Qualitative Comparative Analysis (QCA) as an Approach to Comparative Policy Analysis

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Qualitative Comparative Analysis (QCA) as an Approach to Comparative Policy Analysis

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Abstract[1]

This chapter discusses different approaches to Qualitative Comparative Analysis (QCA) and their application to comparative public policy analysis. There seems to be a preferential connection between QCA and public policy analysis both in terms of research design and in terms of the actual needs and goals of policy-oriented research. Moreover, the QCA technique can be used with a diversity of research approaches. Accordingly both small-N and large-N, as well as exploratory and theory-led variants of QCA have developed, which prioritize either the parsimony of the results, or their substantive interpretability. The chapter introduces a recently developed typology of QCA approaches. Through a selective review of recent applications, it illustrates the usefulness and limitations of different QCA approaches in analyzing important research questions at all stages of the policy process. The chapter helps policy researchers identify the most useful QCA approach for a given analytic goal in order to capitalize on the remarkable flexibility of the QCA technique.

Keywords

Comparative Public Policy, Qualitative Comparative Analysis (QCA), research design, set-theoretic methods

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[1] The parts of this chapter describing the QCA technique and the types of approaches to QCA are excerpts from Thomann, E. and M. Maggetti. 2017. Designing Research with Qualitative Comparative Analysis (QCA): Approaches, Challenges, Tools. *Sociological Methods & Research*, DOI: 10.1177/0049124117729700, copyright © 2017 by The Author(s). Reprinted by Permission of SAGE Publications, Inc.

Introduction

This chapter discusses different approaches to Qualitative Comparative Analysis (QCA) and their usefulness in addressing major themes of comparative public policy analysis in different research contexts. There seems to be a preferential connection between QCA and public policy analysis both in terms of research design and in terms of the actual needs and goals of policy-oriented research (Rihoux et al. 2011, 2013). At the same time, recent years have witnessed a diversification of research approaches to QCA. In many ways, QCA, which was always intended to be a multi-method approach, is situated in-between quantitative and qualitative methodologies (Ragin 1987/2014). Accordingly both small-N and large-N, exploratory and theory-led variants of QCA have developed, which prioritize either the parsimony of the results or their substantive interpretability (Thomann and Maggetti 2017). While this diversification has broadened our understanding of the nature, purpose and usefulness of QCA, it can also create misunderstandings and provoke criticisms (Tanner 2014), thus providing a welcome opportunity for self-reflection and improvement.

This chapter asks the following question: what do different approaches to QCA offer to comparative public policy analysis? To answer this question, this chapter first briefly introduces the core features of the QCA method that influence how well it is suited to public policy analysis. Second, the chapter discusses how these core features relate to seminal perspectives, research questions, and analytic goals in comparative policy analysis. Third, the chapter introduces a recently developed typology of QCA approaches (Thomann and Maggetti 2017) which differ in three ways, and critically discusses the strengths, limitations and implications for public policy research. Recently published QCA applications illustrate how different QCA approaches can inform public policy scholars when designing their research. A key message is that the particular assumptions underlying QCA set out the many possibilities for its use in small-N and large-N, theory-developing, and theory-testing research designs, focusing on

different aspects of causation. The chapter identifies situations in which different approaches to QCA may be helpful for public policy analysts.

QCA as a Technique

When situating QCA among other methods of comparative public policy, it is useful to distinguish QCA as a technique from QCA as an approach. As Thomann and Maggetti (2017) discuss, the QCA technique refers to formalized data analysis based on data-set observations involving truth table analysis and logical minimization (Rihoux and Ragin 2009). The QCA technique is unique in that it combines an analysis of complexity—preserving cases as configurations of attributes—with a systematic cross-case comparison in order to detect regularities (Berg-Schlosser et al. 2009; Engeli et al. 2014).

Assumptions of QCA

Thomann and Maggetti (2017) describe how explanatory uses of QCA can address research questions concerning the *causes of a given effect* in terms of set relations, that is (quasi-)necessary and/or (quasi-)sufficient conditions, and assuming complexity (Mahoney and Goertz 2006). A condition X is necessary (←) for an outcome Y if whenever Y is given, X is also given (that is, Y implies X; and, Y is a subset of X). X is sufficient (→) for Y if whenever X occurs, Y also occurs (that is, X implies Y; and, X is a subset of Y). QCA specifically models three aspects of *complexity*: Asymmetry, equifinality and conjunctural patterns (Berg-Schlosser et al. 2009; see also Mahoney et al. 2009). Asymmetry means that the conditions leading to the occurrence of an outcome can differ from those leading to its non-occurrence. Equifinality relates to the fact that many roads can lead to Rome: the same phenomenon can have different, mutually non-exclusive explanations. When focusing on conjunctural patterns, the researcher does not assume isolated effects of single variables. Instead the effect of a single condition might unfold only in combination with other conditions (Schneider and Wagemann 2012: 78;

see also Thiem et al. 2016; Baumgartner and Thiem 2017). For instance Damonte (2014) argues that mainstream assumptions about how environmental effectiveness results from interests and policymaking have produced erratic results. Instead she uses QCA to explain effectiveness through the interplay between policy tools and ideas (conjunctural patterns).

Steps of a QCA Analysis

The typical QCA analysis proceeds as follows (described in Thomann 2018; for comprehensive introductions, see, for example, Ragin 2008b; Rihoux and Ragin 2009; Schneider and Wagemann 2012). The selection, conceptualization and operationalization of cases, the outcome (dependent variable) and conditions (independent variables) follow the protocols of (qualitative) comparative research design and measurement validity (Adcock and Collier 2001; Radaelli and Wagemann 2018; Toshkov 2016). QCA is distinctive in that it requires an additional step in which social phenomena are translated into sets through a process called calibration (De Block and Vis 2018; Ragin 2008a). QCA can handle different types of sets in the same analysis, reflecting the nature of the underlying phenomena: dichotomous crisp sets (Ragin 1987), differences in degree as expressed in fuzzy sets (Ragin 2000, 2008b), and polytomous multi-value sets (Cronqvist and Berg-Schlosser 2009; Haesebrouck 2015). All sets establish a difference in kind between partial or full membership in the set (for example, partially or fully successful implementation), and partial or full non-membership in the set (for example, partially or fully unsuccessful implementation) (see also Dusa 2018; Thiem 2014).

QCA integrates parameters of fit to assess how 'perfect' (consistency) and empirically relevant (coverage) a set relation is (Thomann 2018). *Consistency* is the extent to which the results are in line with the statements of necessity or sufficiency. *Coverage* tells us about the empirical importance of necessary and sufficient conditions. The analysis of necessity (Schneider 2018) often starts with identifying simple conditions that are a superset of (that is, they are necessary for) the outcome. If no simple condition proves necessary, further simple conditions can be

added disjunctively until necessity is obtained (Dusa 2018).

The analysis of sufficiency is based on the so-called *truth table* which depicts all logically possible configurations of conditions (Thomann 2018). We can insert the cases into the truth table rows and identify empirically unobserved configurations (so-called logical remainders). If the set membership of all or enough cases in a truth table row is smaller than or equal to its membership in the outcome, then the row is identified as a sufficient configuration for the outcome. The *logical minimization* process then serves to identify the shortest possible expression depicting the configurations that imply the outcome—the solution term. For example, let the Boolean multiplication sign * denote the logical AND, + the logical OR, and the tilde sign ~ the logical NOT. It is easy to see that A*B*C + A*B*~C can be reduced to A*B (for detailed descriptions, see Baumgartner and Thiem 2015; Dusa 2018; Schneider and Wagemann 2012).

QCA in Comparative Public Policy Analysis

The choice of a given method should follow the research question at hand (Schneider and Wagemann 2012; Toshkov 2016). There seems to be a clear relationship between prominent research questions that arise in public policy and the kind of patterns QCA enables researchers to identify (for example, Befani and Sager 2006; Engeli et al. 2014; Fischer and Maggetti 2016; Gerrits and Verweij 2016; Maggetti et al. 2012; Rihoux et al. 2011; Varone et al. 2006). This theory-methods-fit has specific reasons and limitations (see Table 1) (Howlett et al. 1995; Jann and Wegrich 2007; Knill and Tosun 2012; Sabatier and Weible 2017).

Table 1: Applying QCA to Study Policy Processes

Process	*Research questions, theories, and the strengths and limitations of the QCA technique*
Problem definition and agenda-setting	*Research questions* Why do perceptions and definitions of policy problems change over time/vary from country to country? How do actors influence the definition of problems? Why are certain problems ignored while others are placed on the agenda? *Prominent theories and frameworks* Multiple Streams (Kingdon 1984), Punctuated Equilibrium (Baumgartner and Jones 1993; True et al. 1999), Policy Feedback (Pierson 1993) *Strengths* **Complexity**: Models conjunctural coupling of multiple streams (Sager and Thomann 2017), contingent effects of issue attention and issue framing on the policy agenda (Dekker and Scholten 2017) **Case sensitivity**: accounting for rare or non-events (ignored problems) through theory-guided case selection is possible (Goertz and Mahoney 2006) *Limitations* QCA technique might not capture: - Changing agendas over time - Cognitive processes under lying the formation and change of perceptions and preferences
Policy formulation and adoption	*Research questions* How do actors come to formulate policy solutions to policy problems? How do policy decisions come about? Why are some options preferred over alternative options? How can policy outputs, the way(s) in which they change over time, and variation outputs and their changes be explained? *Prominent theories and frameworks* Advocacy Coalition Framework (Sabatier 1988), Institutional Analysis and Development Framework (Ostrom 2011), Policy Diffusion (Braun and Gilardi 2006), Social construction of target groups (Schneider and Ingram 1993), policy narratives (Jones and McBeth 2010) *Strengths* **Complexity**: Models constellations of stakeholders and coalitions, the interplay between institutions and political interest representation, contextual scope conditions for causal relationships, combinations of target group characteristics, contextual contingency of narratives; non-decisions can have different explanations than decisions; several paths to policy decisions and change are possible **Causes of effects**: identifies conditions that bring about policy decisions, outputs and change *Limitations* QCA technique might not capture: - Changing explanations for policies over time - Processes underlying decision-making and narratives

Process	*Research questions, theories, and the strengths and limitations of the QCA technique*
Policy implementation	*Research questions* Why do certain policies succeed at being carried out in practice and why do others fail?? How do policies change when put into practice? Which factors account for variance in policy implementation? How do political, administrative and societal actors interact in policy implementation? *Prominent theories and frameworks* Conditions for effective implementation (Sabatier and Mazmanian 1980), ambiguity-conflict-model (Matland 1995), Forward and backward mapping (Elmore 1985), integrated model of policy implementation (Winter 2003), Street-level bureaucracy (Lipsky 1980/2010), multi-level governance (Hooghe and Marks 2003), goodness of fit (Börzel and Risse 2003) *Strengths* **Set relations**: captures necessary and sufficient conditions (for example, capacity/willingness) for compliance/successful implementation **Complexity**: Captures the interplay between multiple design/institutional/organizational characteristics with domestic politics and constellations of actors, allows for more than one path to successful implementation contingent on idiosyncratic context, captures multilevel or fit-misfit-configurations **Causes of effects**: the main goal of research is often to identify how successful implementation can be guaranteed; complex interplay of variables more insightful than isolated effects of causes *Limitations* The QCA technique might not capture: - Processes underlying behavior of implementing agents
Policy evaluation and termination	*Research questions* How can policy effects (outcomes and impacts) be identified and improved? Under what conditions does the policy (not) achieve its goals? What are the effects of different policy measures? Which factors explain variation in policy effects? *Prominent theories and frameworks* Context-mechanism-outcome (CMO) (Pawson and Tilley 1997), utilization-focused evaluation (Patton 1997), five criteria for policy evaluation (Knöpfel et al. 2011), logic models (Funnel and Rogers 2011), regulatory impact assessment (Radaelli and De Francesco 2010) *Strengths* **Set relations**: captures complex necessary and sufficient conditions (for example logic models) for goal achievement (outcomes and impacts) **Complexity**: complexity is a core assumption of evaluation theories; Captures CMO configurations, input-output-outcome-impact configurations, allows for several paths to successful goal achievement, different explanations for success and failure possible; average effects often irrelevant for practitioners who seek to achieve certain results **Causes of effects**: the main goal of research is often to identify how goal achievement can be achieved, or how certain outcomes can be prevented **Case sensitivity**: identifies pathways to success even if rare *Limitations* Inherent limits in isolating causes of policy impacts QCA technique does not capture: - The extent of the impact of a certain measure - Processes underlying behavioral change of target groups

Sources: own illustration drawing from Knill and Tosun 2012; Sabatier and Weible 2017.

Advantages of QCA for Public Policy Analysis

The first main advantage of QCA for public policy analysis is that the *notions of necessity and sufficiency can often accurately capture the analytic interests* of studying decision-making, implementation and evaluation outcomes (Rihoux et al. 2011). These interests may include core requirements for achieving certain results (necessity). For example, public sector organizations might want to know what they need to do to ensure their employees are willing to implement a given policy (necessity). Or policy researchers focus on the situations in which particular outcomes—for example, the coupling of multiple streams—come about (sufficiency). In line with goal-oriented policy analysis, QCA techniques

> 'allow policy analysts or evaluators to examine under which conditions a specific policy would be effective or not. (…) QCA produces 'deterministic' results that are applicable to groups or clusters of cases, in the form of: 'this given combination of conditions leads to the outcome (say: a policy success) in such and such cases; by contrast, this other given combination of conditions does not lead to the outcome (say: a policy failure) in such and such cases'' (Engeli et al. 2014: 89; see also Rihoux et al. 2011).

The second main advantage of the QCA technique is that in *modelling complexity*, it 'moves away, quite radically, from simplistic, probabilistic causal reasoning' (Berg-Schlosser et al. 2009: 8-9; Ragin 1987). Major theories of the policy process often include an assumption about complexity, especially in policy implementation and evaluation (Sabatier and Weible 2014; Emmenegger et al. 2013; see also Rihoux et al. 2011: 15). In bringing about behavioral change, factors such as polity, policy and politics never act in isolation, or as mutually independent variables (Sager and Andereggen 2012). Instead QCA can produce empirically well-grounded, context-sensitive evidence about policy instruments (Befani and Sager 2006; Pattyn et al. 2017; Rihoux et al. 2011). Rather than following a 'standard recipe', policy effectiveness often depends upon a blend of unique ingredients, national/regional settings, sector-specific features,

and cultural, political and administrative traditions (Engeli et al. 2014: 89; Patton 1997; Thomann 2018). Identifying conjunctural patterns helps formulate useful policy recommendations, such as appropriate 'policy mixes' to achieve a given policy goal (Engeli et al. 2014: 88; for example, Thomann 2018); or they capture the intersectionality characterizing disadvantaged target groups (Rihoux et al. 2011: 56; Ragin and Fiss 2017; Schneider and Ingram 1993). According to realistic evaluation approaches, a political program can result in different outcomes depending on the context and assuming equifinality (Befani and Sager 2006; Falletti and Lynch 2009; Gerrits and Verweij 2018; Pawson and Tilley 1997).

The third main advantage of QCA is that it allows for the *systematic analysis of case study material within a quasi-experimental design*—arguably a typical research setting in policy analysis. The objects of interest for policy researchers and practitioners are often '(…) 'naturally' limited in number: nation states or regions, different kinds of policies in different states, policy outputs and outcomes, policy programmes, policy styles, policy sectors, etc.' (Rihoux et al. 2011: 17). QCA offers procedures for systematic comparison of the case study material (for example, policy programmes) in a small- or medium-N design, while aiming to achieve a middle-range generalization. It allows for cross-national, cross-regional and cross-sectoral comparisons of macro-level (such as countries), meso-level (such as collective organizations) and micro-level (such as policy players) phenomena, nested within multi-level systems such as the European Union (EU), the Organisation for Economic Co-operation and Development (OECD), regions, countries and municipalities (Engeli et al. 2014: 89). In contrast with classic comparative case studies, this versatility of the QCA technique '(…) opens up the possibility of achieving more parsimonious explanations for qualitative comparative research on a larger number of cases. (…) and so places QCA into a more cumulative knowledge research approach' (Engeli et al. 2014: 86-87).

Limitations of QCA for Public Policy Analysis

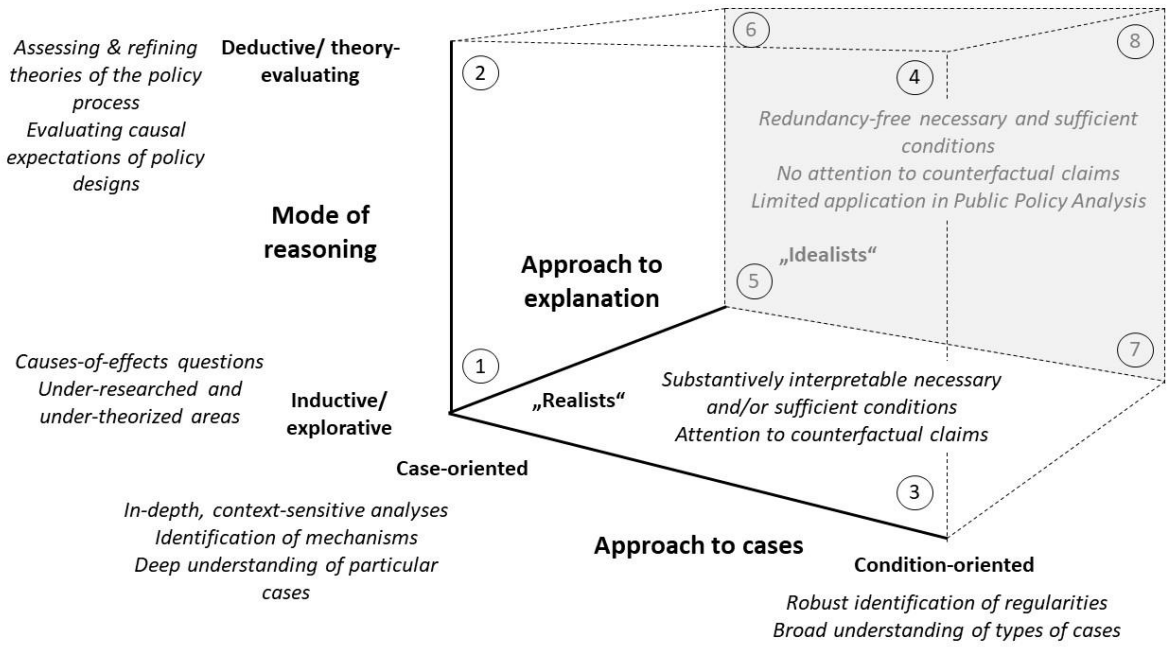
One limitation of the cross-sectional QCA technique is that it does not easily deal with dynamic elements of the processes underlying policy outcomes and their evolution over time (Fischer and Maggetti 2016). Multi-method approaches to QCA help integrate dynamic elements. Recent advances include temporal QCA (Caren and Panofsky 2005), panel-data QCA (Hino 2009; Garcia-Castro and Ariño 2016) and the systematic integration of process tracing through set-theoretic multi-method research and sequence analysis (Rohlfing and Schneider 2013, 2016; Williams and Gemperle 2017). Moreover, QCA is case-sensitive and not a suitable method for identifying average effect sizes (Tanner 2014) such as the precise effect size of a reduction of the education budget on disadvantaged target groups (Knöpfel et al. 2011; Radaelli and De Francesco 2010). Deriving general theories about policy phenomena or broad generalizations about populations is not usually possible due to the case-sensitivity and contingency of QCA results. Instead QCA is best located in the more general area of 'middle range' theorizing in social research (Befani 2013, Berg-Schlosser et al. 2009).

Approaches to QCA in Comparative Public Policy

As Thomann (2018) highlights, QCA does not allow researchers to simply input data and let software find the solution (Berg-Schlosser et al. 2009). Rather QCA demands researchers be accountable and transparent about the choices they make regarding selecting and processing cases and variables, choosing tools, intervening during the analysis, and engaging in causal interpretations and generalization. Much of what makes a 'good' QCA relates to these processes. QCA as an approach includes fundamental questions of research design, that is, 'the processes before and after the analysis of the data, such as the (re-)collection of data, (re-)definition of the case selection criteria, or (re-)specification of concepts' (Schneider and Wagemann 2012: 11; see Peters 1998; Thomann and Maggetti 2017; Toshkov 2016). QCA is

inherently a multi-method approach (Ragin 1987; Rihoux et al. 2011: 55). Thomann and Maggetti (2017) note that many current QCA uses do not seem to align with the original, case-oriented, inductive approach to QCA. There are now several approaches to QCA, which differ in three main ways: in the approach to cases, explanations and modes of reasoning. The remainder of this chapter describes these approaches as introduced by Thomann and Maggetti (2017). It discusses their application to the comparative analysis of public policy using examples of studies published since 2014 (see Figure 1).

Figure 1: Approaches to QCA in Comparative Policy Analysis



Source: adapted from Thomann and Maggetti (2017) and Schneider (2018).

A Case-oriented or Condition-oriented Approach to Cases

All QCA studies are configuration-oriented since cases are conceived of as a holistic configuration of attributes (Berg-Schlosser et al. 2009; Rihoux 2013). However, QCA approaches differ in the emphasis researchers put on cases as an object of inquiry (Greckhamer

et al. 2013; Thomann and Maggetti 2017).

The Case-oriented Approach

As Thomann and Maggetti (2017) outline, the focus of the traditional case-oriented approach is close analysis of particular cases using deep contextual knowledge. In addition to cross-case inference, in-depth case knowledge helps establish measurement and internal validity. It emerges from an intensive qualitative engagement with the cases often based on purposively selected small- to medium-N samples (Berg-Schlosser and De Meur 2009). In-depth knowledge of cases, often acquired during primary data collection such as interviews and document analysis, helps researchers minimize measurement error ex-ante, mitigate potential problems of limited diversity, and can clarify causally interpretable aspects of QCA results (Beach and Rohlfing 2018; Rohlfing and Schneider 2013; Schneider and Rohlfing 2013, 2016).

According to Thomann and Maggetti (2017), under such a case-oriented approach, cases are selected because obtaining in-depth knowledge about them is relevant for answering the research question (Mahoney and Goertz 2006). The theoretical criteria determining the relevance of the cases to the research question also constitute the scope conditions for the results; that is, the specific, explicitly defined empirical contexts in which observed relations or hypotheses apply (Byrne and Ragin 2009; Foschi 1997; Goertz and Mahoney 2006; Schneider and Rohlfing 2016). Case-oriented studies usually generate middle range rather than grand theories (Mahoney and Goertz 2006), which cannot be applied to other empirical contexts without further testing. This type of generalization is also called ‘limited,’ ’historical’ or ‘contingent’ (Blatter and Blume 2008; Rihoux and Ragin 2009).

The Condition-oriented Approach

Thomann and Maggetti (2017) point out that condition-oriented applications focus on cases primarily in terms of a well-defined set of conditions. The results are interpreted mainly as patterns across cases and are not complemented with an in-depth, qualitative treatment of

individual cases (Seawright and Collier 2010; Greckhamer et al. 2013). This approach typically uses QCA on large samples, which are often implicitly or explicitly deemed representative. This facilitates resorting to complementary statistical techniques and parameters to evaluate QCA models (Cooper and Glaesser 2015; Fiss et al. 2013; Greckhamer et al. 2013). In the absence of qualitative case knowledge, and/or a priori guidance on the best model specification, a number of complementary strategies can assist to ensure measurement and internal validity (for example, Cooper and Glaesser 2015; Skaaning 2011). These strategies depend on the type of error that is expected to prevail (Maggetti and Levi-Faur 2013). According to Thomann and Maggetti (2017), a challenge for condition-oriented studies can be that inference is neither assisted by inferential statistics, nor by comprehensive case intimacy. A large N alone does not ensure generalizability. A strong condition-orientation entails that researchers support their inferences with tools that typically work best on a relatively large number of cases (for example Braumoeller 2015; Eliason and Stryker 2009; Meuer et al. 2016; Ragin 2000; Rohlfing 2018).

Discussion

Rather than the sheer number of observations, Thomann and Maggetti (2017) argue that what distinguishes these two approaches is the relative closeness to or distance from empirical cases. Whereas the case-oriented approach emphasizes the complementary use of within-case knowledge, the condition-oriented approach predominantly relies on cross-case inference, focused on relations between sets and based on knowledge of conceptual relationships rather than knowledge of particular cases. This orientation towards conditions is sometimes found in relatively small-N analyses. For example Jano (2016) analyzes 34 cases in which pre-acceding southeast European countries did or did not comply with EU law. Despite the medium number of cases, the study relies little on case knowledge. Instead, it focuses on cross-case inferences which are tested extensively for robustness. Moreover a large number of cases does not preclude an interest in particular cases. Namely, set-theoretic multi-method research provides case

selection criteria to assist in making inferences derived from cross-case comparisons with targeted within-case studies (Beach and Rohlfing 2015; Mikkelsen 2015; Rohlfing and Schneider 2013; Schneider and Rohlfing 2013, 2016). For instance Thomann (2018) analyzes a relatively large set of 95 cases of customized implementation of EU food safety policies. The interpretation of results relies on in-depth studies of typical and deviant cases.

Usefulness for Public Policy Analysis

The *case-oriented approach* is useful for public policy scholars who want to perform in-depth analyses that will enable them to uncover causal mechanisms, and for scholars who work on subjects and questions where they expect the particular context to be highly relevant (Braun and Gilardi 2006; Falletti and Lynch 2009). For instance, Fischer (2015) uses QCA to study how institutions grant opportunities and impose constraints on actors when structures with a dominant coalition or with competing coalitions emerge. Fischer does this through an in-depth study and discussion of eleven important decision-making processes in Switzerland between 2001 and 2006.

Sager and Andereggen (2012; also Befani and Sager 2006) highlight that this case-oriented approach resonates particularly well with the assumptions of realist evaluation approaches which focus on the singularity and wholeness of each case (Pawson and Tilley 1997). This holistic, generative perspective is directly reflected in the way in which case-oriented QCA studies constantly use knowledge of individual cases in order to interpret the results (Sager and Andereggen 2012). Contingent generalization parallels the realist synthesis approach to generalization according to which the policy community 'is not offered a 'best buy' (approach 'x' or case 'y' seems to be the most successful) but a tailored, 'transferable theory' (this programme theory works in these respects, for these subjects, in these kinds of situations)' (Sager and Andereggen 2012: 64). In this vein Pattyn and Brans (2014) study the conditions that promote or impede the application of evaluation quality assurance mechanisms in 18

Flemish (Belgian) public sector organizations. Similarly, van der Heijden (2015) identifies three types of roles governments play in the outcomes of voluntary environmental programs in Australia, the Netherlands and the United States, and illustrates these roles using interview excerpts.

Conversely, the *condition-oriented approach* is less likely to be found in public policy analysis. This may partly be due to the prevalence of small-and medium-N data situations. Public policy scholars would choose a condition-oriented approach if the main goal of their analysis were to identify regularities that appear robustly in a range of cases. For example Thomann et al. (2018) evaluate central assertions of bottom-up implementation theory about the role of discretion in the willingness of frontline workers to implement public policies. Two large samples of Dutch street-level bureaucrats in two different policy sectors provide broad and robust support that perceived discretion is necessary for the motivation of policy implementers. Moreover, a condition-oriented approach enables scholars to gain a broad understanding of different *types* of policies, organizations, et cetera. For example, Boon and Verhoest (2014) explain reported overhead level by identifying three different types of agencies in terms of formal autonomy, result control, agency size and task (N=44). Simultaneously, the absence of case knowledge poses significant challenges in performing the back-and-forth between ideas and evidence that QCA requires from analysts (see Wagemann et al. 2016). Therefore case-oriented applications may remain the more attractive option for policy scholars.

A Theory-generating or Theory-evaluating Mode of Reasoning

Thomann and Maggetti (2018) also highlight that QCA studies differ in their modes of reasoning. The QCA technique can be fruitfully applied either to an exploratory, inductive research design, or a confirmatory, deductive research design (Eliason and Stryker 2009). Both modes of reasoning are valuable ways of contributing to knowledge and/or theory.

The Exploratory/Inductive Approach

According to Thomann and Maggetti (2017), traditionally, QCA is often employed to 'help the researcher generate some new insights, which may then be taken as a basis for a further theoretical development or for reexamination of existing theories' (Berg-Schlosser et al. 2009: 16). Thus the bulk of QCA studies in public policy analysis adopt an exploratory or inductive approach that primarily aims to build or modify a hypothesis or abstract concept after the analysis (Rihoux et al. 2011). The studies start with data analysis from which specific conclusions or broader theoretical statements can be derived (Maggetti et al. 2012). QCA can be a powerful tool in generating set-theoretic hypotheses that account for causal complexity.

The Deductive Approach

In contrast to this traditional theory-generating approach, Thomann and Maggetti (2017) point out that QCA applications in public policy research increasingly explicitly formulate a priori expectations against which they compare their results. The primary aim of this deductive approach to QCA, which differs from traditional hypothesis testing, is to evaluate existing, rather than to generate new knowledge. It starts out with an expectation which is then compared to and ultimately supported or refuted by empirical observations. This deductive approach to QCA is especially useful when a rich body of theoretical and substantial knowledge can be assessed and refined from a set-theoretic lens (Eliason and Stryker 2009). Expectations assessed with QCA must be formulated in line with set-relational patterns of (quasi-)necessity or (quasi-)sufficiency and/or aspects of complex causation (Fischer and Maggetti 2016; Schneider and Wagemann 2010, 2012; Thiem et al. 2016).

Thomann and Maggetti (2017) argue that deductive QCA studies can inform us about the capacity, relevance, or relative strength of the theories used to explain and understand the case(s) under study, and that deductive QCA studies typically retain an iterative element (Blatter and Blume 2008). Formal set-theoretic theory evaluation, as developed by Ragin (1987)

and refined by Schneider and Wagemann (2012), is an especially interesting tool for this approach. It enables researchers to systematically evaluate set-theoretic propositions against the empirical results, based on the Boolean intersections of the solution terms, the theoretical propositions, and their negation. Other than traditional deductive hypothesis testing, this enables researchers to answer four questions. First, which parts of the hypothesis are supported by the findings? Second, in which directions should the hypothesis be expanded (exploratory)? Third, which parts of the hypothesis should be dismissed? Fourth, which cases are the most relevant for ex-post within-case analysis? Schneider and Wagemann (2012) show how researchers can account for how many cases are members of the outcome and the non-outcome in the different intersecting areas (examples in Sager and Thomann 2017; Thomann 2015).

Discussion

Thomann and Maggetti (2017) note that while these two approaches adopt a different mode of reasoning, they neither correspond to the ideal notions of inductive designs, nor to the ideal notions of deductive research designs (Eliason and Stryker 2009). First, as an approach, QCA has an inherent iterative element that involves conceptual and theoretical considerations: researchers engage in a back-and-forth between prior knowledge and case knowledge. Theories, explanatory frameworks, concepts and analytic decisions are refined based on preliminary empirical insights gained throughout the analysis; sampling and measurement decisions are re-specified using theoretical or conceptual insights (Berg-Schlosser et al. 2009; Schneider and Wagemann 2012). As deep theoretical knowledge should drive analytic decisions, 'QCA is ill-equipped for analytic induction' (Engeli et al. 2014: 88). Second, truth table analysis inherently entails a search for results, rather than simply testing the consistency and coverage of previously defined set-theoretic hypotheses (Thiem 2016a).

Usefulness for Public Policy Analysis

Exploratory QCA analyses are attractive for public policy scholars who operate in under-

researched or under-theorized areas. As Gerring (2004: 349) notes, 'path-breaking research is, by definition, exploratory.' Additionally, as Table 1 highlights, many prominent research questions in comparative public policy analysis are of the 'causes of effects' type (Goertz and Mahoney 2006). Especially if the goal is to comprehensively understand why some hitherto unexplored outcome occurs, it is useful to be open to new, unexpected trajectories. For example, Cacciatore et al. (2015) use a strongly exploratory approach to assess whether and to what extent different aspects of the EU2020 strategy have influenced the National Reform Programs, resulting in patterns of 'clustered Europeanization'. Hinterleitner et al. (2016) explicitly prefer an exploratory approach to explain the International Monetary Fund's evaluation of national austerity programs, arguing that established theoretical approaches do insufficient justice to the context of the Eurozone.

More theory-led QCA applications are becoming increasingly common in public policy analysis (Sager and Thomann 2017; Rihoux et al. 2011; Thomann 2015). This allows scholars to assess and refine the various theories of the policy process. For instance Pahl-Wostl and Knieper (2014) assess the ability of 27 water governance systems to deal with the climate change adaptation challenge. Their assessment is based on a strongly theory-led typology of the coordination and centralization of governance regimes. Shahidi (2015) uses QCA to explain the cross-national diversity of labor market policy responses to the Great Recession in 18 advanced welfare states. QCA enables them to combine the assertions made in a number of theoretical frameworks which attempt to explain cross-national patterns of welfare state recommodification in the aftermath of economic crises. Results suggest that

> 'theories of welfare state change that attribute theoretical centrality to political and institutional factors do not provide a compelling explanation for patterns of labour market reform observed since the onset of the economic crisis' (Shahidi 2015: 659).

As Table 1 illustrates, many public policy theories – for example, the multiple streams

framework (MSF) (Kingdon 1984) or Sabatier and Mazmanian's (1980) framework of necessary and sufficient conditions for successful policy implementation – implicitly or explicitly entail a set-theoretic, configurational logic or other aspects of causal complexity. Sager and Thomann (2017), for example, assess the applicability of MSF to explain differences in the labor market integration of asylum seekers in Swiss regions. Employing QCA enables them to assess the coupling of the problem stream, the policy stream, and the politics streams, and to integrate the role of institutional policy paths in the MSF.

A theory-driven observation is also a key feature of realistic evaluation approaches which emphasize the importance of building on theory in systematic review (Pawson and Tilley 1997). For practitioners 'these techniques also allow one to test, both ex post and ex ante, alternative causal (policy intervention) models leading to a favorable/unfavorable policy output and favorable/unfavorable policy outcomes' (Rihoux et al. 2011: 16). The task of evaluation is to gather evidence to see if the process occurs as planned and, if it does not, to amend the theory to account for the divergent outcomes (Sager and Andereggen 2012). Gerrits and Verweij's (2018) comprehensive guide for using QCA to evaluate complex infrastructure projects illustrates this.

Emphasizing Substantively Interpretable or Redundancy-free Models

Finally, Thomann and Maggetti (2017) highlight the fact that there are different ideas about what makes a good and valid explanation using QCA. These questions become salient as limited empirical diversity—the fact that not all logically possible configurations are observed in reality—focuses researchers' attention on the possibility of making counterfactual claims. Accordingly, two diverging protocols to analyze necessity and sufficiency have been put forward.

The QCA Realists

According to Thomann and Maggetti (2017), the traditional, more widespread approach emphasizes the *substantive interpretability* of QCA results from a practical research perspective in which social research 'is built upon a foundation of substantive and theoretical knowledge, not just methodological technique' (Ragin 2008b: 173). Proponents of this approach — Schneider (2018) calls them 'realists' — posit that a good explanation should be plausible and free of logical contradictions. Hence, the purpose of QCA is 'to find meaningful super- and/or subsets of the phenomenon to be explained' (Schneider 2016: 2). This approach views QCA results primarily as supersets or subsets of the outcome that differ in their complexity (Mahoney 2008). Parsimonious and intermediate solution terms include configurations that were not empirically observed, but might occur in other settings. The problem with choosing counterfactual cases may be because there is a tendency to draw 'too many inferences on too little information' (Schneider and Wagemann 2016: 6; Wagemann et al. 2015), or making inferences that are difficult to interpret.

When analyzing sufficient conditions, QCA realists highlight that a parsimonious solution entails the assumption that all logical remainders that help eliminate redundancies are sufficient for the outcome—regardless of the 'goodness' of the counterfactual. In order to ensure accurate results, this approach requires that counterfactual claims be carefully justified (Emmenegger 2011). This can either entail deriving a complex (or conservative) solution that assumes that empirically unobserved configurations (logical remainders) are not sufficient for the outcome; or an intermediate solution based on counterfactual arguments (Ragin 2008b; Schneider and Wagemann 2012, 2013, 2015). Directional expectations, based on theoretical and empirical knowledge, help distinguish plausible (easy) from implausible (difficult) counterfactuals (Standard Analysis, SA; Ragin 2008b). Untenable and other logically impossible arguments can be avoided through an appropriate treatment of remainders with Enhanced Standard

Analysis (ESA) (Schneider and Wagemann 2016; for applications see Sager and Thomann 2017; Thomann 2015).

As Thomann and Maggetti (2017) explain, QCA realists interpret selected necessary conditions as crucial explanatory factors without which a given event could not have occurred (Goertz 2006a; Goertz and Starr 2003; Schneider and Wagemann 2012; Schneider 2018). Supersets of the outcome can only be interpreted as meaningful necessary conditions if there are strong and plausible arguments that the conditions combined by the logical OR represent some higher-order construct; for example by operating as functional equivalents (Goertz and Mahoney 2005; Schneider and Wagemann 2012: 74; 2010). The empirical importance of necessary and sufficient conditions is assessed in a second analytic step: necessary conditions become empirically more important as they also approximate a sufficient condition, and sufficient conditions become more important as they approximate a necessary condition (Goertz 2006a; Mahoney and Sweet Vanderpoel 2015; Schneider 2018).

The QCA Idealists

Thomann and Maggetti (2017) describe another, contrasting approach (the 'idealists' according to Schneider 2018) which highlights that 'the crucial mechanism of QCA that turns necessary and sufficient conditions into causally interpretable necessary and sufficient conditions is the elimination of redundancies' (Thiem and Baumgartner 2016a: 3). QCA idealists view QCA results primarily as causal claims. A 'configurationally correct' QCA solution only contains causally relevant factors (Thiem and Baumgartner 2016b; Baumgartner and Thiem 2017). Such Boolean difference-makers are reliably revealed only by parsimonious solutions. While a host of supersets or subsets of an outcome exist, this approach derives causality only from conditions that are *both* minimally sufficient *and* contained in a minimally necessary condition for an outcome. That is, only a parsimonious solution that effectively eliminates all factors that are causally irrelevant (redundant) and has a very high coverage (indicating necessity) is causally

interpretable (Baumgartner 2015; Thiem and Baumgartner 2016b; Baumgartner and Thiem 2017).

According to this approach, intermediate and conservative solution formulas cannot be causally interpreted because they contain conditions that can be further eliminated (Baumgartner 2015). Hence different degrees of complexity are more than just a matter of specificity—they are about 'false positives'. According to this approach, it is possible that an intermediate or conservative solution incorrectly attributes causal relevance to some factors, whereas the parsimonious solution does not (Baumgartner 2015; Thiem 2016b). QCA idealists dissociate the concept of necessity without sufficiency from that of causality. Therefore, they consider it meaningless to propose criteria for the causal interpretation of necessary (or sufficient) conditions that are identified prior to minimization and are not redundancy-free (Thiem and Baumgartner 2016a).

Discussion

According to Thomann and Maggetti (2017), these two approaches present contrasting strategies to maintain internal validity when being faced with 'noisy' social science data (Schneider and Wagemann 2012). They also diverge on the existence of criteria that render (certain) necessary and sufficient conditions causally interpretable. Yet, both approaches refer to the INUS[2] theory of causation (Ragin 2000, 2008b; Schneider and Wagemann 2012; Thiem et al. 2016; Thiem and Baumgartner 2016a). QCA realists and idealists also agree that 'a set relation alone is not enough to postulate a cause' (Schneider 2016: 2; Thiem et al. 2016). The use of the QCA algorithm only describes the consequences attributable to some treatment, but

[2] Insufficient but Non-redundant parts of Unnecessary but Sufficient (INUS) conditions (Mackie 1965; Mahoney et al. 2009).

does not provide a full explanation. That is, it does not provide a clarification of the mechanisms that explain why the (potentially) causal relationship holds.

At the time of writing, many QCA methodologists prefer the realist approach (Ragin 2008; Rihoux and Ragin 2009; Schneider and Wagemann 2012; Schneider 2018). However, recently there has been some critique of the emphasis on substantive interpretability when engaging in causal interpretations (Thiem 2016). A recent study using simulated datasets posits that intermediate and conservative solutions sometimes produce 'incorrect' results, whereas parsimonious models are always correct (Baumgartner and Thiem 2017). Written by 'idealists', this study defines 'correctness' as (amongst other things) the absence of causally irrelevant factors; only parsimonious solutions never contain causally irrelevant conditions. This methodological debate rests on divergent conceptions of what QCA results can or should tell us (see Schneider 2018).

Although it is not possible to resolve this debate here, it is arguable that the approach emphasizing substantive interpretability usually resonates more with the research interests of public policy analysis. This argument relies on the premises that a) typically there is limited diversity in public policy studies and b) public policy scholars usually want to achieve some degree of, though modest, generalization beyond the analyzed cases. A fictional, necessarily simplistic example may illustrate this. Let us assume that we use conditions A, B and C to explain outcome Y, based on the truth table displayed in Table 2. The table contains one configuration that consistently results in outcome Y (row 1 with outcome value 1) and three configurations that do not consistently imply the outcome (rows 2-4 with outcome value 0). There are four logically possible combinations that we did not observe: rows five to eight marked with a question mark ('?') in the outcome column (the so-called logical remainders). Let us also assume that we know the 'true' causally sufficient model (which in reality, with observational data, we never do):

M: A*B → Y

Table 2: Fictitious truth table

Row	A	B	C	Outcome
1	1	1	1	1
2	0	0	0	0
3	0	0	1	0
4	0	1	0	0
5	0	1	1	?
6	1	1	0	?
7	1	0	1	?
8	1	0	0	?

Grey: simplifying assumption for PS M1.

Due to the presence of limited diversity, the QCA analysis might not be able to identify the true model M. Indeed, the above truth table yields one conservative (CS) and two parsimonious solution models (PS):[3]

CS: A*B*C → Y

PS M1: A → Y

PS M2: B*C → Y

The conservative solution CS was not able to detect that condition C is irrelevant for the production of outcome Y. This finding is an artefact of the available evidence, where all cases displaying A, B and Y also display C. Crucially, QCA idealists consider the CS *incorrect*

[3] Since this is an abstract example which does not lend itself to theoretical assumptions, I abstain from discussing the intermediate solution here.

because the CS contains C even though C is, in truth, a causally irrelevant factor (Baumgartner and Thiem 2017). According to QCA idealists this incorrect result arises because of the counterfactual assumption that all logical remainders are *not sufficient* for the outcome (outcome value 0). According to Baumgartner and Thiem (2017), if confronted with imperfect data, QCA cannot be expected to produce 'perfect' or complete results. Instead *at least one* of the identified models must not contain any causally irrelevant factors.[4] PS M1 reads A → Y. Under an approach emphasizing redundancy-free models, it is correct that condition A is *causally relevant* for outcome Y. Hence, PS M1 is correct whereas the CS is incorrect. In this approach, it does not matter that PS M1 is incomplete because it fails to detect the causal relevance of condition B; QCA idealists prioritize the principle of non-redundancy over the completeness of INUS configurations.

In contrast, QCA realists contend that in the true model M, A alone is not sufficient to reliably imply Y. The INUS condition A *has* to combine with the INUS condition B; this contingency is a core assumption of conjunctural causality. Hence, it seems short-sighted to claim that PS M2 is 'correct' under the assumption of INUS causation. For QCA realists, the empirical evidence in Table 2 alone does not suffice in concluding that B is irrelevant (as is C, for that matter). QCA realists contend that the PS M1 requires the (potentially illogical or untenable) counterfactual assumption that rows 6, 7 and 8 (had we observed them) would also have been sufficient for Y.[5] This assumption produces an overly simplistic model. Finally, the laws of logic dictate that if A*B consistently results in Y, then the combination A*B*C (as well as any

[4] PS M2 fails to do justice to M under any approach: not only does it fail to identify the causal relevance of A, it also grants causal relevance to condition C.
[5] PS M2 uses row five as a simplifying assumption.

other subset of A*B) is also sufficient for the outcome Y. Therefore for QCA realists, the CS is entirely correct, though it may be overly specific. The conservative solution is simply the shortest possible description of the empirically observed sufficient configurations, which, absent measurement error, *cannot* contradict the 'true' model M.

Usefulness for Public Policy Analysis

Policy scholars and practitioners face a trade-off between ensuring the completeness of INUS configurations at the cost of allowing for redundancies, and ensuring causal relevance, at the cost of potentially incomplete INUS configurations.

Parsimonious models may omit indispensable parts of the 'policy mix' that consistently prevents or enables an outcome. This may, for example, potentially result in recommendations for policymakers to focus on measures which, on their own, are not effective (Zhang 2017). Generally the approach emphasizing substantive interpretability can ensure that no causally relevant element is missing in the sufficient configurations. Naturally this aim requires QCA realists to avoid making counterfactual simplifying assumptions if there is neither empirical evidence nor a very plausible theoretical argument that a condition is irrelevant. For example Pattyn and Brans (2014: 370) outline that 'given the lack of available theoretical and empirical evidence to make plausible assumptions, we predominantly rely, however, on the type of complex solution.' Intermediate solutions are designed to avoid both over- and under-simplification (Ragin 2008). The limitation that some remaining elements could prove redundant should be made transparent. QCA realists are careful about engaging in causal interpretations; they often use case studies to shed light on underlying mechanisms and causal relevance (Schneider and Rohlfing 2013). For example Hooijer and Picot (2015) use the intermediate solution to analyze the institutional determinants that disadvantage immigrants in terms of poverty because it makes only relatively uncontroversial theoretical assumption. They complement their fsQCA with three short case studies to examine the causal mechanisms.

Conversely, the approach emphasizing redundancy-free models can be suitable if researchers seek to identify only conditions that are causally relevant, without bothering about whether these configurations are, in the 'true' solution, sufficient for the outcome *on their own*. Naturally, QCA idealists seeks to avoid counterfactual claims that make a redundant condition appear causally relevant. This can be justified, for example, when deciding whether or not to invest public money in policy measures. For example Nieto Morales et al. (2015) begin with the parsimonious solution, asking to what degree the availability of financial resources, in combination with other organizational characteristics, is a necessary precondition for compliance with reforms in governmental agencies. However, they then argue that the findings have no empirical foothold in their data and that they are difficult to defend from a theoretical point of view. It is worth noting that in the absence of the complete 'policy mix', the measures identified as causally relevant in the parsimonious model might be ineffective *in any context other than the one analyzed in the given QCA study.* The purpose of the approach may be defeated if potentially relevant conditions are eliminated from the solution formula since causal relevance is identified, but not necessarily (causal) sufficiency beyond the sample at hand (Zhang 2017). This can be a limitation when there is a practical research expectation to interpret QCA solutions as potentially transferable sufficient configurations for a (policy) outcome. Transparency about this limitation (for example by formulating strict scope conditions) is advisable.

Conclusions

For policy researchers interested in the analysis of necessary and sufficient conditions and in modelling complexity, QCA offers a remarkably flexible tool for pursuing diverse analytical interests. Conversely, QCA struggles to model dynamic processes over time as well as average effect sizes. Thomann and Maggetti's (2017) typology of QCA approaches allows public policy

scholars to identify when to use QCA for the purposes of generating or evaluating theories; using in-depth within-case knowledge, or focusing on 'types' of cases; focusing either on the parsimony or on the completeness of sufficient configurations.

In real-life research settings where the 'true' result is always unknown, QCA has limitations, much like any other method for empirical cross-case comparison (Berg-Schlosser et al. 2009: 10, emphasis added):

> 'Of course, QCA techniques do not guarantee the final grasp of the 'true' causal grounds of a given phenomenon because the issue of causality is a much more complex matter (…) Yet, if several competing theories try to explain the same result, QCA techniques will quickly disqualify the theories that are unable to discriminate correctly between cases with and without the outcome under study (…) among the remaining theories, those that best satisfy the 'parsimony principle' (Occam's 'razor') will emerge. (…) as Einstein put in his famous dictum: One should express things '**as simply as possible, but no simpler**'.'

As an inherent and unavoidable aspect of reality, limited diversity can cause QCA results to err in different directions (see also Braumoeller 2015; Rohlfing 2018). However, it is important to note that all QCA solution types contain an accurate description of the sufficiency patterns in the given dataset. Arguably, it is this observation that informs the advice of Engeli et al. (2014: 100):

> 'there is no rule that is set in stone for choosing one solution over the other. It is recommended to examine all three solutions (parsimonious, intermediate and complex) and to concentrate on the solution in which one has the most methodological confidence.'

Arguably, the elephant in the room here is neither a specific QCA solution type, nor the QCA method as such, but the prevalence of limited empirical diversity in the social world. Given

this, it is all the more important to be well aware of the strengths and limitations of choosing a specific QCA approach for public policy analysis, and the implications of that choice on the interpretation of the results.

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