Level 1 Background concept
The broad constellation of meanings and understandings associated with a given concept

Task: Conceptualisation
Formulating a systematised concept through reasoning about the background concept, in light of the goals of research

Task: Revisiting background concept
Exploring broader issues concerning the background concept in light of insights about scores, indicators and the systematised concept

Level 2 Systematised concept
A specific formulation of a concept used by a given scholar or group of scholars; commonly involves an explicit definition

Task: Operationalisation
Developing, on the basis of a systematised concept, one or more indicators for scoring/classifying cases

Task: Modifying systematised concept
Fine-tuning the systematised concept, or possibly extensively revising it, in light of insights about scores and indicators

Level 3 Indicators
Also referred to as 'measures' and 'operationalisations'. In qualitative research, these are the operational definitions employed in classifying cases

Task: Scoring cases
Applying these indicators to produce scores for the cases being analysed

Task: Refining indicators
Modifying indicators, or potentially creating new indicators, in light of observed scores

Level 4 Scores for cases
The scores for cases generated by a particular indicator. These include both numerical scores and the results of qualitative classification

Measurement

Source: Adcock and Collier (2001).

4.2   Making causal inferences

The next issue is how to make causal inferences when there is no variation (i.e. it is just one case). The suggestion of KKV (1994) is that the case should be disaggregated into 5–20 cases, and then look at the mean causal effects on Y. This, however, is not looking at the process, and does not address our interest in explaining the case. As such, process tracing is less analogous to a medical experiment, and closer to a criminal trial, i.e. assessing the evidence for each part of the explanation to detect whether it can be concluded beyond reasonable doubt. The focus is on ensuring 'within case' inference and testing whether the causal mechanism is in place. *X → Y: How does X produce Y*? Is the effect present? (Rather than focusing on *how much* X helps to produce Y.)

So, what kind of inferential logic should we use in process tracing?

It is important to start from the ontological underpinnings (Table 4.1). Frequentist logic has been adapted by KKV (1994) to qualitative case study research. The frequentist logic of inference assesses the magnitude of causal effects of X on Y, or the extent to which the presence of X raises the probability of Y in a population (Gerring 2005). Comparative logic, in contrast, aims to assess the necessary and/or sufficient conditions that produce Y (either in a population or a small number of cases). Here, 'necessary' conditions are defined as causes

that must always precede Y for Y to occur, while 'sufficient' conditions are causes that, if present, always produce Y, but Y is not always preceded by X.

Process tracing, meanwhile, draws upon the Bayesian tradition, and aims to detect the transmission of causal forces through a causal mechanism to produce an outcome in a single case. Bayesian logic tries to assess the likelihood of finding certain evidence if a theory is true, versus the likelihood of finding this evidence if the alternative explanation is true. It then gives greater weight to evidence expected to be *less probable,* based on our previous knowledge of phenomenon. Therefore, it is not interested in increasing the number of observations (i.e. from a quantitative research perspective, inference is better with more observations/data points). Instead, process tracing (like other qualitative research) is looking for quality: observable implications (fingerprints) of the mechanism in our data.

We therefore need to make predictions of:

- What evidence (e) should we expect to see if part of the causal mechanism exists (h)?
- What counts as evidence for an alternative hypothesis (~h)?
- What can we conclude when the predicted evidence is not found (~e)?

  What is important is not the number of pieces of evidence within a case that fit one explanation or another, but the likelihood of finding certain evidence if a theory is true versus the likelihood of finding this evidence if the alternative explanation is true. (Bennett 2006: 341)

Table 4.1   Different logics of causal inference

	Frequentist logic in qualitative case study research (KKV)	Comparative logic of elimination	Bayesian logic of subjective probability (process tracing)
Ontological understanding of causality	Regularity and probabilistic	Regularity and deterministic	Mechanismic and deterministic
Inferences made using:	Classic probability theory and predicted probability that a found association is random or systematic	Mill's method of agreement and difference and variants of them	Bayes' theorem about the expected likelihood of finding specific evidence in light of prior knowledge
Types of causality assessed	Mean causal effect of X's upon Y	Necessary and/or sufficient conditions that result in Y	Presence/absence of causal mechanism (i.e. transmission of causal forces from X to produce Y)

Source: Beach and Pedersen (2013).

In summary, the logic of empirical testing in process tracing is: if we expected X to cause Y, each part of the mechanism between X and Y should leave *the predicted empirical* manifestations which can be observed in the empirical material.

4.3 Strength tests

Empirical testing in process tracing requires an assessment of the strength of evidence observed. There are two dimensions to the strength tests:

1. **Unique predictions** (if e is found, this has confirmatory power). Coming up with empirical predictions that do not overlap with other theories. Uniqueness corresponds to the likelihood ratio, where predictions are developed that maximise the value of p(e|h) in relation to p(e|~h).[4] *What would be unique for the theory I am testing vis-à-vis other explanations?*
2. **Certainty** (if e is not found, this has disconfirmatory power). This should try to establish where the prediction *must* be observed, or otherwise the test will disconfirm the existence of that part of the mechanism. *What has to be present in the case for the theory to be correct?*

One example of maximising uniqueness is Tannenwald's (1999) study of taboo talk versus notions of rational utility in situations where the United States (US) military considered using nuclear weapons. In *The Nuclear Taboo*, unique predictions are made for the presence and absence (or strength) of the independent variable. Taboo talk is evaluated in terms of three effects of norms (regulative effects, constitutive effects, and permissive effects) and three pathways (or causal mechanisms) by which norms can have an effect. The strength that the researcher can assign to these predictions depends on a detailed understanding of the theory underpinning the evaluation. Taboo talk is evaluated, tracing its normative origins throughout the Cold War and after, as well as its operation and influence on US policy and behaviour. Four historical cases are selected (Japan 1945, the Korean War 1950–3, the Vietnam War 1961–73 and the 1991 Persian Gulf War) that include the dependent variable 'use' and 'non-use' of taboo talk. Changes in discourse, institutions and behaviour are used as evidence in light of a broader analysis of the primary causal factors and processes behind the development of taboo talk at its various stages between 1945 and 1991 (see Tannenwald 1999: 17–19).

The two dimensions of 'uniqueness' and 'certainty' give us four types of strength tests:

*   **Straw-in-the-wind tests** (low uniqueness, low certainty). This test can increase the plausibility of a given hypothesis or raise doubts about it; although conducting such types of tests can be pointless since they do little to update our confidence in a hypothesis. This is because both passed and failed tests are of little if any inferential relevance.
*   **Hoop tests** (low uniqueness, high certainty). This test sets a more demanding standard, as the hypothesis must 'jump through the hoop' to remain under consideration. However, passing the test does not by itself affirm the hypothesis; in other words, it is necessary but not sufficient for the validity of a given hypothesis (Collier 2011; Bennett 2008; Van Evera 1997).
*   **Smoking gun tests**: (high uniqueness, low certainty). This metaphor conveys the idea that a suspect who is caught holding the smoking gun is guilty, although those with no smoking gun may not be innocent. As such, passing a smoking gun test is sufficient but not necessary for the validity of a given hypothesis (Collier 2011; Bennett 2008; Van Evera 1997). It has strong confirmatory power, but a low degree of certainty.
*   **Doubly-decisive tests** (high uniqueness, high certainty). This provides a strong inference test, as it confirms the hypothesis while eliminating all others. In other words, it meets both the necessary and sufficient standard for establishing causation.

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[4] p = probability.

Table 4.2   Four tests of causal inference

		Sufficient for affirming causal inference	
		No	**Yes**
Necessary for affirming causal inference	**No**	1. Straw-in-the-wind	3. Smoking gun
		a. **Passing:** Affirms relevance of hypothesis, but does not confirm it	a. **Passing:** Confirms hypothesis
		b. **Failing:** Hypothesis is not eliminated, but is slightly weakened	b. **Failing:** Hypothesis is not eliminated, but is somewhat weakened
		c. **Implications for rival hypotheses:** Passing *slightly* weakens them; Failing *slightly* strengthens them	c. **Implications for rival hypotheses:** Passing *substantially* weakens them; Failing *somewhat* strengthens them
	Yes	2. Hoop	4. Doubly-decisive
		a. **Passing:** Affirms relevance of hypothesis, but does not confirm it	a. **Passing:** Confirms hypothesis and eliminates others
		b. **Failing:** Eliminates hypothesis	b. **Failing:** Eliminates hypothesis
		c. **Implications for rival hypotheses:** Passing *somewhat* weakens them; Failing *somewhat* strengthens them	c. **Implications for rival hypotheses:** Passing *eliminates* them; Failing *substantially* strengthens them

Sources: Adapted from Bennett (2010) and Van Evera (1997).

In summary, process tracing is looking for the observable implications of the mechanism in our data (fingerprints). In other words: 'an insight or piece of data that provides information about the context or mechanism and contributes a different kind of leverage in causal inference. It does not necessarily do so as part of a larger, systematised array of observations' (Collier, Brady and Seawright 2010: 184). The stronger the test used, the more we can update our degree of confidence in the hypothesised mechanism.

4.4   Turning observations into evidence

Empirical observations (o) are not, however, equal to evidence (e). All observations are not created equal, with some observations holding more information than others. Therefore, observations have to be evaluated before they are turned into evidence, and we have to assess their inferential value through our (theoretical and empirical) knowledge (k). As such: e = o + k.

This is essential so that we are able to trust the evidence collected. Because the evidence is not collected through a random sample, the evidence is a function of the research question – i.e. your research question guides what is relevant evidence for you, and you collect only relevant data. Therefore, observations need to be placed in a case-specific context. This requires assessing the quality/accuracy of the data, by looking at:

•   **Reliability** (non-systematic error)
•   **Systematic bias** (the tendency to either favour the hypothesis or an alternative hypothesis).

The best solution to the issue of unreliable measures is to collect multiple independent observations (often termed triangulation); although this does not help unless we can substantiate that the sources are independent of each other (Beach and Pedersen 2013: 127–8).[5] Systematic bias is, however, more of a challenge for process tracing, as the observations collected are not a random sample. For instance, when the researcher/ evaluator deliberately choose observations to either confirm or disconfirm the pattern expected. These are not easy fixes to dealing with systematic bias, and can be dealt with in part by critically examining the source of each observation and by comparing the observation with other independent observations to assess the size and direction of bias (see Beach and Pedersen 2013: 129).

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[5] As an illustration, just collecting three interviews and postulating that they are triangulated is not enough – there is a need to substantiate that the sources are independent of each other.

5   Applying process tracing

The workshop used the example of the IDS Hunger and Nutrition policy intervention (known as HANCI) to build an example of a plausible causal mechanism in the context of policy advocacy in Tanzania. This included building a plausible causal pathway as well as considering data to support the causal mechanism between X and Y (see page 10).

Unpacking the causal mechanism included three stages: (1) theorising the relevant actors and producers of change that transmit power through the causal mechanism; (2) identifying scoping conditions (the contexts that we would expect the mechanism to work within); and (3) suggesting observations that the researcher might expect to see as presence/absence of the theorised mechanism in the context.

Figure 5.1   An example of a causal mechanism
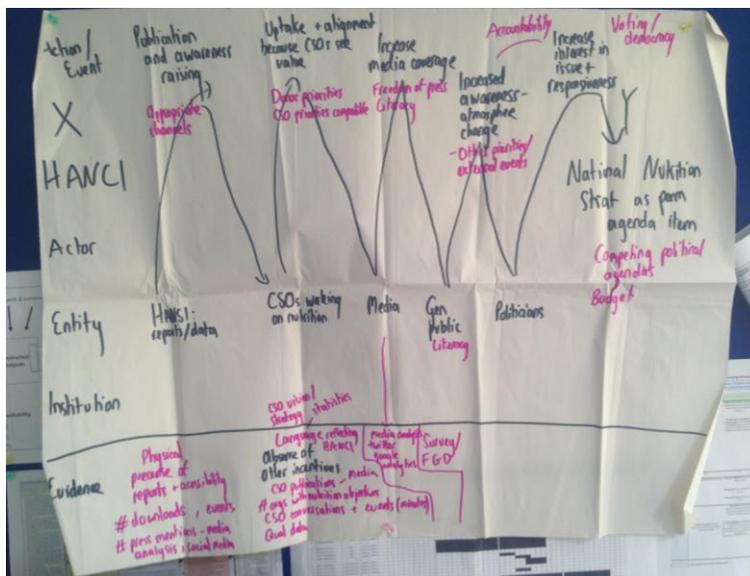
5.1   Workshop example

The Hunger and Nutrition Commitment Index (HANCI) is an intervention with complicated aspects. HANCI seeks to reframe hunger and nutrition as an issue of political commitment and therefore targets key decision-making spaces that are likely to influence public policy, spending and/or law (te Lintelo *et al.* 2014; te Lintelo and Munslow 2014, forthcoming). This is an example of a policy intervention with: multiple components, multiple implementing agents, multiple causal processes, and context specificity. Classic approaches to causal inference are therefore less useful in understanding the impact of the intervention. Causal inference for an intervention like HANCI will need to consider prior and subsequent causal links, simultaneous causal chains, as well as other interventions to make subsequent causal links in order to achieve impact (Forss and Bandstein 2008).

Tanzania is an important case study for two reasons: (1) the national policy environment is representative of an inclusive (decentralised) model for sector-based development, but in practice political commitment is generally viewed by the wider literature as weak; and (2) there are multiple efforts towards reducing and targeting hunger and undernutrition, and this lends itself to methodological enquiry as to 'how' and 'why' an intervention like HANCI can align itself to ongoing activities. Process tracing, in this instance, requires developed

theories about how the HANCI intervention is designed to work in the national policy context of Tanzania, how HANCI will support and inhibit change, and how HANCI will contribute to the desired result.

5.2 Group work

The group work discussed aspects of: (1) developing a causal mechanism to test: how to unpack the narrative description into a series of causal mechanisms; (2) identifying observable evidence that might be used to test the hypothesis and the existence of causal mechanisms; and (3) suggesting possible ways to 'test' the evidence and the strength of causal inference.

What is the expected outcome to test?
Change in public policy, spending and/or law; for example, the National Nutrition Strategy becomes a permanent agenda in Tanzania.[6]

What is the causal mechanism?
HANCI + causal manifestations + scoping conditions *(appropriate channels + donor priorities and Civil Society Organisations' (CSOs) priorities are compatible + coordination across stakeholders and sectors + freedom of press and literacy + mechanisms for accountability).*

What would count as evidence for and against the causal mechanism?

1. Observations: Advocacy messages used by CSOs to influence in-country debates around hunger and nutrition
2. Observations: Narrative changes in the way that hunger and nutrition are discussed in either parliamentary debates or by leading thinktanks
3. Semi-structured interviews: With parliamentarians and activists involved in the debate around reducing hunger and undernutrition
4. Document review: Analysis of the Nutrition Multi-Sector Working Group, National Nutrition Steering Committee, or private sector
5. Social media tracking: Following narrative changes in advocacy messages and monitoring key media platforms.

What kind of 'test' can be developed for each step (certainty/uniqueness) and how much inferential value can be ascribed to each finding?
Key questions:

- To what extent is it also necessary/sufficient for other contexts?
- Which type of evidence is smoking gun evidence of success, and that which we should focus our efforts on for further data collection?
- Strong/weak evidence?
- Can we make claims about whether the evidence is rigorous/credible?

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[6] This is a fictitious example used only for the workshop. It was chosen because it is illustrative of a tangible change and allowed workshop participants to think about observations in light of this.

6   Concluding remarks

This section draws out some of the emerging themes and issues from the workshop, as well as areas for future engagement and research.

6.1   Key discussion points

How are the circumstances different using process tracing in political science research from impact evaluation? It seems as if the third variant of case-centric process tracing is unlikely to be applicable for impact evaluation. This is because we nearly always know X as that is the starting point of an intervention, and thus the evaluation (i.e. the donor did this, so then what happened?). Plus, donors are rarely interested in all the factors leading to Y, only how far their intervention (X) contributed to Y.

What are the limitations of process tracing for evaluating policy change? A key challenge in many policy change studies seems to be that politically-orientated messages (or evidence products) are produced by policy actors in different channels and in different ways, with no obvious causal link to the intervention. Process tracing may provide a way of articulating the mechanisms of change by giving credence to the researcher's theory of how change happens – but it may also be difficult to identify all the mechanisms, and collect sufficient empirical data to test.

How to select cases. How should this be different to other methodologies? How can a single case study contribute to our broader knowledge of causal relationships? Case study selection is a critical part of process tracing. If we follow the frequentist logic used in large-*n* studies, then cases that are on or close to a regression line that plots the actual dependent variable scores against regression predicted scores are identified as possible candidates for in-depth analysis (Beach and Pedersen 2013: 146–7). Our confidence might be further increased if we also select a few outliers that have a wide range of outcome values.

This, however, ignores the purpose of process tracing: to investigate whether the hypothesised causal mechanism was present in a case. Therefore, both X and Y need to be present for the hypothesised causal mechanism to be present (even in theory). Cases with low values of X and/or Y are in practice cases where X and/or Y are not present – so TT process tracing cases should be chosen only where X and Y are present. For a fuller discussion, see Beach and Pedersen (2014).

How to translate mechanisms beyond the borders of a single case. This can be challenging but should be possible at the theoretical level (i.e. by deducting a theoretical mechanism at a level of abstraction beyond the individual case). But it will not be possible to export the empirical side as it is highly case-specific.

What to do if the theory is not well-specified. Often in impact evaluation we do not have a well-specified theory. The prevalent use of theories of change is one thing, but often they are grounded in solid theoretical underpinnings – and not to the extent that they might be available for political science research. In such cases, the practice of process tracing is likely to be doing a combination of the TT and TB variants. The three variants are ideal types, and there is always an element of back and forth between the deductive and the empirical perspectives.

In small-*n* studies, how can we exclude competing mechanisms/confounding factors?
This is a limitation, and is only possible if there is a high degree of uniqueness/certainty in the test type. Process tracing can only say that the independent variable helps to produce the dependent variable, and it can verify or increase confidence that X leads to Y (including how and why this happens). Process tracing is about verifying that a particular mechanism is present and studies it; it is not so interested in competing understandings.

6.2   Future opportunities and areas for development

Several important questions and areas for further research and development emerged as a result of the workshop, detailed below:

Finding ways to adapt process tracing to impact evaluation: can a method conventionally developed within the social and political sciences be used to inform designs of impact evaluations? Objectivity is a concern when applying process tracing methodologies – and to do it well, it requires in-depth work around collecting and assessing the observations. Rasmus Brun Pedersen's experience of using process tracing is primarily around trade agreements and European Union negotiations, where the timeframe is relatively short, and the methodology is used to better understand how the agreement came about by back-tracing after the event. In contrast, evaluation often has to deal with multiple outcomes, which could become very resource intensive and impractical. Several participants are about to apply process tracing in an evaluation context, and so there is an opportunity to learn lessons about what works best, and why.

Developing ways to apply process tracing to situations where the outcome is not known: can we build a clearer picture of what Y should look like using process tracing? In many evaluation settings, particularly when evaluating the longer term outcomes and impacts of policy change, Y may be ill-defined or somewhat uncertain. One alternative approach may be to use milestones instead of having a set outcome. The milestones could then be used to build a clearer picture of the outcome that the researcher/evaluator might seek to achieve. Still, there is a lack of experience and research about whether process tracing should only be used as a tool for *ex post* evaluation, or whether it has potential to provide a basis by which to plan an impact evaluation (including baseline and ongoing data collection alongside the intervention).

Exploring the potential for cross-fertilisation and combinations of different methodologies: to what extent can we combine QCA with process tracing in terms of developing a common language of conditions being 'sufficient' and 'necessary'?
There seems to be the potential to combine QCA with process tracing as a means to create cross-case comparisons, but little experience of doing so. Furthermore, many elements of process training (around causality and the use of cases) reflect similar terminology used by realist evaluation (Pawson and Tilley 1997, 2004), QCA (Rihoux 2006; Ragin 1987) and contribution analysis (Mayne 2012a, 2012b). To what extent are the concepts substantially different, and to what extent can methodologies be adapted and blended to be useful for evaluation purposes?

Annex 1　　Workshop agenda

09h15	**Introductions and aims** of the workshop	CB
09h30	**Definition and origins**, general principles and underlying philosophy of science: • The rise of experimentation and the potential of process tracing • Causal mechanisms in case studies • What is process tracing? • How does it differ from other social science methods – what is its particular advantage? Question and answer session on: • When is process tracing appropriate? • What does it have to offer impact evaluation?	RBP
10h30	Coffee/tea break	
11h00	A *brief overview* of the uses of process tracing and their usefulness for impact evaluations. Three variants of process tracing designs: • **Theory-testing:** Is the causal mechanism present and does it function as theorised? • **Theory-building**: What is the causal mechanism between X and Y? • **Explaining a particular outcome**: What mechanismic explanation accounts for an outcome?	RBP
11h30	**An introduction to theory-testing (TT)** (is the causal mechanism present and does it function as theorised?): • Research situations suitable for TT process tracing • Developing TT process tracing designs • Selecting data • Example on TT process tracing design and analysis. Group discussion on: • How does TT apply to our evaluation work? • What are the key challenges/issues?	RBP RBP, CB
13h00	Lunch	
14h00	**Guidelines (step-by-step methodology)** on how to do process tracing: • Working with mechanisms • Key methodological steps in process tracing analysis: research questions, conceptualisation, operationalisation, data collection and evaluation, and analysis.	RBP
15h00	Coffee/tea break	

15h30	Group work on: • A case study example(s), with groups applying the guidelines/steps provided in the earlier session.	RBP, CB
16h30	Plenary discussion on **the potential and pitfalls of process tracing**: • Feedback on group work – what was easy/difficult, and why? • Broader discussion – the potential of process tracing in impact evaluation, and areas for further work.	RBP, CB
17h00	Close	

Annex 2 Workshop participants

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Tamlyn Munslow	Research Officer, IDS
Dr Inka Barnett	Research Fellow, IDS
Dr Hayley MacGregor	Research Fellow, IDS
Dr Shandana Mohmand	Research Fellow, IDS
Dr Kathi Welle	Senior Consultant, Itad
Mel Punton	Consultant, Itad
Jake Allen	Senior Consultant, Itad
Dr Laura Camfield	Senior Researcher, University of East Anglia
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